



# REMEDIES: Co-Creating a Plastic Litter Free Future

## DELIVERABLE: D3.1

### TITLE: Delivery of cups, bottles & water demo installations

REVISION TABLE		
Document Version	Date	Modified sections- Details
0.1	26.08.2025	Draft to be revised
0.2	08.09.2025	Draft review from NTUA and CNR
0.3	10.09.2025	Final revision
1.0	13.09.2025	1.0 submission

Contractual Date of Delivery	14.06.2025 extended to 14.09.2025
Actual Date of Delivery	13.09.2025
Lead Contractor for this Deliverable	Alchemia-nova Greece
Author(s)	Maria Troullou (ANGR), Polymnia Dagtzidou (ANGR), Johannes Kisser (ANGR)
Participant(s)	Filip Miketa (BMI), Ivona Miketa (BMI), Leyre Hernandez (AITIIP), Lidia Garcia (AITIIP), Athanasia Tsertou (CIBOS), Elias Caracatsanis (CIBOS), Antonis Athanasiou (MCG), Giannis Lelekis (MCG), Milos Milosevic (EXIT), Ida Siljanovic (EXIT), Ambre Badique (SMILO), Andriani Galani (NTUA), Daphne Argyropoulou (NTUA)
WP contributing to the deliverable	WP3
Nature	DEM – demonstrator, pilot, prototyping
Version	V.1.0

#### Abbreviations

Acronym	Title
AITIIP	Aitiip Centro Tecnológico
ANGR	alchemia-nova Greece
AWG	Atmospheric Water Generator
BMI	Bio-Mi
BOD	Biochemical Oxygen Demand
COD	Chemical Oxygen Demand
D3.1	Deliverable 3.1
DoC	Document of Compliance
DRS	Deposit Reuse System
DS	Demo Site
DW	Dishwasher
EoL	End of Life
EPR	Extended Producer Responsibility



EXIT	Exit Foundation
GA	Grant Agreement
GMP	Good Manufacturing Practices
IHA	Impact Hub Athens
LCA	Life Cycle Assessment
MCG	Marine Conservation Greece
NFC	Near Field Communication
NTUA	National Technical University of Athens
P&ID	Piping & Instrumentation Diagram
PBAT	Polybutylene adipate terephthalate
PBS	Polybutylene Succinate
PEF	Product Environmental Footprint
PHAs	Polyhydroxyalkanoates
PHBV	Poly(3-hydroxybutyrate-co-3-hydroxyvalerate)
PLA	Polylactic Acid
PLC	Programmable Logic Controller
RFID	Radio-Frequency Identification
RO	Reverse Osmosis
SMILO	Small Islands Organisation
SUP/s	Single Use Plastic/s
T3.1/3.2	Task 3.1/3.2
WP	Work Package

## Executive Summary

The REMEDIES project addresses one of the most critical environmental challenges of our time: the pervasive presence of marine litter in the Mediterranean Sea(1) and the profound risks it poses on biodiversity, human health, and economies dependent on clean waters. Positioned within the framework of the EU Mission “Restore Our Ocean and Waters by 2030,” Deliverable 3.1 (D3.1) demonstrates the feasibility of upstream solutions to prevent waste before it enters the system. It emphasizes that the challenge is not merely one of waste management but of systemic overreliance on disposable plastics, particularly single-use cups and bottles that dominate in critical sectors(2). It advances the transition from single-use plastics (SUPs) toward scalable, circular, and sustainable models of consumption, emphasizing prevention, reuse, and citizen engagement.

To do so, D3.1 integrates the research and development of “sustainable, circular, safe and non-toxic products”(3) with Nature-Based Solutions (NBS) and sustainable materials management, complying with key EU directives and regulations, including Single-Use Plastics Directive (EU) 2019/904 and the Plastics Regulation, (EU)10/2011. By adopting a systemic approach to circular design methods, explicitly aligning with key EU policy priorities such as the Circular Economy Action Plan, the Waste Framework Directive, and the European Green Deal, D3.1 embraces the core principles of circular design to “eliminate waste and pollution at the source”, “circulate products and materials”, and “regenerate natural systems” (4).

Additionally, it operationalizes innovative materials, smart pathways to reuse, and decentralized water infrastructures not only to mitigate plastic waste but also reduce greenhouse gas emissions by lowering reliance on virgin materials, save water and energy through closed-loop cleaning and water refilling systems, strengthen social awareness and participation in circular practices, and finally provide new data streams on material use and reuse cycles, informing both science and policy.

Deployed in diverse Mediterranean contexts including a global tourist hotspot in Greece, a natural reserve in France, and a cultural festival in Croatia, D3.1 pilot demonstrators exemplify the power of combining technological innovation with circular business models to support coastal communities that are challenged by water quality and availability being more vulnerable to the impacts of climate change(5). Moreover, these interventions demonstrate the adaptability and scalability of the approach, confirming that the solutions developed are not only technically sound but also socially adaptable and environmentally effective. They highlight how different combinations of technologies and infrastructures can be tailored to address specific challenges, whether ecological sensitivity, tourism pressure, or mass cultural consumption. By showcasing flexibility and real-world performance, these pilots provide replicable models that point the way toward systemic solutions to Europe’s plastic problem.

Through this comprehensive framework, D3.1 advances a circular, resource-efficient, and climate-resilient design methodology that supports the EU’s transition to a circular economy, reporting the following key achievements:

**Reusable Cup and Bottle Systems:** Designed, produced and manufactured 25,000 reusable biobased cups and introduced reusable glass bottles as sustainable alternatives to disposable containers. These products meet strict technical and safety standards, demonstrating durability across multiple washing cycles while reducing lifecycle emissions compared to fossil-based plastics.

**Decentralized Washing-as-a-Service Infrastructures:** Large- and small-scale washing units were developed as the backbone of reuse ecosystems. Equipped with energy-saving and water-recovery technologies, coupled with advanced treatment systems (vertECO® and GRETA™), these infrastructures enable safe, efficient, and scalable cleaning of reusable containers.

**Digital Deposit–Return Systems (DDRS):** Innovative digital tools—comprising web platforms and mobile applications—were deployed to allow real-time monitoring of reusable cups and bottles. These systems enhance transparency, provide accountability through data-driven insights, and encourage active consumer participation and high return rates.

**Water Refilling Technologies:** Two complementary solutions were piloted to reduce reliance on bottled water: (i) an Atmospheric Water Generator (AWG) that harvests potable water directly from air humidity, and (ii) a smart water fountain offering high-quality drinking water. These installations provide practical, accessible alternatives to SUP bottles in public and outdoor spaces.

**Pilot Demonstrations in Three Contexts:** The integrated solutions were tested in real-world environments: A beach bar on Mykonos Island, Greece, combining reusable cups, washing infrastructure, and AWG refilling stations; the Sea Star Festival in Umag, Croatia, deploying reusable cups and cleaning under high-traffic conditions; Porquerolles Island in France, within a protected natural reserve, showcasing sustainable bottle and refilling solutions. These pilots validated not only the technical functionality but also the social acceptance and economic feasibility of reuse ecosystems.

**Data Generation for Science and Policy:** The technologies embed generated new and valuable data streams on material performance, reuse cycles, consumer behavior, and environmental impact. These insights inform ongoing scientific research, support EU policymaking, and contribute to future innovation in circular economy strategies.

In conclusion, D3.I demonstrates that upstream prevention of SUP pollution is both technically feasible and socially viable. By combining biobased product innovation, decentralized infrastructures, digital accountability tools, and behavioral engagement, the deliverable lays the foundation for a new paradigm in plastic prevention. It establishes pathways for replication and scaling, advancing Europe’s transition toward a zero-pollution, circular, and climate-resilient economy, while actively contributing to the EU’s mission of restoring oceans and waters by 2030.

## Table of Contents

Table of Contents.....	6
Table of Figures.....	9
Table of Tables.....	11
<b>I Introduction.....</b>	<b>13</b>
<b>2. Reusable Biobased Cups.....</b>	<b>15</b>
<b>2.1 Initial Design Review.....</b>	<b>15</b>
2.1.1 Design Brief and Concept.....	15
2.1.2 Product Analysis.....	15
2.1.3 Materials Selection.....	16
2.1.4 Benchmark Analysis.....	17
2.1.5 Technical Specifications.....	18
2.1.6 Preliminary Design.....	19
<b>2.2 Bioplastic Mixtures Formulation and Development.....</b>	<b>19</b>
2.2.1 First Trial – TRL5.....	19
2.2.2 Technical Testing –Formulations First Screening.....	21
2.2.3 Second Trial.....	21
2.2.4 Mechanical Testing.....	22
2.2.5 Technical Testing – Second Screening.....	23
2.2.6 Third Trial.....	24
2.2.7 First Scale Up Trial – TRL7.....	25
2.2.8 Preliminary Migration Testing.....	27
2.2.9 Second Scale Up Trial.....	28
2.2.10 Dishwashing Life Testing.....	30
<b>2.3 Mold Design and Fabrication.....</b>	<b>32</b>
2.3.1 Initial Injection Trials.....	32
2.3.2 Testing and Optimization.....	33
2.3.3 Texturing and Colour.....	33
2.3.4 Branding Elements and Methods.....	34
<b>2.4 Food Compliance Assessment.....</b>	<b>36</b>
2.4.1 Documents Screening.....	36
2.4.2 Chemical Analysis and Compliance Testing.....	36
<b>2.5 Production Upscaling.....</b>	<b>37</b>
<b>3. Plastic-free Reusable Bottles.....</b>	<b>40</b>
<b>3.1 Design Brief.....</b>	<b>40</b>
<b>3.2 Technical Analysis and Specifications.....</b>	<b>40</b>

<b>4. Digital (Deposit) Reuse Systems (DDRS)</b> .....	<b>42</b>
<b>4.1 Design Considerations</b> .....	<b>42</b>
<b>4.2 Digital Return Scheme for Water Bottles</b> .....	<b>42</b>
4.2.1 System Overview.....	42
4.2.2 App Architecture and Roles.....	43
4.2.3 Registration and access .....	43
4.2.4 Use cases .....	43
Use Case 1: Participant registration (participant) .....	43
Use Case 2: Storage unlock and bottle pickup (participant).....	43
Use Case 3: Bottle use and return (participant).....	43
Use Case 4: Error handling and support (organizer).....	43
4.2.5 Engagement content.....	43
4.2.6 Data, privacy, and analytics .....	44
<b>4.3 Deposit Reuse System for Plastic Cups</b> .....	<b>44</b>
4.3.1 System Overview.....	44
4.3.2 App Architecture .....	44
4.3.3 Use Cases .....	45
Use Case 1: Organize a Campaign (organizer, bartender) .....	45
Use Case 2: Participant Auto-Registration .....	46
Use Case 3: Participant association with Campaign (participant) .....	46
Use Case 4: Cup Exchange procedure (participant, bartender) .....	47
Use Case 5: Campaign Status (organizer) .....	48
Use Case 6: Cup exchange analysis and statistics (organizer, participant).....	48
4.3.4 Campaign Management (Web Platform) .....	49
Add Campaign.....	49
Previous Campaign .....	50
Map.....	51
4.3.5 Cup Exchanges (Mobile App) .....	52
Bartender .....	52
Select exchange types .....	54
Types of Points of Interest .....	54
4.3.6 Statistics and Aggregated Views .....	55
View Personal Statistics (Mobile App).....	55
View "Overview Statistics for all Campaigns" (Web Platform).....	55
Statistics.....	56
Campaigns.....	57
<b>5. Decentralized Dishwashing Infrastructures</b> .....	<b>58</b>
<b>5.1 Large-scale Circular Dishwashing System</b> .....	<b>58</b>

5.1.1 System Overview.....	58
5.1.2 System Layout.....	59
5.1.3 Dishwashing.....	60
5.1.4 Process Flow and Capacity .....	60
5.1.5 Water Management and Ancillary Systems .....	61
5.1.6 Energy System.....	61
5.1.7 Automation, Control, and Monitoring.....	61
5.1.8 Green Wall Water Treatment Design and Objectives- vertECO® .....	62
5.1.9 Operational Function.....	64
5.1.10 Hydraulic Design.....	65
5.1.11 Aeration System.....	65
5.1.12 Artistic Interventions .....	65
<b>5.2 Small-scale Circular Dishwashing System.....</b>	<b>67</b>
5.2.1 System Overview and Layout.....	67
5.2.3 Dishwashing.....	69
5.2.4 Process Flow and Capacity .....	70
5.2.5 Water Management and Ancillary Systems .....	70
5.2.6 Energy and Control Systems.....	70
5.2.7 Water Treatment Design and Objectives - GRETA™ .....	71
5.2.8 Hydraulic Design.....	72
<b>6. Water Refilling Stations .....</b>	<b>73</b>
<b>6.1 Atmospheric Water Generation System.....</b>	<b>73</b>
6.1.1 Operating Mechanism.....	74
6.1.2 System Characteristics and Performance Evaluation .....	75
6.1.3 Water Sample Analysis .....	75
<b>6.2 Water Fountain Technology .....</b>	<b>75</b>
6.2.1 Operating Mechanism.....	76
6.2.2 System Characteristics and Performance Evaluation .....	77
<b>7. Pilot Demonstrators.....</b>	<b>78</b>
<b>7.1 Mykonos Island, Cyclades, Greece.....</b>	<b>78</b>
7.1.1 Establishment of a Circular Dishwashing Service On-Site.....	79
7.1.2 Deployment of Water Refilling Station and Reusable Bottles .....	83
<b>7.2 Porquerolles Island, Provence-Alpes-Côte d'Azur, France.....</b>	<b>85</b>
<b>7.3 Sea Star Festival, Umag, Croatia.....</b>	<b>87</b>
<b>8. Conclusions and Next Steps .....</b>	<b>94</b>
<b>9. References .....</b>	<b>96</b>
<b>Annexes.....</b>	<b>97</b>
<b>Annex I: Candidate Formulations Material Characterization.....</b>	<b>97</b>

<b>Annex II: Candidate Formulations DSC Thermographs .....</b>	<b>98</b>
<b>Annex III: Candidate Formulations Mechanical Properties .....</b>	<b>105</b>
<b>Annex IV: Raw Materials Compliance Documents .....</b>	<b>106</b>
PBS Declaration of Compliance .....	106
PBS Technical Data Sheet .....	107
PHBV Declaration of Compliance .....	109
PVBV Material Safety Data Sheet .....	114
Filler's Declaration of Compliance .....	118
Filler's Safety Data Sheet .....	121
Filler's Technical Data Sheet .....	129
Filler's Product Data Sheet .....	142
Colorant's Declaration of Compliance .....	143
Colorant's Safety Data Sheet .....	144
Colorant's Technical Data Sheet .....	151
<b>Annex V: REMEDIES Cups Chemical Analysis .....</b>	<b>152</b>
<b>Annex VI: REMEDIES Cups Compliance Documents .....</b>	<b>165</b>
REMEDIES 6 Declaration of Compliance by Bio-Mi .....	165
REMEDIES 6 Technical Data Sheet by Bio-Mi .....	167
REMEDIES 6 Material Safety Data Sheet by Bio-Mi .....	169
REMEDIES Cups Product Data Sheet by ANGR .....	178
<b>Annex VII: P&amp;ID of the container system with vertECO® by ANGR .....</b>	<b>179</b>
<b>Annex VIII: P&amp;ID of the Isobox system with GRETA™ by ANGR .....</b>	<b>180</b>
<b>Annex IX: Indicative Water Sample Results of the AWG by NTUA .....</b>	<b>181</b>
<b>Annex X: Breakdown of Festival's Allocation of Activities by ANGR .....</b>	<b>182</b>
<b>Annex XI: Sea Star Festival DRS Initial Design by ANGR .....</b>	<b>183</b>

## Table of Figures

Figure 1 Initial technical drawings .....	15
Figure 2 Examples for the leak-proof feature .....	16
Figure 3 Benchmark samples, reusable PHBV of 250ml .....	18
Figure 4 REMEDIES cup preliminary design by AITIIP .....	19
Figure 5 Twin screw extruder – compounding at TRL 5 .....	20
Figure 6 Sample discs of the candidate formulations .....	20
Figure 7 Compounding process .....	21
Figure 8 DSC thermograms for Remedies 4 (left), Remedies 6 (middle), Remedies 10 (right) .....	22
Figure 9 Candidate formulations' mechanical properties charts .....	23
Figure 10 Immersion tests visual check results with 1mm & 1,5mm discs .....	24
Figure 11 Compounding process of Remedies 10 on 3 <sup>rd</sup> Trial .....	24
Figure 12 Remedies 10 granules (middle), and Remedies 10.1 granules (right) .....	24
Figure 13 DSC thermograms of Remedies 10 (left) and Remedies 10.1 (right) .....	25

Figure 14 Compounding process at TRL7 (left) and drying (right).....	25
Figure 15 DSC thermogram of Remedies 6 – TRL5 .....	26
Figure 16 Injection moulding machine (left) and Impact testing machine (right).....	26
Figure 17 Specimens impact test results.....	27
Figure 18 Dispatch of 280 kg Remedies 6 of 1 <sup>st</sup> scale-up trial .....	27
Figure 19 Compounding process of Remedies 6 on a twin screw extruder .....	27
Figure 20 Compounding process of Remedies 6 - TRL7 .....	28
Figure 21 Underwater pelletizing unit.....	29
Figure 22 DSC thermogram of Remedies 6 – TRL7 .....	29
Figure 23 Test specimens – 2nd scale-up trial.....	30
Figure 24 Dispatch of 1520kg of Remedies 6 – 2 <sup>nd</sup> scale up trial .....	30
Figure 25 Dishwashing temperatures calibration .....	31
Figure 26 Specialized dishwashing rack for testing.....	32
Figure 27 Mold plan, design and fabrication phases.....	32
Figure 28 Preliminary mold design.....	33
Figure 29 Mold iterations .....	33
Figure 30 REMEDIES engraved logo on cup walls (left) and symbols at the base (right).....	35
Figure 31 Demolding Process with Robotic Arm.....	37
Figure 32 Transport with Robotic Arm and Inspection.....	38
Figure 33 End Product Inspection and Packaging .....	38
Figure 34 Photo of the End Product the REMEDIES Cups .....	38
Figure 35 Reusable glass bottles global warming potential (g CO <sub>2</sub> eq/L.) graph.....	40
Figure 36 Technical drawings of the selected glass bottle and lids by Apikian .....	41
Figure 37 Organize a Campaign Flowchart.....	45
Figure 38 Participant Auto-registration.....	46
Figure 39 Participant association with Campaign .....	46
Figure 40 Cup Exchanges flow throughout a Campaign .....	47
Figure 41 Cup exchange (distribute/collect).....	47
Figure 42 Cup exchange (swap).....	47
Figure 43 Campaign Statuses.....	48
Figure 44 Home page for Campaigns .....	49
Figure 45 Add Campaign Form.....	50
Figure 46 Highlighted Point from Previous Campaign.....	50
Figure 47 Selected Points for New Campaign.....	51
Figure 48 Setup of Selected Campaign.....	51
Figure 49 Add new point to map.....	52
Figure 50 Add Campaign code (left) and Campaign Identifier Scan Results (right).....	52
Figure 51 Scan participant code (left), select exchange type (right) .....	53
Figure 52 Cup Exchange - Successful exchange (left), error on exchange (right).....	53
Figure 53 Exchange Settings - Select Exchange Types.....	54
Figure 54 Personal statistics view about all Campaigns .....	55
Figure 55 Data Overview page .....	56
Figure 56 Statistics tab of a participant.....	56
Figure 57 Campaigns Tab of a Selected Person .....	57
Figure 58 Personal Statistics in a Selected Campaign .....	57
Figure 59 The container before (left), after initial modifications (middle), and finished (right) .....	59
Figure 60 Floor plan of the containerized large-scale washing infrastructure with vertECO®.....	59
Figure 61 The basin (left), staff position (middle) and dishwashing units (right) inside the large-scale unit.....	60
Figure 62 Dishwashing cycle in progress .....	60
Figure 63 Reverse Osmosis Unit (left), Control Panel Display (right).....	61
Figure 64 External and internal views of the vertECO® water treatment system installed .....	62
Figure 65 vertECO® modules filled with substrate to begin plantation.....	62

Figure 66 Pictures of the Green infrastructure growth ~3weeks old .....	63
Figure 67 Pictures of the Green infrastructure growth ~8weeks old .....	63
Figure 68 Screenshot of the plants dashboard per layer at the vertECO© system.....	64
Figure 69 Plant performance analytics at the vertECO© system.....	64
Figure 70 Water entry points of the vertECO® system before (left) and after plantation (right).....	65
Figure 71 Street artist Dimitris Marinis at work (left) kick-off day and upon completion (right) .....	66
Figure 72 Mural mock-ups by artist D. Marinis .....	66
Figure 73 Mural details at the container’s backdoor.....	66
Figure 74 The complete mural on the large-scale cleaning system .....	67
Figure 75 Side Views of the Isobox Frame during Construction .....	68
Figure 76 The DW unit (left), the basin (middle), and integrated water tanks for GRETA™ (right) .....	68
Figure 77 Floor plan of the Small-Scale Cleaning Infrastructure with GRETA™ water treatment unit .....	69
Figure 78 Automated detergents and rinse-aid.....	69
Figure 79 Photos of the control unit.....	70
Figure 80 GRETA™ pots installation process (left) and final set-up (right).....	71
Figure 81 GRETA™ Plants Preparation, before and after removing soil at Mykonos.....	71
Figure 82 Views of GRETA™ before and after plantation on Mykonos Island.....	72
Figure 83 Installation of components (left) and complete AWG back side (middle) and front (right) .....	73
Figure 84 Temperature and humidity impact on water production and energy consumption of the AWG....	74
Figure 85 Diagram of the Water Production Process of the AWG.....	74
Figure 86 Explanatory illustrations displayed on the AWG.....	75
Figure 87 Product Photos of the Water Fountain Technology Kumulus .....	76
Figure 88 Operating mechanism and performance infographic by Kumulus.....	76
Figure 89 Maps of Cyclades (left), Mykonos Island (middle) and Lia beach (right).....	78
Figure 90 Lia beach visitors.....	79
Figure 91 The organized beach-setting and the beach-bar deck at Lia beach.....	79
Figure 92 Establishment of the dishwashing system with GRETA™ on Lia beach, Mykonos, Greece.....	80
Figure 93 Side views of the circular dishwashing service on-site .....	80
Figure 94 Infographic of the beach-bar reuse model by ANGR.....	81
Figure 95 REMEDIES cups distribution from the DW to the front bar realized by the staff.....	81
Figure 96 REMEDIES cups service starts at the front-bar located on the beach.....	82
Figure 97 REMEDIES cups used by the customers of the beach-bar instead of SUPs for water .....	82
Figure 98 REMEDIES cups collection is monitored by the staff at the front-bar .....	82
Figure 99 REMEDIES cups cleaning phase with prewashing, dishwashing and drying .....	83
Figure 100 Deployment of the water refilling station (AWG) on Lia beach, Mykonos demo site.....	83
Figure 101 General Map of Porquerolle island, France.....	85
Figure 102 Maison du Parc of the Port-Cros National Park on Porquerolles.....	86
Figure 103 Sea Star Festival stage next to the sea by EXIT .....	87
Figure 104 Stella Maris beach aerial photo .....	87
Figure 105 The tennis stadium “Gorana Ivaniševića” and its surroundings.....	88
Figure 106 Sea Star festival map, 6 <sup>th</sup> edition.....	88
Figure 107 Unsorted waste steams .....	89
Figure 108 Festival's Plastic Waste Generation Graph.....	90
Figure 109 Photograph of the first (left) and second touch point (right).....	90
Figure 110 Photograph of the third (left) and fourth (right) touch points .....	91

## Table of Tables

Table 1 Injection Molding Suitability Aspects .....	16
Table 2 Benchmark samples mechanical properties.....	17
Table 3 Preliminary design specifications.....	18



Table 4 Characterization of developed formulations.....	20
Table 5 Immersion Tests Comparative Results.....	21
Table 6 Three Finalist Compounds Characterization Results on 2nd trial .....	22
Table 7 Results of characterization of compounds in the 3rd trial .....	25
Table 8 Results of Remedies 6 characterization in the 1st scale-up trial.....	25
Table 10 of Characterization of Remedies 6 - TRL7.....	29
Table 11 Washing Tests Objectives.....	31
Table 12 Technical Specifications of the Colorant .....	34
Table 13 Points of interest for cup exchanges.....	55
Table 14 Mykonos beach-bar vs Sea Star Festival use case comparisons .....	58
Table 15 Large-Scale Unit Dimensions.....	59



# I Introduction

Plastic pollution in the Mediterranean has been driven by heavy reliance on SUP cups and bottles, particularly in high-traffic areas such as tourist destinations, cultural events, and coastal communities. While the EU Single-Use Plastics Directive (2019/904) has spurred important regulatory progress, implementation remains uneven across Member States, with significant challenges in enforcement, consumer acceptance of reuse models, and insufficient infrastructure for large-scale adoption(6).

D3.1 addresses these gaps by providing a comprehensive account of the delivery, installation, and deployment of upstream solutions developed under Tasks T3.1 and T3.2 targeting two of the most pervasive pollutants in European marine environments, single-use plastic (SUP) cups and bottles. With the objective of delivering reusable cups, bottles and deploying water demo installations, D3.1 encompasses approachable pathways for avoiding SUP containers and preventing their distribution and use in the first place, across systemic sectors. It's scope, is not merely about replacing one product with another but rather facilitating a holistic shift in service logistics, moving from a linear 'take-make-dispose' model to a sustainable circular model(4) through value propositions oriented to satisfying users through function delivery instead of product ownership(7).

Committed to circular design, D3.1 innovations and interventions are shaped and guided by three core principles. The first principle “eliminating waste and pollution” is reflected in the development of reusable, bio-based cups and plastic-free bottles designed to prevent new material extraction and waste before it is created. By focusing on upstream solutions, D3.1 shifts the emphasis from managing pollution to avoiding it altogether, as detailed in Chapters 2 and 3 of the report. The second principle “circulating products and materials” comes to life through the implementation of digital deposit reuse systems (DDRS) and decentralized infrastructures for dishwashing and water refilling. These systems are built to keep products in use for as long as possible, enabling multiple reuse cycles and extending the lifespan of materials. This approach not only reduces environmental impact but also supports a more resilient and resource-efficient consumption model, as explored in Chapters 4, 5, and 6. The third principle “regenerating nature” is woven into the overarching goal of the REMEDIES project specific objectives to prevent 600 kg of waste per festival and an additional 120,000 kg per tourist season in the Cyclades islands of Greece, mitigating plastic pollution at the source and directly contributing to the quality of marine ecosystems, protecting biodiversity across the regions of implementation. Moreover, this principle is underscored through nature-based solutions, and closed-loop process integrated for water generation, treatment, and reuse, combatting plastics reliance in water stressed regions.

D3.1 goes beyond stand-alone technologies as their real impact emerges from their interdependence, forming an integrated ecosystem of prevention that is flexible, accessible and tailored to meet diverse stakeholders' needs, empowering public authorities, businesses, and civil society to combat plastic reliance without compromising hygiene, efficiency, or user convenience.

A clear and comprehensive overview of the design, development, installation, and successful deployment D3.1, as direct output of T3.1 and T3.2 is organized in the following breakdown of chapters:

- Chapter two reports the milestones during research and development of reusable biobased cups as a substitute for conventional SUPs, concluding with a successful industrial production of 25.000 items through injection molding.
- Chapter three turns to the problem of plastic water bottles, following a comparative analysis of available materials, presenting reusable glass bottles as the most sustainable alternative.
- Chapter four introduces the DRS, reporting on the web platform and mobile applications developed to allow real-time monitoring of reuse cycles, coupling the physical circulation of cups and bottles with data-driven accountability.



- Chapter five presents in detail the large-and small-scale dishwashing installations, which incorporate advanced energy optimization technologies, and water treatment closed-loop management, to guarantee increased circularity and ease decentralization.
- Chapter six is dedicated to innovative water refilling technologies and installations, including an Atmospheric Water Generation (AWG) and a smart water fountain to mitigate SUP water bottles dependence in the outdoors.
- Chapter seven outlines the planning of the interventions and the deployment of the pilot demonstrators on the pre-selected DS illustrating the potential to address the systemic issue of plastic pollution through a multifaceted approach and replicable models that can be scaled under varied conditions.
- Chapter eight synthesizes the insights gleaned from the various demonstrators, incorporating updated data from the interventions and outlining optimized pathways for future progress. It advocates for EU-level endorsement to replicate and scale these integrated systems throughout the Mediterranean Sea Basin, thereby establishing prevention ecosystems as a fundamental element of Europe's transition towards a zero-pollution, circular economy.

Ultimately, D3.1 goes beyond technical deployment and does more than deliver tangible outputs; By framing reuse as a systemic and policy-aligned solution it provides transparency and evidence about material performance, reuse cycles, consumer behavior, and environmental impact. It demonstrates that prevention ecosystems—combining technology, infrastructure, and social innovation—can become a cornerstone of Europe's transition toward a zero-pollution, climate-neutral, and circular economy, underscoring the imperative of sustained citizen engagement, the implementation of robust monitoring frameworks, and the integration of upstream solutions within existing EU policy instruments, ranging from the Zero Pollution Action Plan to the European Green Deal.



## 2. Reusable Biobased Cups

### 2.1 Initial Design Review

The general product description according to the GA, is a reusable cup that claims a Biobased, Biodegradable, and Recyclable alternative to SUPs. A big size is proposed particularly for draft beer (up to 20% alcohol) holding 0.5L capacity targeting industrial production, manufactured with injection molding. The research objective was to achieve a practical lightweight cup, resistant to impact and heat, with the less quantity of materials possible.

#### 2.1.1 Design Brief and Concept

Advocating an industry-specific solution, the REMEDIES reusable cup conceptualizes a pathway to prevent plastic use and waste at the source with a circular design approach, demonstrating environmental benefits at all stages of the product life cycle. Essential to the product concept is the use of new plastic materials and the innovative features they hold, especially as regards to their capacity to withstand re-use as many times as possible, to be recycled efficiently with mechanical processes, and to meet the conditions of industrial composting (8).

#### 2.1.2 Product Analysis

Conceptual mapping was used to analyse the monomaterial construction key-concepts as regards to the manufacturing process: 1) Valuable, 2) Resistant to impact, 3) Resistant to heat, 4) Practical, 5) Inclusive, and 6) Easy Storage. Initial technical drawings were developed exploring mold design and cup's geometry cone-shaped, rounded profile and branding (Figure 1).

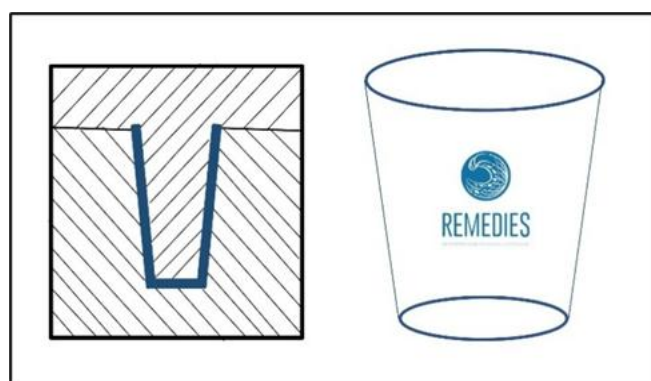


Figure 1 Initial technical drawings

To reconcile technical choices related to injection molding, a prioritization model was employed, considering nice-to-have features (Table I). Essential requirement is to meet all relevant EU safety legislation for food contact materials, ensuring full compliance for repeated use. This involves a comprehensive approach including risk assessments for additives and potential non-intentionally added substances (NIAS), migration testing using standardized simulants, and specifically food simulant C for alcoholic food with an alcohol content of up to 20%, and the issuance of a Declaration of Compliance (DoC) including REACH.

The environmental impact of the product throughout the value chain is focusing on lower carbon emissions, reduced virgin materials extraction and sustainable end-of-life options. The LCA and PEF are developed in WP4. Material innovation prioritizes a bio-based, biodegradable plastics mixture, as well as Good Manufacturing Practices (GMP). Bio-based content is essential, focusing on innovative aspects, PHAs and

marine biodegradability. Injection molding and mechanical recycling are key, Extended Producer Responsibility (EPR) with a decentralized End-of-Life management model for the cups is desirable. Repeated use is essential, with a life expectancy of 200 uses being a desirable goal.

Table 1 Injection Molding Suitability Aspects

Priority	Aspects	Must-Have	Nice-to-Have
1	Safety	BPA-free, Food compliance EU 10/2011	N/A
2	Environmental Impact	Low lifecycle emissions	LCA/PEF
3	Material Innovation	Bio-based, Biodegradable, GMP	PHAs, Marine biodegradability
4	Recyclability	Mechanical Recycling	EPR, Decentralized EoL plan
5	Repeated Use	Reusable, Dishwasher-safe	Life expectancy 200 uses
6	Functionality & UX	Leak-proof, Storable	Tactile appeal & easy handling
7	Aesthetic & Branding	Customized branding, Eco-labels	Transparency, Visual appeal

Targeting durability, longevity, and high performance to withstand excessive dishwashing, the cups resistance to impact, heat and water, are of great importance. EU No 10/2011 compliance for repeated use is necessary, to prove that subsequent use cycles do not increase the migration of substances into food.

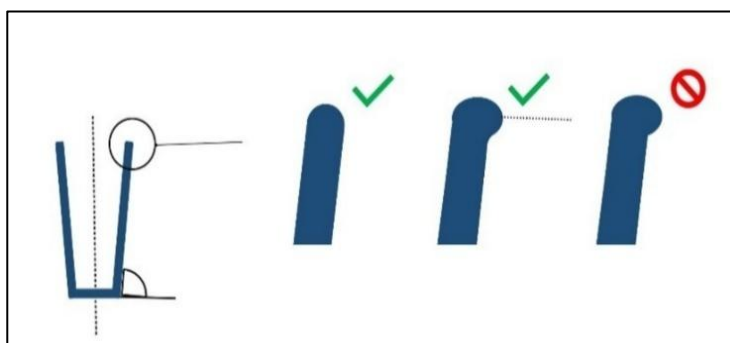


Figure 2 Examples for the leak-proof feature

Functionality focuses storability (Figure 2), while comfortable handling, and tactile appeal are nice to have. To promote brand identity and encourage repeated use, the possibilities for branding (e.g., printing, etching) are considered important, while transparency is nice to have.

### 2.1.3 Materials Selection

Different material options were identified as suitable candidates based on product's key-aspects. Each option was further analysed in positive (pros) and negative aspects (cons) based on their expected performance and competence to satisfy the design key-concepts. The starch-based materials were excluded due to their poor performance in thermal resistance. The biopolymers proposed were the following:

**1. Polylactic Acid (PLA)** is a thermoplastic polymer derived from renewable resources like cornstarch or sugarcane. It's known for its decent mechanical properties, with a glass transition temperature ( $T_g$ ) of  $60^{\circ}\text{C}$  making it suitable for packaging. However, PLA can be brittle and may have limitations in terms of barrier properties and heat resistance. Moreover, PLA currently lacks adequate recycling options and generally scores negatively in landfill scenarios.

**2. Polyhydroxyalkanoates (PHAs)** is a family of polyesters produced by various bacteria and algae. They are fully biodegradable and can be synthesized from renewable resources, making them a promising alternative to traditional plastics. PHAs offer a wide range of properties depending on their composition and can be tailored for various applications, including packaging. They exhibit strong mechanical properties, thermal stability, and good oxygen and moisture barrier capabilities. The material properties of PHAs can be tuned by varying the repeat unit chain length, side chain functionalities, and co-monomer composition. However, challenges exist with the PHAs supply chain. Especially, within Europe, the demand in PHAs is currently exceeding the supply with many implications challenging industrial production.

**3. Polybutylene Succinate (PBS)** is a biodegradable thermoplastic polyester, known for its properties comparable to polypropylene. Typically synthesized from non-renewable feedstocks, but monomers can be obtained from renewable sources. PBS degrades into water and carbon dioxide under the soil, making it an environmentally friendly option. Key benefits include its biodegradability, good mechanical properties, and relatively high heat resistance compared to other bioplastics. However, challenges exist with its higher production cost, limited availability, and potential for lower gas barrier properties than some conventional plastics.

**4. Polybutylene adipate terephthalate (PBAT)** is designed to be biodegradable under various conditions, including composting (both industrial and home composting), however it does not degrade in marine and fresh water. PBAT has a high elongation at break, high flexibility and toughness making it suitable for flexible packaging. However, currently made from fossil-based resources, suggesting the least preferable among the proposed materials.

**5. Starch-based materials** are formulated with various additives to enhance their properties and are suitable for a wide range of applications, particularly in food packaging. They exhibit strong mechanical properties, thermal stability, and good oxygen and moisture barrier capabilities. However, starch-based plastics are often sensitive to moisture and may require modifications to improve their mechanical strength and barrier properties. Moreover, due to being "supersoft," they imply limitations in rigidity or durability necessary for a reusable cup.

## 2.1.4 Benchmark Analysis

An existing product made in Europe with 100% PHBV content was used as a benchmark and subjected to several analysis (DSC, MFI, Density, HDT, FTIR and TG) to achieve full characterization (Table 2).

Table 2 Benchmark samples mechanical properties

Parameter	HC Brown	HC Blue	PHBV (granules)
Mass, g	27,1	25,5	n/a
Thickness, $\mu\text{m}$	1100	850	n/a
MFR, g/10min, 180 °C, 2,16 kg	> 50	> 50	6,35
T <sub>m</sub> , °C	169,8	169,6	171,8
Density, gcm <sup>-3</sup>	1,17	1,19	1,22



Figure 3 Benchmark samples, reusable PHBV of 250ml

Two products (Figure 3) were tested, blue and brown cups holding common physical properties: volume of 250 ml, weight ~27.5 g and thickness at 1.1 mm.

## 2.1.5 Technical Specifications

Initial product properties (Table 3) were studied focusing on the following investigative parameters:

- material properties
- thickness of the cup's walls,
- thermal resistance to washing.

Table 3 Preliminary design specifications

	<b>Characterization</b>	<b>Specification</b>
<b>Type</b>	Reusable Cup	≥200 times
<b>Material</b>	Biopolymers	Food Contact Material (FCM)
<b>Application</b>	Beer 20% alcohol	≥20% alcohol
<b>Useful Capacity</b>		0.5L
<b>Maximum Capacity</b>		0,55L
<b>Weight</b>	Light	63 - 86 (g)
<b>Craft</b>	Injection Molding	80.000 items
<b>Height</b>		120 (mm)
<b>Diameter</b>		100 (mm)
<b>Thickness</b>		1,5-2mm
<b>Color</b>	Neutral	Transparent
<b>Claim 01</b>	Bio-based	≥65% biobased content
<b>Claim 02</b>	Biodegradable	Industrial Composting
<b>Claim 03</b>	Recyclable	Mechanical Recycling
<b>Claim 04</b>	Dishwasher Safe	50/60°C
<b>Design Feature 01</b>	Easy to hold and storage	Cone profile, Rounded Shape
<b>Design Feature 02</b>	Secure holding	Non-slip grip
<b>Design Feature 03</b>	No dripping	Rounded spout

Thermal resistance was the most important parameter to control. It's dependence to the variable of the cup's walls thickness was the research objective. Thermal resistance was proposed by design at 100oC, to compete

the product's endurance to excessive washing, specifically 200 cycles. However, important considerations underlined the technical challenges to achieve industrial production of 80.000 units within the project timeline and budget. Therefore, the specification for preliminary testing was temperature resistance at 50/60°C.

### 2.1.6 Preliminary Design

Desktop research was performed to study the geometry of the regular 0.5L PP cups, typically used for beer at festivals, and which can range from 120-130mm height and 100-95mm.

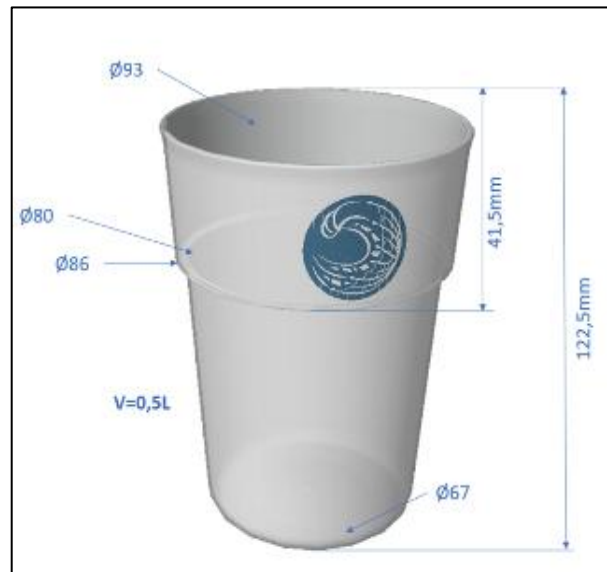


Figure 4 REMEDIES cup preliminary design by AITIIP

AITIIP developed the cup's technical drawing (Figure 4) specifying the geometry profile and actual dimensions. These were 122.5mm height and 93mm diameter, including the following design features:

- Rounded shape to hold in hand,
- Non-slip grip for secure holding, and
- Rounded spout to prevent dripping.

## 2.2 Bioplastic Mixtures Formulation and Development

BMI developed in total eleven formulations (Annex 10.1). Three of them proved the most promising to compete the technical and mechanical properties for a reusable plastic cup based on design specifications.

### 2.2.1 First Trial – TRL5

The initial candidate formulations were based on PHAs, PLA, PBS, cellulose, and organic fillers with temperature resistance set up to 50/60 °C. Compounding (Figure 5) was conducted on intermeshing twin screw extruder with screw diameter 35 mm, and L/D ratio 44:1 without issues. BMI performed the 1st trial, resulting in nine different formulations.

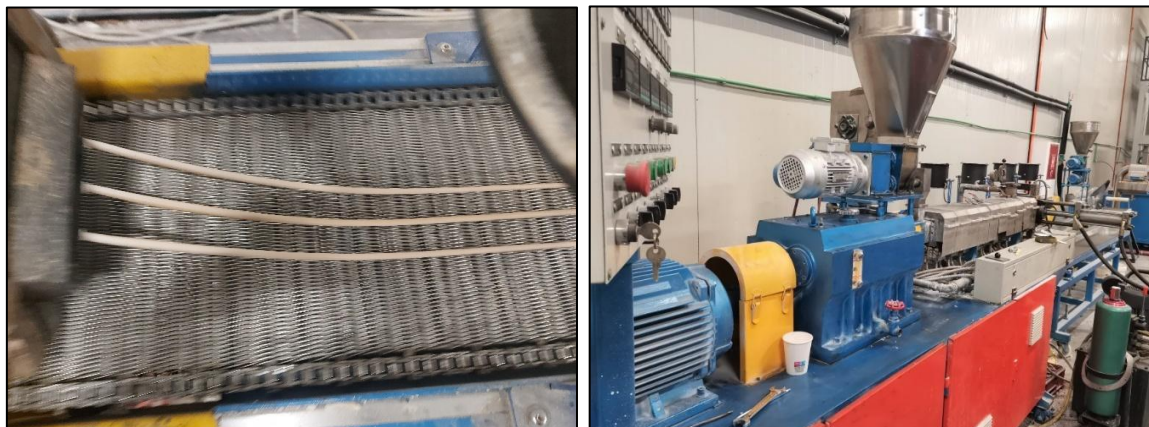


Figure 5 Twin screw extruder – compounding at TRL 5

All formulations were characterized (Table 4) for their thermal (DSC, ASTM D3418) (Annex 10.2), rheological (MFR, ISO 1133) and physical properties (density – ASTM D792 & moisture – ASTM 6980).

Table 4 Characterization of developed formulations

Formulation	T <sub>m</sub> , °C	MFR, g/10 min 2,16 kg/190 °C	density, g/cm <sup>3</sup>	moisture, %
Remedies 1	146.3 / 167.6	11.6	1.247	0.3
Remedies 2	146.6 / 168.1	8.7	1.198	0.5
Remedies 3	147.3 / 167.9	18.7	1.345	0.4
Remedies 4	112.0 / 166.8	8.8	1.166	0.3
Remedies 5	112.9 / 169.4	10.9	1.277	0.4
Remedies 6	114.5 / 169.0	14.7	1.361	0.3
Remedies 7	116.8 / 167.5	9.2	1.202	0.4
Remedies 8	111.7 / 167.4	9.8	1.197	0.4
Remedies 9	168.6	10.5	1.374	0.3

Sample discs of several thicknesses (2mm) were prepared by AITIP (Figure 6) and theoretical screening was applied to narrow the candidate recipes, resulting to five qualifying candidates. Remedies 7, Remedies 8 and

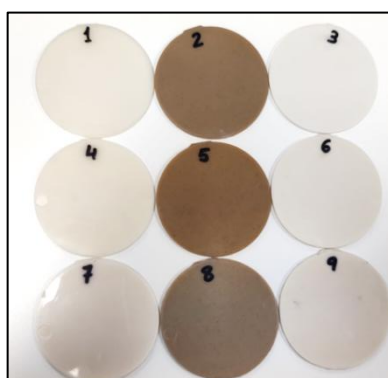


Figure 6 Sample discs of the candidate formulations

Remedies 9 were excluded as well as Remedies 3. The first three, because of the low bio-based content (PBAT is a fossil-based plastic), and the later because of the resulting hue, affecting the aesthetic aspect of the end-product.

## 2.2.2 Technical Testing –Formulations First Screening

The temperature resistance of the five candidate formulations (Remedies 1, Remedies 2, Remedies 4, Remedies 5 and Remedies 6) was further tested and measured with dishwashing simulations. In-lab immersion tests were performed with specimens of 2mm thickness. The immersions were realized in 10 specimens of each formulation, followed by 10 minutes sensory check on each with the following schemes:

- immersion for 60 min at 65°C
- immersion for 200 min at 85°C,
- immersion for 60 min at 100°C.

Based on the immersion results (Table 5):

- all candidate formulations failed, however the benchmark proved resistant to 100°C,
- all candidate formulations performed well at 65°C,
- Remedies 1, Remedies 2 & Remedies 5 were excluded due to their poor performance at 85°C,
- Remedies 4 specimens exhibited 1.4%, dimensions change (shrink) but only in 2 of the 10 specimens,
- Remedies 6 proved resistant at 200 minutes immersion at 85°C.

Table 5 Immersion Tests Comparative Results

Specimens of 2mm	Immersion 60 min at 65 oC (10 specimen check)		Immersion 200 min at 85 oC (10 specimen check)		Immersion 60 min at 100 oC (10 specimen check)	
	Shrink	Discoloration	Shrink	Discoloration	Shrink	Discoloration
<b>Remedies 1</b>	No	No	1,4 %	No	1,4 %	Yes
<b>Remedies 2</b>	No	No	1,4 %	Yes	1,4 %	Yes
<b>Remedies 4</b>	No	No	1,4 % (2/10)	No	1,4 %	Yes
<b>Remedies 5</b>	No	No	1,4 %	Yes	1,4 %	Yes
<b>Remedies 6</b>	No	No	No	No	1,4 %	Yes
<b>Benchmark</b>	No	No	No	No	No	No

## 2.2.3 Second Trial

The two most promising formulations, Remedies 4 and Remedies 6, were scaled up. Remedies 4 and Remedies 6 are PHBV and PBS made, the first one containing no filler and the second one incorporating an organic filler. During the compounding step (Figure 7), no issues were encountered with any of these three formulations). Additionally, a new formulation, Remedies 10, was developed based on PHBV and fillers. Produced compounds were characterized (Table 6) for their rheological (MFR, ISO 1133), thermal (DSC, ASTM D3418) (Figure 8) and physical (density – ASTM D792 & moisture – ASTM 6980) properties (Table 6).



Figure 7 Compounding process

Table 6 Three Finalist Compounds Characterization Results on 2nd trial

Parameter	Remedies 4	Remedies 6	Remedies 10
T <sub>m</sub> , °C	113.7/168.1	115.4/168.2	171.0
MFR, g/10 min (190 °C/2.16 kg)	10.97	11.20	33.01
Density, g/cm <sup>3</sup>	1.218	1.345	1.367
Moisture, %	0.2	0.3	0.2

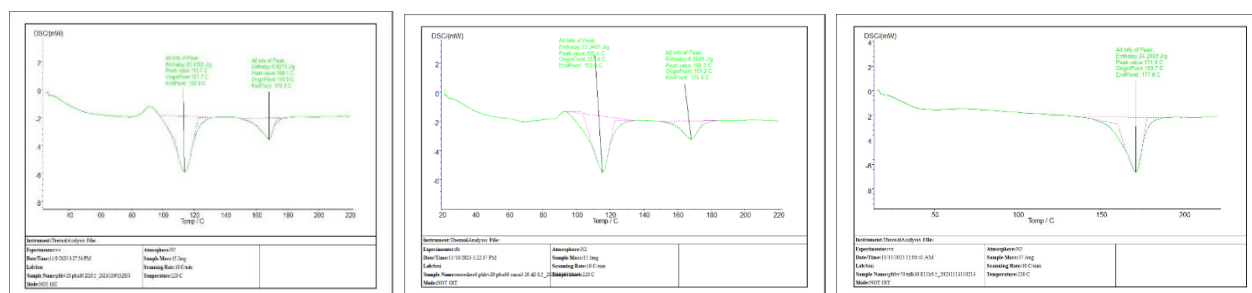


Figure 8 DSC thermograms for Remedies 4 (left), Remedies 6 (middle), Remedies 10 (right)

70 kg of each scaled up formulation along with 7.5 kg of Remedies 10 was shipped to AITIIP for further investigation. However, Remedies 10 filling simulations at 1,5 mm and 1 mm was technically challenging. During the filling simulations processability issues occurred, therefore it was decided BMI to perform the necessary modifications, to enhance processability, and repeat the trials on the injection molding machinery.

## 2.2.4 Mechanical Testing

A series of mechanical tests were conducted by AITIIP on the five candidate formulations (Remedies 1, Remedies 2, Remedies 4, Remedies 5 and Remedies 6). The objective was to identify the most promising for injection molding balancing stiffness, flexibility, and impact resistance. Remedies 10 and the benchmark cups (Figure 9) were also analyzed. The following properties were measured:

- Young's Modulus (MPa): Indicates tensile stiffness.
- Elongation at Break (%): Measures ductility and the ability to deform before failure.
- Flexural Modulus (MPa): Reflects resistance to bending.
- Elongation at Maximum Force (%): Indicates deformation under peak load.
- Impact Resistance (kJ/m<sup>2</sup>): Assesses toughness under dynamic stress.
- Heat Deflection Temperature (HDT, °C): Measures thermal resistance under load.
- VICAT Softening Temperature (°C): Indicates the temperature at which the material begins to soften.

The mechanical performance of each formulation across the seven parameters was evaluated (Annex 10.3) based on the results, according to which:

1. Remedies 4 (PHB:PBS) showed outstanding ductility (elongation at break: 320.77%) and the highest impact resistance (14.35 kJ/m<sup>2</sup>), but its low stiffness (Young's modulus: 864 MPa) could compromise dimensional stability.
2. Remedies 6 (PHB:PBS + organic filler) offered a well-balanced profile including the following:
  - Moderate stiffness (Young's modulus: 1374 MPa)
  - Good ductility (elongation at break: 60.25%)
  - Acceptable impact resistance (4.45 kJ/m<sup>2</sup>)
  - High thermal stability (VICAT: 108.45 °C)
3. Remedies 10 (PHBV) exhibited high stiffness (Young's modulus: 5669.6 MPa; Flexural modulus: 7668.6 MPa), but its low impact resistance (2.53 kJ/m<sup>2</sup>) and lack of elongation data suggested brittleness,

making it unsuitable for applications requiring rigidity. The formulation demonstrated also the highest thermal resistance (VICAT: 159.55 °C), compared to Remedies 4 and Remedies 6 (exceeding 108 °C).

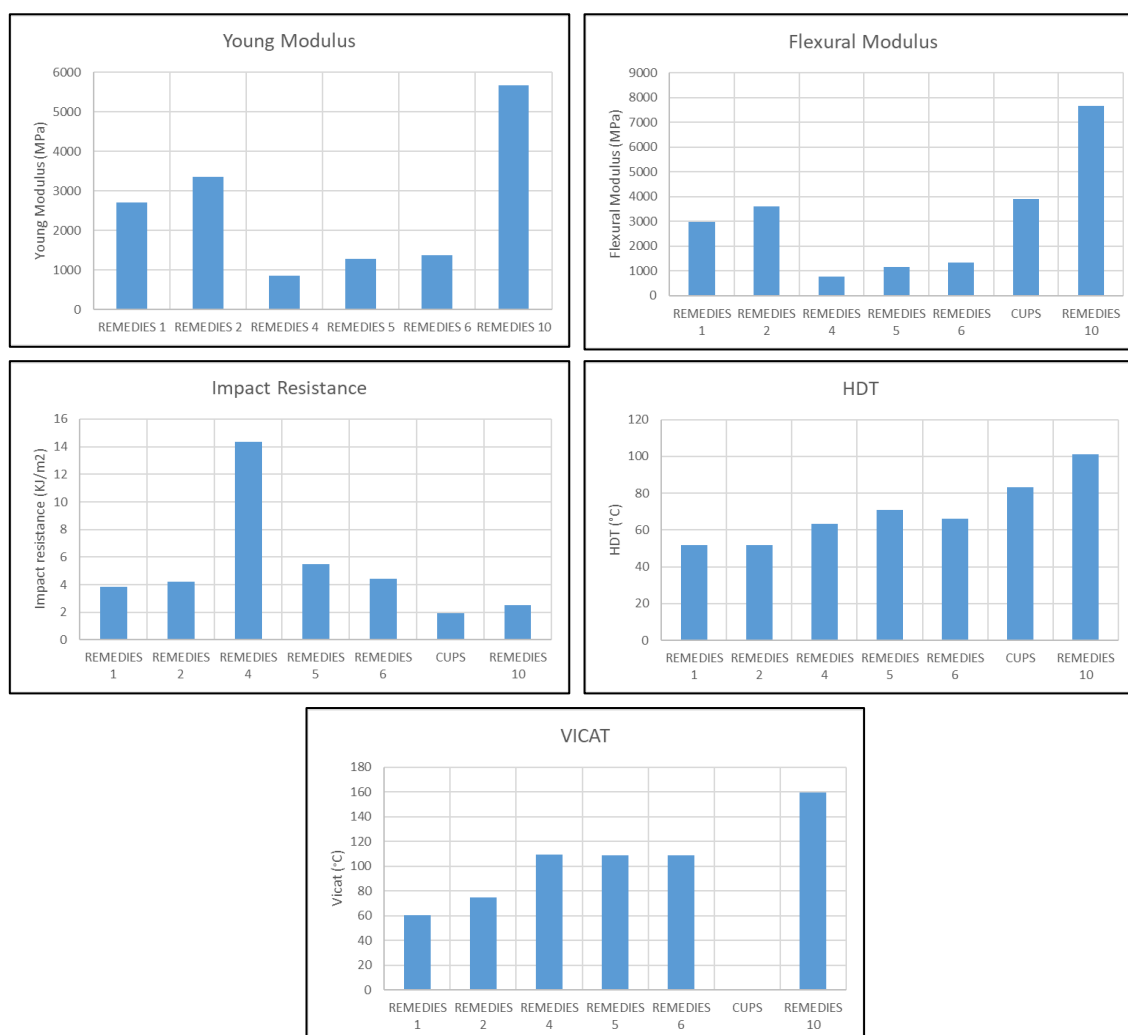


Figure 9 Candidate formulations' mechanical properties charts

## 2.2.5 Technical Testing – Second Screening

The new specimens for the two qualifying formulations, Remedies 4 and Remedies 6 were produced by AITIIP and sent to ANGR to compare their heat resistance at 1mm and 1,5 mm thickness (5 of each per formulation).

The second run of immersions was realized for 200 min at 85°C. Based on the second run of immersion tests, Remedies 6 proved the best candidate to upscale, exhibiting no changes in dimension or colour compared to Remedies 4 at 1,5mm (Figure 10). As regards the 1mm Remedies 6 specimens, one out of five (1/5) specimens exhibited whitening and slight curling.

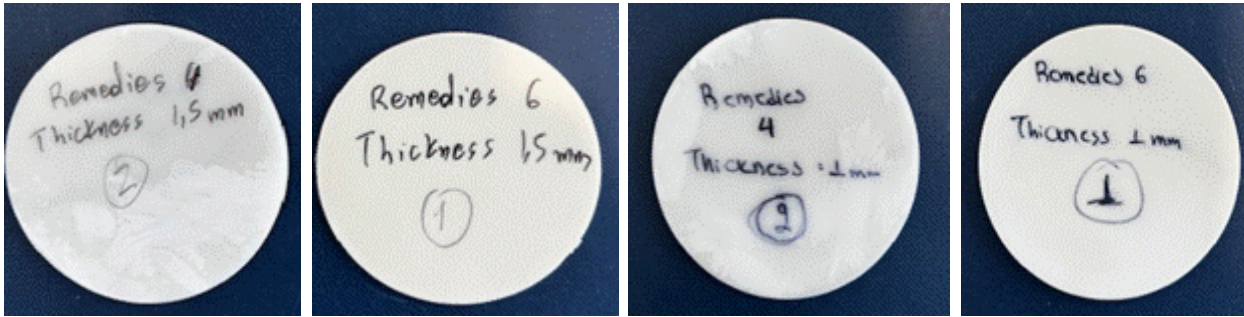


Figure 10 Immersion tests visual check results with 1mm & 1,5mm discs

### 2.2.6 Third Trial

BMI produced additional quantities of Remedies 10 and achieved an alternative formulation with a higher PHBV content, Remedies 10.1.

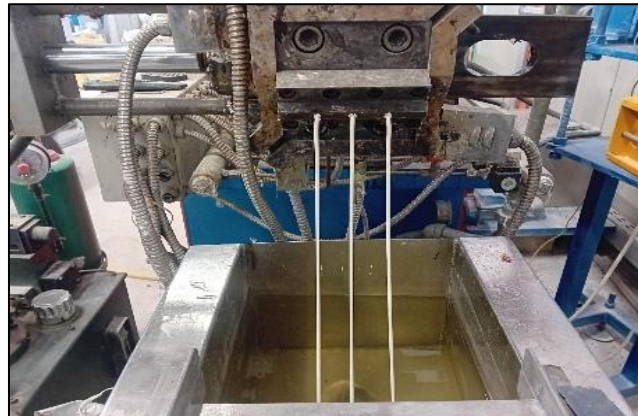


Figure 11 Compounding process of Remedies 10 on 3<sup>rd</sup> Trial

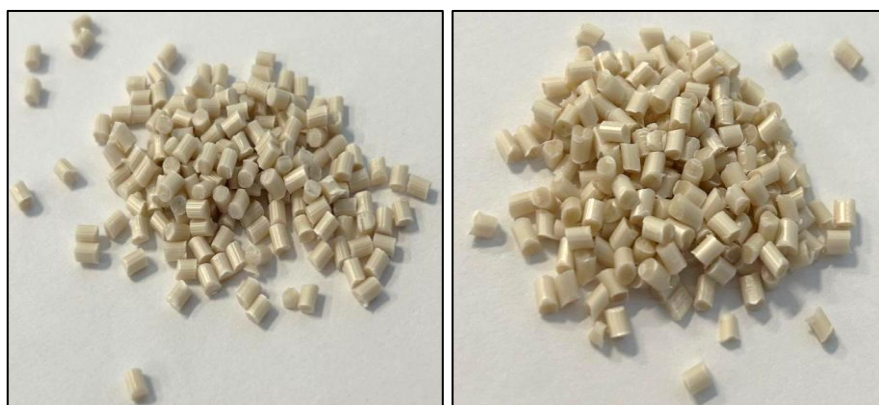


Figure 12 Remedies 10 granules (middle), and Remedies 10.1 granules

Both formulations were produced successfully on twin screw extruder (Figure 11) and characterized following standards, exhibiting the same properties as in the previous trial. 23 kg of Remedies 10, and 24 kg of Remedies 10.1 (Figure 12) were produced and dispatched to AITIIP. Characterization of compounds (Table 7) and DSC thermograms results (Figure 13) are presented below.

Table 7 Results of characterization of compounds in the 3rd trial

Material	T <sub>m</sub> , °C	MFR, g / 10 min 190 °C/2.16 kg	Density, g / cm <sup>3</sup>	Moisture, %
Remedies 10	175.3	22.4	1.4	0.2
Remedies 10.1	174.1	20.0	1.3	0.1

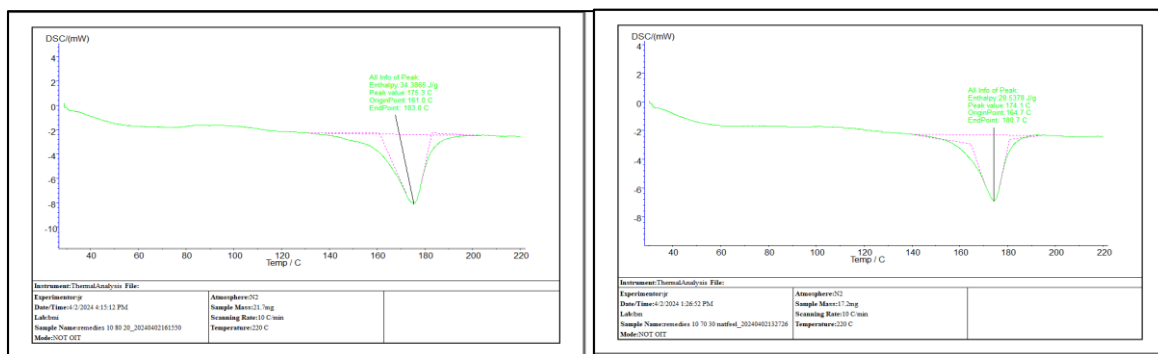


Figure 13 DSC thermograms of Remedies 10 (left) and Remedies 10.1 (right)

## 2.2.7 First Scale Up Trial – TRL7

Remedies 6 first scale-up trial was conducted by BMI at TRL7 level based on the outcomes from previous trials. The material was produced successfully on a twin screw extruder line with a screw diameter of 52 mm, a length-to-diameter (L/D) ratio of 40:1, and an output capacity of 100 to 200 kg/h. After extrusion the material was initially dried in a hot air dryer (Figure 14) and then characterized (Table 8 and Figure 15) according to the relevant standards.



Figure 14 Compounding process at TRL7 (left) and drying (right)

Table 8 Results of Remedies 6 characterization in the 1st scale-up trial

T <sub>m</sub> , °C		106,3; 164,7
MFI, g / 10 min 2,16 kg	160 °C	0,3
	170 °C	1,8
	180 °C	13,3

	190 °C	23,0
<b>Density, g cm<sup>-3</sup></b>		1,370
<b>Moisture, %</b>		0,248

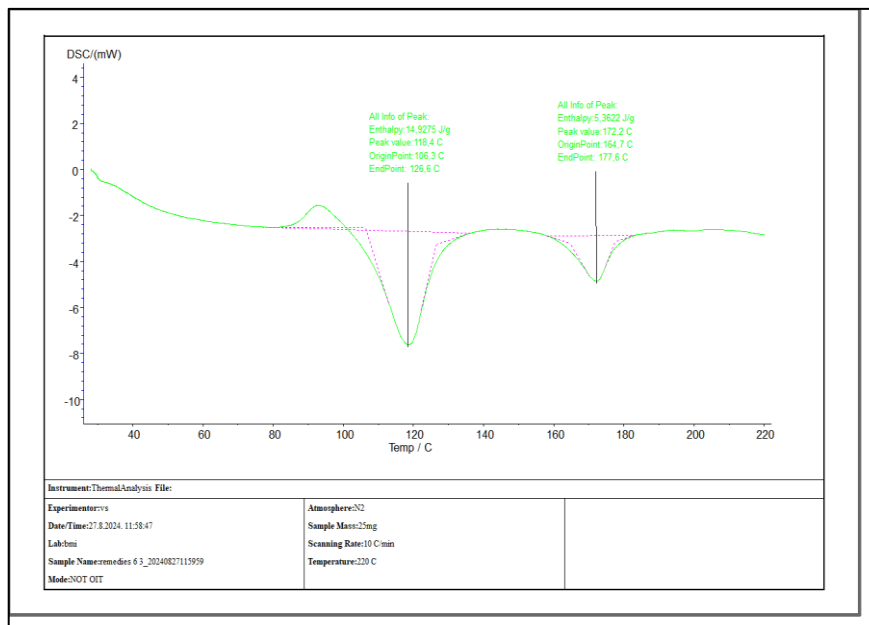


Figure 15 DSC thermogram of Remedies 6 – TRL5

To evaluate the processability, test specimens were produced using an injection molding machine (Figure 16). Once the specimens were prepared, they were subjected to impact testing using a standardized impact testing machine (ISO 179) (Figure 16).



Figure 16 Injection moulding machine (left) and Impact testing machine (right)

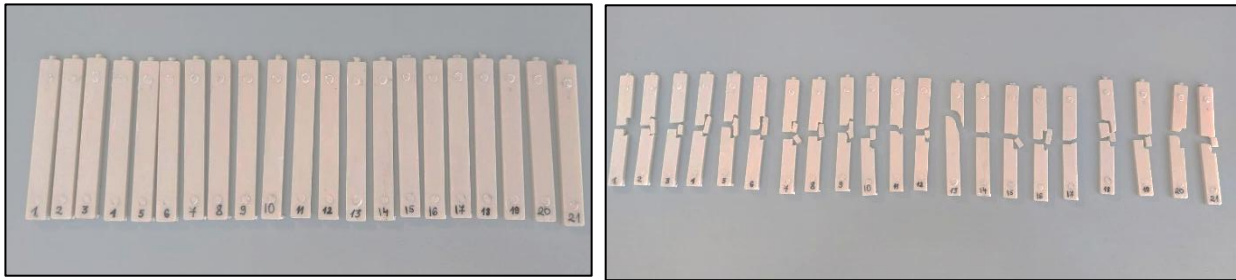


Figure 17 Specimens impact test results

The results on the tested specimens (Figure 17) showed that the average impact strength of the specimens was 22.2 kJ/m<sup>2</sup>. This value represents the amount of energy absorbed by the material per unit area before fracturing. The results of the 1<sup>st</sup> scale-up trial are comparable with previous trials which confirm successful transition to higher TRL. After initial difficulties with scale-up, the process was successfully optimized and 280 kg of material produced were sent to AITIIP (Figure 18).



Figure 18 Dispatch of 280 kg Remedies 6 of 1<sup>st</sup> scale-up trial

## 2.2.8 Preliminary Migration Testing



Figure 19 Compounding process of Remedies 6 on a twin screw extruder

Preliminary migration testing was performed on Remedies 6 formulation produced on a twin screw extruder (Figure 19), following the same procedures (Table 9) as in previous trials.

Table 9 Remedies 6 characterization results

Parameters		Remedies 6
Tm, °C		115,4; 170,5
MFI, g/10 min	2,16 kg, 160 °C	0,3
	2,16 kg, 190 °C	11,9
Density, gcm-3		1,341
Moisture, %		0,160

Migration tests concluded on compliant results but were performed for food product “water” and not “beer”. Due to the unforeseen challenges in the biopolymers market (December 2024), partners had to procure same grade of PBS from a different European supplier. This condition obliged partners to repeat preliminary migration tests for Remedies 6. Second run of migration testing was performed, both overall and specific. For these tests, 500 grams of granules were sent to the Laboratory for the Control of Food and Items of General Use at the Teaching Institute of Public Health in Primorsko-Goranska County, Croatia. The results were consistent with the previous trials. Furthermore, overall migration and specific migration of metals had to be repeated with the appropriate simulant on the end-product.

### 2.2.9 Second Scale Up Trial

Remedies 6 second scale-up (February 2025) trial was conducted successfully in BMI facilities (Figure 20). The same procedures, methodologies, and temperatures were applied as in the first scaling-up trial.



Figure 20 Compounding process of Remedies 6 - TRL7

After drying material was characterized (Table 10 & Figure 22).



Figure 21 Underwater pelletizing unit

Table 10 of Characterization of Remedies 6 - TRL7

Remedies 6	
<b>T<sub>m</sub>, °C</b>	106.4; 171.3
<b>MFI, g / 10 min 2,16 kg; 190 °C</b>	19.0 - 22.0
<b>density, g cm<sup>-3</sup></b>	1.356
<b>moisture, %</b>	0.331

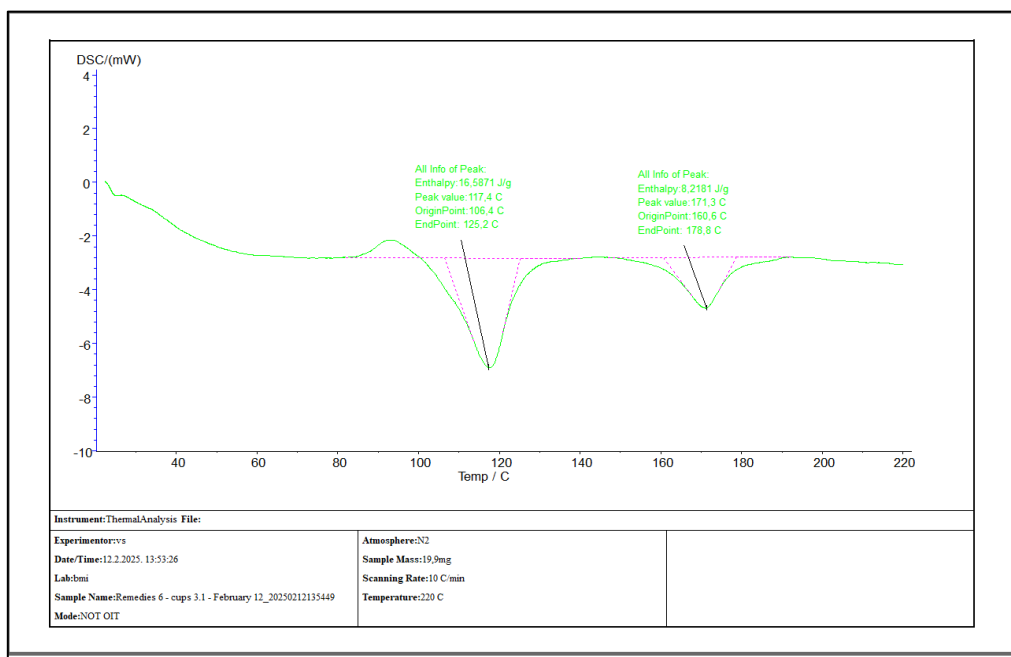


Figure 22 DSC thermogram of Remedies 6 – TRL7

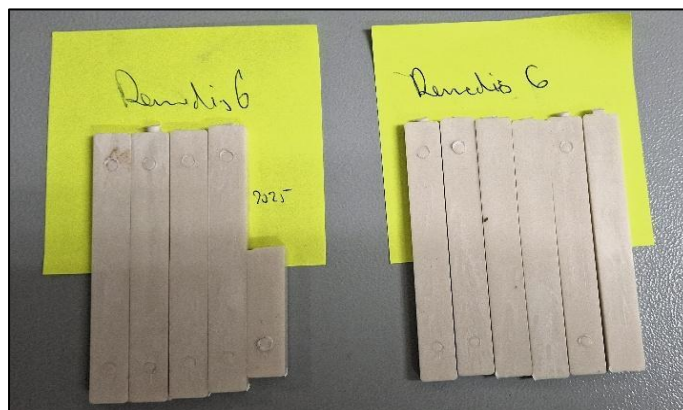


Figure 23 Test specimens – 2nd scale-up trial

Injection trials and impact testing were repeated with the same method as in the first scale-up trial. The results (Figure 23) are aligned with those from the first scale-up trial. Finally, 1520 kg of Remedies 6 were dispatched (Figure 24) to AITIIP.



Figure 24 Dispatch of 1520kg of Remedies 6 – 2<sup>nd</sup> scale up

## 2.2.10 Dishwashing Life Testing

In general, thermal resistance in dishwashing is assessed by the European standards EN 12875-1 and EN 12875-2 particularly for materials like ceramic, glass, and plastics. EN 12875-1 specifies a reference test method for assessing the resistance of these materials to the combined chemical, thermal, and mechanical stresses of a domestic dishwasher, specifically the impact of detergents, rinse agents, high temperatures, and mechanical action (water jets and utensil movement). Based on these standards, kitchenware can generally be considered dishwasher-safe if it can withstand 125 washing cycles without showing visible damage, but the number of cycles can be adjusted to show a higher level of dishwasher resistance (e.g. 250 or 500 cycles). However, fixed temperature values for dishwashers, are not specified, but a reference method for testing the resistance to washing cycles with a specific detergent concentration and temperature (60°C for 20 minutes during the wash cycle).

Dishwashing life testing on 100 pilots was organized and realized in ANGR facilities with the following objectives:

1. measure the cups' useful life in professional washing to specify their lifespan,
2. reduce energy consumption by lowering dishwashing temperatures,

3. test detergents chemical compatibility and customize proportions if needed.

The washing conditions investigated and compared were:

- professional washing at 60°C / R 85°C the norm in EU countries and prevalent HORECA practice,
- calibrated washing and rinsing temperatures set at 55°C / R 75°C.

The dishwashing tests proved the following:

1. REMEDIES cups can withstand 135 cycles (120 seconds) of dishwashing.
2. Excessive dishwashing affected the material after 12 cycles of dishwashing, and 2 minutes intervals in between.
3. Drying was insufficient with conventional detergents. This condition was studied further.
4. At 55°C / R 75°C cups required less time to dry, compared to higher dishwashing temperatures.

Table 11 Washing Tests Objectives

Test Type	Parameter
Durability Testing	Material durability under excessive washing conditions
Lifespan Testing	Useful life of cups with pilots in the dishwasher – 100 samples
Safety Testing	Safety of use at lower washing temperatures (aiming to reduce energy footprint)
Lifespan Testing	Effect of lower washing temperatures on cup lifespan
Cleaning Efficacy	Effective cleaning with one detergent
Desktop Research	Investigation of existing practices in other countries from literature
Chemical Tests	Chemical analysis of cups after uses

Technical considerations regarding the efficient cleaning and treatment of the reusables were addressed involving the traditional baskets drawbacks for washing reusable plastic items. Their design frequently compromises stability, leading to glasses tipping over or accumulating water, which impedes thorough washing and hygiene.



Figure 25 Dishwashing temperatures calibration

Moreover, these baskets prove ineffective in removing residues, as beverage and food remnants can tenaciously adhere to plastic surfaces, necessitating more intensive cleaning than traditional baskets can facilitate. Lastly, they often contribute to incomplete drying, resulting in streaks and moisture marks that are aesthetically displeasing and foster an environment conducive to bacterial proliferation. With market research two products were identified holding the potential to address effectively these challenges. Compared to their ergonomic design, the rack made by *Sistema Project Italia* (Figure 26) was preferred to that of HOBART.



Figure 26 Specialized dishwashing rack for testing

## 2.3 Mold Design and Fabrication

The mold plan (Figure 27) was proposed by AITIIP to ensure the effective allocation of resources, organize research activities and methods. The injection mould was specifically designed to produce two cups simultaneously (2-cavity mould), optimizing production efficiency (Figure 28). Key design features include:

- Hot runner system to ensure consistent flow and reduce material waste.
- Wall thickness of 1.5 mm, balancing structural integrity and material savings.
- Initial geometry included a sharp internal step, which was later revised for improved demoulding.

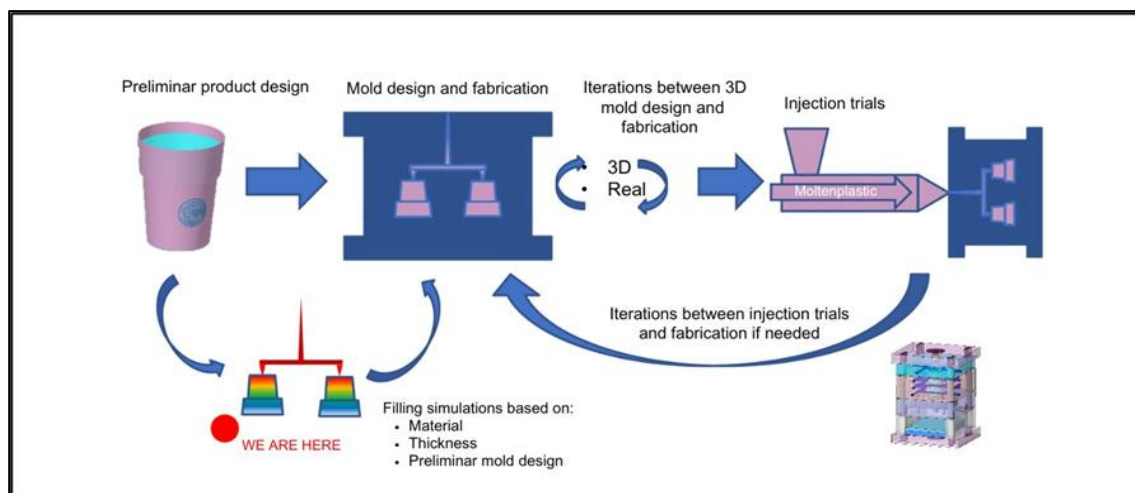


Figure 27 Mold plan, design and fabrication phases

### 2.3.1 Initial Injection Trials

Initial runs were conducted using Remedies 6 to evaluate mould performance. Key parameters assessed included:

- Filling behaviour (to detect short shots or air traps),
- Cooling efficiency (to identify hotspots or uneven shrinkage),
- Ejection performance (to prevent part sticking or deformation).

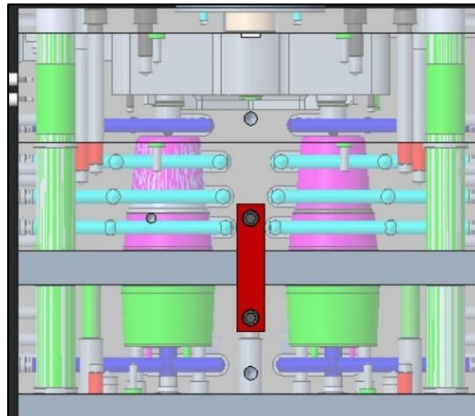


Figure 28 Preliminary mold design

### 2.3.2 Testing and Optimization

Based on the trial results, process optimization was carried out by adjusting injection speed, pressure, and cooling time. Following the initial trials, the mould underwent successive modifications to further enhance performance and ensure high-quality, repeatable production.

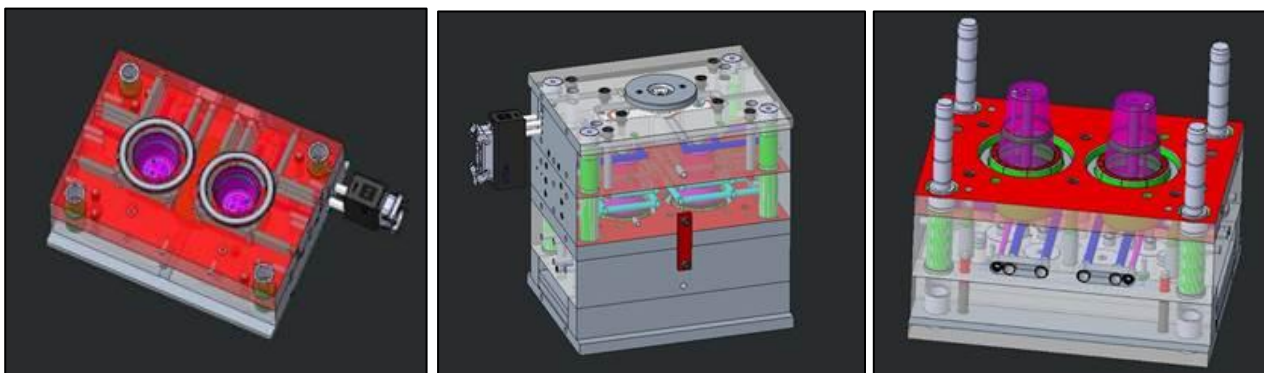


Figure 29 Mold iterations

Mold iterations included (Figure 29):

**1. Gate enlargement:**

The gate size was increased to improve material flow and reduce injection pressure, ensuring complete filling of the cavity without defects.

**2. Geometry smoothing:**

The original design included a steep internal step that hindered demoulding. This was replaced with a smooth curvature, significantly improving part release and reducing stress marks.

**3. Addition of air valves:**

Air valves were added to facilitate the release of trapped air during injection and to assist in demoulding by breaking vacuum effects.

**4. Incorporation of internal undercut:**

An internal undercut was introduced to ensure the cup remained on the moving half of the mould during opening. This undercut also served as a 0.5 L fill line, combining functionality with process control.

### 2.3.3 Texturing and Colour

The technical specifications (Table 12) and key characteristics of the colorant are:



- Thermal Stability: 140-160°C
- Light Fastness: 7-8
- Additives, Heavy Metals, Diarylides: None
- Recommended Material: PBS
- Recommended Dosage: 2%
- Color Tolerance:  $\Delta E \leq 1.5$

Table 12 Technical Specifications of the Colorant

Feature	Value
Product Reference	014111 MTB AMARILLO RAL-1016 BIOPBS
Thermal Stability	140-160°C
Light Fastness	7-8
Additives	No
Heavy Metals	No
Diarylides	No
Recommended Use	PBS material
Recommended Dosage	2%
Color Tolerance	$\Delta E \leq 1.5$
Storage	Dry, ventilated place, <50°C, out of sunlight
Disclaimer	Values are theoretical; buyer must test for suitability
Manufacturer	NEMARA RESEARCH S.L.
Date	05-05-2025

### 2.3.4 Branding Elements and Methods

The final modification to the mould focused on the integration of logos and regulatory markings to ensure compliance and enhance project visibility. Integrating logos and regulatory markings directly into the mould offers significant advantages over post-processing methods such as ink printing or labelling. This approach eliminates the need for additional materials (e.g., inks, adhesives) and energy-intensive steps, reducing both environmental impact and production costs. It also ensures that the markings are permanent, resistant to wear, and compliant with food safety standards. By embedding the information during the moulding process, the solution aligns with circular economy principles and enhances the overall sustainability of the manufacturing workflow. The branding specifications addressed the following claims:

- Ownership Claims,
- Production Claims,
- Environmental Claims,
- Safety Claims,
- Claims of Impact.

The following branding elements were engraved into the mould:

- The European flag (12 stars forming a circle), proving the support and funding from Horizon Europe,
- The REMEDIES project logo (Figure 30), symbolizing partners shared mission for prevention,
- The food-safe symbol, certifying that the material is suitable for contact with food.
- The plastic identification code, indicating the type of polymer used.
- The recyclability logo, promoting environmental responsibility and proper waste sorting.





Figure 30 REMEDIES engraved logo on cup walls (left) and symbols at the base (right)

These engravings were designed to be shallow and precise, ensuring they do not interfere with the demoulding process or compromise the structural integrity of the cup. The project logo was added to the lateral surface of the cup using a textured finish rather than traditional engraving. This decision was made to avoid complications during demoulding, as deep or sharp engravings on the side walls could hinder part ejection or cause damage to the mould or the product. The textured logo provides a visually distinct and tactile branding element while maintaining manufacturability and process efficiency. This final design update ensures that each produced cup carries the necessary regulatory information and project identity, aligning with both technical and communication objectives of the Horizon Europe initiative.

It is important to note that initially the tag line “Green EXIT” was to stand on the opposite side of the project logo to re-brand a sustainable identity for EXIT festivals. However, to adjust both elements, several mold modifications were required, which was not technically wise to conduct at that stage.

## 2.4 Food Compliance Assessment

### 2.4.1 Documents Screening

The DoCs at every step of the production chain were collected to ensure the provision of sufficient information on the composition of the substance or material that is used for Remedies 6. This is key to ensuring the safety and compliance of the finished food contact article and is conducted to approve the industrial scaling. Screening was performed by ANGR's packaging expert. The collected documents can be reviewed in Annex 10.4.

### 2.4.2 Chemical Analysis and Compliance Testing

The chemical analysis tests were monitored by ANGR and performed by a certified lab in Greece, between May 13, 2025, and June 2, 2025. The methods and test conditions used for the chemical analysis on various substance migrations and organoleptic properties, are the following:

- **Overall migration** using ethanol 20% v/v simulant at 70°C for 2 hours (repeated contact). The 3rd migration showed a mean value of 1.6 mg/dm<sup>2</sup> with a limit of 10.0 mg/dm<sup>2</sup>.
- **Specific migration of elements** (compliance with EC 10/2011) using ethanol 20% v/v simulant at 40°C for 2 hours (repeated contact). Results for elements like Chromium, Mercury, and Lead were all below their respective limits of 0.01 mg/Kg. Calcium showed a result of 0.090 ± 0.018 mg/Kg in the 1st migration.
- **Specific migration of primary aromatic amines (PAA)** (compliance with EC 10/2011) using Acetic Acid 3% w/v simulant at 40°C for 2 hours (repeated contact). The results for individual and sum of "more amines" were below the detection limits and within the set limits.
- **Specific migration of non-intentionally added substances (NIAS)** using GC-MS/FID with ethanol 20% v/v simulant at 40°C for 2 hours. Two unknown substances were detected with results of 0.08 ± 0.04 mg/Kg and 0.63 ± 0.32 mg/Kg, respectively.
- **Organoleptic properties (Odour and Flavour)** using water simulant at 40°C for 2 hours. The 3rd migration showed an Odour mean value of 0.0 (no noticeable deviation) and a Flavour mean value of 1.0 (barely noticeable deviation).

**All results are within legislation limits for beer and short-term contact (up to 2 h). The cups are suitable for repeated use.**

Note: on the NIAS assessment, during the material for volatile migrating substances screening, two substances were found, which are unknown. An unknown substance in this analysis means that the graph given by the instrument does not match a substance of the library by more than 80 %, which is the minimum percentage to safely identify the nature of the substance. The match percentage in these cases is called match factor (MF). In such cases, the best hits were provided, which means the substances which best match the substances library of the instrument. In our case we have 78 % match factor and 71 % match factor for the two substances found:

1. Unknown substance RT: 16.2

Best Hit: 1,3-Dioxepane, 2-heptyl- [CAS: 61732-92-1; RT: 16.2 min; MF: 78 %]; This substance has a limit of ≤ 0.09 mg/kg; The result here is 0,08 mg/kg, so the substance is in compliance.

2. Unknown substance RT: 39.6

Best Hit: Succinic acid, di(but-2-en-1-yl) ester [CAS: 1000391-23-3; RT: 39.6 min; MF: 71 %]; This substance has a limit of ≤ 1,8 mg/kg; The result here is 0,63 mg/kg, so the substance is in compliance.

Therefore, the material is safe for use for the intended application (beer and water) and this is clearly stated in the evaluation page at the end of the analysis report (Annex 10.5).



## 2.5 Production Upscaling

To ensure efficient, scalable, and hygienic production of biobased drinking cups, the injection molding process was fully automated. The system was designed not only to optimize productivity but also to meet the specific requirements of food-contact applications.

The following automation strategies were implemented:

1. The molding cycle was optimized to a total of 30 seconds, including injection, cooling, and ejection phases. This ensured high throughput while maintaining dimensional stability and surface quality of the cups.
2. Two separate feeding systems were used:
  - One for the biobased polymer formulation developed within the project.
  - Another for the colorant, which was dosed and mixed automatically at a controlled ratio of 2%.

This ensured consistent coloration and material homogeneity, while minimizing operator intervention and material waste.

A robotic arm was programmed to pick the cups directly from the mold after ejection (Figure 31). This eliminated manual handling, reduced the risk of deformation, and ensured consistent orientation for downstream operations (Figure 32). It allowed manufacturing fluently more than 25,000 cups.



Figure 31 Demolding Process with Robotic Arm

The system includes full traceability of:

- Incoming material batches.
- Production parameters.
- Outgoing cup batches delivered to project partners.

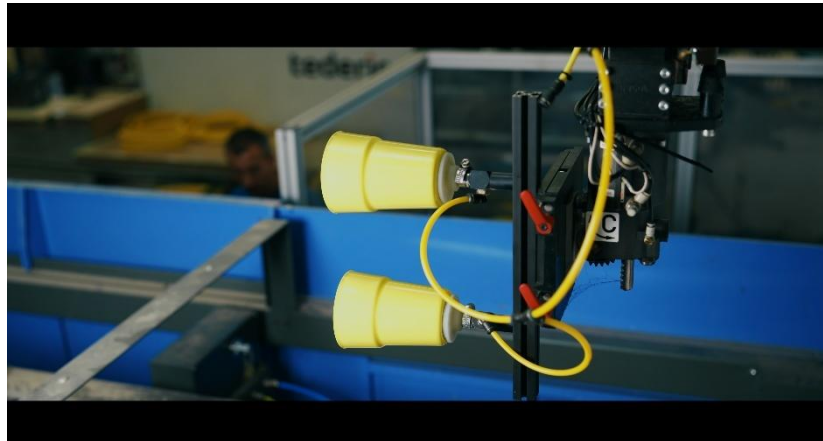


Figure 32 Transport with Robotic Arm and Inspection

This traceability is essential for food-contact compliance and quality assurance and supports auditability throughout the supply chain. Once inspected, the cups are automatically sorted and packed using food-grade packaging materials. To prevent jamming or deformation during transport cups are stacked horizontally inside the boxes (rather than vertically) (Figure 33).



Figure 33 End Product Inspection and Packaging

Each box contains 280 cups (Figure 34), arranged to optimize space and stability. All packaging materials used are compliant with food-contact regulations, ensuring the final product is ready for safe distribution and use.



Figure 34 Photo of the End Product the REMEDIES Cups

A small production was prioritized for 5.000 items and was ready to be shipped to Greece on June 17, 2025, to demonstrate in Mykonos. The industrial production of 20.000 items was finalized on August 1 and was later dispatched to EXIT.

The REMEDIES cups compliance documents are presented in Annex 10.6.



## 3. Plastic-free Reusable Bottles

### 3.1 Design Brief

Single-use plastic bottles for water contribute to massive waste generation and plastic accumulation. Especially at high stressed tourist destinations and water stressed locations, where the demand in cool water increases disproportionately to the available resources, plastic water bottles are hard to refuse, as access to other options is inexistent. Based on the GA specifications 5.000 reusable bottles are deployed in Mykonos DS, to equip the water refilling station developed by MCG. The reusable bottles target to the visitors of the beach, who can use them to refill cool water on site.

### 3.2 Technical Analysis and Specifications

To decide the proper and most sustainable alternative to SUP water bottles for the DS of Mykonos, market research was conducted by ANGR. The market offers several sizes, shapes and materials as solutions for reusable bottles. Several factors were considered in choosing the most appropriate material and eventually the most suitable size for the demonstrator, including in relation to the material:

- health hazards and safety,
- sustainability,
- ease of availability and replacement.

Desk research was performed, looking into results, publications and papers comparing the different materials used for reusable bottles available in the market. Aspects studied and compared included:

- the behaviour of the material,
- potential bacterial growth,
- migration of substances hazardous for human health,
- reaction to washing, transparency providing proof of cleanliness,
- end of life potential for recycling, especially when the material is distributed in a remote place.

Based on the above, glass bottles appeared as the best suitable choice for the demonstrator. Regarding the environmental impact, compared to other materials, SUP glass bottles have the highest overall impacts compared to other alternative materials, such as PET, aluminium and beverage cartons. However, reusing glass bottles avoids emissions associated with new production; even after the first use, the reduction in emissions can be drastic (Figure 35). As the study reports, a 40% reduction in CO<sub>2</sub> emissions for the glass bottles is possible after the second cycle (9).

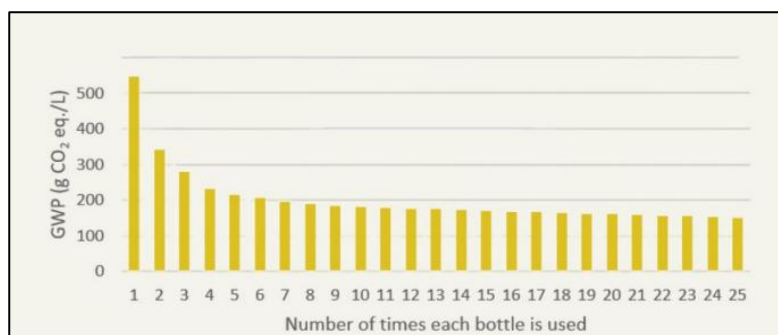


Figure 35 Reusable glass bottles global warming potential (g CO<sub>2</sub> eq/L.) graph

Emissions from reusable packaging are usually related to the washing process and the transportation phase (backhaul and resupply), which are present in every cycle of a reusable packaging. However, in the specific case, the reuse scheme of the water-bottles in Mykonos DS does not embed for collection and washing any means of transportation that could result in CO<sub>2</sub> emissions. Specifically, the Mykonos DRS demonstrates a



decentralized loop where the water is locally produced, and bottles are self-distributed and returned to a collection point next to the beach. Redistribution is monitored by the cleaning staff that operates the dishwashing system, for the cleaning. Therefore, the transportation factor within the loop is eliminated and the logistics are kept to the outmost minimum.

When the size of the bottle was considered, after discussions with the demo site leader MCG, a small size/volume was chosen. The AWG system produces 10-50L of water depending on the atmospheric conditions (see 2.4.3 below). Bearing this in mind and aiming at being able to serve as many people as possible, a 300 ml glass bottle was chosen. Moreover, the smaller volume appears more suitable for personal use, it optimizes the operational ease of the involved staff, and end-user convenience, while preventing irrational water use, because of heat exposure.

Market research identified a manufacturer of glass bottles located in Greece, *Apikian Packaging*, bearing the suitable ISO 22000 certification accompanied by the equivaled lid. One palette, that is 4.693 bottles, and 2 boxes, that is 6.200 metal lids were purchased by ANGR and send to Lia Beach Mykonos.

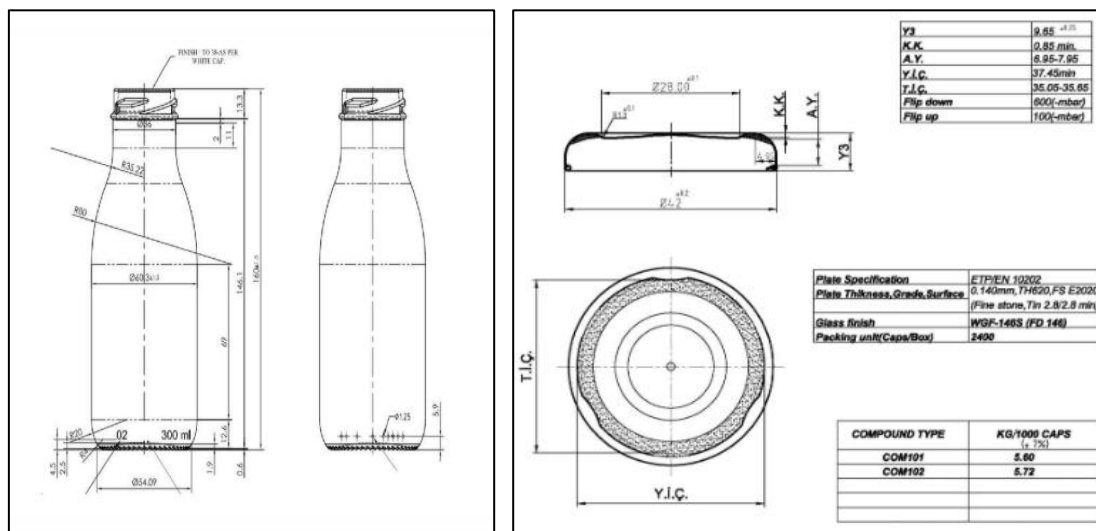


Figure 36 Technical drawings of the selected glass bottle and lids by Apikian

## 4. Digital (Deposit) Reuse Systems (DDRS)

Digital reuse systems typically comprise four standard and widely accepted components: unique marking codes, a consumer-facing smartphone application, smart collection points, and sophisticated IT orchestration platforms. It is also important to note that reuse schemes can exist without smart interventions and are commonly integrated with a free-deposit reuse scheme in real-life business-to-consumer (B2C) interactions, often at eco-conscious outdoor events.

A DRS can either incorporate a classic model, which refunds the consumer upon the return of an empty container with the deposit initially charged for the packaging or service of a product, or a Reuse with Deposit (or Reusable DRS) model, which applies to the circular economy of reuse. In the latter, consumers pay a deposit on a reusable container, which is returned after use, whereupon the deposit is refunded, and the container is subsequently washed, sanitized, and prepared for reuse. This system can effectively replace single-use plastics entirely by establishing a closed loop of reuse, whereas the classic model enhances the collection of containers with a short lifespan by incentivizing recycling.

Within the framework of the REMEDIES project, the focus is on Digital Reusable Deposit-Return Systems (DRS) to transparently monitor the lifecycle of reusable cups and bottles. These systems integrate advanced technologies, such as QR codes and RFID, to facilitate the tracking of reusable containers, optimize the return process, and yield valuable data for enhancing reuse cycles. The implementation of unique identifiers per item is deemed ineffective for embedding on the REMEDIES biobased cups and glass bottles. Given the paramount importance of the environmental impact of innovative material aspects, conventional options like printing or stickers are not favored. Conversely, an alternative approach emphasizes transparency in circular performance and accountability among all participating entities.

### 4.1 Design Considerations

In general, the material characteristics as regards the reuse life, cleaning, handling, transportation and storage conditions were considered in the initial design of the DRS, focusing on the product's use environment and specific reuse modalities (use cases), as well as labeling and communication of essential information specifically as regards the environmental claims and impact of reuse. The reuse modalities were further investigated including requirements for collection, sorting, redistribution, and cleaning, as well as end user engagement to enable high return rates through incentives, improved user experience, and clear instructions.

### 4.2 Digital Return Scheme for Water Bottles

To fit the use-case of the DRS in Mykonos, CIBOS has provided the necessary hardware to achieve smart use on the beach. With the aim to maximize glass bottles returns IT tools were coupled with the Atmospheric Water Generation System to engage actively end users via their mobile phones.

#### 4.2.1 System Overview

The bottle scheme provides an always-on, app-mediated access and return flow that couples smart storage with the Atmospheric Water Generation System, enabling seamless self-service bottle pickup, refill, and return without the need for event-based “Campaigns.” Participants unlock storage via the mobile app, withdraw one or more reusable glass bottles, refill at the Atmospheric Water Generation System, and return bottles to the same smart storage where in/out counting is automated to generate anonymous usage analytics. Smart sensors on the Atmospheric Water Generation System and lockable cabinets with RFID readers support reliable access control, inventory accounting, and closed-loop reuse without single-use plastics.



## 4.2.2 App Architecture and Roles

The bottle module builds on the same multi-role, mobile-first architecture as the cup DRS, but operates perpetually and independently of Campaign lifecycle states, reflecting the static infrastructure and continuous service model of refilling points. Two roles are supported: participants, who register and self-serve bottles through the app, and organizers, who monitor operations and can intervene when a user requests support or when anomalies in flow are detected. The app also delivers REMEDIES engagement content to inform participants about goals, impacts, and local guidance, reinforcing circular behavior at point of use.

## 4.2.3 Registration and access

Participant registration follows the same flow as Use Case 2 in 4.3.3 (auto-registration): account creation, email verification, then app login, after which the user may immediately access bottle storage without any Campaign association. This ensures frictionless onboarding for first-time users and consistent credentials for subsequent visits across days or seasons. Once authenticated, the participant can select the unlock action near the storage, which triggers proximity-based or RFID-assisted authorization and automated door release.

## 4.2.4 Use cases

### Use Case 1: Participant registration (participant)

A first-time user downloads the app, selects Register, completes the form, and verifies the account via email to activate access rights for bottle storage and Atmospheric Water Generation System usage.

### Use Case 2: Storage unlock and bottle pickup (participant)

From the home screen, the authenticated user taps Unlock Storage while physically near the cabinet; the system validates proximity and user state, then unlocks the door automatically.

The storage system counts bottles extracted in real time via embedded sensors/RFID, updating inventory and the participant's session metadata (anonymized) without creating item-level unique identifiers on the bottles.

### Use Case 3: Bottle use and return (participant)

The user refills bottles at the Atmospheric Water Generation System and consumes water in the venue, then returns bottles to the same storage or designated return compartment that automatically re-counts inbound items to reconcile the loop. The system stores anonymized events for analytics (e.g., pickups, returns, dwell time), feeding dashboards that summarize throughput, reuse rates, and return compliance.

### Use Case 4: Error handling and support (organizer)

If unlocking fails, sensors error, inventory mismatches occur, or a participant requests help, an organizer is alerted via notifications; organizers can remotely re-initiate unlock, assist on site, or flag units for inspection. All interventions are logged to support quality assurance, root-cause analysis, and service-level monitoring across usage.

## 4.2.5 Engagement content

The app includes an engagement section that showcases REMEDIES objectives, environmental benefits of reuse, and site-specific guidance, reinforcing correct return behavior and social norms that improve return rates.



## 4.2.6 Data, privacy, and analytics

The system tracks anonymized session data—such as number of bottles taken and returned per unlock session, time between pickup and return, and aggregated throughput with per-item unique identifiers on bottles. Organizers access aggregate dashboards to monitor availability and return ratios. All telemetry follows data minimization, with personally identifiable information limited to account credentials required for authentication and support.

## 4.3 Deposit Reuse System for Plastic Cups

The system is designed for a multi-stakeholder environment, catering to organizers responsible for planning and overseeing Campaigns, bartenders stationed at the event's service points, and the participants attending the events. The DRS system is a composite solution, comprising a web-based platform and two distinct mobile applications. The web platform serves as the primary interface for Campaign management and provides organizers with tools for tracking cup reuse metrics. Conversely, the mobile applications are designed to facilitate the cup exchange process during a Campaign and to offer participants a personalized view of their contribution to sustainability through reuse statistics.

### 4.3.1 System Overview

The reusable cups DRS mobile application is engineered to monitor and quantify the reuse of cups within the framework of organized events, hereafter referred to as Campaigns. These Campaigns typically represent gatherings where beverages are served in reusable containers, which this document standardizes as "cups." Within the operational area of an event, participants can access various designated locations, or Points of Interest (e.g., bars). At these points, cups are initially distributed and subsequently exchanged for clean ones, promoting a circular economy model and sustainable consumption practices. Consequently, the facilitation of cup reuse constitutes the central functionality of a Campaign, which is strategically planned and targeted toward the event's attendees.

### 4.3.2 App Architecture

The DRS application architecture supports a variety of user roles, each with distinct permissions and functionalities. Campaign members are integral to the organization and execution of a Campaign. Within this group:

- **Organizers** function as the principal event planners; they possess the capabilities to create and manage Campaigns, as well as to administer the roles of other members involved.
- **Bartenders** are defined as qualified staff members who execute the core operational tasks of a Campaign. They are responsible for distributing, swapping, and collecting cups at designated Points of Interest, thereby managing the physical logistics of the cup exchange process.
- **Participants** are the end-users who attend Campaigns. Their interaction, which involves receiving and exchanging cups, is fundamental to the viability of the reuse process.
- **Admin users**, who possess a higher level of authorization than organizers, granting them access to advanced system-wide configuration and management features.

The fundamental use cases, suggest the scenarios under examination including:

- Organize a Campaign,
- Participant Auto-Registration,
- Participant association with Campaign,
- Cup Exchange,
- Campaign States,
- Cup exchanges and statistics.



### 4.3.3 Use Cases

#### Use Case 1: Organize a Campaign (organizer, bartender)

As explained, Campaigns represent events where reusable cups are given to participants for their drinks. In order to successfully monitor these cup reuses, a new Campaign must be added to the system. After all the required parameters are set, the Campaign can start enabling the tracking functionalities (Figure 37).

1. To plan a new event the first step is to create a Campaign. Campaign creation includes basic information (name, location, date), the setting up of the bars and the cups that will be given to participants.
2. After the creation of a new Campaign, it is suggested for an organizer to perform some preparatory steps. Nevertheless, these steps could also be performed throughout the Campaign.
  - a. Organizers can assign new members for the Campaign, including co-organizers and bartenders. Newly added organizers and bartenders of a Campaign are then associated with it according to their role.
  - b. Then bartenders can take their place at a Point of Interest for the specific Campaign. To define their position, they should scan the codes of Campaign and Point of Interest through the app.
  - c. Participants will use unique participant identifiers during the event to show at the bars and

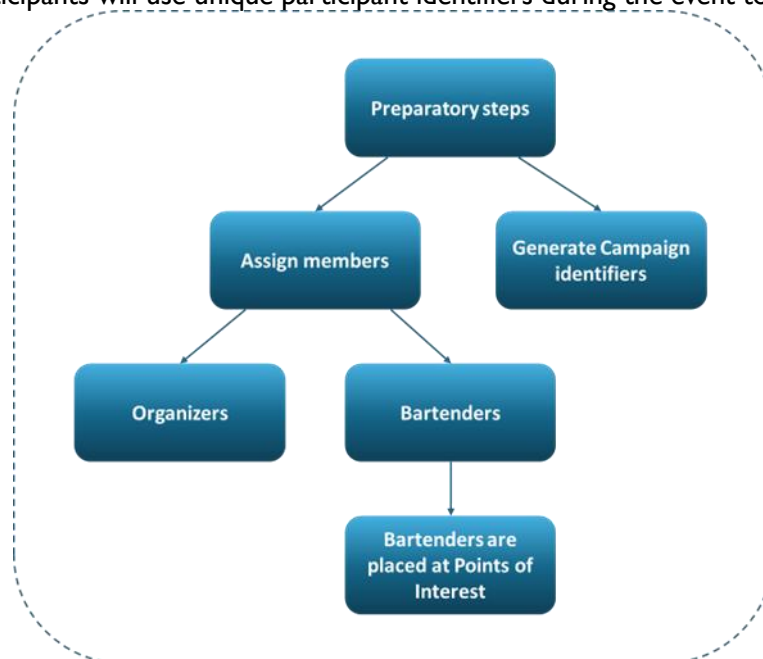


Figure 37 Organize a Campaign Flowchart

make cup exchanges. These identifiers are generated by the organizer for the specific event, can be printed and distributed to participants.

## Use Case 2: Participant Auto-Registration

When a new user wants to use the mobile app, they should, first of all, create a new account (Figure 38). This account will be then associated with any Campaigns they attend.

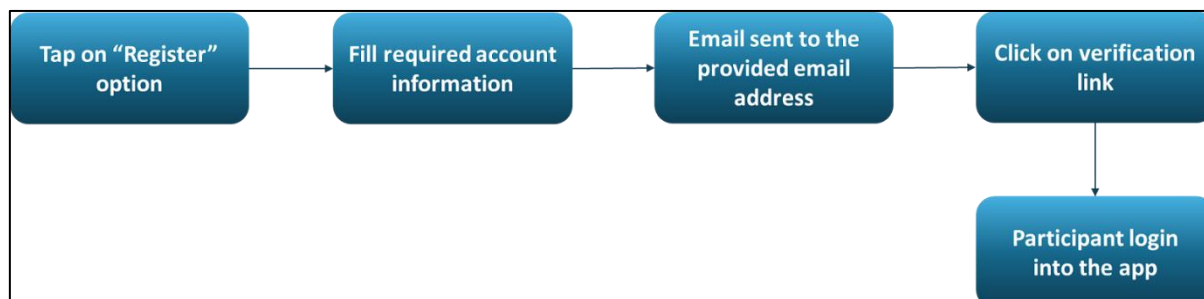


Figure 38 Participant Auto-registration

1. Participants who use the app for the first time need to sign up with a new account. Auto-registration for participant users is supported by the mobile app, by clicking "Register" in the login page and providing the relevant account information.
2. After submitting the required form, users are prompted to verify their email to login for the first time. Specifically, they will receive an e-mail which contains a verification link for the e-mail address they provided in the registration form. This action is required for a participant to login and use the application.

## Use Case 3: Participant association with Campaign (participant)

This use case concerns participants who want to attend a certain Campaign (Figure 39). Each time a person (participant) attends a Campaign, they must associate with it to 'unlock' the feature of their personal reuses tracking. More specifically, the following use case describes the actions required for an already registered application user (participant) to be associated with a Campaign, which includes an activation process enabling them perform to Cup Exchanges in the Campaign.

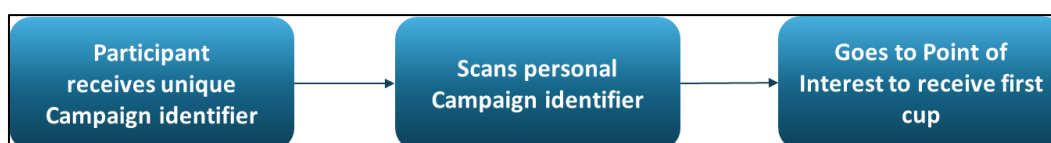


Figure 39 Participant association with Campaign

1. After receiving a unique participant identifier for a Campaign, each participant should first scan this code with the application to perform any cup exchange on the Campaign and view personal statistics.
2. After the above activation step, participants can go to the nearest Point of Interest which serves as a Distribution point to receive their first cup.

## Use Case 4: Cup Exchange procedure (participant, bartender)

Whenever a participant wants to get a drink during a Campaign they must go to a Point of Interest (bar). In general, the exchange between a bartender providing a drink in a reusable bottle and the participant receiving it, is called a Cup Exchange in the application. Different cup exchanges can be performed at specialized Points of Interest of a Campaign.

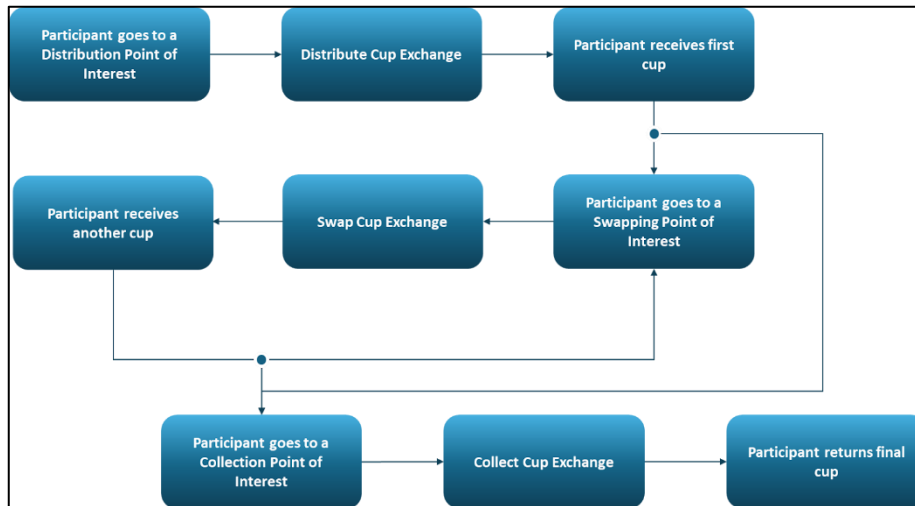


Figure 40 Cup Exchanges flow throughout a Campaign

The following use case describes the steps required to perform a Cup Exchange. The first figure (Figure 40) represents an overview of the different Cup Exchanges flow throughout a Campaign for a participant. The second figure (Figure 41) focuses on a discrete Cup Exchange and can be interpreted as either the flow of a distribution or a collection cup exchange.

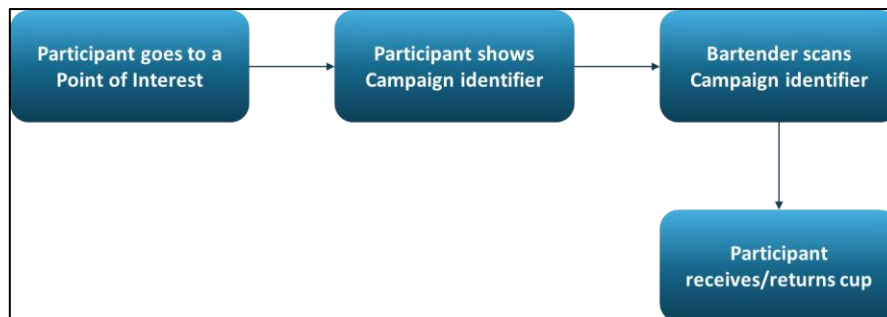


Figure 41 Cup exchange (distribute/collect)

The third figure (Figure 42) involves an extra step and refers to a swapping exchange.

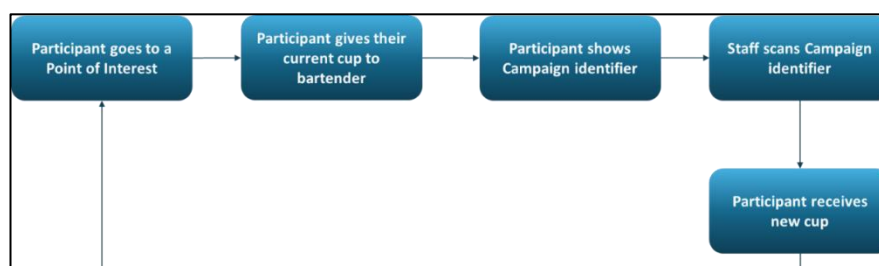


Figure 42 Cup exchange (swap)

1. A participant can go to a relevant Point of Interest to perform a cup exchange. This means to receive, swap or return a cup.
2. Then, they should display their personal participant identifier to the bartender.
3. Next, the bartender scans this code through the app.
4. Upon a successful cup exchange, the bartender gives a new cup to the participant or collects their current one according to the type of cup exchange performed.

Note: In a **swap** cup exchange, when a participant already uses a cup and wants to get another one, they must first give their current cup to the bartender.

### Use Case 5: Campaign Status (organizer)

Prior to the official start of a Campaign, its functionalities related to reuse-tracking are inactive, and users can only view preliminary information. During this "upcoming" phase, Campaign organizers have the ability to view and modify Campaign details. Conversely, participants who have registered for the Campaign and bartenders assigned to Points of Interest must await the Campaign's official activation.

Once the organizer activates the Campaign, its state transitions to "active." In this state, participants and bartenders are enabled to commence with Cup Exchanges. Concurrently, the system begins to collect data, and all relevant statistics are updated in near real-time (Figure 43).

When the organizer determines that the event should conclude, they must execute the corresponding action within the application. This is accomplished by navigating to the Campaign Details and selecting the "End Campaign" option. Upon this action, the Campaign's status is updated to "ended" across both the web and mobile platforms. While no further cup exchanges can be performed, organizers and participants retain the ability to view all statistics associated with the completed Campaign (Figure 43).



Figure 43 Campaign Statuses

### Use Case 6: Cup exchange analysis and statistics (organizer, participant)

Whenever a Cup Exchange is successfully performed, there is a related change in both Campaign and participants statistics in the web application. Participants are also informed nearly real-time about these changes by the statistics displayed on their mobile app:

1. Distribution:
  - Participant's personal statistics for this Campaign become visible.
  - Total distributed cups for this Campaign are increased by one.
2. Swapping:
  - Participant's reuses are increased by one.
  - Total Campaign reuses are increased by one as well as distributed cups.
3. Collection:
  - If participant returns their last cup, their cup usage status for this specific Campaign is updated to "Returned".
  - Total collected cups for this Campaign are increased by one.

In general, statistics' values are updated according to cup exchanges throughout the Campaign. This is important for:

- An organizer: Can be informed about total cups needed for their events and track the reuses with different metrics.
- A participant: Personalize their experience of the event by informing them about their contribution to reuses.

#### 4.3.4 Campaign Management (Web Platform)

This section contains information on how a Campaign can be successfully organized and monitored from start to finish. All actions described below can be performed either by an organizer or admin.

The web platform can be found in this link: <https://reuse.mycibos.eu/>

#### Add Campaign

To add a campaign, an organizer user should navigate to Campaigns > Add New Campaign (Figure 44) and fill in the required info (Figure 45) including:

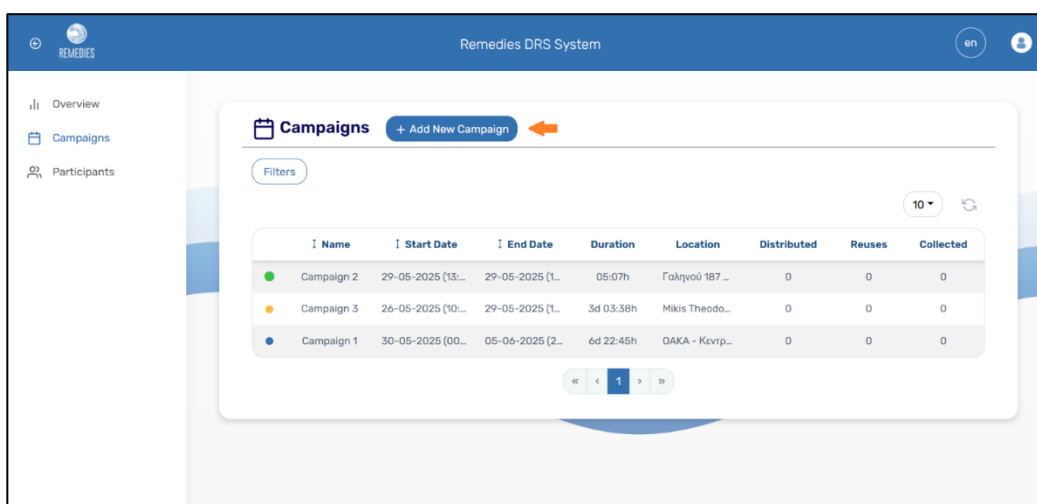


Figure 44 Home page for Campaigns

- Basic details about the Campaign: name, date, location,
- The quantity (and optionally the type) of the cups that will be provided for the specific Campaign,
- The distribution limit: each participant can have in their possession up to a specific number of distributed cups,
- The collection limit: each participant can return up to a specific number of cups,
- The option whether to allow or not, participants to take new distributed cups after returning old ones,
- The setup of the bars by defining the corresponding Points of Interest.

If an admin creates a Campaign, they will have to also add elevated staff members, such as organizers and bartenders, as described in the Members section.

Concerning distribution and collection limits: if the collection limit is greater than the distribution limit, then a participant is allowed to return extra cups in addition to their own (e.g. their friends' cups). Points of interest can be added either by selecting previously used points from other campaigns or by adding new ones on the map.

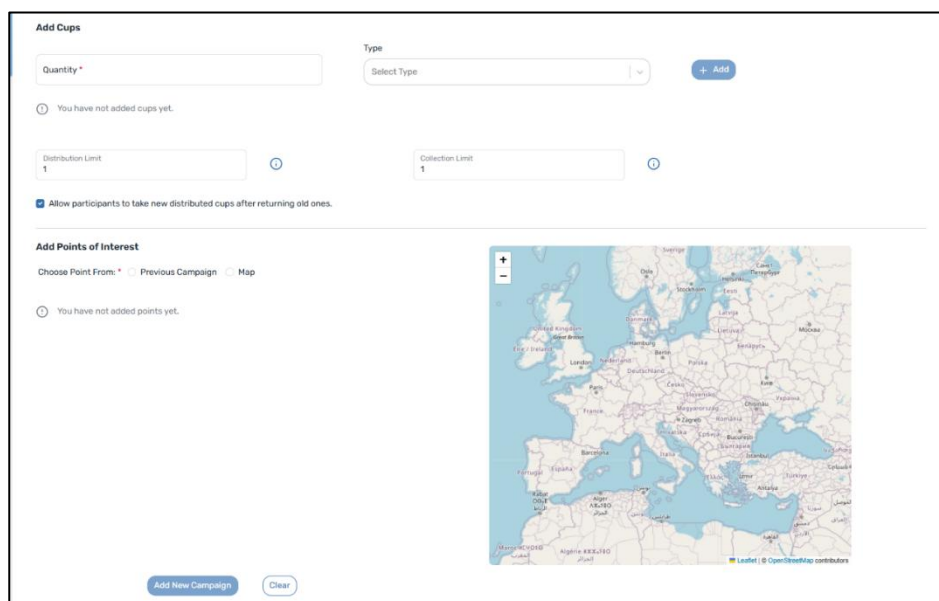


Figure 45 Add Campaign Form

### Previous Campaign

All points used in previous campaigns will appear on the map (blue points). When clicking on a point, it will become highlighted with the option to add it (Figure 46).

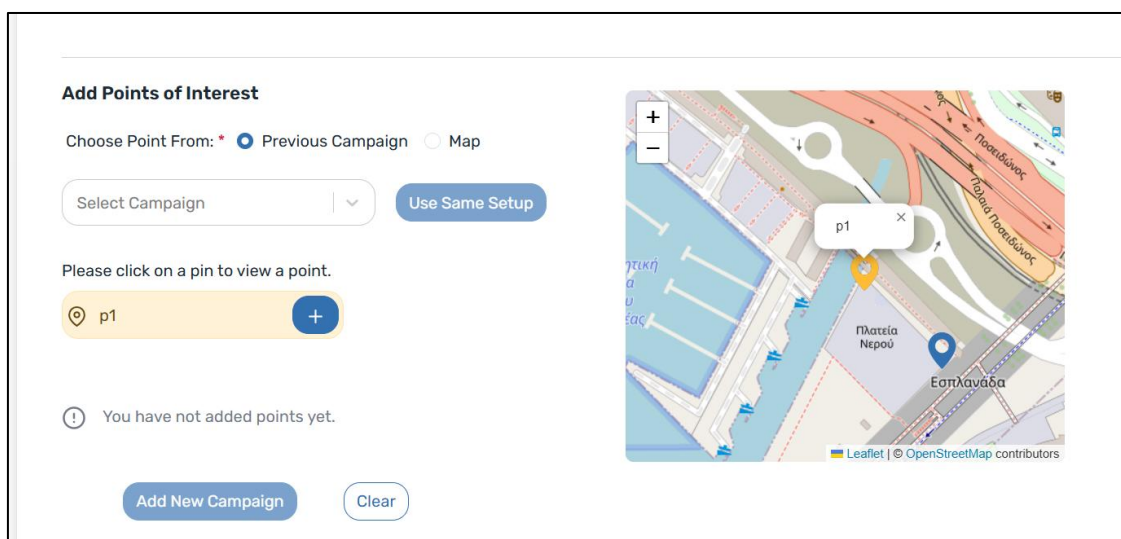


Figure 46 Highlighted Point from Previous Campaign

After adding points to the new Campaign, a list of the selected ones will appear along with the ability to remove all of them or specific ones. These points will be displayed on the map in the colour red (Figure 47).

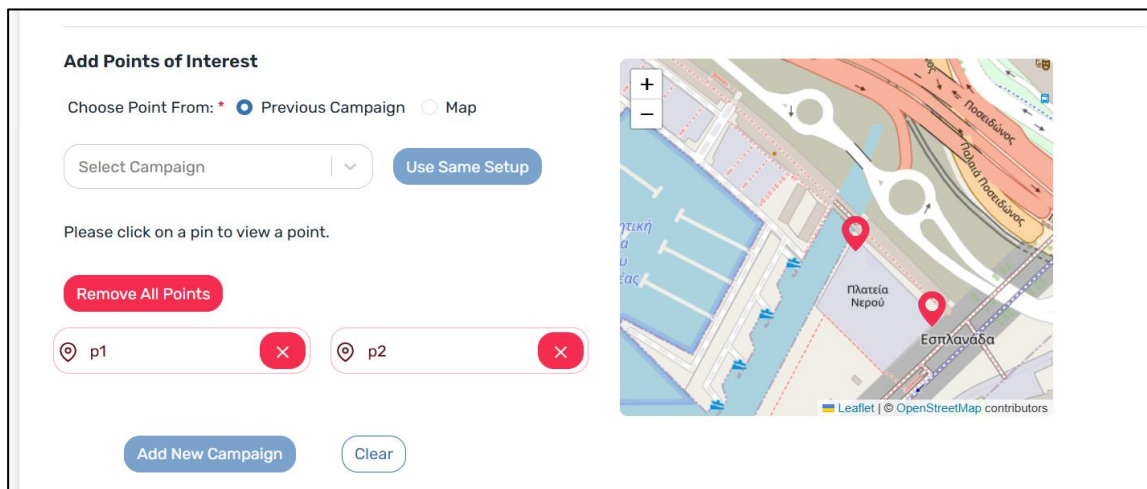


Figure 47 Selected Points for New Campaign

Furthermore, a user can view the setup of a specific campaign by selecting the campaign's name from the corresponding list. The setup will be highlighted with green colour. Optionally, the whole setup can be added to the new Campaign by clicking on the button "Use Same Setup", or a subset of that by selecting individual points as described above (Figure 48).

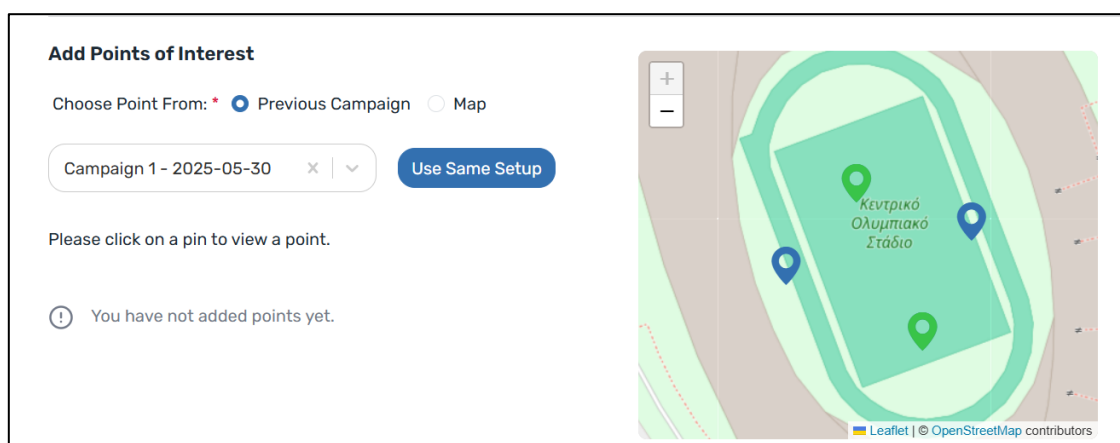


Figure 48 Setup of Selected Campaign

## Map

To add a new point, its name and location are required. By clicking on the map, user can place the point in its corresponding location (Figure 49). After adding the point to the new Campaign, the point's colour will turn from blue to red.

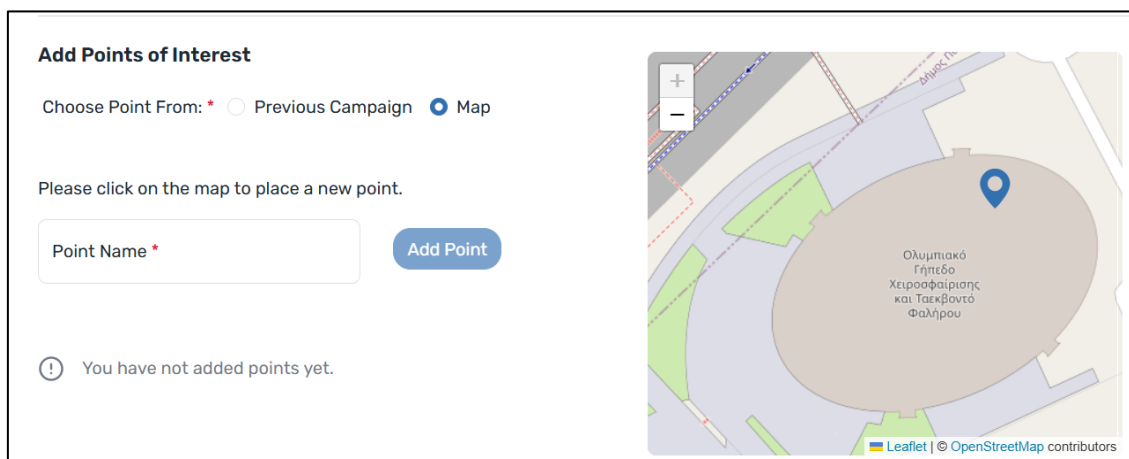


Figure 49 Add new point to map

### 4.3.5 Cup Exchanges (Mobile App)

#### Bartender

There is a separate mobile application targeted at Campaigns' bartenders. Detailed information about the application's usage by bartenders (other elevated users can also use this application), is provided in the following sections. To determine a bartender's position on the event, the following preparatory step is required.

The bartender user should navigate to Campaign Info option from the menu and provide "Campaign" and "Point of Interest" codes:

1. Scan or manually enter a Campaign's code (Figure 50),
2. After each scan, a message is shown indicating the success/failure of adding the Campaign, (Figure 50)
3. After a successful Campaign code scan, the corresponding Campaign is selected and the user can proceed to scan or manually enter a Point of Interest's code, following a similar process.

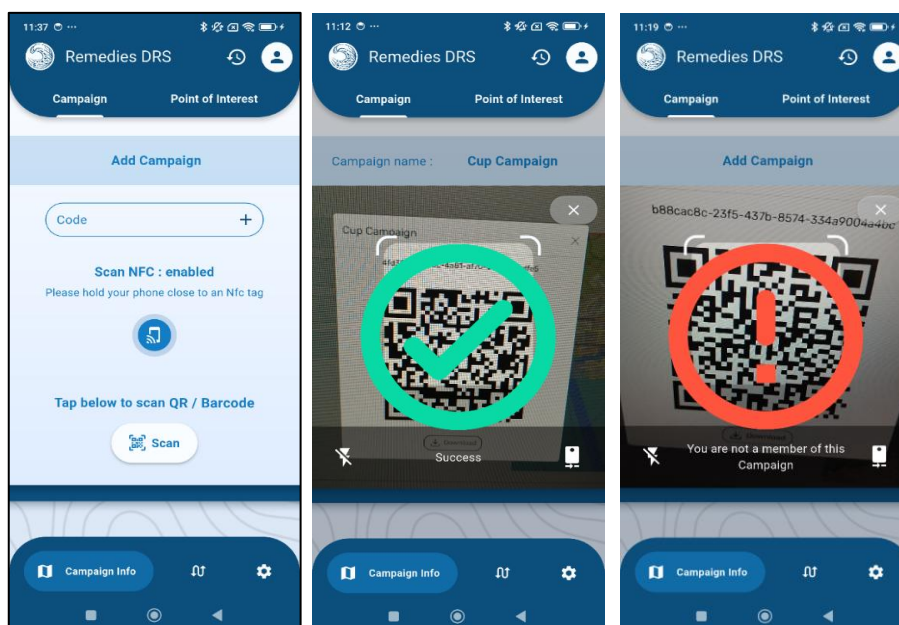


Figure 50 Add Campaign code (left) and Campaign Identifier Scan Results (right)

Note: The Campaign Info initialization needs to be performed only once before beginning cup exchanges and can be changed at any time, for example, if a bartender is placed in a different Point of Interest.

Bartenders are qualified users for making cup exchanges throughout the Campaign. There are three types of exchange:

1. **Distribute:** Distribute the first cup to a participant user.
2. **Swap:** Receive the cup a participant already uses to give them another cup.
3. **Collect:** Final collection of a participant's last cup.

After specifying the Campaign and Point of Interest, a bartender can begin performing cup exchanges from the **Exchange** menu option, according to the following steps (Figure 51, Figure 52):

1. A participant displays their personal participant identifier and the bartender scans it.
2. The bartender selects and confirms one of the available exchange types.
3. Success/failure message is displayed on the screen, providing relevant information if exchange fails.

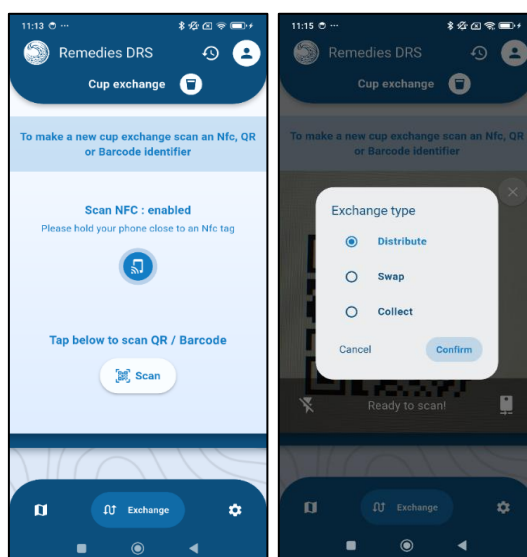


Figure 51 Scan participant code (left), select exchange type (right)

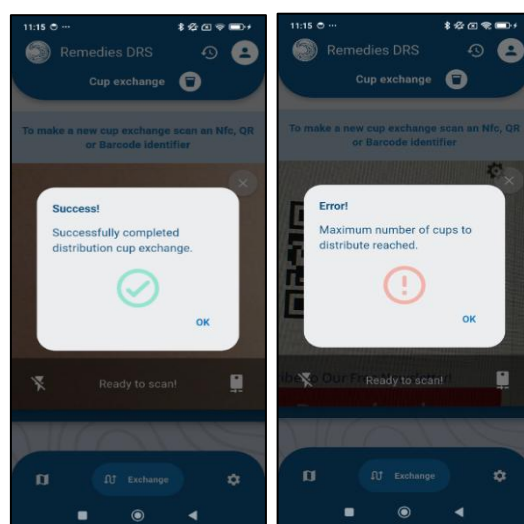


Figure 52 Cup Exchange - Successful exchange (left), error on exchange (right)

Note: If Campaign's exchange limits (Distribution/Collection limit) are set to a value greater than the default value of 1 cup per exchange, bartender can optionally choose to pick quantity of cups to be distributed, swapped or collected, as presented below:

## Select exchange types

Bartenders can select which exchange types of the app are configured for, from the Settings menu option (Figure 53). If none are chosen, all options will be displayed as available. Otherwise, only the selected options will be visible during the exchange process. If only one option is selected during the exchange process the type of exchange selection is skipped.

Note: This option is connected to the types of Points of Interest. For example, if a Point of Interest serves as a Swapping point, only the Swap option can be used to accelerate the cup exchange process.

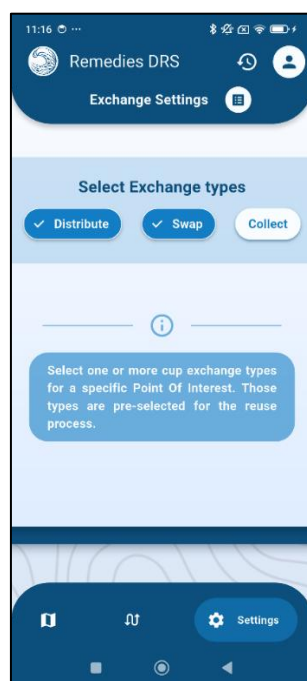


Figure 53 Exchange Settings - Select Exchange Types

## Types of Points of Interest

There are three types of Points of Interest. At Distribution points participants can receive their first cup after entering the Campaign. At Swapping points, they can exchange the cup they use to get another one. Finally at Collection points participants can return their cup before leaving the event.

Accordingly, the possible exchanges are the following (Table 13):

- **Distribution cup exchanges:** The first time a participant gets a drink, they should go to a Distribution point of interest.
- **Swap cup exchanges:** Any time a participant wants to 'swap' the cup they currently use for another one, they should go to a Swap point of interest.
- **Collect cup exchanges:** The last cup of a participant is returned before they leave the Campaign to a Collection point of interest.

Table 13 Points of interest for cup exchanges

Point of Interest type	Cup exchange	Description
Distribution	Distribute	The first time a participant gets a drink in a Campaign
Swapping	Swap	Any time the participant 'swaps' the cup they use for another one
Collection	Collect	The last cup of a participant is returned before they leave the Campaign

Note: A Point of Interest may help more than one types of Cup Exchanges.

### 4.3.6 Statistics and Aggregated Views

#### View Personal Statistics (Mobile App)

Reuse statistics for a participant user about the Campaigns they currently attend or attended in the past are available in the mobile app dedicated to participants. A participant can view their statistics by tapping on the **Campaigns** menu option (Figure 54).

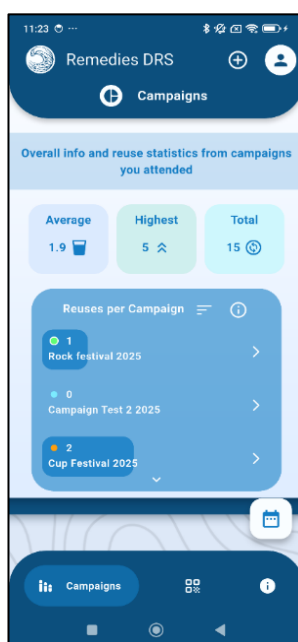


Figure 54 Personal statistics view about all Campaigns

#### View "Overview Statistics for all Campaigns" (Web Platform)

On the web platform, the "Overview" page provides organizers and admins with a high-level statistical summary of all combined campaigns. This dashboard (Figure 55) displays aggregated metrics such as average distributed cups per campaign, average reuses per campaign, average collected cups per campaign, average missing cups per campaign, average reuses per participant, and average reuses per cup.

Visualizations, such as a "Reuses per Campaign" chart, a "Total Participants per Campaign" bar graph, and a line graph showing "Total Participants vs Campaign Date," offer a comprehensive view of the system's overall performance and trends.

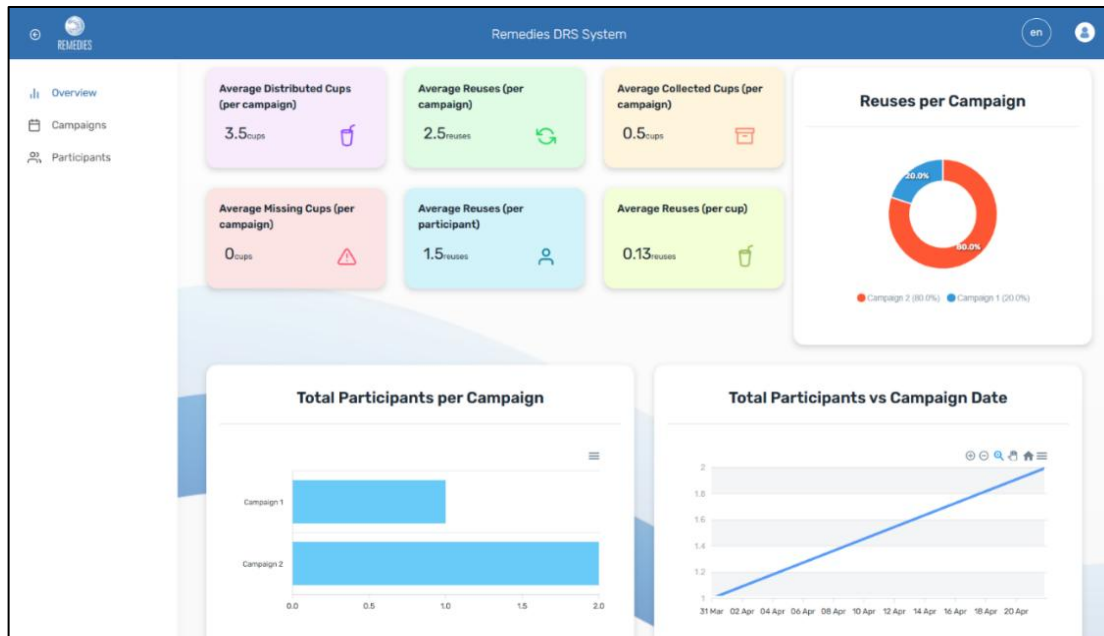


Figure 55 Data Overview page

## Statistics

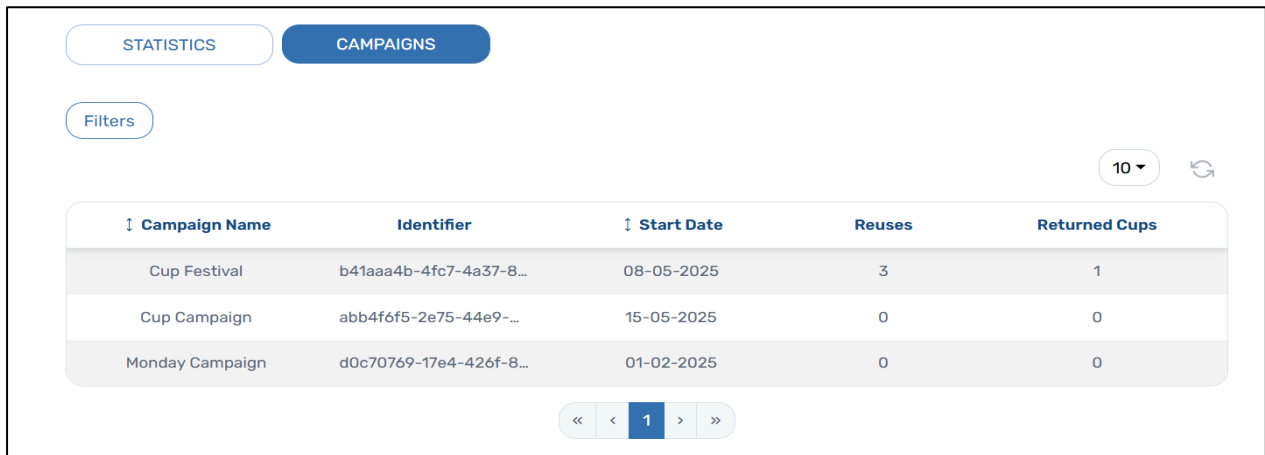
The "Statistics" tab for a selected participant (Figure 56) displays aggregated data from all campaigns they have participated in. This includes their total number of attended campaigns, total reuses, total returned cups, and their average reuses per campaign. Charts provide a visual comparison of their reuses across different campaigns and their performance relative to the average campaign reuses.



Figure 56 Statistics tab of a participant

## Campaigns

Organizer's view provides a list of campaigns (Figure 57) that have been launched to track the cup reuses in a specific campaign (Figure 58).



The screenshot shows a web interface with two tabs: 'STATISTICS' and 'CAMPAIGNS'. Below the tabs is a 'Filters' button and a dropdown menu set to '10' with a refresh icon. The main content is a table with the following data:

↑ Campaign Name	Identifier	↓ Start Date	Reuses	Returned Cups
Cup Festival	b41aaa4b-4fc7-4a37-8...	08-05-2025	3	1
Cup Campaign	abb4f6f5-2e75-44e9-...	15-05-2025	0	0
Monday Campaign	d0c70769-17e4-426f-8...	01-02-2025	0	0

At the bottom of the table, there are navigation arrows and a page indicator showing '1'.

Figure 57 Campaigns Tab of a Selected Person



Figure 58 Personal Statistics in a Selected Campaign

## 5. Decentralized Dishwashing Infrastructures

Although the project planned one washing system, after a deeper analysis of the distinct use cases of the DS, it became clear that the initially planned larger unit was unsuitable for use at the Mykonos. More specific as shown in the table below (Table 14), the differences between the two DS are important.

Table 14 Mykonos beach-bar vs Sea Star Festival use case comparisons

Lia beach DS Mykonos – Beach bar	Umag Sea Star DS - Festival
Longer demo duration – up to 3 months	Shorter demo duration – 3 days
Regulated low volume daily washing	Unregulated large volume of washing
1000 – 2840 items per week	25.000 items in 3 days up to >100.000 per week
No time pressure in washing phase	Pressure to deliver fast
Low volume and slow production of grey water	High volume and fast production of grey water
Need for a small vertical wastewater treatment system treating low volumes of grey water	Need for a vertical wastewater treatment system treating high volumes of grey water

Therefore, to support the project's reusable packaging scheme, two distinct decentralized, "plug-and-play" cleaning systems were engineered and constructed. The core purpose of these systems is to provide hygienic, resource-efficient, and scalable on-site washing capabilities, thereby creating a viable alternative to single-use plastics at different types of venues. Both systems are designed on the same loop achieving basis and are equipped to wash any reusable tableware and bottles.

Both systems are designed to minimize fresh water and energy consumption by creating a closed loop for washing water, directly addressing the environmental pressures of water scarcity and waste generation in Mediterranean tourist areas. The primary innovation of these systems is the integration of nature-based solutions – more specific, vertically constructed wetlands, or "functional green walls" - to treat greywater generated from the washing process. This approach creates a closed water loop that significantly reduces the consumption of fresh water, a critical advantage in the water-scarce areas.

Furthermore, the systems have fitted solar heating panels pre-heating the water entering the DW. The latter one is in turn equipped with a heat exchanger aiming at utilising the heat generated by one washing cycle into the next one. These two technology applications wish to reduce the energy consumed during the heating/preparing and washing phases of the DW washing cycle.

### 5.1 Large-scale Circular Dishwashing System

#### 5.1.1 System Overview

The large-scale cleaning infrastructure is a plug-and-play system, built into a standard shipping container (Figure 59) that uses the VertECO® technology (10) for increased water circularity in reusables cleaning.

The integration of this nature-based solution, the vertical wastewater treatment plant, or "functional green wall" - to treat greywater generated from the washing process is creating a water loop that significantly reduces the consumption of fresh water. The closed-loop process is monitored via sensors to adjust water quality and safety. Integrated heat exchangers and solar water heaters ensure the system's energy efficiency. The system also includes a Reverse Osmosis (RO) unit for inflow water treatment.

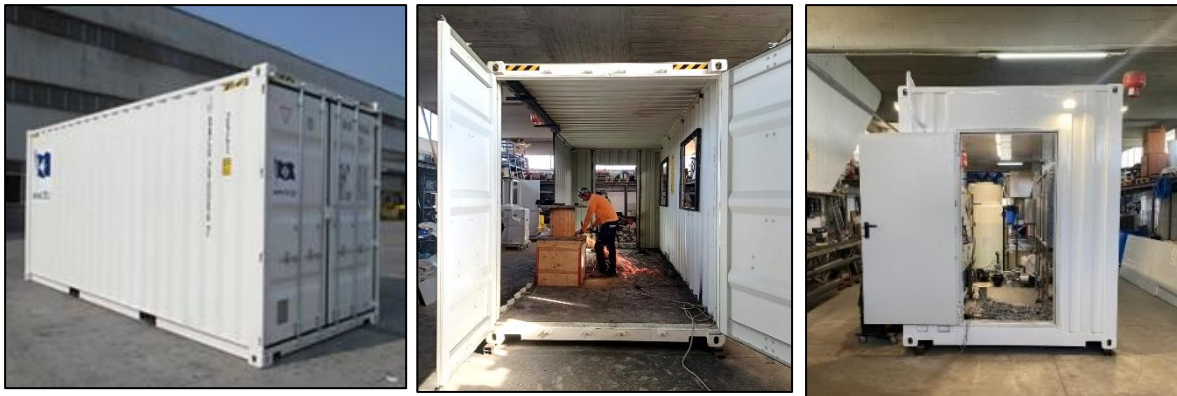


Figure 59 The container before (left), after initial modifications (middle), and finished (right)

Engineered to meet the high demands of large-scale music festivals and public gatherings, with a target capacity of cleaning over 2,000 reusable items per hour, the infrastructure measures approximately 6.0m x 2.4m x 2.9m (L x W x H) (Table 15) and holds 6 tons weight.

Table 15 Large-Scale Unit Dimensions

Unit Dimensions	Length (m)	Width (m)	Height (m)
External	6.05	2.45	2.9
Internal	5.9	2.35	2.69

### 5.1.2 System Layout

The unit integrates three commercial dishwashers and the high-performance vertECO® green wall for on-site greywater treatment and reuse. The interior is logically divided into zones to ensure a one-way workflow. An integrated technical section houses the main control unit, pumps, and water treatment manifolds (Figure 60).

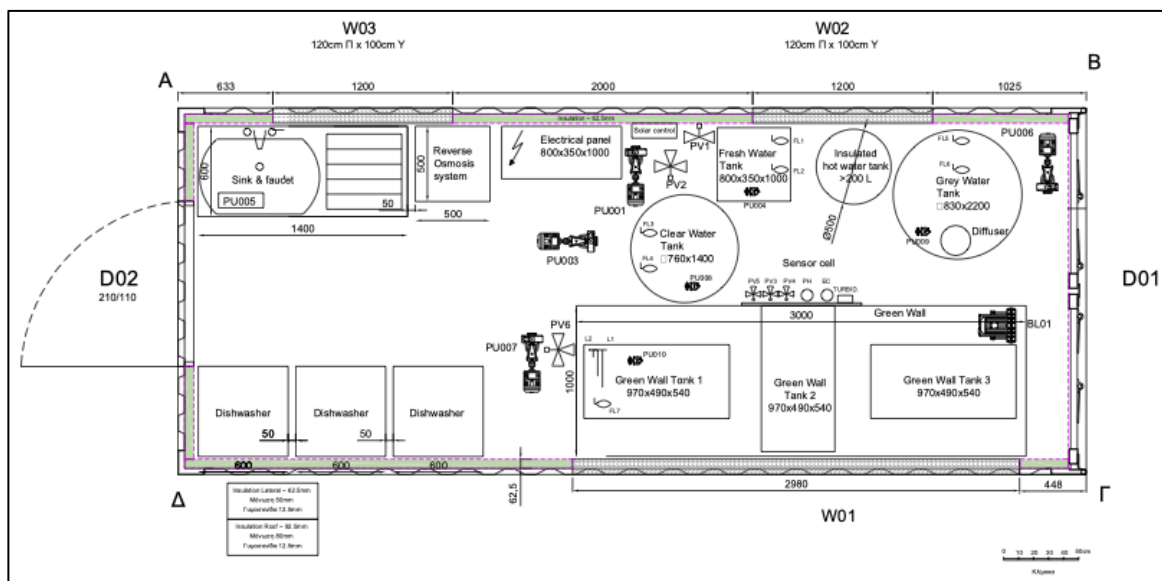


Figure 60 Floor plan of the containerized large-scale washing infrastructure with vertECO®

The DW units are housed in a tailor-made stainless-steel cage, which is secured on the floor. This ensures that they are placed at an ergonomic height and are secured safely during transportation and operation. The

space below the DW is designed to be used for storing the detergents, baskets with cups/bottles, or as a drying surface for items before storing. The DWs are placed opposite the washing basin, minimising movement and ensuring ergonomic workflow (Figure 61).



Figure 61 The basin (left), staff position (middle) and dishwashing units (right) inside the large-scale unit. Given the substantial quantity of items requiring washing, it is apparent that the container lacks adequate drying space. Furthermore, for reasons of hygiene and operational efficiency, it is crucial to distinctly separate soiled and cleaned items. Consequently, the incorporation of external areas or on-site tents is being considered from the outset.

### 5.1.3 Dishwashing

The washing area is equipped with three professional industrial-grade MEIKO M-iClean UM+ professional DW, providing the necessary capacity and hygiene assurance.



Figure 62 Dishwashing cycle in progress

Each machine operates with a rapid cycle time (Figure 62) of approximately 90 sec, using a wash temperature of ~55-60°C and a final sanitizing rinse of  $\geq 70^\circ\text{C}$  to comply with EU hygiene regulations (EC) No 852/2004. Detergent and rinse-aid are managed by automated dosing systems to ensure consistent cleaning performance and operational efficiency.

### 5.1.4 Process Flow and Capacity

The system is designed for high throughput, capable of redistributing an estimate of 48.000-57.600 clean cups on-site over a three-day festival period, achieved in 8-hour dishwashing operations which equates to a feasible on-site operational capacity of approximately 2,000-2,400 cups per hour. The water management follows a circular path detailed in the system P&ID: mains water is pre-treated by a Reverse Osmosis (RO) unit (Figure 63) and stored; this water is pre-heated and used in the dishwashers; the resulting greywater is collected,



Figure 63 Reverse Osmosis Unit (left), Control Panel Display (right)

stored and intermittently pumped to the vertECO® green walls for biological treatment; finally, the treated water is further filtered (activated carbon and UV) and reused, minimising waste-water and clean-water consumption.

### 5.1.5 Water Management and Ancillary Systems

- **Inlet Water Pre-treatment:** An integrated RO unit treats incoming water to prevent scale build-up and ensure consistent washing water quality.
- **Hot Water Generation:** Hot water is supplied by a hybrid system, combining solar thermal heaters mounted on the container's roof with standard electric boilers built-in the dishwashers to guarantee constant availability.
- **Storage Tanks:** A network of appropriately sized tanks is integrated for freshwater, hot water, pre-treatment greywater, and post-treatment (reusable) water, ensuring sufficient buffer for continuous flow of water during operation.

The P&ID of the system with the vertECO® is presented in Annex 10.7

### 5.1.6 Energy System

The container requires two 400V systems with 64A (dishwasher panel) and 40A (main electrical panel) three-phase electrical connection for full operation of all systems. The total estimated energy consumption for one hour of operation with all systems fully working, including dishwashers, pumps, and control systems, is approximately 26 kWh. As stated above, an attempt to reduce the consumption of energy by heating the water was made by integrating the solar water pre-heating system and the heat exchangers, one for each DW at manufacturing stage.

### 5.1.7 Automation, Control, and Monitoring

The entire facility is managed by a central Click-PLC (Programmable Logic Controller). This system automates the complete water management circuit according to a predefined protocol, monitoring key parameters in real-time, including water levels in all tanks, water temperature, conductivity, turbidity, and pH levels, to ensure efficient and safe operation.

Prior to its scheduled deployment, the container system underwent a series of comprehensive technical checks and a multi-week continuous test run to validate its full operational functionality, mechanical integrity, and automation logic.

### 5.1.8 Green Wall Water Treatment Design and Objectives- vertECO®

The core of the system's water recycling capability lies in the two identical, parallel vertECO® units mounted on the floor of the container's front, behind the two large sliding glass doors (Figure 64). This dual configuration ensures a high treatment capacity and system redundancy.

The primary objective of the vertECO® system is the biological treatment of greywater from the dishwashers. It is designed to significantly reduce the organic load (BOD, COD), surfactants from detergents, and suspended solids, rendering the water suitable for reuse in the washing process. Each of the two units consists of three



Figure 64 External and internal views of the vertECO® water treatment system installed vertically stacked modules with each module having a length of 1500 mm and a width tapering from 500 mm at the top to 400 mm at the bottom (Figure 64). This design facilitates even water distribution and creates a combined treatment volume of almost 1.8 m<sup>3</sup>.

The modules are filled with a lightweight, inert substrate (Figure 65). More specifically expanded clay and zeolite were used in 4:1 proportion, to provide a high surface area for microbial colonization and support the plant root structure.



Figure 65 vertECO® modules filled with substrate to begin plantation

Both units are planted with a robust polyculture of helophytes known for their high phytoremediation capacity and resilience. The selected species, including *Typha latifolia* (Broadleaf Cattail) and *Iris pseudacorus* (Yellow Flag Iris), develop extensive root systems (rhizospheres) that host the microbial communities responsible for breaking down pollutants(10).

The 115 plants in the vertECO© green wall system were planned during the first week of April. It was essential that they adjust and build-up a root biofilm before the dispatch to Croatia. After a three-week adjustment period in their new habitat (Figure 66), the plants began receiving "synthetic grey water" and occasional liquid



Figure 66 Pictures of the Green infrastructure growth ~3weeks old  
fertilizer. The proportion of soap-water in the grey-water tank was gradually increased weekly. This continued until the soap-water constituted 50% of the tank's total volume, as determined by NTUA and ANGR. The plants showed very satisfactory growth and response by the eighth week (Figure 67).



Figure 67 Pictures of the Green infrastructure growth ~8weeks old

To ensure that the health of the plants in the vertECO© system is maintained in good state, as it is now in a state of "limbo", ANGR cooperated with specializing in urban agriculture and gardening for the set-up and maintenance of the functional green wall. Part of the collaboration was the development of an application/on-line dashboard which depicts the vertECO© system (<https://plantation.adeka.gr/>) log in is simple, by entering an email address).

On the first page a dashboard depicts the plants as they are planted in the different levels of the system (Figure 68). As they are monitored, their health status is also stated, which ones are thriving, which need attention,

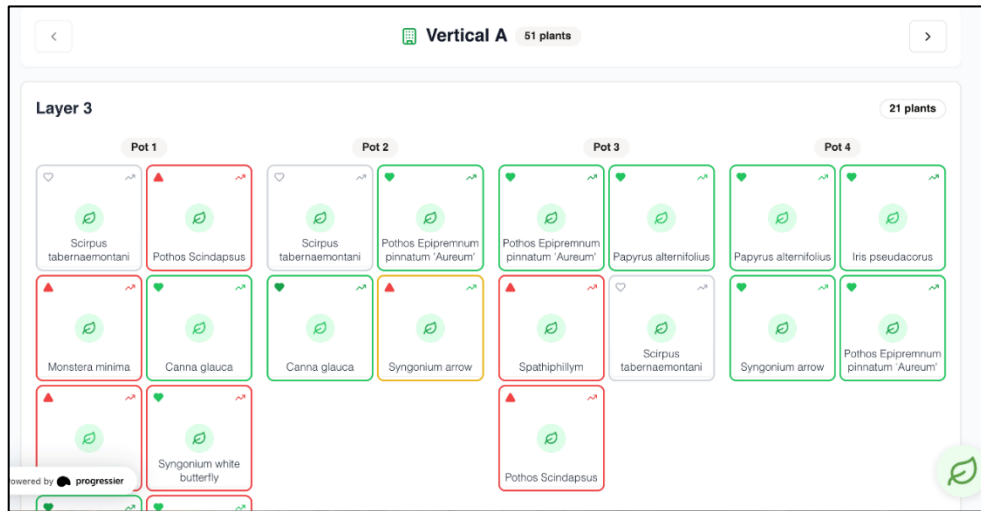


Figure 68 Screenshot of the plants dashboard per layer at the vertECO© system and which are in danger (Figure 69). Further tabs offer a list of the plants planted in summary and statistics regarding their growth and health.

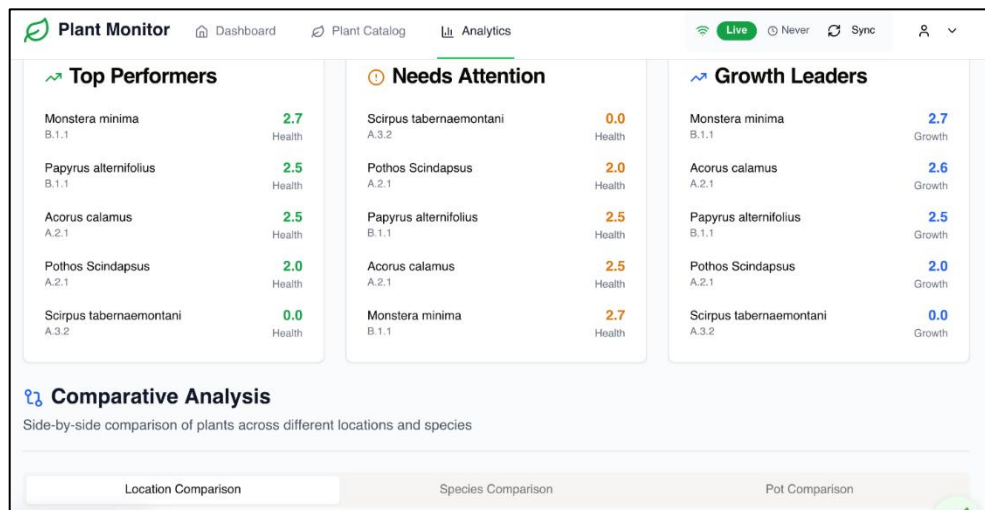


Figure 69 Plant performance analytics at the vertECO© system

### 5.1.9 Operational Function

In operation, greywater is intermittently pumped from the collection tank and distributed across the top of the vertECO® system. The water then percolates vertically downwards through the substrate and root zone, where it is biologically treated. An integrated aeration pump operates on a cyclical basis (e.g., 45 minutes on, 15 minutes off) to supply oxygen to the root zone, ensuring aerobic conditions are maintained for efficient and odour-free microbial decomposition.

The system is designed to significantly reduce key water quality parameters such as Biochemical Oxygen Demand (BOD<sub>5</sub>), Chemical Oxygen Demand (COD), and turbidity, producing treated effluent suitable for reuse in the washing cycles.

### 5.1.10 Hydraulic Design

Greywater is pumped from a collection tank and evenly distributed across the top of both vertECO® units (Figure 70). The water then percolates vertically through the substrate, where it undergoes treatment.

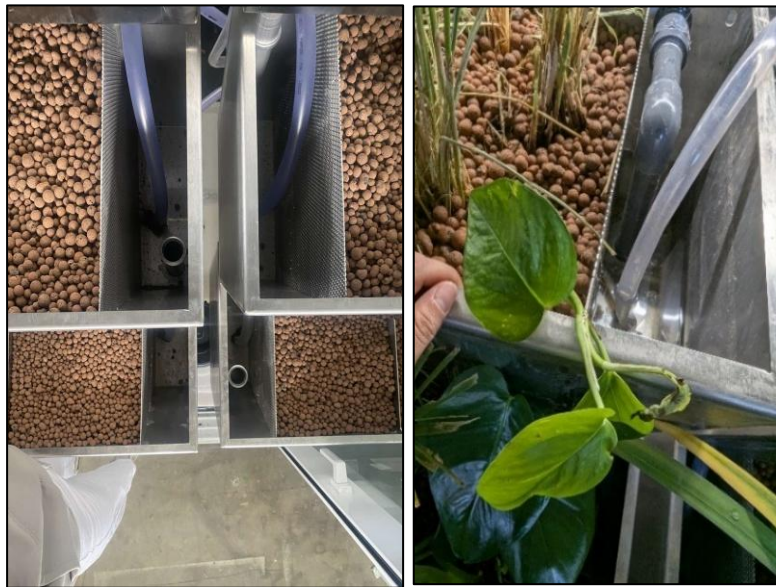


Figure 70 Water entry points of the vertECO® system before (left) and after plantation (right)

The system is designed with a Hydraulic Loading Rate (HLR) - the volume of greywater applied per square meter of the green wall surface each day - and Hydraulic Retention Time (HRT) - the average duration the water spends within the system for treatment. These parameters are optimized to match the greywater output of the three dishwashers during peak operation, ensuring efficient treatment without overloading the system. Based on a peak output of approximately 1.0 m<sup>3</sup> of greywater per day, the system operates with:

- An HLR of approximately 741 L/m<sup>2</sup>/day. This loading rate is well within the design parameters for an intensive, aerated vertical flow system treating greywater with high organic content.
- An HRT of approximately 17.2 hours. This calculated retention time ensures there is sufficient contact between the greywater and the microbial communities in the plant root zone for the effective biological breakdown of pollutants before the water is collected for reuse.

### 5.1.11 Aeration System

To enhance treatment efficiency and prevent anaerobic conditions, an aeration system is integrated into the base of the units. Operating on a pre-programmed cycle (e.g., 45 minutes on, 15 minutes off), it actively supplies oxygen to the plant root zones, stimulating the aerobic microbial activity crucial for the rapid decomposition of organic compounds.

### 5.1.12 Artistic Interventions

One of the most creative aspects of REMEDIES is the Artists' & Researchers' Residencies, curated and led by IHA. These residencies aim to develop and/or produce original works that align with the project's mission.

A notable example is the mural created by the local street artist Dimitris Marinis (Figure 71) on the façade of the containerized system. This concept, originally developed by ANGR and assigned by IHA, was a large-scale mural transformation of the ordinary façade of the container into a vibrant celebration of biodiversity.

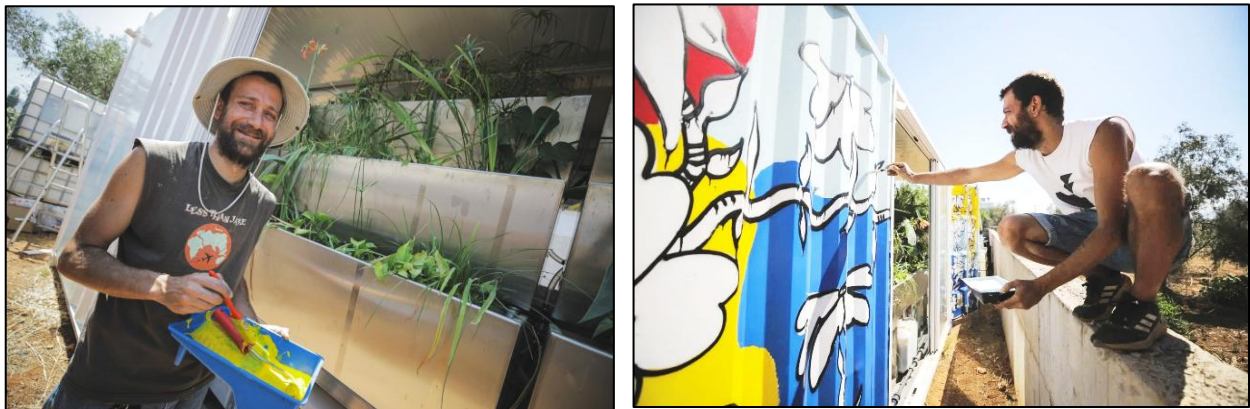


Figure 71 Street artist Dimitris Marinis at work (left) kick-off day and upon completion (right)

The artwork bridges the industrial and the natural, reclaiming utilitarian festival infrastructure as a living canvas for ecological storytelling, the heart of a festival, this piece turns infrastructure into eco-symbolic architecture. Street-art design uses colorful, nature-inspired motifs to connect people emotionally to the environment during festivals. Instead of showing plastic waste directly, it celebrates what we protect by rejecting SUPs.

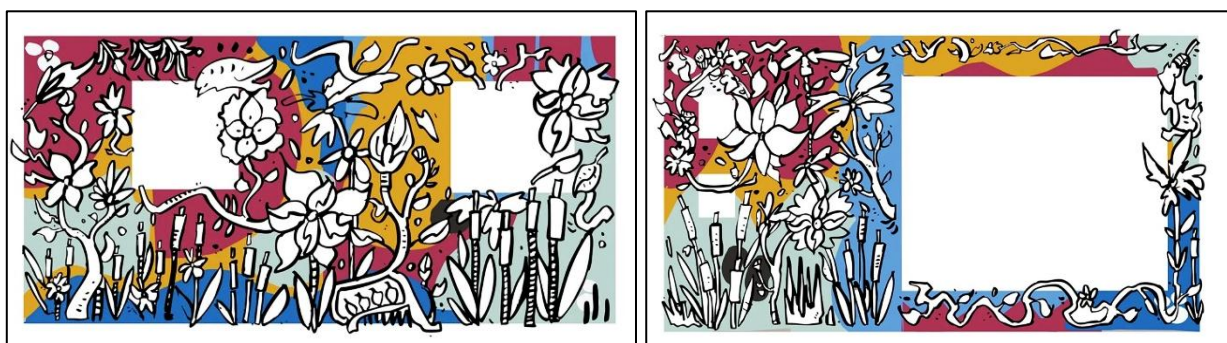


Figure 72 Mural mock-ups by artist D. Marinis

The joyful, accessible design (Figure 72) resonates with diverse audiences, embedding sustainability within the festive spirit rather than positioning it as a limitation. It offers an uplifting call to action protecting beauty is not about giving something up, but about choosing better alternatives together. Its placement on festival infrastructure makes it both a functional and artistic intervention, embedding the anti-SUP message seamlessly into the festive experience.

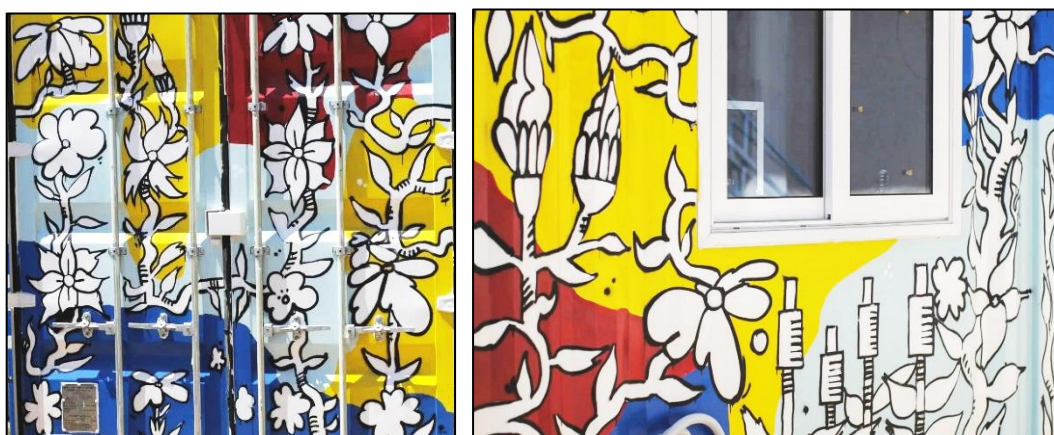


Figure 73 Mural details at the container's backdoor

Bold black outlines of flowers, plants, and organic forms dance across a backdrop of vivid color blocks—red, yellow, blue, and green—evoking the richness of ecosystems (Figure 73).

The presence of blank white panels integrated into the design creates spaces for interaction—whether through educational signage, refill station labeling, or participatory elements. These voids act as reminders that human choices leave gaps in nature’s pattern, which can either harm or heal the environment.

By celebrating the abundance of nature rather than the ugliness of plastic, this artwork operates as a positive protest. It demonstrates how art at festivals can do more than decorate—it can shift collective habits by inspiring pride in ecological stewardship. Here, rejecting single-use plastics becomes not just a responsibility, but part of the celebration itself.

Instead of confronting audiences with images of waste, this mural shifts the perspective. By flooding the container with motifs of blooming flowers and thriving landscapes (Figure 74), the art reminds visitors of what we protect when we refuse SUPs: clean water, healthy soil, and flourishing habitats.



Figure 74 The complete mural on the large-scale cleaning system

## 5.2 Small-scale Circular Dishwashing System

Complementing the large-scale festival unit, ANGR developed a second compact, modular cleaning system designed for smaller, permanent venues with smaller consumption and longer duration, such as beach bars, cafés, and small resorts.

### 5.2.1 System Overview and Layout

The small-scale modular closed-loop infrastructure of a compact cleaning system is housed in a 2.1 m x 2.1 m ISOBOX (Figure 75), coupled with the GRETA™ green wall for localized greywater treatment.



Figure 75 Side Views of the Isobox Frame during Construction

The small unit has a cleaning capacity of ~ 700 items per hour and provides only one workstation. This modular design offers significant flexibility, allowing the washing unit to be installed indoors or in separate space, while the green wall can be positioned elsewhere, where space and sunlight are available.

It also allows the GRETA™ green wall to be offered as a standalone solution for businesses that may already have dishwashing facilities but wish to add a sustainable water recycling component. It includes a dedicated position for the dishwasher, a stainless-steel basin, a professional DW solar heating system and integrated water storage tanks (Figure 76), creating a complete, self-contained washing station (Figure 77).



Figure 76 The DW unit (left), the basin (middle), and integrated water tanks for GRETA™ (right)

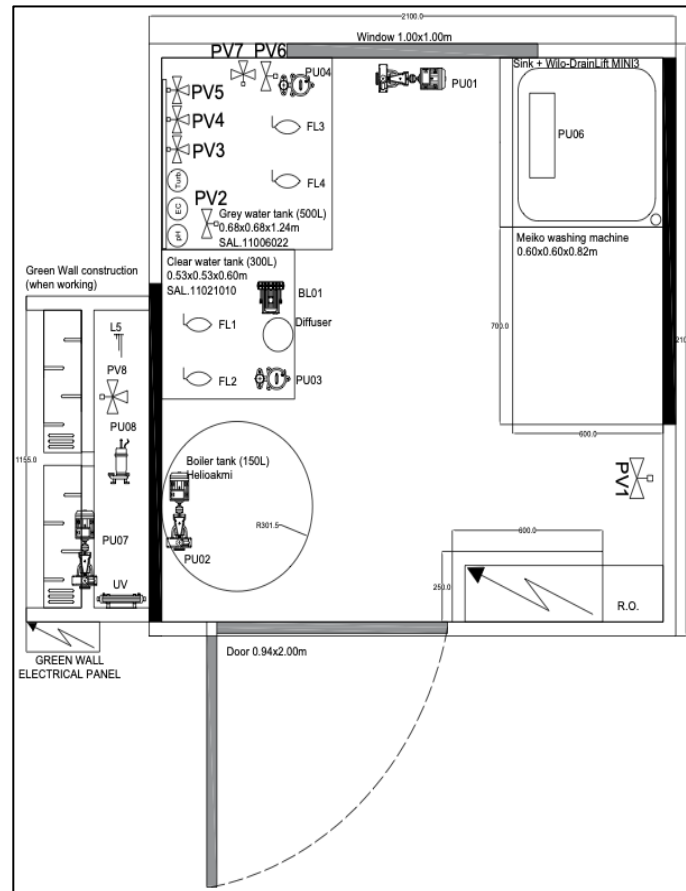


Figure 77 Floor plan of the Small-Scale Cleaning Infrastructure with GRETA™ water treatment unit

### 5.2.3 Dishwashing

The unit is fitted with one commercial-grade MEIKO i-Clean UM+ dishwasher, appropriately equipped for its intended capacity and use. The machine adheres to the same strict hygiene protocols as the larger system, using high-temperature wash and rinse cycles to ensure proper sanitization of reusables. It is also fitted with a heat exchanger and an automated detergent and rinse-aid dosing system for consistent and efficient operation (Figure 78).



Figure 78 Automated detergents and rinse-aid

### 5.2.4 Process Flow and Capacity

The system is engineered for the consistent, daily operational needs of a small commercial venue, with an estimated throughput capacity of approximately ~700 cups and 400 bottles per day. The water process flow is conceptually similar to the large-scale system but simplified: water from the local supply is pre-treated and stored in a clean water tank; it is then used by the dishwasher, generating greywater that is collected in a dedicated tank within the Isobox. Subsequently, the greywater is conveyed to the standalone GRETA™ green wall unit, where it undergoes integrated physicochemical (e.g., filtration, adsorption) and biological treatment processes. Upon completion of the treatment cycle, the reclaimed water is suitable for reuse in irrigation or other non-potable applications, subject to compliance with relevant regulatory standards.

### 5.2.5 Water Management and Ancillary Systems

- **Inlet Water:** The system connects to the local water supply, with an integrated Reverse Osmosis (RO) unit to pre-treat the water. Preliminary water analyses performed by the Sanitary Engineering Laboratory (SEL) of NTUA indicated that the water used in the location has a high concentration of dissolved ions (EC up to 3,000  $\mu\text{S}/\text{cm}$ ), thus the incorporation of the RO was necessary to ensure quality and protect the equipment.
- **Water Storage:** Custom-sized water tanks for clean water and greywater collection are fitted within the Isobox frame, providing a sufficient buffer for a full day's operation.

The P&ID of the system with the GRETA™ is presented in Annex 10.8.

### 5.2.6 Energy and Control Systems

The system is designed for a standard three-phase electrical connection suitable for commercial venues (Figure 79). Automation is managed by a dedicated, simplified control unit housed within the Isobox, just as in the larger system, which governs the operation of the internal pumps and coordinates with the dishwasher plus the water flow to the green wall. Key parameters such as water levels, conductivity, pH, turbidity are monitored from the different tanks to ensure smooth operation.



Figure 79 Photos of the control unit

Here as well, the water is pre-heated before entering the DW by a solar water heater and the DW is equipped with a heat exchanger to minimise energy consumption.

### 5.2.7 Water Treatment Design and Objectives - GRETA™

The GRETA™ green wall is the compact, nature-based treatment component designed to work in tandem with the Isobox washing unit. It functions as an independent, externally sited module for biological greywater polishing. The system is based on modular, stackable planting pots arranged on a support frame to create a vertical flow constructed wetland. Its design prioritizes a small physical footprint while maximizing the biological treatment surface area, making it ideal for venues with limited space.



Figure 80 GRETA™ pots installation process (left) and final set-up (right)

The standalone nature of the unit, complete with its own pump and controls, allows for flexible installation and potential retrofitting to existing greywater sources. It consists of 20 individual GRETA™ pots, each with a calculated volume of approximately 5.12L. This creates a total substrate volume of around 102.4L. The pots are arranged in two columns of ten, mounted on a custom-built aluminum frame (Figure 80). The total top surface area of the system is approximately 1.33 m<sup>2</sup>, filled with a lightweight inorganic substrate mix, amended zeolite to enhance water retention and nutrient absorption.



Figure 81 GRETA™ Plants Preparation, before and after removing soil at Mykonos

The plant selection was specifically tailored for the coastal, saline conditions of the Mykonos demo site, where the plantation was realized in middle June. Plants preparation and planting took place on Mykonos (Figure 81) mid-June.

A polyculture of robust, salt-tolerant helophytes (halophytes) was chosen (Figure 82) including *Crithmum maritimum* (Rock Samphire) and *Salicornia europaea* (Glasswort), alongside aesthetic and aromatic species like *Mentha aquatica* (Water Mint). These plants provide the essential root zone environment for the microbial breakdown of pollutants in the greywater.



Figure 82 Views of GRETA™ before and after plantation on Mykonos Island

The system remained under supervision and watering for three weeks, before connecting to the dishwashing unit.

### 5.2.8 Hydraulic Design

Greywater is pumped from the Isobox's collection tank to the GRETA™ unit. A pump integrated within the base of the GRETA™ frame feeds the water to the top tier of pots. The water then percolates vertically down through the series of pots, undergoing treatment. Based on the Isobox's daily greywater output of ~54L, the system operates at a design HLR of approximately 4l L/m<sup>2</sup>/day. A three-way valve at the outlet allows the treated water to either be recirculated for further polishing or directed through a UV filter for safe use in local irrigation. As the planting of GRETA™ was completed in the beginning of July, the continuous heat waves started to scorch Greece. These extended throughout July. The plants in the GW unit were not able to adopt to their new environment. Many of them dried out and had to be changed in the beginning of August. As availability of small plants on the island was limited, *Mentha Aquatica*, Tomatoes, *Origanum*, *Basilicum* were selected to replace the lost ones.

## 6. Water Refilling Stations

Two water refilling stations are developed to mitigate the problem of irrational SUP containers distribution and disposal resulting from bottled water consumption. Using commercially available dehumidifiers, where water vapors are recovered, treated and mineralized, refilling stations will regenerate high quality water for direct consumption on public sites. The Atmospheric Water Generation System (AWG) is coupled with reusable bottles (T3.1) offering an alternative to plastic water bottle use to visitors of a remote island beach in Mykonos, Greece. On the other hand, the Water Fountain Technology adheres to maximize refills and reuse by the public, the environmentally conscious community of tourists and locals of a small French island. In both cases, distribution runs with a self-service model embedding a free-deposit reuse scheme.

### 6.1 Atmospheric Water Generation System

The Atmospheric Water Generation System is a compact atmospheric water generation (AWG) unit designed and developed by MCG to produce, purify, store, and dispense potable water derived from ambient air integrating cooling and storage functions (Figure 83). The system incorporates the following key components:



Figure 83 Installation of components (left) and complete AWG back side (middle) and front (right)

1. Dehumidifier of Genaq s50 model capable of extracting up to 50L of potable water per day from atmospheric humidity in nominal conditions around 80% at 30°C,
2. 150L stainless steel storage tank for the accumulation of treated water,
3. One Hp stainless steel Flow 100 370W - PM5 Plus pump for water circulation,
4. Water chiller Eiger EGI03B-F equipped to deliver both cold and hot water on demand.

As mentioned above, the nominal production of the cooler is 50L per day, but it varies depending on the region and conditions such as humidity and temperature. Below (Figure 84) is the water production as a function of external conditions, and the energy required for water generation.

		Generation (liters per day)								Consumption (kWh per liter)							
		Temperature (°C)								Temperature (°C)							
Relative Humidity (%)	100	61	60	57	55	46	35	22	19	0.49	0.47	0.46	0.42	0.47	0.57	0.76	0.80
	90	59	56	55	55	46	35	22	17	0.47	0.45	0.42	0.39	0.46	0.52	0.69	0.80
	80	56	54	52	52	43	33	21	13	0.45	0.42	0.41	0.39	0.44	0.50	0.67	0.94
	70	54	54	52	47	38	26	17	9	0.42	0.40	0.39	0.41	0.45	0.57	0.73	1.25
	60	50	51	47	40	29	21	13		0.42	0.40	0.41	0.44	0.53	0.65	0.87	
	50	43	43	37	29	22	15	7		0.46	0.44	0.47	0.55	0.64	0.82	1.49	
	40	31	30	25	20	14	7			0.62	0.59	0.64	0.72	0.89	1.53		
	30	20	19	15	11	6				0.86	0.84	0.96	1.16	1.94			
	20	14	13	12	11					1.10	1.10	1.15	1.20				

Figure 84 Temperature and humidity impact on water production and energy consumption of the AWG

### 6.1.1 Operating Mechanism

Ambient air is drawn into the dehumidifier, where water vapor is condensed and collected in a stainless-steel tray. The condensate is then directed to an internal 12L reservoir within the dehumidifier. From there, the water is circulated via a pumping system and undergoes a multi-stage treatment process, which includes mineral enrichment with trace elements suitable for human consumption and dual-stage filtration using activated carbon and ultraviolet (UV) light for microbial decontamination.

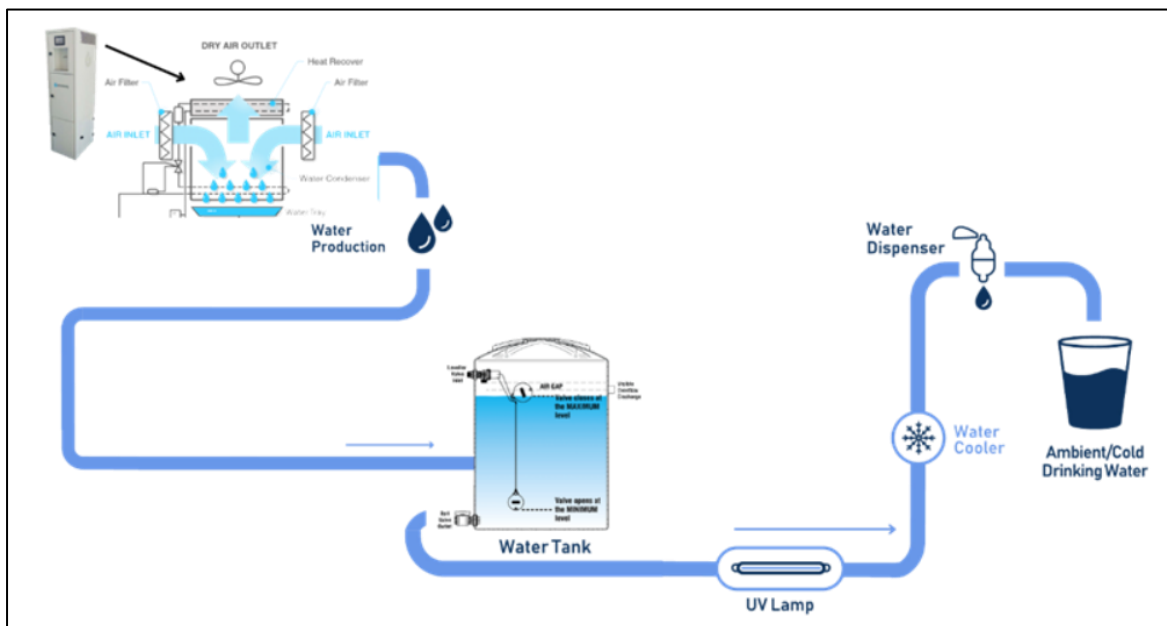


Figure 85 Diagram of the Water Production Process of the AWG

The purified water is subsequently stored in the main 150L stainless steel tank. Based on end-user demand, water is pumped from the storage tank to a cooling unit that includes a 2L reservoir for cold water and an integrated heating function for hot water supply (Figure 85).

System operation is fully automated and monitored through a dedicated local control panel, which displays real-time data on dehumidifier status, water volume, storage tank temperature, and pump pressure. This integrated monitoring ensures efficient and safe operation of the water production and delivery cycle.

### 6.1.2 System Characteristics and Performance Evaluation

The complete unit weighs slightly over 200 kilograms and is mounted on a Euro-pallet with standard dimensions of 1.2 × 0.8 meters, allowing for easy transportation using a pallet jack. The total energy consumption of the system is approximately 85 kWh, corresponding to an average specific energy consumption of 0.39 kWh per liter of produced water. The water production process, from the initial stage of air capture to its transfer to the cooler and the end user diagram is illustrated on the unit to direct user interaction and appropriate use (Figure 86).



Figure 86 Explanatory illustrations displayed on the AWG

### 6.1.3 Water Sample Analysis

Preliminary testing of the water output has demonstrated full compliance with current European drinking water standards. This compliance has been validated through detailed laboratory analyses conducted by the NTUA.

Water quality assessments have been conducted throughout the machine's construction and operational phases. Measurements were meticulously taken at all stages, encompassing production, transfer to the storage tank, and delivery to the end user. Representative analytical results, detailed in Annex 10.9, confirm that the produced water consistently meets the quality standards stipulated by European legislation.

## 6.2 Water Fountain Technology

Kumulus technology (Figure 87) is available across all markets for a standard price, exclusive of tax, maintenance, and delivery fees, including a mandatory annual maintenance fee covering service and necessary interventions. The technology was launched in 2022 with 140 units sold in schools, hotels, public institutions, and events across France, Tunisia, Spain, and other Mediterranean countries.

On island Porquerolles the local cultural institution Carmignac Foundation has recently upgraded their refilling systems with new models in June 2025. Moreover, under the REMEDIES cascade funding, the Municipality of Kerkennah, winner of the call, acquired two of these fountains and expressed full satisfaction with their performance.



Figure 87 Product Photos of the Water Fountain Technology Kumulus

### 6.2.1 Operating Mechanism

Kumulus is an innovative atmospheric water generator producing up to 30L of drinking water per day from ambient humidity, using a condensation process inspired by natural dew formation (Figure 87).

The system requires no heavy infrastructure or connection to the public water network and operates with

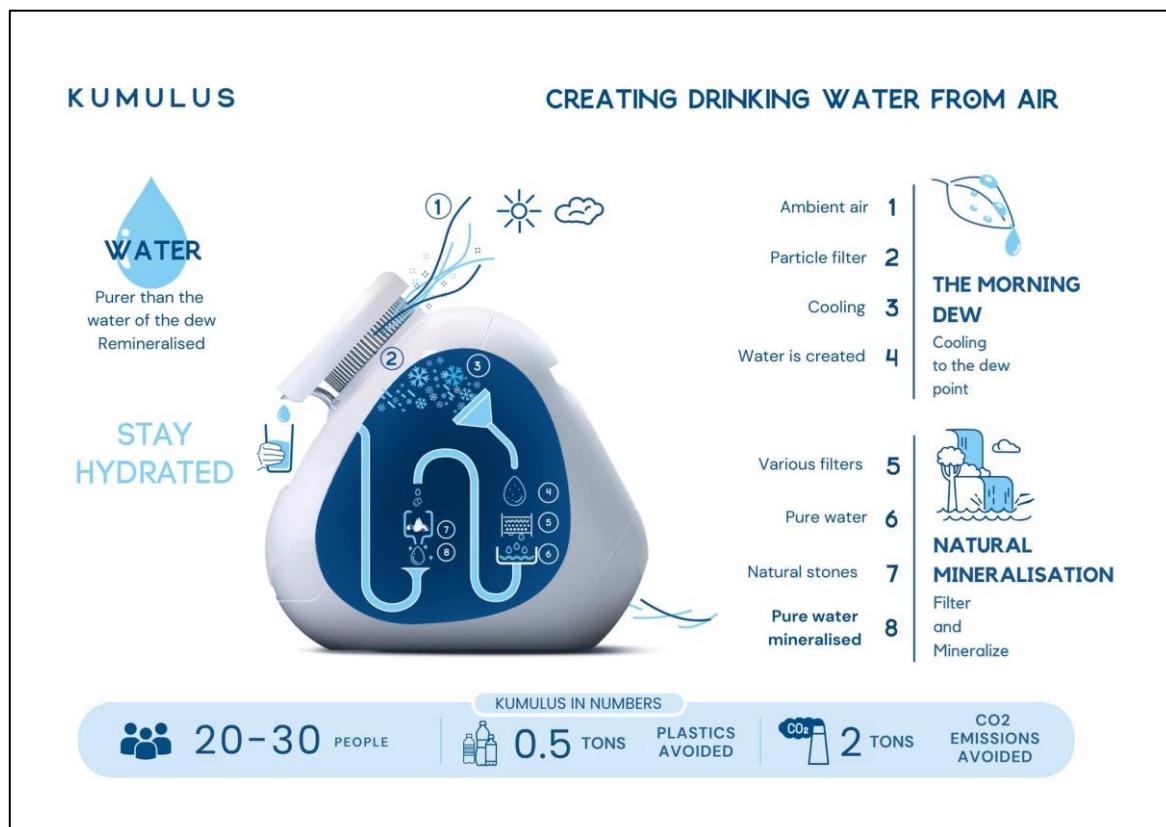


Figure 88 Operating mechanism and performance infographic by Kumulus standard electrical supply. It's autonomous, local production cycle including water generation, mineralization and distribution, significantly reduces transport-related impacts and dependence on industrial supply chains. Its design is particularly suited to insular, arid, or water-stressed territories.

## 6.2.2 System Characteristics and Performance Evaluation

Kumulus technology is technology offers multiple environmental benefits:

- Addresses water scarcity in climate-vulnerable areas (islands, coastal zones),
- Cuts CO<sub>2</sub> emissions linked to bottled water transport (up to 2T of CO<sub>2</sub> and 0.5 T of plastic avoided per machine/year),
- Raise awareness on water conservation and circular use of local resources

Energy consumption is contingent upon environmental humidity and temperature; however, the machine typically consumes between 0.4 and 0.7 kWh per liter. This translates to an approximate cost of 7 to 12 cents per liter in France. Kumulus proprietary algorithms dynamically adjust the machine's parameters to optimize power consumption and water production.

Additionally, Kumulus machines feature a smart platform with predictive algorithms, energy management, and remote-control capabilities, making them more efficient and user-friendly than typical dehumidifiers. Water quality is monitored to ensure its safe and healthy in terms of filter functionality and the level of minerals, while regular quality checks are conducted by the Kumulus team in collaboration with accredited third-party laboratories. Quality tests and reports can also be shared with clients upon request.



## 7. Pilot Demonstrators

### 7.1 Mykonos Island, Cyclades, Greece

Mykonos is one of the 220 islands of the Cyclades group in the Aegean Sea (Figure 89), on the southeast of mainland Greece. It has an area of 86 km<sup>2</sup> while the length of its shores reaches 89km (11). Tourism is clearly important for the island, and it is the ultimate source of economic activity. The island is a globally recognized tourist destination, attracting every year more than 1.5 million tourists with another 1.2 million arriving by cruise ship (12).



Figure 89 Maps of Cyclades (left), Mykonos Island (middle) and Lia beach (right)

However, Mykonos faces severe water shortage primarily due to limited water resources, relying on a combination of desalination plants and underground water sources, which are not sufficient to meet the high demand. As per the statistics, between the 1st of July and the 31st of October, water consumption is reaching an astounding 15,000 cubic meters daily (13) and 2.5-3 million cubic meters per year (14).

Due to the lack of potable water, the reliance on plastic water bottles is exacerbated during the summer months as many visitors are advised to avoid tap water and opt for bottled water for drinking. Moreover, public water fountains, as an alternative to bottled water, are often underutilized or in disrepair discouraging their use.

The preference for bottled water contributes to the prevalence of plastic waste in the environment, a growing problem in Mykonos and the Aegean islands, with raising concerns about the marine ecosystem degradation and microplastics entering the water supply.

The DS is geographically located on beach Lia, South-East of Mykonos town, 14klm distance (Figure 89). Compared to the standards of Mykonos, Lia is considered a rather quiet beach (Figure 90), accessible to the public, a famous destination for scuba diving. A full-organized beach-bar occupies the beach providing sun umbrellas, sunbeds, and other facilities to its customers (Figure 91).



Figure 90 Lia beach visitors

In general, preference to glassware especially for cold drinks is evident, especially for draft beer, wine and cocktails. Nevertheless, SUP cups and bottles are used in parallel, to serve juices and water. Cool water is mostly served in PET bottles, of 1.5L volume, accompanied by a set of SUP cups for the customers of the sunbeds.



Figure 91 The organized beach-setting and the beach-bar deck at Lia beach

### 7.1.1 Establishment of a Circular Dishwashing Service On-Site

The DW system was transported in mid-July and was installed on-site at Lia beach in the last days of the month (Figure 92,93). MCG prepared the area and secured a remote space close to the beach bar for setting up the infrastructure. ANGR was present the first week of August. The automations were set and the PLC access to internet for monitoring was established.

ANGR and MCG worked on the workflow for the distribution, collection, washing and redistribution of the cups, trained the beach bar staff in the circular dishwashing system and organized the washing line. The MEIKO Mobile App was downloaded and connected with the DW, to collect daily activity reports.



Figure 92 Establishment of the dishwashing system with GRETA™ on Lia beach, Mykonos, Greece

The demo is equipped with 5000 REMEDIES reusable cups, 1500 of which are stored at the demo site, the rest is stored in another location to secure their exposure to heat. The reuse model introduced is a free-deposit reuse scheme (Figure 94) that aligns more effectively with the business context and the specific application, to serve bottled water.

The cups are introduced by the beach bar to substitute single-use cups for serving water to the customers occupying the organized beach. The maximum capacity of this setting is estimated to 480 people, based on the number of sunbeds, set in pairs under a total of 120 umbrellas.



Figure 93 Side views of the circular dishwashing service on-site

However, daily consumption rates vary, with a minimum of 100 SUP cups per day. This material flow in the peak of the season (June - August) can raise over 500 items per day, resulting to 4kgs of plastic per day, approximately 450kgs in 16 weeks, which is the tourist season. In the event, REMEDIES cups are introduced for beer, the plastic refused will raise significantly.



Figure 94 Infographic of the beach-bar reuse model by ANGR

Despite the lack of a monetary DRS the scheme was successfully launched to support reuse through the following staff-flows:

1. **Distribution:** Clean cups are transported by the beach-bar staff from the DW to the front bar (Figure 95) which is located on the beach side.
2. **Service:** Clean cups are waiting at the front bar to serve customers at the beach (Figure 96)



Figure 95 REMEDIES cups distribution from the DW to the front bar realized by the staff



Figure 96 REMEDIES cups service starts at the front-bar located on the beach



Figure 97 REMEDIES cups used by the customers of the beach-bar instead of SUPs for water

3. **Use:** Customers use the cups to drink water at the beach (Figure 97).
4. **Collection:** When customers leave, staff collect all used cups and return them to the bar (Figure 98).
5. **Transportation:** The collected cups are placed in racks and carried back to the dishwashing system.



Figure 98 REMEDIES cups collection is monitored by the staff at the front-bar

6. **Cleaning:** Cups are washed, sanitized, and dried on site in the dishwashing unit (Figure 99).
7. **Storing:** To prevent contamination, the clean cups are transferred to a dedicated clean storage room adjacent to the dishwashing installation, following manufacturer specifications.



Figure 99 REMEDIES cups cleaning phase with prewashing, dishwashing and drying

### 7.1.2 Deployment of Water Refilling Station and Reusable Bottles

The AWG demonstrator developed by MCG was installed at the opposite side of the beach-bar, to generate and provide cool water to random visitors, aiming to expand reuse practices beyond the organized beach area. By embedding the reuse scheme in the beach experience, visitors are encouraged to adopt sustainable behaviors in a visible and practical way (Figure 100).



Figure 100 Deployment of the water refilling station (AWG) on Lia beach, Mykonos demo site

The 0.3L glass bottles are also deployed, however a smart use pathway is necessary to support effortless returns and secure a safe and hygienic circular supply chain, on site. The total capacity of items to distribute and reuse is 5000 glass bottles.

The digital reuse system which will be launched at the end of September 2025, will enable REMEDIES partners to monitor water refills, calculate returns, and support end user engagement. Co-developed by MCG, ANGR and CIBOS the smart reuse scheme with glass water bottles embeds smart sensors on the AWG, with lock cabinets equipped with RFID readers, to optimize cups' collection for both the solution provider (MCG) and the end users. The reuse scheme to embed to the glass bottles for the visitors of the beach was studied by CIBOS proposing the following flows and interactions in the setting:

- **1<sup>st</sup> touchpoint:** the Refilling station is where the bottle can be picked up from the dehumidifier or from the 2<sup>nd</sup> cabinet where stock of bottles is settled. The user, by entering the fewest possible details, will receive a bottle via a code that will be sent to him and charged to him. The bottle via RFID will leave the warehouse so we know what is missing.
- **2<sup>nd</sup> touchpoint:** the beach-side where the cups are in use by the visitors of the beach.
- **3<sup>rd</sup> touchpoint:** the collection point, located either next to the dehumidifier or in cabinet 2, is where empty bottles can be returned by the end users, the visitors of the beach.
- **4<sup>th</sup> touchpoint:** At this stage we can do it again via RFID to check how many bottles have left the used cabinet and gone to the washing machine. The purpose of this stage is to check for any losses or breakage of bottles during the process from washing to their return to the original cabinets.

The detectors in stages 1 and 4 should communicate with each other to identify the bottles that are re-entered.

A critical component of the system is the on-site washing and sanitization of bottles ensuring that all items are hygienically maintained and safe for repeated use. After use, bottles can be returned to designated collection points, where they are cleaned and prepared for subsequent use. This process, combined with RFID-enabled tracking and smart monitoring, guarantees that all bottles are hygienically maintained, thereby ensuring both safety and user confidence in the reuse program.

This intervention emphasizes shared responsibility, demonstrating that sustainable behaviors are both actionable and seamlessly integrated into everyday experiences. Visitors are thus engaged in a circular, environmentally responsible system that combines convenience, safety, and operational efficiency, fostering awareness and participation in a sustainable community.



## 7.2 Porquerolles Island, Provence-Alpes-Côte d'Azur, France

Porquerolles is the largest of the three *Îles d'Hyères* (also called the Golden Islands), located in the Mediterranean Sea, off the coast of the Var department in southern France (Figure 101). It is 3 km wide and 7 km long. Its highest point is 142m above sea level, located at the semaphore level. Tourism is regulated in the context of the Public Service Delegation (Délégation de Service Public – DSP) lunched in 2021, limiting the number of daily visitors to 6,000(15).

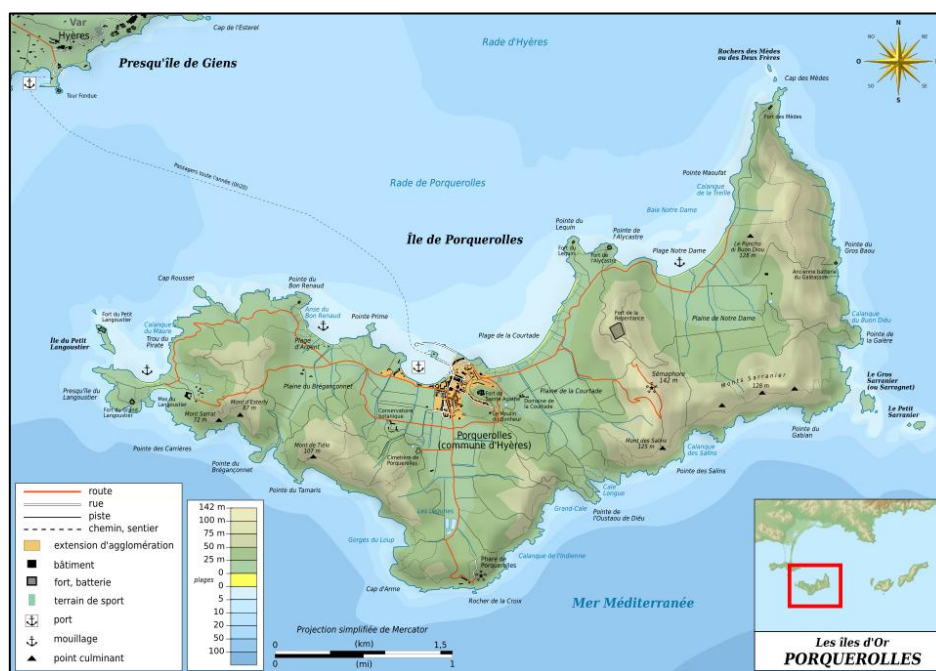


Figure 101 General Map of Porquerolle island, France

Although Porquerolles is considered a sustainable mediterranean destination, it remains vulnerable to climate change, water scarcity, and mass tourism pressures, particularly on clear and drinkable water resources, which are scarce (no connexion to the mainland and limited water stocks on the island). Ships transport clean water from the mainland to meet the water supply needs on the island. Since May 2024, the island has been reliably supplied with potable water through a newly installed submarine pipeline, commonly known as the Sealine. This significant shift addresses large-scale freshwater supply needs on a structural level especially for residents, fire safety, and mass tourism. However, the island's sustainability depends on continuous management of resources and active engagement from locals and visitors.

The Maison du Parc of the Port-Cros National Park on Porquerolles island has been selected as the installation site (Figure 102) for the second water refilling station, the water fountain technology developed by Kumulus. Port-Cros National Park is a French national park established on the Mediterranean island of Port-Cros, east of Toulon. Located just a few minutes' walk from the village centre, the Maison du Parc is a strategic hub for several reasons:

- Visitor reception hub: it's often the first point of contact for tourists when they arrive on the island, where they orient themselves, pick up maps, and learn about trails and rules.
- Information centre: the Maison du Parc provides guidance on biodiversity, cultural heritage, and sustainable practices shaping how people understand and experience the island.
- Awareness-raising space: exhibitions, educational materials, and interactive displays help communicate key environmental challenges (like water scarcity, waste reduction, and ecosystem protection).



Figure 102 Maison du Parc of the Port-Cros National Park on Porquerolles

The placement of the Kumulus fountain at the Maison du Parc is planned to take place by the end of 2025, constituting a targeted policy measure aimed at promoting sustainable water practices and environmental awareness to the community, both locals and visitors. As the island's central visitor reception and information hub, the Maison du Parc ensures maximum visibility and engagement, allowing the intervention to reach both residents and tourists effectively. By integrating a tangible demonstration of local water production into the Park's educational infrastructure, the demonstration aligns with broader strategic objectives: fostering reuse and mindful consumption, reinforcing the island's conservation and resource management policies, reducing dependence on single-use plastics,

This policy-driven deployment illustrates the value of socio-technical interventions that complement large-scale infrastructure interventions, such as the Sealine pipeline, by maintaining public awareness of environmental limits and preventing complacency in the face of perceived resource abundance. The visibility of the water fountain on Porquerolle island is crucial to counterbalance the powerful social narrative that the pipeline conveys; a perception of permanence with the potential of creating a form of technological lock-in. In practice, technological interventions such as the Sealine pipeline although secure water supply, they can unintentionally create a rebound effect, where increased availability leads to higher consumption and undermines sustainability goals, encouraging wastefulness and discouraging adoption of conservation behaviors such as reuse and refill practices.

In this context, the value of this demonstrator lies less in its quantitative contribution (30 L/day) and more in its mediating role between technology, users, and institutions. It functions as a boundary object: a material presence that opens conversations about reuse, reduces reliance on single-use plastics, and reminds visitors that water resources are not unlimited. By enabling visitors to refill bottles directly from atmospheric condensation, the fountains translate an abstract sustainability challenge into a tangible experience. This approach mitigates the risk of complacency by maintaining awareness of environmental limits and encouraging responsible water use, ensuring that efficiency gains do not lead to unintended increases in consumption.

## 7.3 Sea Star Festival, Umag, Croatia

The Sea Star Festival is a vibrant electronic music festival, one of the seven cultural productions organized by EXIT Foundation (Figure 103). It's a multi-stage electronic music festival that takes place every year in late spring (21-25 May) at Stella Maris beach (Figure 104), one of the most popular destinations across the Istrian peninsula, the largest of the Adriatic Sea.

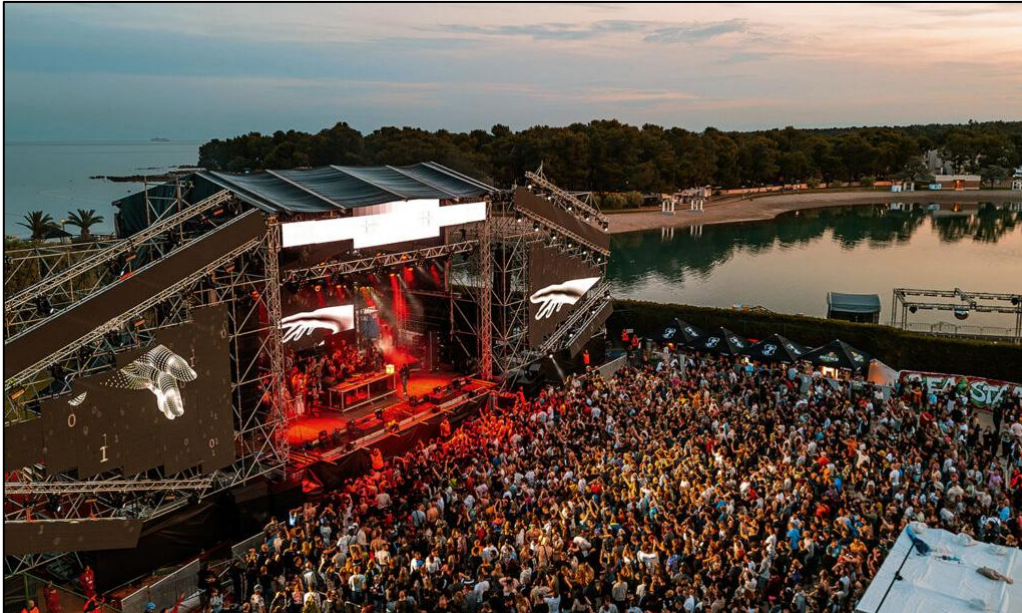


Figure 103 Sea Star Festival stage next to the sea by EXIT



Figure 104 Stella Maris beach aerial photo

Since 2017, Sea Star Festival brings tens of thousands of young people from all over Europe to this location, just 1,5 km away from city Umag, the westernmost town of Croatia, and the third most visited destination in the region. The location has various amenities at the disposal of beach guests, such as food & beverage outlets, sports & recreation amenities, showers, changing booths, lounge chairs and parking and a complex of





Figure 105 The tennis stadium “Gorana Ivaniševića” and its surroundings apartments and luxurious villas the Plava Laguna Resort with a marina for boats and yachts. The center of the festival activities is the tennis stadium “Gorana Ivaniševića” and its surroundings (Figure 105).

In May 2024, a crucial field study was conducted by ANGR to meticulously observe the festival's existing waste management practices, particularly concerning SUP cups, and to explore the potentials of this use case for implementing a sustainable, reusable cup system, detailing observations on festival operations, visitor behavior, and the pervasive challenge of plastic waste. A central focus of the study was to quantify the festival's plastic waste, specifically from single-use PP cups.



Figure 106 Sea Star festival map, 6<sup>th</sup> edition

The festival's allocation of activities as displayed on the festival map (Figure 106) was further analyzed by ANGR to design a strategic allocation of the points of interest dedicated to cups exchanges (Annex 10.10). Based on these findings the venue's settlement and the arrangement of the spectacles is pretty much predetermined; the festival production occupies around 10 locations of the existing architectural settings and runs 33 operations in total, 10 of which were dedicated to the promotion of brands and initiatives. Beer bars operated in 5 different locations, 4 of them in stage areas, and 1 at the Plaza area.

The festival operations are strategically distributed across these locations, with a strong presence of cashless payment points and branded beer bars across multiple stages and areas. The Brand zones offer a mix of product promotions and interactive experiences, some of which provide free services like photoshoots to attract visitors. The waste streams during the four days of festival activities put a lot of pressure on the festival's waste management team.

Good practices for collecting, sorting and recycling waste were not implemented systematically, but mainly to serve the dissemination purposes of a call-to-action initiative and not the management of recyclable waste during the days of the event. *Recan Pixelata* was a zone set in a central location, the round plateau area, next to many bars, dedicated to promoting cans recycling. The zone was equipped with three (3) small custom-made green bins made of cardboard for cans collection, and two-people carrying backpacks designed to collect cans after drinks consumption. Generally, the waste management system is under the responsibility of the communal services, therefore no separate material collection was applied, during or after the event days. Material streams included plastic, paper and aluminum packaging. During the field visit realized by ANGR in 2024 evidence supports that visitors didn't respond to the action at all.

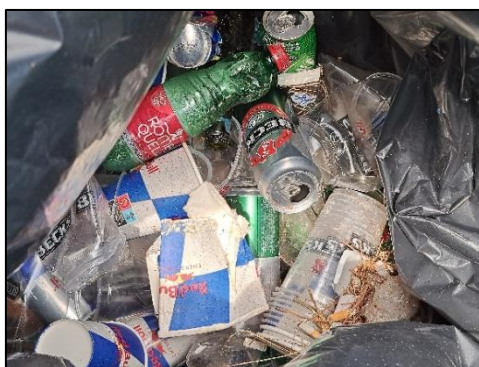


Figure 107 Unsorted waste streams

The green plastic waste bins (240 Lt & 120 Lt of max weight 110 Kg & 60 Kg respectively) were set almost everywhere in triples or sets of more, to manage the amount of waste produced inside the venue settings. Waste of any kind was reported inside the green waste bins (Figure 107), such as single use paper and plastic cups of varied sizes, 1lt plastic jugs, plastic bottles, cans, glass bottles, food waste, food wrapping paper, single use cutlery and paper trays used at the Foodland zone. All types of waste that was reported in the green bins were identified as well inside the ones for recycling. Despite the lack of a consistent waste management system, it must be noted that littering inside the venue and its surroundings, although occurred it is considerably small compared to the excessive consumption and the waste produced.

In 2024, the festival served a total of 44,000 PP cups, leading to 298 kg of plastic waste. While the total number of cups served decreased slightly compared to 2023, the overall plastic waste increased marginally (Figure 108).

In general disposables generated by the festival goers include the single-use polypropylene (PP) cups of different volumes serving beer and spirits. The breakdown by cup type based on two years data is:

- 0.5L Branded Cups: The usage of these cups increased to 27,000, contributing 216 kg of plastic waste. This represents a 2,000 cup increase and a 16 kg increase in plastic waste from this category compared to 2023.
- 0.3L Non-Branded Cups: The usage of these cups decreased to 14,000, resulting in 70 kg of plastic waste. This is a reduction of 3,000 cups and 15 kg of plastic waste from this category compared to 2023.

- **0.2L Non-Branded Cups:** A slight increase was observed, with 3,000 cups served, contributing 12 kg of plastic waste. This is an increase of 500 cups and 2 kg of plastic waste from this category compared to 2023.

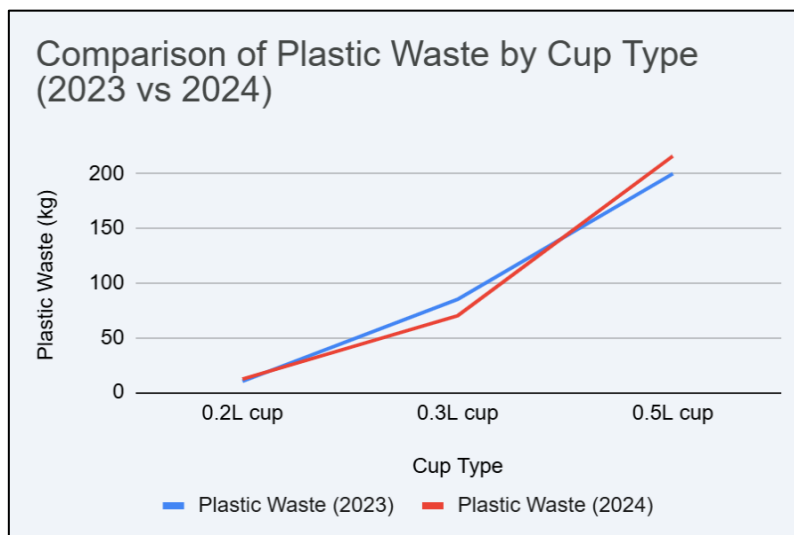


Figure 108 Festival's Plastic Waste Generation Graph (2023 vs 2024)

These findings highlight the significant environmental benefits of replacing conventional 0.5L disposable cups with reusable alternatives. According to ANGR's study and calculations regarding the festival's plastic footprint, cups used for beer consumption represent over 70% of the total disposable plastics generated during the four-day event.

Regarding the implementation of the DRS, the four main touchpoints are considered for the demo interventions to enable a flexible and effective reuse scheme:

1. **Gateway Points:** Two main entrances managed visitor flow, with a side entrance catering to guests from the nearby Stella Maris Resort and a main entrance for car arrivals and VIPs (Figure 109).
2. **Cashless Card Vendor Points:** Strategically located near stages and bars, these staffed kiosks facilitated card issuance and top-ups, emphasizing the festival's reliance on this non-personalized payment method (Figure 109).
3. **Venue Stages:** Four stages, ranging from large spectacles to smaller, more relaxed areas, served as the primary hubs for musical performances and visitor congregation (Figure 110).
4. **Bar Zones:** Distributed throughout the venue, these bars offered a full array of drinks, with Beck's Pills draft beer exclusively served in 500ml single-use polypropylene (PP) cups (Figure 110).

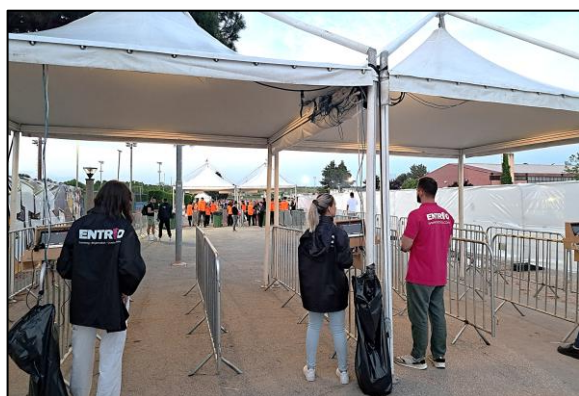


Figure 109 Photograph of the first (left) and second touch point (right)

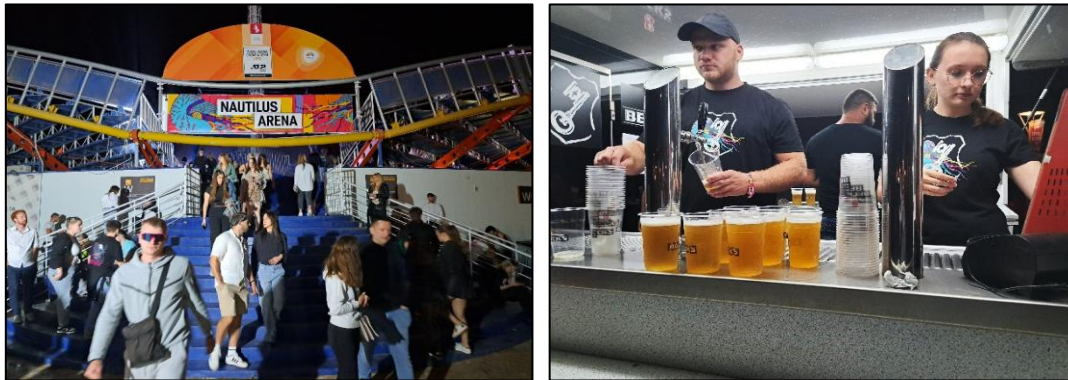


Figure 110 Photograph of the third (left) and fourth (right) touch points

A survey of 25 attendees provided invaluable insights into visitors' attitudes towards a reusable cup system. The findings were overwhelmingly positive:

- **Understanding of DRS:** Visitors demonstrated a basic understanding of deposit-return systems.
- **Limited Experience:** Most had limited prior experience with reusable cup schemes at festivals.
- **Future Standard:** There was a strong belief that such schemes would become common practice.
- **Reasonable Deposit:** Attendees found the concept of a monetary deposit for cups reasonable.
- **Acceptance of Responsibility:** Visitors were willing to accept the responsibility of returning their cups.
- **Willingness to Pay (WTP):** A significant willingness to pay a deposit ranging from €1 to €10 was observed.

However, communication challenges were also identified. The proximity of stages made oral communication difficult, and English was not always sufficient for engaging with the audience, highlighting the need for communication in Balkan languages. While mobile phone use was high for recording the festival experience, battery concerns might deter app downloads for active participation. Notably, branded zones offering free services, like photoshoots, were more successful in attracting visitor participation than those solely focused on drinks consumption.

Further observations on visitor behavior revealed a preference for issuing a single cashless card for group use, with one person often placing beer orders for an entire group. Visitors frequently carried group orders on six-pack trays and utilized branded stands for their cups, both full and empty. Crucially, instances of empty cups being disposed of on the ground were rare, suggesting a generally disciplined audience.

The user flow-chart developed by ANGR as part of this study (Annex 10.11) outlines a proposed reusable cup scheme, integrated within the festival's existing four touchpoints. In this model, visitors would be charged a deposit upon their first order. Cup returns would necessitate a scanning process with the same NFC card, supported by designated collection points and cup swap options at bars. The model also explores options for restarting the loop and offering rewards upon cup return.

Based on the field study and the information gathered, the Sea Star Festival faces several challenges related to single-use plastics (SUPs), particularly the PP beer cups:

- **High Volume of SUPs:** A significant number of single-use PP cups are consumed at the festival. In 2024, 44,000 cups were served, resulting in nearly 300kg of plastic waste. The trend shows a slight increase in waste despite a marginal decrease in the total number of cups served, driven by the higher consumption of heavier 0.5L branded cups.
- **Ineffective Waste Management and Recycling:** The festival's waste management system, handled by communal services, lacks systematic separate material collection. All plastic, paper, and

aluminum packaging are discarded unsorted into general waste bins. While there were marketing-focused recycling initiatives, visitor participation in sorting waste was minimal.

- **Non-Personalized Payment System:** The cashless NFC card system, while efficient for transactions, is not personalized. This leads to group purchases and makes it difficult to track individual consumption patterns, which is important for understanding the true impact of SUPs per person.
- **Communication Challenges:** The noisy environment and the need for communication in Balkan languages in addition to English pose challenges in effectively educating and engaging visitors on waste management and potential reusable cup systems.
- **Operational Strains:** High demand, especially on peak days, can lead to operational strains at bar areas. While pre-filling cups was possible on less busy days, increased demand necessitated instant preparation and serving, which could be a factor to consider when implementing a reusable system.
- **Limited Visitor Experience with Reuse Schemes:** Most visitors surveyed had limited prior experience with reusable cup schemes at festivals, although they were positive about the concept and believed it would become standard. This indicates a need for clear communication and a well-designed system to encourage adoption.

These challenges highlight the need for a more sustainable approach to waste management at the Sea Star Festival, with a focus on reducing the reliance on SUPs and implementing effective reusable alternatives. Acknowledging the burdens of SUPs on its identity and operations the challenges addresses can be turned into an opportunity for the festival to rebrand itself, moving beyond its current identity to one that is more environmentally conscious and forward-thinking, especially concerning its plastic footprint:

**1. Embrace a "Green Festival" Identity:** Become a leader in sustainability, instead of just being a music festival, rebrand as a pioneer in sustainable large-scale events in the region and beyond. This means actively promoting commitment to environmental responsibility. A new slogan that encapsulates the festival's environmental mission, and clear communication of why they are making these changes (e.g., protecting the beautiful Stella Maris beach, preserving marine life, setting an example for future generations) to make the shift to a reusable cup system a more meaningful experience for festival attendees and to highlight the positive environmental impact. By framing the reusable cup system not just as a logistical change, but as a collective effort to protect the beautiful festival location and contribute to a more sustainable future, the Sea Star Festival can connect with visitors on a deeper level. This can transform the act of using a reusable cup and participating in the deposit-return system into a positive and memorable part of their festival experience.

**2. Shift Focus from "Single-Use" to "Reusable Experience":** Make the reusable cup system a central part of the festival experience, not just a logistical change. Promote the DRS not just the reusable cup. Attendees' contribution to sustainability should be framed not as a cost, but as a small investment in a greener festival, with the reward of a refund. Interventions such as a "Fast Lane for Reusables" should be considered, to ease the experience of reuse, creating dedicated, faster service lines at bars for those using reusable cups to encourage their use.

**3. Enhance Communication and Engagement around Sustainability:** Multilingual "Green Guides" and engaging content (digital and physical) in Balkan languages that explains the reusable cup system, waste sorting, and the festival's environmental efforts are fundamental, as well as interactive info-points where visitors participate in fun environmental activities, and even see the cup washing process in action and learn more about reuse and how they can contribute to maximize return rates,. "Green Challenges" with rewards opting to gamify sustainability. For example, a challenge to return a certain number of cups for a prize, or a social media campaign for photos with reusable cups.

**4. Leverage Data and Transparency:** To build trust and demonstrate tangible impact embed real-time impact metrics accessible to end users of the mobile App developed for the reusable cups DRS. The festival's plastic footprint report should also be publicly shared after the event, including key environmental metrics, contributing to a long-term strategy to sustainability.



**5. Community Involvement and Local Sourcing:** Build collaborations with local businesses and organizations for sustainable initiatives, creating a sense of community pride, and engage regional influencers who align with sustainability values to spread the message organically.

**6. Sustainable Food and Beverage Options:** While the focus is on cups, subtly promote other sustainable practices, such as locally sourced food or plant-based options, to reinforce the overall green message.

By strategically implementing these rebranding efforts, the Sea Star Festival can not only mitigate its environmental impact but also attract a growing segment of environmentally conscious attendees, setting a new standard for sustainable entertainment in the region. To this direction, to re-brand the Sea Star Festival the brand brief below was proposed by EXIT:

*Established in 2000 in Novi Sad as a student movement advocating peace and freedom, EXIT Festival has been spearheading numerous socially responsible projects over the years.*

*EXIT's mission focuses on environmental protection. In recent years, we have implemented a series of ecological projects, among which we particularly highlight the Life Stream, Green A:Evolution, and the Green EXIT platform.*

*EXIT Foundation participates in REMEDIES and INSPIRE, two innovative ecological projects within the European Union programme "EU Mission: Restore our Ocean and Waters". These projects aim to attract public interest in creation and use of means to heal the oceans, seas, rivers, and water, in general, through detection, collection, and valorization of plastic waste, and, above all, through prevention of existing and new sources of pollution.*

*We are aware that it is necessary to gradually continue with setting the standards for the well-being of the environment in which everyone will be involved – from contractors, artists, employees, crew, volunteers, all the way to the subcontractors and suppliers. We are enthusiastically proceeding with our mission to make our planet better for everyone, to prevent plastic pollution, and to leave no traces behind.*

*Through the Green EXIT platform, we aim to mobilise and facilitate the cultural shift towards sustainable living habits, ethical choices, and responsible event practices.*

*We continue to press onward by implementing innovations, seeking fresh solutions and inspiration, and consistently advance with each festival edition.*

*Choose the Green EXIT*

*because*

*WE CAN ONLY DO THIS TOGETHER!*



## 8. Conclusions and Next Steps

D3.1 has successfully implemented the REMEDIES project's upstream solutions, directly addressing environmental pressures such as water scarcity and waste generation in vulnerable natural sites, particularly coastal areas and islands within the Mediterranean Sea basin.

Single-use plastic (SUP) containers for water were successfully phased out and replaced at Lia beach, Mykonos, Greece, through the provision of plastic-free alternatives and closed-loop water solutions, significantly reducing plastic waste generation on-site. The pilot demonstrators established a small-scale prevention ecosystem through the operational deployment of a comprehensive solution offering hygienic, resource-efficient, and scalable on-site service for clean reusable plastic containers, both cups and bottles.

Conversely, transitioning to reusable cup systems at large-scale outdoor events, such as music festivals, was challenged, mainly due to the significant role of branding and marketing, diverse vendor relationships, and intense competition—factors that require careful management and strategic negotiation. While the significant environmental impact of reusable cups is widely acknowledged (16) and their adoption is becoming an emerging trend in the events and entertainment industries, successful implementation remains far from guaranteed. Festival organizers are often more inclined to adopt branded cups, which can support marketing efforts. However, redistributing and reusing these cups across multiple events, thereby extending their lifespan, presents challenges. One suggested approach involves partnering directly with venues' brewery partners, where possible, to facilitate the transition. Yet, branding decisions can directly impact cup return rates. Event-specific branding, while appealing to organizers and sponsors, often encourages attendees to keep the cups as souvenirs, reducing their return and reuse. A more effective strategy may involve using mostly unbranded or generically branded cups, allowing them to be reused across various events, thereby maximizing their lifespan and minimizing losses.

A framework of actionable recommendations to successfully navigate D3.1 next steps is planned. The most effective first step is to optimize the complex logistics of collection, transportation, washing, sanitization, and inventory management, focusing on the system, not just the cup. Key performance indicators should include not only the durability of the cup but the entire operational loop, providing verified efficiency of the washing process, reliability of the logistics chain, and robustness of the tracking and inventory system.

Furthermore, to maximize the number of reuses per cup the most effective mechanism for ensuring high return rates is a financial incentive. Implementing a mandatory deposit or levy (e.g., €1 to €3) on the first cup provides a powerful motivation for attendees to return their cup for a refund or reuse it for their next drink. To this end, clear and consistent communication is key to educating attendees on how the system works.

Opportunities to benchmark existing reuse alternatives are already under investigation and will be further explored as a distinct business model. Finally, a decentralized End-of-Life (EoL) plan is expected to be realized within the DS regions, presented under WP2 deliverables by AITIIP.

As part of the outputs for the SO3 KPI, partners responsible for the implementation and replication of deploying 25,000 reusable REMEDIES cups and 5,000 multi-use bottles, alongside circular dishwashing services and water refilling stations (T3.1, T3.2), will continue to monitor the solutions' performance and impact in the selected DS and their replications with the aim to identify gaps, weaknesses, and optimization opportunities, thereby enriching the evaluation of achieved results, contingent upon the availability of all data by Autumn 2026.

ANGR will continue to spearhead the implementation of these systems, with plans for replication across diverse environments and business interventions. This initiative will engage key stakeholders to facilitate feedback loops for continuous improvement, impact reporting, and evaluation. This will enable the



customization of event-specific seamless integration adaptable to various scales—from beach bars to large festivals—and efficient on-site reuse, with comprehensive transparency and real-time monitoring of resource management and environmental impact via the DRS App, co-developed by CIBOS and ANGR.

Moreover, the implementation of traditional sampling methods during the demonstration of the cleaning systems and the AVG, will continue to support the water quality assessments supervised by NTUA as regards water solutions assessment and impact. Furthermore, optimization is anticipated regarding the integration of various collection systems and their adaptability across different environments and business cases. Additionally, to avoid negating the benefits of efficient washing with excessive transport emissions, the facility should ideally be located within 50 kilometers of the event site. Route optimization and full-load transport is used as the standard practice to further minimize the logistical footprint.

The final version of the report will conclude with the actual values attained relative to the project's specific objectives, including the number of SUPs refused, cleaning system efficiency, water quality metrics, and the volume of plastic waste prevented during these interventions.



## 9. References

1. Hanke G, Canals M, Vescovo V, MacDonald T, Martini E, Ruiz-Orejón LF, et al. Marine litter in the deepest site of the Mediterranean Sea. *Marine Pollution Bulletin*. 2025 Apr 1;213:117610.
2. Grelaud M, Ziveri P. The generation of marine litter in Mediterranean island beaches as an effect of tourism and its mitigation. *Sci Rep*. 2020 Nov 23;10(1):20326.
3. Regulation - EU - 2024/1781 - EN - EUR-Lex [Internet]. [cited 2025 May 24]. Available from: <https://eur-lex.europa.eu/eli/reg/2024/1781/oj/eng>
4. Towards the Circular Economy – Ellen Macarthur Foundation | UNFCCC [Internet]. [cited 2025 Sept 4]. Available from: <https://unfccc.int/documents/66280>
5. The Economic Impacts of Climate Change in the Mediterranean [Internet]. [cited 2025 Sept 3]. Available from: <https://www.iemed.org/publication/the-economic-impacts-of-climate-change-in-the-mediterranean/>
6. Evaluation-report-SUP-final-text.pdf [Internet]. [cited 2025 Sept 4]. Available from: <https://seas-at-risk.org/wp-content/uploads/2024/12/Evaluation-report-SUP-final-text.pdf>
7. Ceschin F, Gaziulusoy I. Evolution of design for sustainability: From product design to design for system innovations and transitions. *Design Studies*. 2016 Nov 1;47:118–63.
8. Regulation - EU - 2025/40 - EN - EUR-Lex [Internet]. [cited 2025 July 10]. Available from: <https://eur-lex.europa.eu/eli/reg/2025/40/oj/eng>
9. Amienyo D, Gujba H, Stichnothe H, Azapagic A. Life cycle environmental impacts of carbonated soft drinks. *International Journal of Life Cycle Assessment*. 2013 Jan;18(1):77–92.
10. Vobruba T, Hartl M, Langergraber G, Pucher B, Gattringer H, Bertino G, et al. vertECO® vertical green wall system demonstration for domestic wastewater treatment and on-site reuse in an Austrian eco-village. *Ecological Engineering*. 2025 Jan 1;211:107460.
11. The Island : Μύκονος [Internet]. [cited 2025 Aug 13]. Available from: <https://mykonos.gr/en/the-island/>
12. Georgakopoulos T. The paradox of Greece's most popular destination.
13. Βασιλείου Κ. How Mykonos Found Itself Parched and Thirsty [Internet]. *travel.gr*. 2023 [cited 2025 Aug 13]. Available from: <https://www.travel.gr/en/how-to-travel-en/travel-news-en/how-mykonos-found-itself-parched-and-thirsty/>
14. Lialios G. Water shortages a looming threat for Greek isles | eKathimerini.com [Internet]. 2024 [cited 2025 Aug 13]. Available from: <https://www.ekathimerini.com/society/1234642/water-shortages-a-looming-threat-for-greek-isles/>
15. <https://www.bateliersdelacotedazur.com/> [Internet]. [cited 2025 Sept 5]. Our commitment to the preservation of Porquerolles. Available from: <https://www.bateliersdelacotedazur.com/en/our-commitment-to-the-preservation-of-porquerolles.php/>
16. zwe\_reloop\_report\_reusable-vs-single-use-packaging-a-review-of-environmental-impact\_en.pdf.pdf\_v2.pdf [Internet]. [cited 2025 Sept 5]. Available from: <https://zerowasteurope.eu/wp->



content/uploads/2020/12/zwe\_reloop\_report\_reusable-vs-single-use-packaging-a-review-of-environmental-impact\_en.pdf.pdf\_v2.pdf

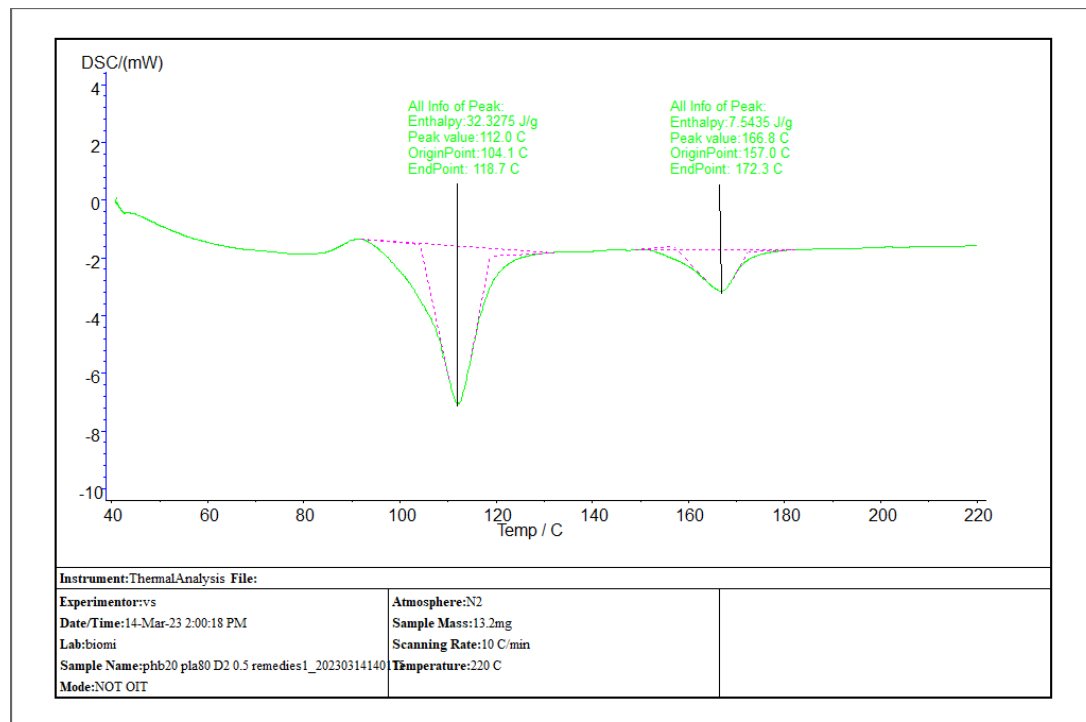
## Annexes

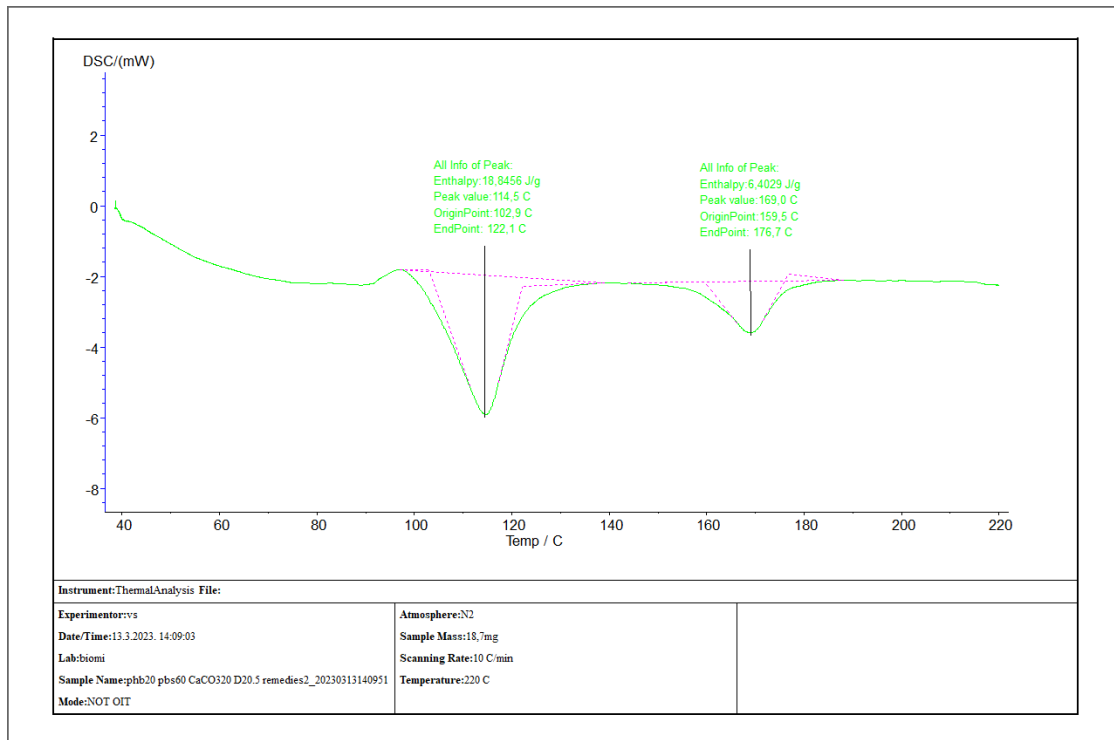
### Annex I: Candidate Formulations Material Characterization

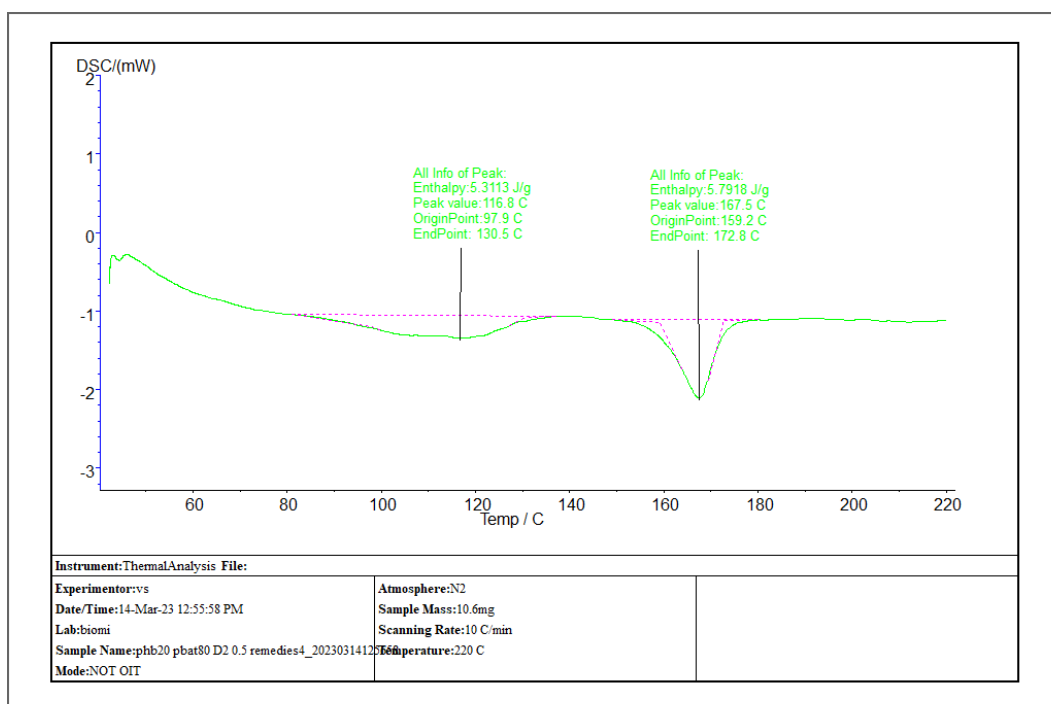
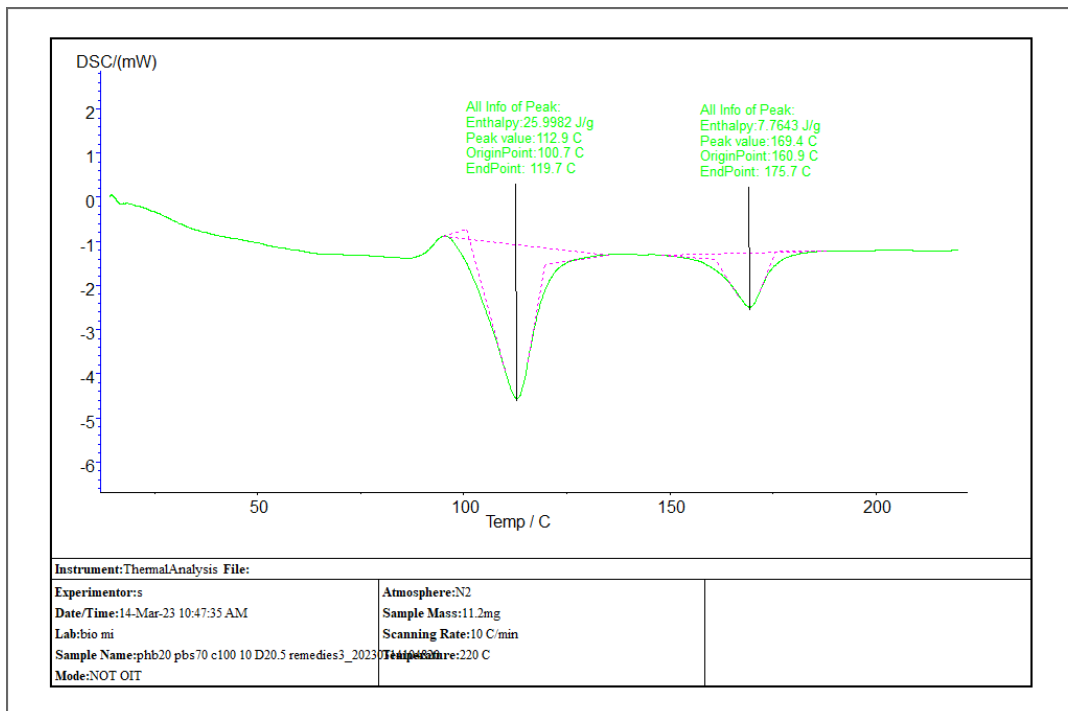
Name	Polymer matrix	Filler	T <sub>m</sub> (°C)	MFR, g/10 min 190°C, 2.16 kg	Density, g/cm <sup>3</sup>
Remedies 1	PHBV:PLA	-	146,3/167,6	11,6	1,247
Remedies 2	PHBV:PLA	Wood fiber	146,6/168,1	8,66	1,198
Remedies 3	PHBV:PLA	Organic filler	147,3/167,9	18,72	1,345
Remedies 4	PHBV:PBS	-	112,0/166,8	8,84	1,166
Remedies 5	PHBV:PBS	Wood fiber	112,9/169,4	10,90	1,277
Remedies 6	PHBV:PBS	Organic filler	114,5/169,0	14,65	1,361
Remedies 7	PHBV:PBAT	-	116,8/167,5	9,17	1,202
Remedies 8	PHBV:PBAT	Wood filler	111,7/167,4	9,80	1,197
Remedies 9	PHBV:PBAT	Organic filler	168,6	10,49	1,374
Remedies 10	PHBV	Talc	175.3	22.4	1.4
Remedies 10.1	PHBV	Talc	174.1	20.0	1.3

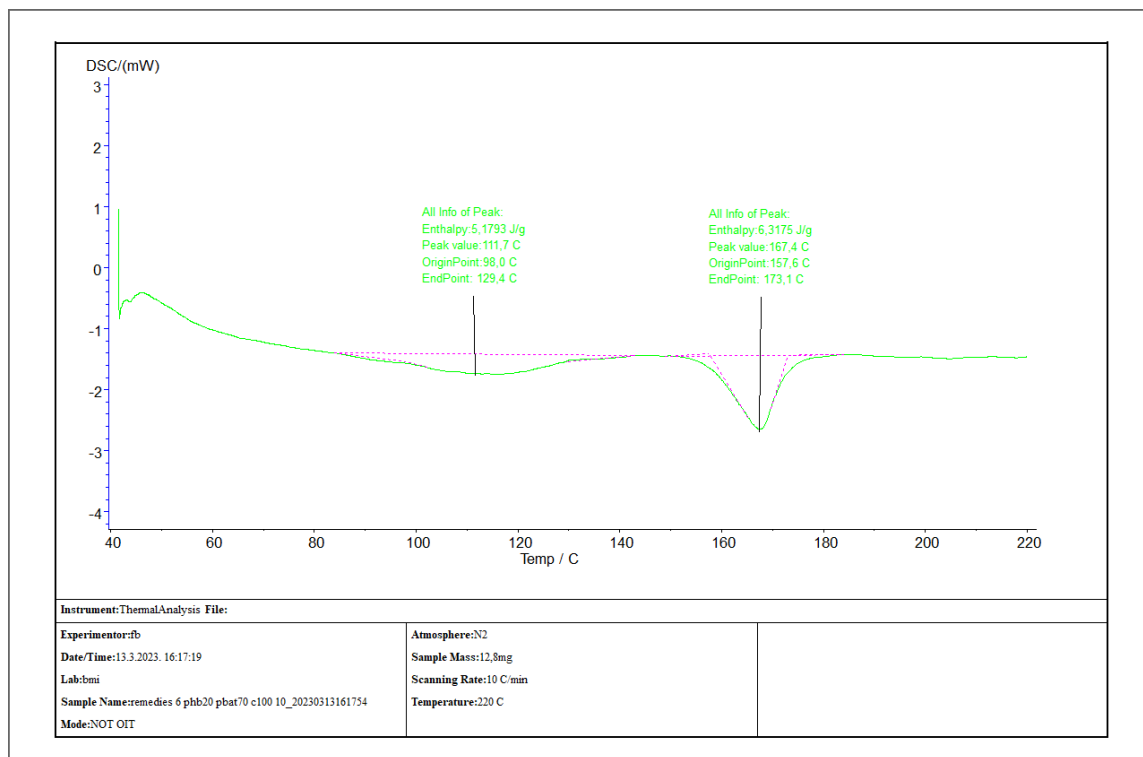
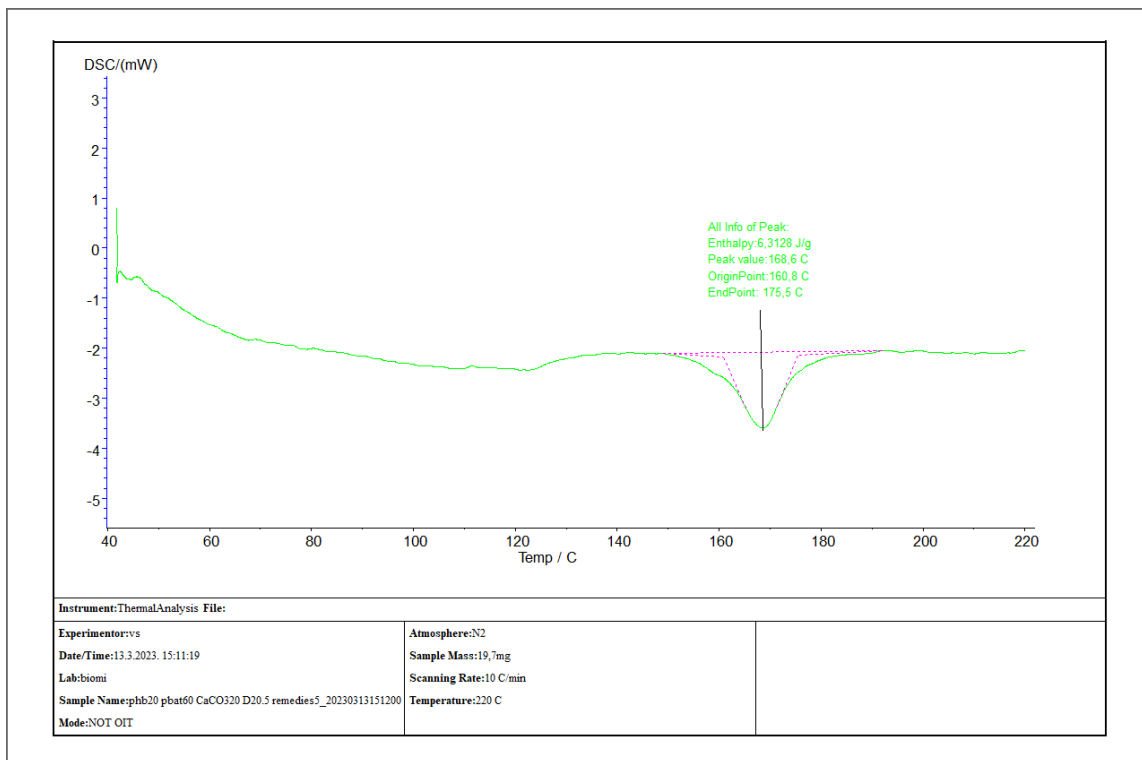


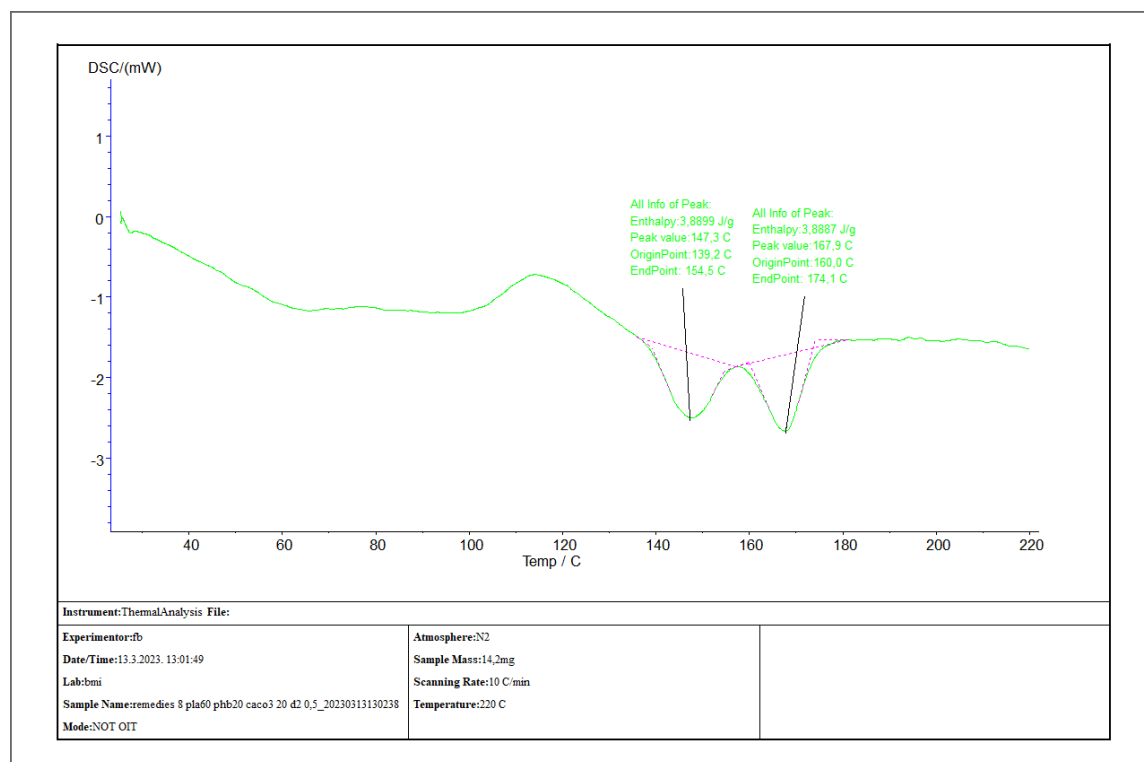
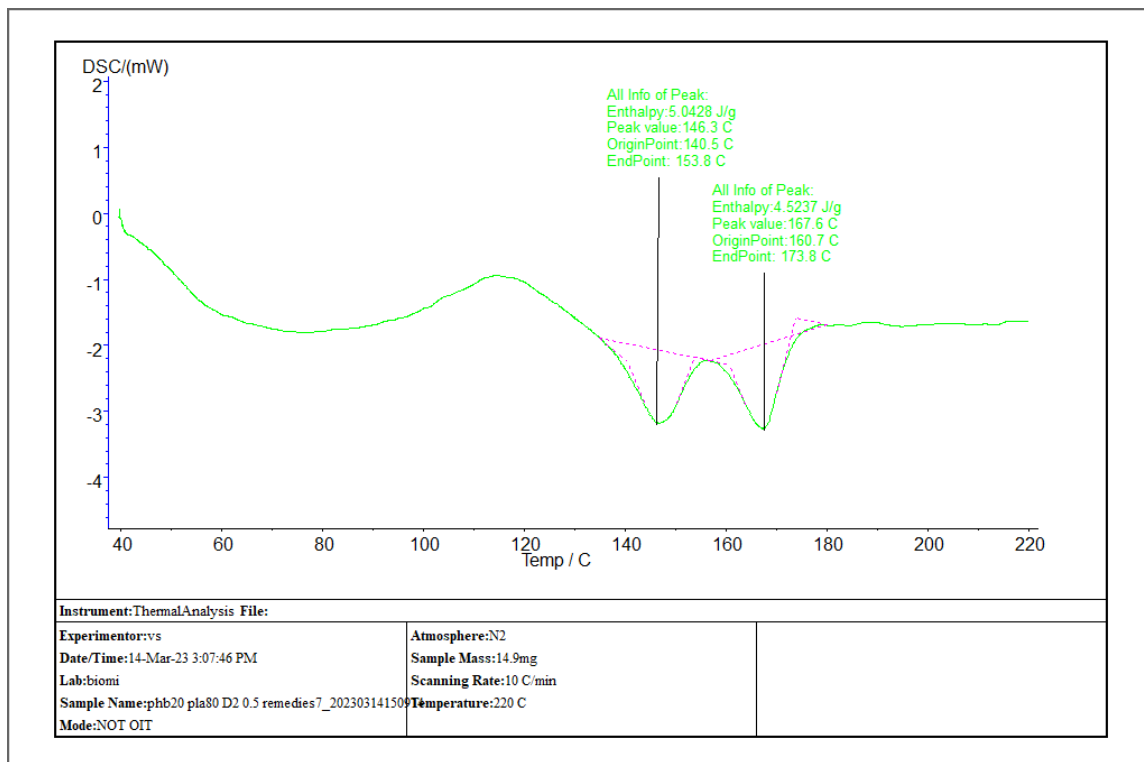
## Annex II: Candidate Formulations DSC Thermographs

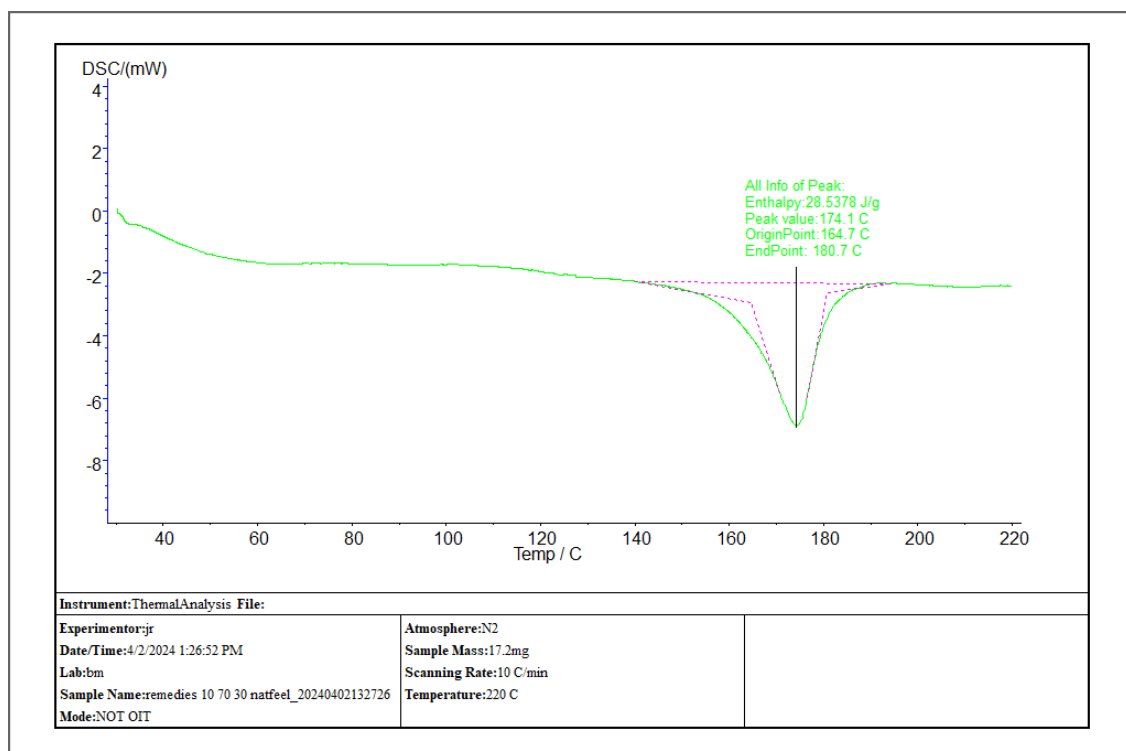
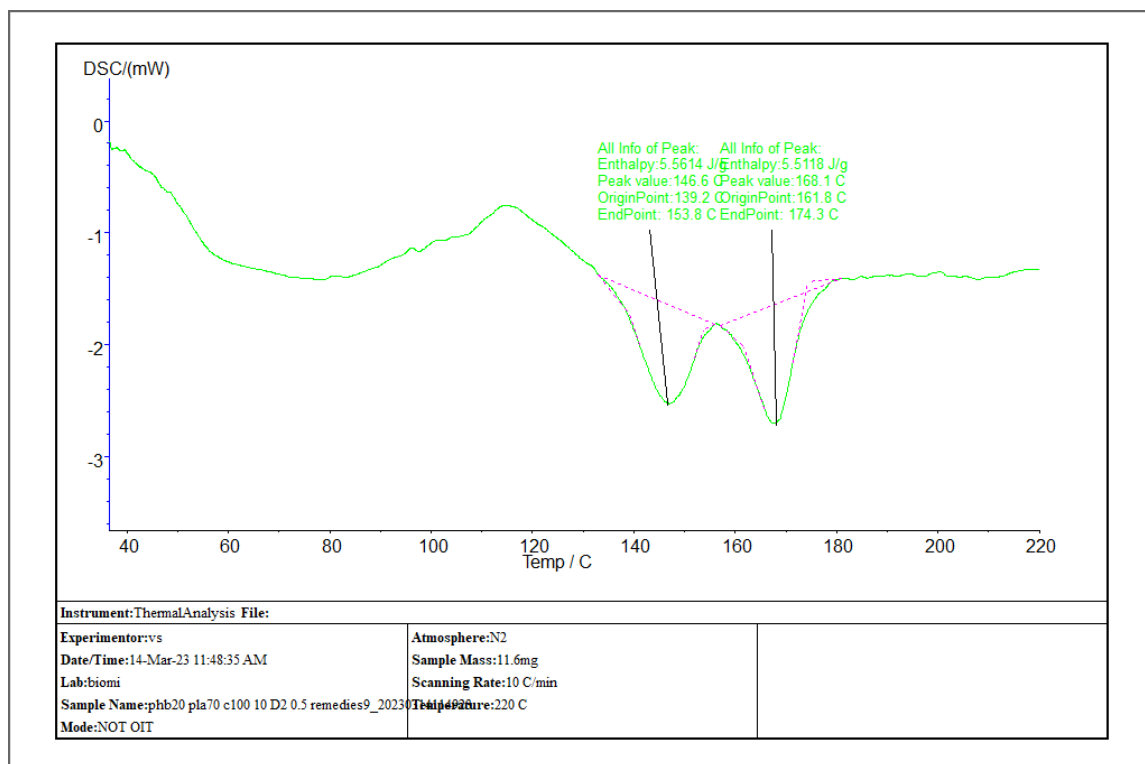


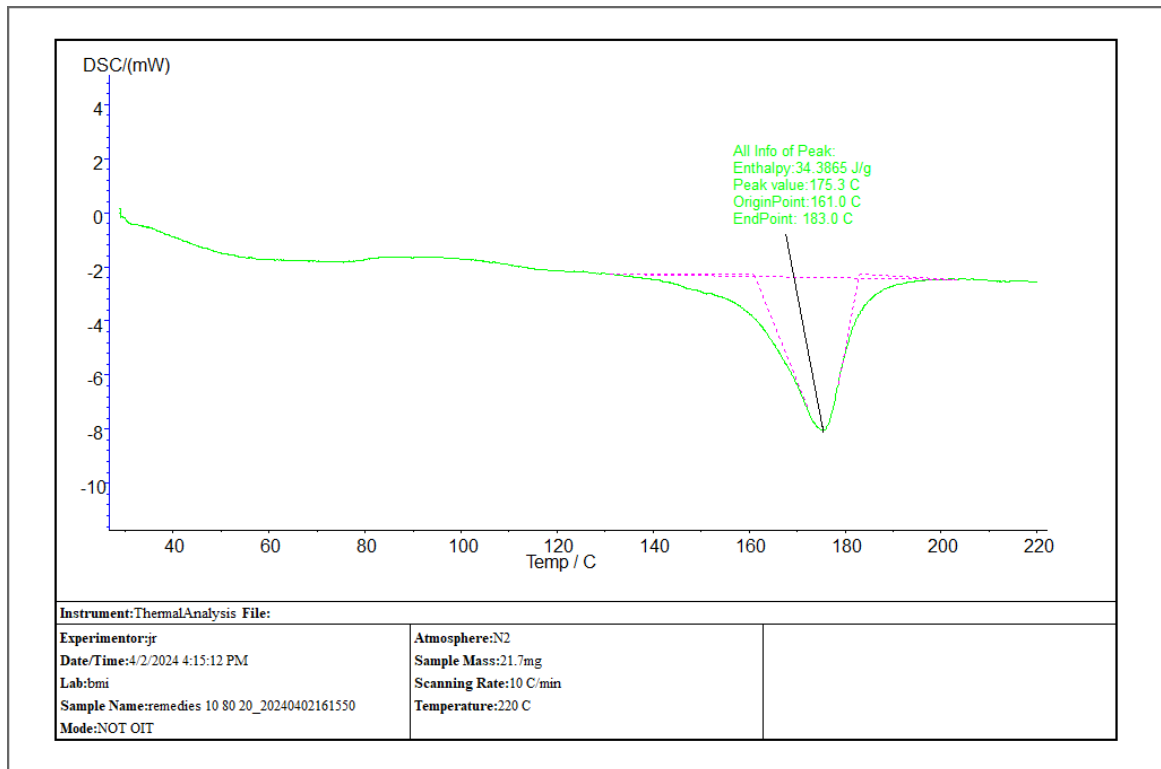












## Annex III: Candidate Formulations Mechanical Properties

Material		Young Modulus (MPa)	Flexural Modulus (MPa)	Impact Resistance (KJ/m <sup>2</sup> )	HDT (°C)	VICAT (°C)
Name	Matrix + filler					
HAPPY CUPS	rPHA	-	3914 ± 58	1,95 ± 0,25	83,34 ± 0,19	-
REMEDIES 1	PHB:PLA	2712 ± 248	2994 ± 36	3,83 ± 0,17	51,63 ± 0,44	60,44 ± 0,51
REMEDIES 2	PHB:PLA + Wood Fiber	3362 ± 192	3605 ± 53	4,20 ± 0,52	51,63 ± 0,22	74,43 ± 2,29
REMEDIES 4	PHB:PBS	864 ± 25	773 ± 10	14,35 ± 1,62	63,33 ± 1,35	109,56 ± 0,06
REMEDIES 5	PHB:PBS + Wood Fiber	1286 ± 85	1162 ± 33	5,48 ± 0,61	71,07 ± 1,76	108,45 ± 0,06
REMEDIES 6	PHB:PBS + Organic Filler	1374 ± 155	1335 ± 15	4,45 ± 0,24	65,94 ± 1,4	108,4 ± 0,59
REMEDIES 10	PHA?	5669 ± 36	7669 ± 68	2,53 ± 0,06	100 ± 4	159 ± 1

# Annex IV: Raw Materials Compliance Documents

## PBS Declaration of Compliance



1

12<sup>th</sup> March 2024

### Regulation Data Sheet

**Reference: PBE 003**

To whom it may concern,

#### STATEMENT FOR MATERIALS IN CONTACT WITH FOOD:

##### European Union (EU) Food contact

**PBE 003** complies with European Union (EU) Framework Regulation (EC) No.1935/2004 and Plastics Regulation (EU) No.10/2011 amended by Regulation (EU) No.2020/1245.

- **Monomers and additives**

We hereby certify that all monomers and additives used in the manufacture of this product are listed on the Plastics Regulation (EU) No 10/2011 and its amendment.

- **Specific Migration Limits:**

1,4-butandiol	SML(T)	=	5 mg/kg
Tetrahydrofuran	SML	=	0.6 mg/kg

- **Overall Migration Limit ('OML')** of 10 mg/dm<sup>2</sup> or 60 mg/kg is met in 50 µm films under OM-2 condition

- **Dual Use Additive**

E-number	Name	CAS No.	Concentration in product
E363	Succinic Acid	110-15-6	400 ppm (estimated)
E296	Malic Acid	6915-15-7	< 10 ppm

- The final product does not bring about deterioration in the organoleptic characteristics of the food.

#### US FOOD and DRUG Administration (FDA)

The FCS is intended for use in coatings, films, molded articles, and thermoformed articles, except for use in contact with infant formula and breast milk.

The FCS may be used in contact with all foods, except alcoholic foods, under Conditions of use B (Boiling water sterilized) through H (Frozen or refrigerated storage: Ready-prepared foods be reheated in container at time of use). The FCS is not for use in contact with infant formula and breast milk.



NaturePlast® • 6 Rue Ada Lovelace - 14120 Mondeville • Tél : +33 (0)2 31 83 50 87 • [www.natureplast.eu](http://www.natureplast.eu)  
 SAS au capital de 163 572 € • APE : 4676Z • SIREN : 493 442 891 • TVA : FR 45 49 344 2891



Co-funded by  
the European Union

## PBS Technical Data Sheet



Revision date: 30/10/2021

### TECHNICAL DATA SHEET

**PBE 003**

Biopolyester

Extrusion

#### General properties

**PBE 003** reference is a thermoplastic resin of polyester with **51 %** of biobased carbons according to **ASTM D 6866:2012-01** standard.

**PBE 003** is **industrially compostable** according to **NF EN 13432:2000** standard.  
The production waste can be recycled in production with a rate to determine according to the specificities of the product.

**PBE 003** is dedicated to extrusion applications.

	Method	Unit	Value*
<b>General properties</b>			
<i>Density</i>	ISO 1183	/	<b>1.26</b>
<i>MFI (190°C; 2,16 kg)</i>	ISO 1133	g/10min	<b>4 – 6</b>
<i>Optical properties</i>	/	/	<b>Translucent</b>
<i>Biobased carbon content</i>	ASTM D6866	%	<b>51</b>
<i>Shrinkage</i>	/	%	<b>1,3</b>
<b>Thermal properties</b>			
<i>Melt temperature</i>	/	°C	<b>115</b>
<i>HDT Method B120</i>	ISO 75-1	°C	<b>95</b>
<i>Vicat Method A50</i>	ISO 306	°C	<b>110</b>
<b>Mechanical properties</b>			
<i>Tensile maximal strength</i>	ISO 527	MPa	<b>40</b>
<i>Tensile strength at break</i>	ISO 527	MPa	<b>36</b>
<i>Tensile elongation at break</i>	ISO 527	%	<b>210</b>
<i>Young's Modulus</i>	ISO 527	MPa	<b>720</b>
<i>Flexural Modulus</i>	ISO 178	MPa	<b>680</b>
<i>Charpy impact strength (unnotched)</i>	ISO 179	kJ/m <sup>2</sup>	<b>NB</b>
<i>Hardness (15 s)</i>	ISO 868	Shore D	<b>66</b>

\*Typical values for reference only which do not have to be considered as specifications



NaturePlast® • 6 Rue Ada Lovelace - 14120 Mondeville • Tél : +33 (0)2 31 83 50 87 • www.natureplast.eu  
SAS au capital de 163 572 € • APE : 4676Z • SIREN : 493 442 891 • TVA : FR 45 49 344 2891



Co-funded by  
the European Union

## Storage and processing

Drying and storage conditions for **PBE 003** in order to get optimal properties and processing behavior (water content less than 250 ppm) are as following:

### Pellets drying:

- Five (5) hours at 80°C in oven or desiccator.

### Pellets storage:

- Pellets have to be stored avoiding air, direct lighting and any heat source.
- Packaging has to be kept sealed until the material is ready to be processed and resealed after use in order to avoid water contamination.

### Processing recommendations:

- **PBE 003** is not compatible with a wide variety of polyolefins resins so a prolonged purge could be necessary in order to avoid contamination.
- A good regulation of feed zone **under 30°C** is essential in order to avoid pellets consolidation phenomenon which could causes production issues.
- Long time material stagnation into the barrel has to be avoided otherwise thermal degradation could occur and lead to production instability and properties decreasing.

Processing temperature profile (for reference only)	
Feed zone	25°C
Zone 2	130°C
Zone 3	135°C
Zone 4	140°C
Zone 5	145°C
Die	150°C

*Information which is contained in this document is correct and exact at our best knowledge and at the date of publication. Before using this material, customers and users must verify the adequacy between the material and its final utilization. The NaturePlast Company can not be held responsible concerning the manipulation, the utilization and the treatment of this product.*



## PHBV Declaration of Compliance

# REACH24H

Report No.: CNT20241982-1041001

April 10, 2024

Ningbo Tianan Biologic Material Co., Ltd.  
No. 68, Dagang 6<sup>th</sup> Road, Beilun District  
Ningbo City, Zhejiang Province, P.R.China

Contact Person: Hui Huang

Phone: +86-159 6785 9421

Fax: +86-574 8687 7980

Email: jessy@tianan-enmat.com

## DECLARATION OF COMPLIANCE

### To whom it may concern,

We, on behalf of Ningbo Tianan Biologic Material Co., Ltd. hereby declare that the product identified as:

### PHBV

is intended to come into contact with food.

The product information is shown below:

**Table 1 Product information**

Chemical Name	CAS No.
3-hydroxybutanoic acid-3-hydroxypentanoic acid, copolymer	80181-31-3
Boron nitride	10043-11-5
pentaerythritol tetrakis[3-(3,5-di-tert-butyl-4-hydroxyphenyl)-propionate]	6683-19-8

The product complies with the following regulatory requirements:

### European Union:

- (1) Framework Regulation (EC) 1935/2004 on materials and articles intended to come into contact with food;*
- (2) Regulation (EC) No. 2023/2006 on good manufacturing practice for materials and articles intended to come into contact with food;*

REACH24H CONSULTING GROUP CHINA

China Office: 14th Floor, Building No.3, Haichuang Technology Center, 1288 West Wen Yi Road, Hangzhou, China 311121;

Ireland Office: Paramount Court, Corrig Road, Sandford, Dublin 18, Ireland;

USA Office: 11921 Freedom Drive, Suite 550, Reston, VA 20190 USA;

Page 1



Co-funded by  
the European Union

(3) Commission Regulation (EU) 10/2011 on plastic materials and articles intended to come into contact with food;

(4) All amendments of Regulation (EU) 10/2011 – up to Commission Regulation (EU) 2023/1627 on plastic materials and articles intended to come into contact with food.

The components of the product are listed in the Union list with specific regulatory requirements, as shown below:

**Table 2 Union list of authorized substances**

FCM substance No	CAS No.	Substance name	Use as additive or polymer production aid (yes/no)	Use as monomer or other starting substance (yes/no)	SML (mg/kg) / SML (T) (mg/kg)	Restrictions and specifications
744	80181-31-3	3-hydroxybutanoic acid-3-hydroxypentanoic acid, copolymer	No	Yes	SML (T) = 0.05 mg/kg as crotonic acid	The substance is used as product obtained by bacterial fermentation. In compliance with the specifications mentioned in the Table 4 of Annex I
583	10043-11-5	Boron nitride	Yes	No	SML (T) = 6 mg/kg as boron	/
496	6683-19-8	pentaerythritol tetrakis[3-(3,5-di-tert-butyl-4-hydroxyphenyl)-propionate]	Yes	No	/	/

The main component PHBV and additives used are listed in the Union list of Regulation (EU) 10/2011. Product complies with the following regulatory requirements:

- The chemical structure of PHBV complies with the structural formula set out in Table 4 of Regulation (EU) 10/2011 Annex I. A report provided by Tianan Biologic Material Co., Ltd. indicates that the ratio of hydroxybutanoic acid and hydroxypentanoic acid (or m:n) is 7.67:1. Therefore,  $n/(n+m) = 1/(1+7.67) = 0.13$ , which is less than or equal to 0.25 as required in Regulation (EU) 10/2011.
- Average molecular weight: The GPC test report, provided by Tianan Biologic Material Co., Ltd., indicates that the molecular weight of PHBV is 453,730 Daltons, which complies with the requirements in Table 4 of Regulation (EU) 10/2011 Annex I.
- Assay: The purity test report, provided by Tianan Biologic Material Co., Ltd., indicates that the purity of PHBV is 98.4% and complies with the requirements in Table 4 of Regulation (EU) 10/2011 Annex I.
- Description: The test report, provided by Tianan Biologic Material Co., Ltd., indicates that the sample appears as “white powder” and this is in compliance with the requirements in Table 4 of Regulation (EU) 10/2011 Annex I.
- Solubility: The solubility test report, provided by Tianan Biologic Material Co., Ltd., indicates that the sample is completely soluble in chloroform. Further, sample is almost insoluble in deionized water, absolute ethanol and hexane. Thus, PHBV is in compliance with the requirements in Table 4 of Regulation (EU) 10/2011 Annex I.
- Residues of nitrogen and metals: The test report, provided by Tianan Biologic Material Co., Ltd., indicates that the residues of nitrogen and metals are in compliance with the requirements in Table 4 of Regulation (EU) 10/2011 Annex I. Test results are shown in the table below:

Test item	Residue level (mg/kg)	Regulatory limitation (mg/kg)
Nitrogen	1600	2500
Zinc	6.8	100
Copper	1.2	5
Lead	0.18	2
Arsenic	0.037	1
Chromium	0.022	1

# REACH24H

Report No.: CNT20241982-1041001

A compliance test report provided by Tianan Biologic Material Co., Ltd. indicates that the total specific migration of crotonic acid does not exceed 0.05 mg/kg. Further, the test report confirms that the product complies with the following migration requirements:

- Boron nitride is listed in (EU) 10/2011 with SML(T) group restriction that the total specific migration of boron shall not exceed 6 mg/kg.
- Pentaerythritol tetrakis[3-(3,5-ditert-butyl-4-hydroxyphenyl)propionate] is listed in (EU) 10/2011 without any restrictions.
- Specific migration of heavy metals and primary aromatic amines shall not exceed the limitations as required in Annex II in Regulation (EU) 10/2011, as amended by Commission Regulation (EU) 2020/1245.
- The overall migration shall not exceed 10 mg/dm<sup>2</sup>.

**Thus, PHBV may be used safely in contact with food under precondition that complying with the regulatory requirements mentioned above.**

### End-use testing:

Manufacturers using the above product for the fabrication of food contact materials and articles, must comply with the general principles and regulatory requirements that these materials and articles should not pose a risk to human health or bring about either a deterioration in the organoleptic characteristics or other unacceptable changes to the food which they come into contact with.

Plastic materials and articles shall not release substances exceeding the limits listed under Annex II in Commission Regulation (EU) 2020/1245.

### Disclaimer:

*REACH24H CONSULTING GROUP CHINA was entrusted by Ningbo Tianan Biologic Material Co., Ltd. to perform the compliance reviewing work for its product PHBV according to the specific regulations, and the reviewing result and regulation basis are summarized in this statement.*

*Please note that this DoC is prepared based on the product information and intended use information provided by Ningbo Tianan Biologic Material Co., Ltd., and also REACH24H's knowledge of the currently effective regulations. Ningbo Tianan Biologic Material Co., Ltd. Shall be responsible for the accuracy and sufficiency of the provided information, while REACH24H makes no warranties or representations, expressed or implied to this part. If there is any variation either in product itself or the intended use, Ningbo Tianan Biologic Material Co., Ltd. shall bear the responsibility to verify the product compliance and the applicability of this DoC. REACH24H also suggests Ningbo Tianan Biologic*

REACH24H CONSULTING GROUP CHINA  
China Office: 14th Floor, Building No.3, Haichuang Technology Center, 1288 West Wen Yi Road, Hangzhou, China 311121;  
Ireland Office: Paramount Court, Corrig Road, Sandyford, Dublin 18, Ireland;  
USA Office: 11921 Freedom Drive, Suite 550, Reston, VA 20190 USA;

Page 4



# REACH24H

Report No.: CNT20241982-1041001

*Material Co., Ltd. to re-evaluate the compliance status once the related regulation is revised. Besides, additional measures may be necessary for Ningbo Tianan Biologic Material Co., Ltd. to ensure the use of the described products comply with other applicable regulatory requirements.*

*This certificate of compliance has validity of 2 years and consists of 5 pages.*

**Date: 2024.4.10**

**Signed:**



**Yini Jin**

**Regulatory Technical Engineer**



# PVBV Material Safety Data Sheet

## Material Safety Data Sheet

According to Regulation (EC) No. 1907/2006 (REACH) Article 31, Annex II as amended.

Trade Name: PHBV Pellet  
Product Code: ENMAT Y1000P

Version: 4.0

Revision Date: 2021/10/10

### SECTION 1: Identification of the substance/mixture and of the company/undertaking

#### 1.1 Product identifier

Product name: PHBV Pellet

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses: A thermoplastic polyester with a variety of uses

Uses advised against: Not mentioned

#### 1.3 Details of the supplier of the safety data sheet

Company Name: Ningbo Tianan Biologic Material Co., Ltd

68 Dagang 6th Rd. Beilun Ningbo China

Tel: +86-574-86895240

E-mail: [jessy@tianan-enmat.com](mailto:jessy@tianan-enmat.com)

#### 1.4 Emergency telephone number

24-hour emergency: +86-13336636366

### SECTION 2: Hazards identification

#### 2.1 Classification of the substance or mixture

The product has not been classified as hazardous according to the legislation in force.

Classification according to Regulation (EC) No 1272/2008 as amended.

Not classified

#### 2.2 Label Elements

Not applicable

#### 2.3 Other hazards

None

### SECTION 3: Composition/information on ingredients

Chemical name	CAS Number	Content	Hazardous
Poly(3-Hydroxybutyric acid-co-3-hydroxyvaleric acid)	80181-31-3	98.5%	No
Boron nitride	10043-11-5	1%	No
KY1010 (antioxidant)	6683-19-8	0.5%	No

REACH Registration No.: PHBV is exempted from REACH registration.

### SECTION 4: First aid measures

General Information: Not toxic

#### 4.1 Description of first aid measures

Inhalation: Not applicable

Skin Contact: After contact with skin, wash immediately with plenty of water and soap. Cool burns with molten



## Material Safety Data Sheet

According to Regulation (EC) No. 1907/2006 (REACH) Article 31, Annex II as amended.

Trade Name: PHBV Pellet

Product Code: ENMAT Y1000P

Version: 4.0

Revision Date: 2021/10/10

material with warm water, consult doctor if molten resin sticks to skin. Use gloves. Get medical attention if irritation occurs.

**Eye contact:** Get medical attention if irritation occurs.

**Ingestion:** Never give to an unconscious person. Call a physician immediately if getting choked

### 4.2 Most important symptoms and effects, both acute and delayed:

Swallowing by mistake may get choked

## SECTION 5: Firefighting measures

**5.1 Extinguishing Media:** Water, carbon dioxide, dry powder, foam.  
Inappropriate Extinguishing Media: None

**5.2 Specific Hazards by the Chemical Composition, by Its Burned Products or by the Emitted Gases:** Burning products include carbon monoxide(CO), carbon dioxide(CO2), or crotonic acid.

**5.3 Special Protection in Fire Fighting:**  
Wear self-containing breathing apparatus and chemical- protective clothing.

## SECTION 6: Accidental release measures

**6.1 Personal Protection:** None

**6.2 Protection of the Environment:** None

**6.3 Procedures for Cleaning/Collection:** Shovel into suitable container for disposal.

**6.4 Additional Information:** Biodegradable

## SECTION 7: Handling and storage:

**7.1 Precautions for safe handling:**  
Minimize airborne dust and eliminate all ignition sources. Keep away from heat, hot surfaces, sparks, and flame.

**7.2 Conditions for safe storage:**  
Store in a cool place, sealed. Keep at temperatures below 140F (60C).

**7.3 Specific end use(s):**  
Thermoplastics processing to make biodegradable products

## SECTION 8: Exposure controls/personal protection

### 8.1 Control Parameters

**Specific Limits in Germany (AGW):** Not applicable

**Specific Limits of the EU:** Not applicable

**Surveillance of the Exposition:** Not applicable

### 8.2 Individual protection measures, such as personal protective equipment

**Personal Protection:** Not applicable

**Respiratory Protection:** Wear a NIOSH-certified respirator in case of burning

**Hand Protection:** Wear gloves when handling molten resins

**Eye Protection:** Not applicable

**Protection of the Body:** Not applicable

**Information for Work Hygiene:** Not applicable

**Environmental Protection:** Not applicable, biodegradable



## Material Safety Data Sheet

According to Regulation (EC) No. 1907/2006 (REACH) Article 31, Annex II as amended.

Trade Name: PHBV Pellet  
Product Code: ENMAT Y1000P

Version: 4.0

Revision Date: 2021/10/10

### SECTION 9: Physical and chemical properties

#### 9.1 Information on basic physical and chemical properties

Form: Pellets  
Color: Off-white to beige  
Odor: Odorless to slightly sourish  
Explosion: Not applicable  
Lower Explosion Limit: Not applicable  
Upper Explosion Limit: Not applicable  
Vapor Pressure: Not applicable  
Density: 1.25g/ml, (ISO 2811-1)  
Solubility in Water: Not soluble  
PH Value: Not applicable  
Boiling Point Range: Not applicable  
Flammability Point: Not applicable  
Ignition Temperature: Not applicable

#### 9.2 Other information: None

### SECTION 10: Stability and reactivity

#### 10.1 Reactivity:

Under normal conditions: stable

#### 10.2 Chemical Stability:

Stable under recommended storage conditions.

#### 10.3 Possibility of hazardous reactions:

None

#### 10.4 Conditions to avoid:

Extremes of temperature and direct sunlight; avoid strong acids, alkali, oxidizing agents.

#### 10.5 Incompatible Materials:

Not known

#### 10.6 Hazardous Decomposition Products:

None

### SECTION 11: Toxicological information

**General Information:** Not toxic, not irritant

**Toxicological Information:** None

**Observation During Use:** None

**Data for composition:** No toxic additives

### SECTION 12: Ecological information

#### 12.1 Toxicity

**Fish:** Not applicable

**Aquatic Invertebrates:** Not applicable

**Water Plants:** Not applicable



## Material Safety Data Sheet

According to Regulation (EC) No. 1907/2006 (REACH) Article 31, Annex II as amended.

Trade Name: PHBV Pellet

Product Code: ENMAT Y1000P

Version: 4.0

Revision Date: 2021/10/10

**12.2 Persistence and Degradation:** Biodegradable

**12.3 Bioaccumulation Potential:** Does not bioaccumulate. Inherently biodegradable.

**12.4 Mobility in soil:** Biodegradable

**12.5 Results of PBT and vPvB:** Not available

**12.6 Other adverse effects:** No data available

### SECTION 13: Disposal considerations

#### 13.1 Waste treatment methods

General information: No data available

Disposable methods: Dispose like plastics

Contaminated Packaging: No data available

### SECTION 14: Transport information

#### 14.1 UN number:

Not regulated as a dangerous good

#### 14.2 UN proper shipping name

Not regulated as a dangerous good

#### 14.3 Transport hazard class(es)

Not regulated as a dangerous good

#### 14.4 Packing group

Not regulated as a dangerous good

#### 14.5 Environmental hazards

Not regulated as a dangerous good

#### 14.6 Special precautions for user

Not applicable

#### 14.7 Transport in bulk according to Annex II of Marpol and the IBC Code

Not applicable

### SECTION 15: Regulatory information

#### 15.1. Safety, health and environmental regulations / legislation specific for the substance or mixture

Not applicable

#### 15.2 Chemical safety assessment

No safety analysis was performed for this product or composition

### SECTION 16: Other information

**EU Regulations:** Not regulated

**Restrictions Suggested by the Producer:** Not applicable

**Other Suggestions:** Not applicable

**Changes Since Last Update:** 4

**Producer of the Safety Data Sheet:** Ningbo Tianan Biologic Material Co., Ltd.



## Filler's Declaration of Compliance



Omya SAS  
6 rue Pierre Semard  
FR-51240 Omev

[www.omya.com](http://www.omya.com)

BIO-MI d.o.o  
Put brdo 15  
51211 Matulji  
Croatia

Orgon, 02 April 2024

### CONFIRMATION

**Producer:** OMYA SpA  
**Product name:** Omyacarb 1 T-AV

We confirm that our above-mentioned product complies with the following requirements:

#### EU Food contact:

**COMMISSION REGULATION (EU) No 10/2011 and its amendments  
"On plastic materials and articles intended to come into contact with food"**

**Annex I, Table 1 of the Regulation contains the Union List of authorized monomers, other starting substances, and macromolecules obtained from microbial fermentation, additives and polymer production aids.**

The Omya product complies with the Union list, and none of its substances is regulated with specific migration limits (SML) as listed in Annex I.

Therefore, as far as the Omya ingredient is concerned, compliance with overall migration limit (OML) ensures the safe use of the Omya product.

Concerning overall migration we can foresee that overall migration tests performed with European food simulant B (3% acetic acid in water), on plastic samples containing the Omya Calcium Carbonate based product, could get results above 10 mg/dm<sup>2</sup>. Therefore, a suitable concentration of the product in the finished articles should be individuated to allow compliance to the OML.

Please note that simulant B is requested for plastic food contact applications intended for acidic foods (pH of < 4.5).





Omya SAS

### **Annex II restrictions**

Concerning heavy metals as listed under Annex II paragraph 1 of the Regulation, we confirm that we do not intentionally add any of the listed metals. Nevertheless, the Omya product is based on natural mineral that can be a source of traces of said listed metals.

Therefore, it is suggested to check compliance to the given metal migration limits directly on the final food contact article.

Primary Aromatic amines are not intentionally used.

### **Dual use additives under EU Regulation**

The product contains CaCO<sub>3</sub> which is a Dual Use substance, not classified as hazardous.

The Calcium Carbonate in the product doesn't comply with the food additive or flavoring regulations.

The CaCO<sub>3</sub> used in the product is only dedicated to industrial purposes and is not analyzed according to the E170 food additive criteria.

Therefore, the above product is not a food additive, or a flavoring as defined by Regulation (EC) No 1333/2008 and Regulation (EC) No 1334/2008.

Other substances (confidential) authorized as direct food additives ("Dual use additives") are present in traces that in case of migration are not expected to exceed the applicable limits as set by food legislation nor exert any technical effect in food. These substances are regulated by the Overall Migration Limit.

This statement does not remove the obligation of the manufacturer to test the finished product under the above mentioned regulations and standards, if required, and to check compliance to any other applicable provisions for use in contact with food.

This confirmation is valid 2 years from the date of issue.





Omya SAS

Omya, to the best of its knowledge, believes that the information provided above is accurate and correct, based on the sources available at the time of writing. Omya does not assume liability for the use of the information or claims or damages from any third party.

Sincerely,

Omya SAS

Magali Brochard-Terral  
Manager Regulatory Affairs Europe



Solène OLIVIER  
Regulatory Affairs Specialist



## Filler's Safety Data Sheet

### ITAV 75801-00 Omyacarb 1T - AV\_Information on Regulatory Status



Omya International AG  
Group Regulatory Affairs  
CH-4665 Oftringen  
www.omya.com

## INFORMATION ON REGULATORY STATUS

Product Name : Omyacarb 1T - AV

Author: Omya Product Regulatory Affairs

The following statements provide common regulatory information regarding the above-listed product Ground Calcium Carbonate (GCC).

The herein compliance statements are referred to the applicable legislations in the version which is current at the date as indicated below.

### Contents

Allergen.....	2
Bovine/Transmissible Spongiform Encephalopathy (BSE/TSE).....	2
California Safe Drinking Water and Toxic Enforcement Act (Prop 65).....	2
Chemical Inventory status.....	3
Conflict Minerals.....	3
Coalition of Northeast Governors (CONEG).....	4
Genetically Modified Organisms (GMOs).....	4
Hazardous Air Pollutants (HAPs).....	4
Persistent organic pollutants (POPs).....	5
Ionisation / irradiation.....	5
Packaging and packaging waste : Directive 94/62/EC of 20 December 1994.....	5
Restriction of Hazardous Substances (RoHS) 2011/65/Directive.....	6
Recommendation 2011/696/EU (NANO).....	6
Regulation (EC) 1907/2006 Registration, Evaluation, Authorization and Restriction of Chemicals (REACH) and SVHC.....	7
TOYS SAFETY.....	7
Volatile Organic Compounds (VOC).....	8

Omya, to the best of its knowledge, believes that the information provided above is accurate and correct, based on the sources available at the time of writing. Omya does not assume liability for the use of the information, or claims or damages from any third party.

Document Type: RGP Regulatory Profile  
Document Number: OMYA\_en\_RGP\_3200  
Version: 3

Applicable Date: 26/01/2024  
Location: OMYA  
Controlled- Internal Use

Page 1 of 8



Co-funded by  
the European Union

## ITAV 75801-00 Omyacarb 1T - AV\_Information on Regulatory Status



Omya International AG  
Group Regulatory Affairs  
CH-4665 Oftringen

www.omya.com

### Allergen

The above-listed product does not contain substances or products causing allergies or intolerances according to the Regulation (EU) No 1169/2011 Annex II.

The above-listed product does not contain milk, eggs, fish, crustacean shellfish, tree nuts, peanuts, wheat, soybeans and sesame according to the US Food Allergen Labelling and Consumer Protection Act of 2004 and the Food Allergy Safety, Treatment, Education, and Research Act of 2021

The above-listed product does not contain substances or products causing allergies or intolerances according to Regulation (EC) No 1223/2009 Annex III.

### Bovine/Transmissible Spongiform Encephalopathy (BSE/TSE)

No animal derived material falling under the scope of the EMEA 410/01 rev. 3, "Note for the Guidance on Minimizing the Risk of Transmitting Animal Spongiform encephalopathy agents via Human and Veterinary Medicinal Products" (cfr European Pharmacopoeia Charter 5.2.8) has been used in the manufacture of above-listed product. Therefore, our product is TSE and BSE free.

### California Safe Drinking Water and Toxic Enforcement Act (Prop 65)

The following statements are intended to provide information about California's Proposition 65 and above-listed product.

Being derived from natural calcium carbonate ore, the above mentioned product contains low levels of naturally occurring impurities, such as crystalline silica (quartz). Airborne crystalline silica of respirable size is listed on Prop 65. Concentrations of silica forms above limits specified in applicable regulations are reported on the material safety data sheet.

When considering the applicability of Prop 65's consumer warning requirements, it is important to keep in mind that such requirements are based on the potential exposure to a listed chemical from reasonably foreseeable use of a final product - not merely the presence of the listed chemical in the product.

Omya, to the best of its knowledge, believes that the information provided above is accurate and correct, based on the sources available at the time of writing. Omya does not assume liability for the use of the information, or claims or damages from any third party.

Document Type: RGP Regulatory Profile  
Document Number: OMYA\_en\_RGP\_3200  
Version: 3

Applicable Date: 28/01/2024  
Location: OMYA  
Controlled- Internal Use

Page 2 of 8



Co-funded by  
the European Union



## ITAV 75801-00 Omyacarb 1T - AV\_Information on Regulatory Status

Omya International AG  
Group Regulatory Affairs  
CH-4665 Oftringen

www.omya.com

Regarding crystalline silica; Prop 65's crystalline silica listing is specifically limited to "airborne particles of respirable size", therefore only the inhalation route of exposure would be subject to Prop 65. Because the relatively low amounts of respirable silica in Omya's product may be effectively contained within your finished products, or agglomerated with other product ingredients to produce a non-respirable airborne particle, exposure to airborne crystalline silica particles of respirable size resulting from the reasonably foreseeable use of your products may not occur.

In addition, the above-listed product may contain incidental trace levels of naturally-occurring Prop-65-listed metals such as, among others, lead, cadmium and arsenic. No metals are, however, intentionally added.

### Chemical Inventory status

The following table describes the national chemical inventory status of the above-listed product.

National Inventory	Listed/exempted	Comments
Australia (AICS)	Yes	
Canada (DSL)	Yes	The ground limestone portion of this product is considered to be exempt from the DSL by virtue of its status as a substance occurring in nature
USA (TSCA)	Yes	
China (IECSC)	Yes	
Europe (EINECS)	Yes	
Japan (ENCS)	yes	
Korea (ECL)	Yes	
Taiwan (TSCI)	Yes	
Philippines (PICCS)	Yes	
New Zealand (NZIoC)	Yes	

### Conflict Minerals

As defined under Section 1502 of the Dodd-Frank Wall Street Reform and Consumer Protection Act, and U.S. Securities and Exchange Commission regulations at 17 CFR Part 240, and for the purpose of this correspondence, "Conflict Minerals" are understood to be columbite-tantalite (coltan), cassiterite, gold, and wolframite, or their derivatives including tantalum, tin, and tungsten, or any other mineral or its derivatives determined as of this date by the U.S. Secretary of State to be financing conflict in the Democratic Republic of the Congo or an adjoining country. Omya's ground limestone products are produced by the grinding of naturally-occurring limestone ore and no other minerals, including Conflict Minerals, are added via other product ingredients.

Omya, to the best of its knowledge, believes that the information provided above is accurate and correct, based on the sources available at the time of writing. Omya does not assume liability for the use of the information, or claims or damages from any third party.

Document Type: RGP Regulatory Profile  
Document Number: OMYA\_en\_RGP\_3200  
Version: 3

Applicable Date: 26/01/2024  
Location: OMYA  
Controlled- Internal Use

Page 3 of 8



Co-funded by  
the European Union

## ITAV 75801-00 Omyacarb 1T - AV\_Information on Regulatory Status



Omya International AG  
Group Regulatory Affairs  
CH-4665 Oftringen

[www.omya.com](http://www.omya.com)

In summary, all ground limestone products made at Omya facilities are thus free of Conflict Minerals, and can be said to be "DRC conflict free" as defined under Section 1502 of the Dodd-Frank Wall Street Reform and Consumer Protection Act, and U.S. Securities and Exchange Commission Form SD pursuant to 17 CFR 249b.400.

### Coalition of Northeast Governors (CONEG)

Our ground limestone and calcium carbonate materials are produced by the grinding of natural limestone. Since these are derived from natural ore, our products may contain incidental trace levels of Coalition of Northeast Governors (CONEG) listed metals. However, no metals are intentionally added.

Based on historical data, the concentration of these metals is consistently well below 100 ppm (total) for Lead, Cadmium, Mercury and Chromium. Therefore, Omya's ground limestone and calcium carbonate products are compliant with CONEG's requirement regarding the content of metals.

Additionally, the class of perfluoroalkyl and polyfluoroalkyl substances (PFAS) and ortho-phthalates are not intentionally added to our product listed above. We do not test for these substances as there are not reasonably expected to be present in our products

### Genetically Modified Organisms (GMOs)

The above-listed product does not contain, nor is it produced with genetically modified organisms (GMO) or substances originating from a GMO according to Regulation (EC) No 1829/2003. Therefore, our product is GMO free and does not require GMO-Labeling according to regulations (EC) No 1829/2003 and (EC) No 1830/2003.

### Hazardous Air Pollutants (HAPs)

Based upon our product and process knowledge, Omya ground limestone products do not contain any potential Hazardous Air Pollutants (HAPs) as defined under Section 112 of the Clean Air Act with the exception of certain naturally-occurring metals which may be present in our products at low (ppm) concentrations.

This product has not been tested for these chemical substances as they are not expected to be present in our product.

Omya, to the best of its knowledge, believes that the information provided above is accurate and correct, based on the sources available at the time of writing. Omya does not assume liability for the use of the information, or claims or damages from any third party.

Document Type: RGP Regulatory Profile  
Document Number: OMYA\_en\_RGP\_3200  
Version: 3

Applicable Date: 26/01/2024  
Location: OMYA  
Controlled- Internal Use

Page 4 of 8



Co-funded by  
the European Union

## ITAV 75801-00 Omyacarb 1T - AV\_Information on Regulatory Status



Omya International AG  
Group Regulatory Affairs  
CH-4665 Oftringen

[www.omya.com](http://www.omya.com)

### Persistent organic pollutants (POPs)

Persistent organic pollutants (POPs) are chemical substances that persist in the environment, bioaccumulate through the food web, and pose a risk of causing adverse effects to human health and the environment. This group of priority pollutants consists of pesticides (such as DDT), industrial chemicals (such as polychlorinated biphenyls, PCBs) and unintentional by-products of industrial processes (such as dioxins and furans).

Our product is produced without the intentional addition of the substances listed in the Annex I to IV of the REGULATION (EU) 2019/1021 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 20 June 2019 on persistent organic pollutants.

We do not test for these substances as they are not reasonably expected to be present in our products

### Ionisation / irradiation

This product has not been subject to irradiation of any kind during the manufacture. This product is not ionized: no step in their process contain a phase of ionization.

### Packaging and packaging waste : Directive 94/62/EC of 20 December 1994

Our ground limestone and calcium carbonate materials are produced by the grinding of natural limestone. Since these are derived from natural ore, our products may contain incidental trace levels of listed metals. There are not added as intentional ingredients for the composition of our product.

Based on historical data, the sum of concentration levels of lead, cadmium, mercury and hexavalent chromium is consistently below 100 ppm (total) as required in the article 11 of the consolidated version of the Directive 94/62/EC.

Our product is not classified "N". Therefore, Omya's ground limestone and calcium carbonate products are compliant with the Directive 94/62 requirement regarding the content of metals.

Omya, to the best of its knowledge, believes that the information provided above is accurate and correct, based on the sources available at the time of writing. Omya does not assume liability for the use of the information, or claims or damages from any third party.

Document Type: RGP Regulatory Profile  
Document Number: OMYA\_en\_RGP\_3200  
Version: 3

Applicable Date: 26/01/2024  
Location: OMYA  
Controlled- Internal Use

Page 5 of 8



Co-funded by  
the European Union

## ITAV 75801-00 Omyacarb 1T - AV\_Information on Regulatory Status



Omya International AG  
 Group Regulatory Affairs  
 CH-4665 Oftringen

www.omya.com

### Restriction of Hazardous Substances (RoHS) 2011/65/Directive

The above-mentioned product complies with the Directive 2011/65 (RoHS) of 8 June 2011 and its amendments, relating on the restriction of the use of certain hazardous substances in electrical and electronic equipment insofar as:

- Heavy metal compounds are natural impurities of the mineral. They are not added as intentional ingredients for the composition of our product.
- Their concentration are below the limits imposed by Directive 2011/65 (RoHS) :

• Family of substances	• Maxi Thresholds by weight
• Lead (Pb)	• 0.1%
• Cadmium (Cd)	• 0.01%
• Chromium (Cr)	• 0.1%
• Mercury (Hg)	• 0.1%

- Polybromobiphenyles (PBB), Polybromodiphenyl Ethers (PBDE),
- Bis(2-ethylhexyl) phthalate (DEHP), Butyl benzyl phthalate (BBP),
- Dibutyl phthalate (DBP), Diisobutyl phthalate (DIBP).

This product has not been tested for these chemical substances as they are not expected to be present in our product.

### Recommendation 2011/696/EU (NANO)

On June 10th, 2022 the European Commission published the revision of its definition of nanomaterials in Recommendation 2022/C 229/01. This definition remains not legally binding at this stage. According to our internal assessment and taking into account the Decision Support Flow Scheme as provided by The NanoDefine Method Manual (2020). Omya's product listed above does not fall under the definition of nanomaterials.

Although our products are not intentionally manufactured in the nano scale, they may contain particles with one or more external dimensions in the size range 1 nm-100 nm.

In this respect, it is worth noting that EFSA concluded that trace levels of adventitious nanoscale material within macroscale calcium carbonate are not of toxicological concern.

Product listed above do not fall under the nanomaterials as defined by the French regulation (decree n°2012-232 and order of 6 august 2012 (definition: The minimum proportion mentioned in article R. 523-12 of the Environment code, of particles with one or more external dimensions in the size range 1 nm - 100 nm, is defined as 50% of the number size distribution).

Omya, to the best of its knowledge, believes that the information provided above is accurate and correct, based on the sources available at the time of writing. Omya does not assume liability for the use of the information, or claims or damages from any third party.

Document Type: RGP Regulatory Profile  
 Document Number: OMYA\_en\_RGP\_3200  
 Version: 3

Applicable Date: 26/01/2024  
 Location: OMYA  
 Controlled- Internal Use

Page 6 of 8



Co-funded by  
 the European Union

## ITAV 75801-00 Omyacarb 1T - AV\_Information on Regulatory Status



Omya International AG  
Group Regulatory Affairs  
CH-4665 Oftringen

[www.omya.com](http://www.omya.com)

### Regulation (EC) 1907/2006 Registration, Evaluation, Authorization and Restriction of Chemicals (REACH) and SVHC

We confirm that the above-mentioned product complies with Regulation (EC) No. 1907/2006 (REACH) and its amendments. Products that are mixtures or polymers will not need to be registered themselves. However, the substances that are contained within the mixture are registered by OMYA or within the supply chain or exempted from registration (e. g. natural sourced minerals).

The registration number is communicated in the provided Safety Data Sheet (SDS) in accordance with the requirements of Regulation (EU) 2015/830 where applicable and only for substances to be declared in Section 3 of the SDS. Additionally Section 15 mentions, if the substance or mixture covered by the SDS is the subject of specific provisions (e.g. restrictions according to Annex XIV).

Omya would like to inform you that the above-mentioned product(s) purchased from Omya within the last two years do(es) not include substances, as defined on the candidate list of SVHC for authorization by ECHA (current version, above 0.1% ([http://echa.europa.eu/chem\\_data/candidate\\_list\\_table\\_en.asp](http://echa.europa.eu/chem_data/candidate_list_table_en.asp)). If needed, changes will be reported in the corresponding Safety Data Sheet (SDS).

### TOYS SAFETY

Directive 2009/48/EC of 18 June 2009 and its amendments on the safety of toys.  
This text doesn't apply to our product nevertheless according the annex II part III chemical properties, our product:

- Is not a hazardous substance or mixture according the Regulation 1272/2008/EC (CLP),
- Is not a CMR of category 1A, 1B or 2 under CLP,
- Neither nitrosamines nor nitrosable substances are intentionally added,
- No allergenic fragrance listed in the point 11 of annex II are intentionally added.

Concerning Nitrosamine, nitrosable substances and allergenic fragrance: this product has not been tested for these chemical substances as they are not expected to be present in our product.

Omya, to the best of its knowledge, believes that the information provided above is accurate and correct, based on the sources available at the time of writing. Omya does not assume liability for the use of the information, or claims or damages from any third party.

Document Type: RGP Regulatory Profile  
Document Number: OMYA\_en\_RGP\_3200  
Version: 3

Applicable Date: 26/01/2024  
Location: OMYA  
Controlled- Internal Use

Page 7 of 8



Co-funded by  
the European Union

## ITAV 75801-00 Omyacarb 1T - AV\_Information on Regulatory Status



Omya International AG  
Group Regulatory Affairs  
CH-4665 Oftringen

[www.omya.com](http://www.omya.com)

**Point 13 of annex II : Soluble elements: migration of certain elements (EN 71 Part 3 as harmonized under the EU Toy Directive).**

Heavy metal compounds are natural impurities of the mineral. They are not added as intentional ingredients in our product.

The last analysis (trace elements of the HCL / HNO3 soluble part) done for some elements show results below the limits mentioned in the Category III - in scraped of toy material but not all listed elements have been analyzed (e.g. : aluminum, boron, chrome III and VI, organic tin).

Please note that the thresholds of migration limits listed in the EN71-3 concerns the toys material or components of toys, not the single product stated above. Since you are responsible for your own formula, this statement does not remove the obligation of the manufacturer to evaluate/test the toy material or toy components under the above mentioned standard.

### **Volatile Organic Compounds (VOC)**

We confirm that the mentioned product(s) is excepted from the Tax of incentive on the Volatile Organic Compounds (VOC) as defined in the Swiss Ordinance on the Incentive Tax on Volatile Organic Compounds (SR 814.018).

Omya, to the best of its knowledge, believes that the information provided above is accurate and correct, based on the sources available at the time of writing. Omya does not assume liability for the use of the information, or claims or damages from any third party.

Document Type: RGP Regulatory Profile  
Document Number: OMYA\_en\_RGP\_3200  
Version: 3

Applicable Date: 26/01/2024  
Location: OMYA  
Controlled- Internal Use

Page 8 of 8



Co-funded by  
the European Union

## Filler's Technical Data Sheet

### SIGURNOSNO -TEHNIČKI LIST sukladno Uredba Komisije (EZ) br 2020/878



### 7580100 OMYACARB 1 T-AV

Verzija 1.1 (CLP_HR)	Datum revizije: 09.10.2023	Broj sigurnosno- tehničkog lista: PR75801-00	Datum posljednjeg izdavanja: 02.06.2021 Datum prvog izdanja: 02.06.2021
----------------------------	-------------------------------	--	--

#### ODJELJAK 1.: Identifikacija tvari/smjese i podaci o tvrtki/poduzeću

##### 1.1 Identifikacijska oznaka proizvoda

Trgovačko ime proizvoda	: OMYACARB 1 T-AV
Registracijski broj REACH	: mješavina
Ostala sredstva za identifikaciju	: Kalcijev karbonat (GCC) obložena fini prah

##### 1.2 Utvrđene relevantne uporabe tvari ili smjese i uporabe koje se ne preporučuju

Uporaba tvari/pripravka	: Proizvodnja boja, lakova i sličnih premaza, grafičkih boja i kitova Proizvodnja bojila i pigmenta Proizvodnja ljepila Proizvodnja proizvoda od plastike Miješanje Punjenje Filtri Nosač Sredstva za bojanje, pigmenti
Preporučena ograničenja u svezi s uporabom	: Samo za industrijsku upotrebu. Ostale industrije nisu spomenuti su isključene.

##### 1.3 Podaci o dobavljaču koji isporučuje sigurnosno-tehnički list

Tvrtka	: Omya International AG Baslerstrasse 42 4665 Oftringen
Telefon	: +41627892929
Telefaks	: +41627892077
Adresa elektroničke pošte stručne osobe za STL	: sdb.ch@omya.com

##### 1.4 Broj telefona za izvanredna stanja

Odgovorni odjel	: Broj telefona službe za izvanredna stanja: 112 Broj telefona za medicinske informacije: (+385 1) 23-48-342
-----------------	--



**SIGURNOSNO -TEHNIČKI LIST**  
 sukladno Uredba Komisije (EZ) br 2020/878

**7580100 OMYACARB 1 T-AV**

Verzija 1.1 (CLP_HR)	Datum revizije: 09.10.2023	Broj sigurnosno- tehničkog lista: PR75801-00	Datum posljednjeg izdavanja: 02.06.2021 Datum prvog izdanja: 02.06.2021
----------------------------	-------------------------------	--	--

**ODJELJAK 2.: Identifikacija opasnosti**
**2.1 Razvrstavanje tvari ili smjese**
**Razvrstavanje prema UREDBI (EZ) br. 1272/2008 (CLP)**

Nije opasna tvar ili smjesa.

**2.2 Elementi označivanja**
**Označivanje naljepnicom (UREDBA (EZ) br. 1272/2008 (CLP))**

Nije potreban piktogram opasnosti, nije potrebna oznaka opasnosti, nije potrebna oznake upozorenja, nije potrebna oznaka(e) obavijesti

**2.3 Ostale opasnosti**

Ova tvar/smjesa ne sadrži komponente koje se smatraju postojanim, bioakumulirajućima i toksičnima (PBT), ili jako postojanim i jako bioakumulirajućima (VPvB) na razinama od 0,1% ili više.

Ekološke informacije: Tvar/smjesa ne sadrži komponente za koje se smatra da imaju svojstva endokrine disrupcije prema članku 57(f), propisa o Registraciji, ocjenjivanju, odobravanju i ograničavanju kemikalija (REACH), ili delegiranoj Uredbi Komisije (EU) 2017/2100 ili Uredbi Komisije (EU) 2018/605 u razinama od 0,1% ili više.

Toksikološke informacije: Tvar/smjesa ne sadrži komponente za koje se smatra da imaju svojstva endokrine disrupcije prema članku 57(f), propisa o Registraciji, ocjenjivanju, odobravanju i ograničavanju kemikalija (REACH), ili delegiranoj Uredbi Komisije (EU) 2017/2100 ili Uredbi Komisije (EU) 2018/605 u razinama od 0,1% ili više.

**ODJELJAK 3.: Sastav/informacije o sastojcima**
**3.2 Smjese**
**Sastojci**

Kemijski naziv	CAS-br. EZ-br. Indeks-br. Registracijski broj	Razvrstavanje prema UREDBI (EZ) br. 1272/2008 (CLP)	Koncentracija (% w/w)
Tvari s ograničenjem izlaganja na radnom mjestu :			
magnesium carbonate	546-93-0 208-915-9 Oslobodeni su sukladno REACH Aneksu V.7		>= 1 - < 10

Objašnjenja kratica potražite u Odjeljak 16.

**SIGURNOSNO -TEHNIČKI LIST**  
sukladno Uredba Komisije (EZ) br 2020/878



**7580100 OMYACARB 1 T-AV**

Verzija	Datum revizije:	Broj sigurnosno- tehničkog lista:	Datum posljednjeg izdavanja: 02.06.2021
1.1 (CLP_HR)	09.10.2023	PR75801-00	Datum prvog izdanja: 02.06.2021

**ODJELJAK 4.: Mjere prve pomoći**

- 4.1 Opis mjera prve pomoći**
- Nakon udisanja : Premjestiti se na svjež zrak u slučaju nehotičnog udisanja prašine ili dimova nastalih prekomjernim grijanjem ili gorenjem.  
Ukoliko simptomi potraju, zovite liječnika.
- Nakon dodira s kožom : Odmah skinite kontaminiranu odjeću i obuću.  
Isprati s sapunom i mnogo vode.
- Nakon dodira s očima : Isprati oči vodom iz mjere opreza.  
Skinuti kontaktne leće.  
Zaštititi neozlijeđeno oko.  
Držati oči širom otvorene tijekom ispiranja.
- Nakon gutanja : Isprati usta vodom i poslije piti mnogo vode.  
Ne davati mlijeko ili alkoholna pića.  
Nikada ne davati bilo što u usta nesvjesnoj osobi.

**4.2 Najvažniji simptomi i učinci, akutni i odgođeni**

Nisu poznati.

**4.3 Navod o potrebi za hitnom liječničkom pomoći i posebnom obradom**

Nema raspoloživih podataka

**ODJELJAK 5.: Mjere za gašenje požara**

**5.1 Sredstva za gašenje**

Prikladna sredstva za gašenje : Upotrijebiti mjere suzbijanja požara koje odgovaraju lokalnim okolnostima i okolnom ambijentu.  
Nije gorivo.

**5.2 Posebne opasnosti koje proizlaze iz tvari ili smjese**

Opasni proizvodi izgaranja : Opasni proizvodi izgaranja nisu poznati

**5.3 Savjeti za gasitelje požara**

Posebna zaštitna oprema za vatrogasce : U slučaju vatre nositi samostalni uređaj za disanje.

Dodatni podaci : Standardni postupak za kemijske požare.

**SIGURNOSNO - TEHNIČKI LIST**  
sukladno Uredba Komisije (EZ) br 2020/878



**7580100 OMYACARB 1 T-AV**

Verzija 1.1 (CLP_HR)	Datum revizije: 09.10.2023	Broj sigurnosno- tehničkog lista: PR75801-00	Datum posljednjeg izdavanja: 02.06.2021 Datum prvog izdavanja: 02.06.2021
----------------------------	-------------------------------	--	--

**ODJELJAK 6.: Mjere za slučajno ispuštanje**

**6.1 Osobne mjere opreza, zaštitna oprema i postupci za izvanredna stanja**

Osobne mjere opreza : Spriječiti stvaranje prašine.

**6.2 Mjere zaštite okoliša**

Mjere zaštite okoliša : Nisu potrebne posebne ekološke mjere opreza.

**6.3 Metode i materijal za sprečavanje širenja i čišćenje**

Metodama čišćenja : Pomesti i skupiti na gomilu.  
Čuvati u prikladnim, zatvorenim spremnicima za odlaganje.

**6.4 Uputa na druge odjeljke**

Neprijmjenjivo

**ODJELJAK 7.: Rukovanje i skladištenje**

**7.1 Mjere opreza za sigurno rukovanje**

Savjeti za sigurno rukovanje : Za osobnu zaštitu pogledati odjeljak 8.  
Nisu potrebni posebni savjeti za rukovanje.

Savjeti o zaštiti protiv požara i eksplozije : Uobičajene mjere preventivne protupožarne zaštite.

Nisu potrebne posebne mjere opreza.

Higijenske mjere : Opća industrijska higijenska praksa.

**7.2 Uvjeti sigurnog skladištenja, uzimajući u obzir moguće inkompatibilnosti**

Uvjeti skladišnih prostora i spremnika : Pobriniti se da je spremnik dobro zatvoren i čuvati na suhom i dobro prozračenom mjestu.

Savjeti za zajedničko skladištenje : Ne skladištiti blizu kiselina.

Daljnje informacije o stabilnosti skladištenja : Nema opasnosti od raspada ako se skladišti i koristi prema uputama.

**7.3 Posebna krajnja uporaba ili uporabe**

Nema raspoloživih podataka

**SIGURNOSNO -TEHNIČKI LIST**
  
 sukladno Uredba Komisije (EZ) br 2020/878

**7580100 OMYACARB 1 T-AV**

Verzija	Datum revizije:	Broj sigurnosno-tehničkog lista:	Datum posljednjeg izdavanja: 02.06.2021
1.1	09.10.2023	PR75801-00	Datum prvog izdanja: 02.06.2021
(CLP_HR)			

**ODJELJAK 8.: Nadzor nad izloženošću/osobna zaštita**
**8.1 Nadzorni parametri**
**Grafične vrijednosti izlaganja na radnome mjestu**

Sastojci	CAS-br.	Vrsta vrijednosti (Oblik izloženosti)	Nadzorni parametri	Temelj
magnesium carbonate	546-93-0	GVI (ukupna prašina, inhalabilne čestice)	10 mg/m <sup>3</sup>	HR OEL
		GVI (respirabilna prašina)	4 mg/m <sup>3</sup>	HR OEL

**8.2 Nadzor nad izloženošću**
**Oprema za osobnu zaštitu**

Zaštita oči/lica : zaštitne naočale

Zaštita ruku

Napomene : U slučaju produženog ili višekratnog dodira, koristiti zaštitne rukavice.

Zaštita kože i tijela : Zaštitno odijelo

Zaštita organa za disanje : Ukoliko se radnici susreću s količinama većim od graničnih vrijednosti izloženosti, moraju koristiti odgovarajuće provjerene respiratore.  
Polumaska s filterom za čestice P2 (EN 143)

**ODJELJAK 9.: Fizikalna i kemijska svojstva**
**9.1 Informacije o osnovnim fizikalnim i kemijskim svojstvima**

Fizičko stanje : fini prah

Boja : bijel

Miris : bez mirisa

Talište/područje taljenja : > 800 °C (1.013 hPa)  
Raspadanje: Raspada se ispod točke taljenja.

Vrelište/područje vrenja : Raspadanje: Raspada se ispod točke vrenja.

Zapaljivost : Proizvod nije zapaljiv.  
Ne gori

**SIGURNOSNO -TEHNIČKI LIST**  
sukladno Uredba Komisije (EZ) br 2020/878



**7580100 OMYACARB 1 T-AV**

Verzija 1.1 (CLP_HR)	Datum revizije: 09.10.2023	Broj sigurnosno- tehničkog lista: PR75801-00	Datum posljednjeg izdavanja: 02.06.2021 Datum prvog izdanja: 02.06.2021
----------------------------	-------------------------------	--	--

Donja granica eksplozivnosti / Donja granica zapaljivosti	: Neprimjenjivo
Plamište	: ne iskri
Temperatura raspada	: > 600 °C
pH	: 8,5 - 9,5 (20 °C) Koncentracija: 100 g/l Metoda: DIN-ISO 787/9
Topivost(i) Topljivost u vodi	: 0,014 g/l (20 °C, 1.013 hPa) 0,018 g/l (75 °C, 1.013 hPa)
Koeficijent raspodjele n- oktanol/voda	: Neprimjenjivo
Tlak pare	: Neprimjenjivo
Gustoća	: 2,6 - 2,9 g/cm <sup>3</sup> (20 °C, 1.013 hPa) Metoda: DIN-ISO 787/10
Karakteristike čestica Distribucija veličine čestica	: D50 = 1,7 µm

**9.2 Ostale informacije**

Eksplozivi	: Nije eksplozivno
Zapaljive krutine Broj izgaranja	: 1

**ODJELJAK 10.: Stabilnost i reaktivnost**

**10.1 Reaktivnost**

Stabilno ukoliko se pridržava preporučenih uvjeta skladištenja.

**10.2 Kemijska stabilnost**

Nema opasnosti od raspada ako se skladišti i koristi prema uputama.

**10.3 Mogućnost opasnih reakcija**

Opasne reakcije	: Stabilno ukoliko se pridržava preporučenih uvjeta skladištenja. Nema opasnosti od raspada ako se koristi prema uputama. Reagira s kiselinama. Tvori ugljični dioksid (CO <sub>2</sub> ). To je displaces kisika u zraku u zatvorenim prostorima. (opasnost ugušenje)
-----------------	--



**SIGURNOSNO - TEHNIČKI LIST**  
sukladno Uredba Komisije (EZ) br 2020/878



**7580100 OMYACARB 1 T-AV**

Verzija 1.1 (CLP_HR)	Datum revizije: 09.10.2023	Broj sigurnosno- tehničkog lista: PR75801-00	Datum posljednjeg izdavanja: 02.06.2021 Datum prvog izdanja: 02.06.2021
----------------------------	-------------------------------	--	--

**10.4 Uvjeti koje treba izbjegavati**

Uvjeti koje treba izbjegavati : Nema raspoloživih podataka

**10.5 Inkompatibilni materijali**

Nema raspoloživih podataka

**10.6 Opasni proizvodi raspadanja**

Nema raspoloživih podataka

**ODJELJAK 11.: Toksikološke informacije**

**11.1 Informacije o razredima opasnosti kako su definirani u Uredbi (EZ) br. 1272/2008**

**Akutna toksičnost**

Nije klasificiran na osnovu dostupnih informacija.

**Proizvod:**

Akutna oralna toksičnost : LD50 oralno (Štakor): > 5.000 mg/kg

**Sastojci:**

**magnesium carbonate:**

Akutna oralna toksičnost : LD50 oralno (Štakor): > 5.000 mg/kg

Akutna toksičnost pri  
udisanju : Napomene: Nema raspoloživih podataka

Akutna kožna toksičnost : Napomene: Nema raspoloživih podataka

**Nagrivanje/nadraživanje kože**

Nije klasificiran na osnovu dostupnih informacija.

**Ozbiljno oštećenje oka/nadraživanje oka**

Nije klasificiran na osnovu dostupnih informacija.

**Preosjetljivost kože ili dišnih puteva**

**Izazivanje preosjetljivosti – koža**

Nije klasificiran na osnovu dostupnih informacija.

**Izazivanje preosjetljivosti dišnih puteva**

Nije klasificiran na osnovu dostupnih informacija.

**Mutageni učinak na zametne stanice**

Nije klasificiran na osnovu dostupnih informacija.

**Karcinogenost**

Nije klasificiran na osnovu dostupnih informacija.

**Reproduktivna toksičnost**

Nije klasificiran na osnovu dostupnih informacija.

**SIGURNOSNO - TEHNIČKI LIST**  
sukladno Uredba Komisije (EZ) br 2020/878



**7580100 OMYACARB 1 T-AV**

Verzija 1.1 (CLP_HR)	Datum revizije: 09.10.2023	Broj sigurnosno- tehničkog lista: PR75801-00	Datum posljednjeg izdavanja: 02.06.2021 Datum prvog izdanja: 02.06.2021
----------------------------	-------------------------------	--	--

**Specifična toksičnost za ciljane organe/sustavna toksičnost (jednokratna izloženost)**

Nije klasificiran na osnovu dostupnih informacija.

**Sastojci:**

**magnesium carbonate:**

Ocjena : Tvar ili mješavina nije klasificirana kao poseban ciljani organski otrov, jednostruka izloženost.

**Specifična toksičnost za ciljane organe (ponavljano izlaganje)**

Nije klasificiran na osnovu dostupnih informacija.

**Sastojci:**

**magnesium carbonate:**

Ocjena : Tvar ili mješavina nije klasificirana kao poseban ciljani organski otrov, višestruka izloženost.

**Aspiracijska toksičnost**

Nije klasificiran na osnovu dostupnih informacija.

**11.2 Informacije o drugim opasnostima**

**Svojstva endokrine disrupcije**

**Proizvod:**

Ocjena : Tvar/smjesa ne sadrži komponente za koje se smatra da imaju svojstva endokrine disrupcije prema članku 57(f), propisa o Registraciji, ocjenjivanju, odobravanju i ograničavanju kemikalija (REACH), ili delegiranoj Uredbi Komisije (EU) 2017/2100 ili Uredbi Komisije (EU) 2018/605 u razinama od 0,1% ili više.

**Dodatni podaci**

**Proizvod:**

Napomene : Nema raspoloživih podataka

**ODJELJAK 12.: Ekološke informacije**

**12.1 Toksičnost**

**Proizvod:**

Otrovnost za ribe : LC50 (Oncorhynchus mykiss (Kalifornijska pastrva)): > 10.000 mg/l  
Vrijeme izlaganja: 96 h

Toksičnost za daphnie i druge vodene beskralježnjake : EC50 (Daphnia magna (Vodenbuha)): > 1.000 mg/l  
Vrijeme izlaganja: 48 h



**SIGURNOSNO - TEHNIČKI LIST**  
sukladno Uredba Komisije (EZ) br 2020/878



**7580100 OMYACARB 1 T-AV**

Verzija 1.1 (CLP_HR)	Datum revizije: 09.10.2023	Broj sigurnosno- tehničkog lista: PR75801-00	Datum posljednjeg izdavanja: 02.06.2021 Datum prvog izdanja: 02.06.2021
----------------------------	-------------------------------	--	--

Toksičnost za alge/vodene biljke : NOEC (Desmodesmus subspicatus (Zelena alga)): 75 mg/l  
Vrijeme izlaganja: 72 h  
EC50 (Desmodesmus subspicatus (zelena alga)): 289 mg/l  
Vrijeme izlaganja: 72 h

**Sastojci:**

**magnesium carbonate:**

Otrovnost za ribe : Napomene: Nema raspoloživih podataka

**12.2 Postojanost i razgradivost**

**Proizvod:**

Biorazgradljivost : Napomene: Neprimjenjivo

**12.3 Bioakumulacijski potencijal**

Nema raspoloživih podataka

**12.4 Pokretljivost u tlu**

Nema raspoloživih podataka

**12.5 Rezultati ocjenjivanja svojstava PBT i vPvB**

**Proizvod:**

Ocjena : Ova tvar/smjesa ne sadrži komponente koje se smatraju postojanim, bioakumulirajućima i toksičnima (PBT), ili jako postojanim i jako bioakumulirajućima (vPvB) na razinama od 0,1% ili više.

**Sastojci:**

**magnesium carbonate:**

Ocjena : Neklasificirana PBT tvar. Neklasificirana vPvB tvar

**12.6 Svojstva endokrine disrupcije**

**Proizvod:**

Ocjena : Tvar/smjesa ne sadrži komponente za koje se smatra da imaju svojstva endokrine disrupcije prema članku 57(f), propisa o Registraciji, ocjenjivanju, odobravanju i ograničavanju kemikalija (REACH), ili delegiranoj Uredbi Komisije (EU) 2017/2100 ili Uredbi Komisije (EU) 2018/605 u razinama od 0,1% ili više.

**12.7 Ostali štetni učinci**

**Proizvod:**

**SIGURNOSNO -TEHNIČKI LIST**  
sukladno Uredba Komisije (EZ) br 2020/878



**7580100 OMYACARB 1 T-AV**

Verzija 1.1 (CLP_HR)	Datum revizije: 09.10.2023	Broj sigurnosno- tehničkog lista: PR75801-00	Datum posljednjeg izdavanja: 02.06.2021 Datum prvog izdavanja: 02.06.2021
----------------------------	-------------------------------	--	--

Dodatni ekološki podaci	: U čvrstom stanju te minerali su veliki dio je stijena Zemljine površine. Oni su otopljeni u prirodnom stanju i nezamjenjiv dio prirodnih voda. Ovi minerali nisu biorazgradive. Negativne posljedice na okoliš trebala bi stoga biti isključeni. Ograničenja se mogu pokazati da koncentrirane suspenzije tih minerala u prirodnim vodama mogu imati nepovoljan utjecaj na vodene organizme (poremećaj mikro flore i faune u talogu i naknadna šteta postojanju organizama u dubljim vodama).
-------------------------	---

**ODJELJAK 13.: Zbrinjavanje**

**13.1 Metode obrade otpada**

Proizvod	: Proslijediti ostatke i otopine koje nije moguće reciklirati ovlaštenom poduzeću za zbrinjavanje otpada.
Kontaminirana ambalaža	: Isprazniti preostali sadržaj. Prazne spremnike treba dostaviti ovlaštenoj osobi za postupanje s otpadom na recikliranje ili odlaganje.

**ODJELJAK 14.: Informacije o prijevozu**

**14.1 UN broj ili identifikacijski broj**

ADR	: Nije regulirano kao opasna tvar
RID	: Nije regulirano kao opasna tvar
IMDG	: Nije regulirano kao opasna tvar
IATA	: Nije regulirano kao opasna tvar

**14.2 Ispravno otpremno ime prema UN-u**

ADR	: Nije regulirano kao opasna tvar
RID	: Nije regulirano kao opasna tvar
IMDG	: Nije regulirano kao opasna tvar
IATA	: Nije regulirano kao opasna tvar

**14.3 Razred(i) opasnosti pri prijevozu**

ADR	: Nije regulirano kao opasna tvar
RID	: Nije regulirano kao opasna tvar
IMDG	: Nije regulirano kao opasna tvar



**SIGURNOSNO -TEHNIČKI LIST**  
sukladno Uredba Komisije (EZ) br 2020/878



**7580100 OMYACARB 1 T-AV**

Verzija 1.1 (CLP_HR)	Datum revizije: 09.10.2023	Broj sigurnosno- tehničkog lista: PR75801-00	Datum posljednjeg izdavanja: 02.06.2021 Datum prvog izdanja: 02.06.2021
----------------------------	-------------------------------	--	--

<b>IATA</b>	: Nije regulirano kao opasna tvar
<b>14.4 Skupina pakiranja</b>	
<b>ADR</b>	: Nije regulirano kao opasna tvar
<b>RID</b>	: Nije regulirano kao opasna tvar
<b>IMDG</b>	: Nije regulirano kao opasna tvar
<b>IATA (Teret)</b>	: Nije regulirano kao opasna tvar
<b>IATA (Punik)</b>	: Nije regulirano kao opasna tvar
<b>14.5 Opasnosti za okoliš</b>	
Nije regulirano kao opasna tvar	
<b>14.6 Posebne mjere opreza za korisnika</b>	
Napomene	: Nije klasificiran kao opasan prema uredbama o prijevozu.
<b>14.7 Prijevoz morem u razlišenom stanju u skladu s instrumentima IMO-a</b>	
Ne primjenjuje se za isporučen proizvod.	

**ODJELJAK 15.: Informacije o propisima**

**15.1 Propisi u području sigurnosti, zdravlja i okoliša/posebno zakonodavstvo za tvar ili smjesu**

REACH - Ograničenja proizvodnje, stavljanja na tržište i uporabe određenih opasnih tvari, smjesa i proizvoda (Prilog XVII)	: Neprimjenjivo
REACH - Popis tvari vrlo visoke opasnosti za autorizaciju (članak 59).	: Neprimjenjivo
REACH - Popis tvari koje podliježu odobrenju (Prilog XIV)	: Neprimjenjivo
Uredba (EZ) br 1005/2009 o tvarima koje oštećuju ozonski sloj	: Neprimjenjivo
Uredba (EU) 2019/1021 o postojećim organskim onečišćujućim tvarima (preinaka)	: Neprimjenjivo
Uredba (EZ) br 649/2012 Europskog parlamenta i Vijeća o izvozu i uvozu opasnih kemikalija	: Neprimjenjivo
Seveso II - Direktiva 2003/105/EC kojom se mijenja Direktiva Vijeća 96/82/EZ o kontroli opasnosti velikih nesreća koje uključuju opasne tvari	Neprimjenjivo
Seveso III: Direktiva 2012/18/EU Europskog	Neprimjenjivo

**SIGURNOSNO - TEHNIČKI LIST**  
sukladno Uredba Komisije (EZ) br 2020/878



**7580100 OMYACARB 1 T-AV**

Verzija	Datum revizije:	Broj sigurnosno-tehničkog lista:	Datum posljednjeg izdavanja: 02.06.2021
1.1	09.10.2023	PR75801-00	Datum prvog izdanja: 02.06.2021
(CLP_HR)			

parlamenta i Vijeća o kontroli velikih nesreća uključujući opasne tvari.

Hlapivi organski spojevi : Direktiva 2010/75/EU Europskog parlamenta i Vijeća od 24. studenoga 2010. o industrijskim emisijama (integrirano sprečavanje i kontrola onečišćenja)  
Sadržaj hlapljivih organskih smjesa (HOS): 0,07 %

**15.2 Procjena kemijske sigurnosti**

Procjena sigurnosti kemikalija nije potrebna

**ODJELJAK 16.: Ostale informacije**

**Cjelovit tekst H-oznaka**

**Cjelovit tekst ostalih skraćenica**

HR OEL : Hrvatska. Pravilnik o zaštiti radnika od izloženosti opasnim kemikalijama na radu, graničnim vrijednostima izloženosti i biološkim graničnim vrijednostima.  
HR OEL / GVI : granična vrijednost izloženosti

ADN - Europski sporazum o međunarodnom prijevozu opasnih tvari unutarnjim vodnim putovima; ADR - Sporazum o međunarodnom cestovnom prijevozu opasnih tvari; AIC - Australski popis industrijskih kemikalija; ASTM - Američko društvo za ispitivanje materijala; bw - Tjelesna masa; CLP - Uredba o razvrstavanju, označavanju i pakiranju (CLP) ((EC) br. 1272/2008); CMR - karcinogen, mutagen ili reproduktivno toksičan; DIN - Standard Njemačkog instituta za standardizaciju; DSL - Popis domaćih tvari (Kanada); ECHA - Europska agencija za kemikalije; EC-Number - Broj Europske zajednice; ECx - Koncentracija povezana s x% dgovorom; ELx - Stopa učitanja povezana s x% odgovorom; EmS - Hitni raspored; ENCS - Postojeće i nove kemijske tvari (Japan); ErCx - Koncentracija povezana s x% stopom rasta odgovora; GHS - Globalno usklađen sustav; GLP - Dobra laboratorijska praksa; IARC - Međunarodna agencija za istraživanje raka; IATA - Međunarodna udruga za zračni prijevoz; IBC - Međunarodni kodeks za gradnju i opremanje brodova koji prevoze opasne kemikalije u rasutom stanju; IC50 - Pola maksimalne koncentracije inhibitora; ICAO - Međunarodna organizacija za civilno zrakoplovstvo; IECSC - Popis postojećih kemijskih tvari u Kini; IMDG - Međunarodni pomorski pravilnik za prijevoz opasnih tvari; IMO - Međunarodna pomorska organizacija; ISHL - Zakon o industrijskoj sigurnosti i zdravlju (Japan); ISO - Međunarodna organizacija za standardizaciju; KECI - Popis postojećih kemikalija Koreje; LC50 - Smrtonosna koncentracija za 50% testirane populacije; LD50 - Smrtonosna doza za 50% testirane populacije (Srednja smrtonosna doza); MARPOL - Međunarodna konvencija o sprječavanju onečišćenja s brodova; n.o.s. - Koji nije definiran drugačije; NO(A)EC - Nije promatrana (negativan) koncentracija učinka; NO(A)EL - Nije promatrano (negativan) razina učinka; NOELR - Nije primjetan učinak stope učitanja; NZIoC - Popis kemikalija Novog Zelanda; OECD - Organizacija za ekonomsku suradnju i razvoj; OPPTS - Ured kemijske sigurnosti i sprječavanja onečišćenja; PBT - Postojana, bioakumulativna i otrovna tvar; PICCS - Popis kemikalija i kemijskih tvari Filipina; (Q)SAR - (Kvantitativno) Struktura aktivnosti odnosa; REACH - UREDBA (EZ) br. 1907/2006 Europskog parlamenta i Vijeća o registraciji, evaluaciji, autorizaciji i ograničavanju kemikalija; RID - Propisi o međunarodnom prijevozu opasnih tvari željeznicom; SADT - Samoubrzanje temperature raspadanja; STL - Sigurnosno tehnički list; SVHC - posebno zabrinjavajuća tvar; SVHC - posebno zabrinjavajuća tvar; TCSI - Popis kemijskih tvari Tajvana; TECI - Tajlandski Postojeći popis kemijskih tvari;



**SIGURNOSNO -TEHNIČKI LIST**  
sukladno Uredba Komisije (EZ) br 2020/878



**7580100 OMYACARB 1 T-AV**

Verzija 1.1 (CLP_HR)	Datum revizije: 09.10.2023	Broj sigurnosno- tehničkog lista: PR75801-00	Datum posljednjeg izdavanja: 02.06.2021 Datum prvog izdanja: 02.06.2021
----------------------------	-------------------------------	--	--

TRGS - Tehnička pravila za opasne tvari; TSCA - Zakon o kontroli otrovnih tvari (SAD); UN - Ujedinjeni narodi; vPvB - Vrlo postojani i vrlo bioakumulacijski

**Dodatni podaci**

Ostale informacije : Ovaj sigurnosno-tehnički list sadržava samo podatke koji se odnose na sigurnost i nije zamjena za podatke o proizvodu ili specifikaciju proizvoda.

Izvori ključnih podataka korištenih pri sastavljanju STL-a. : Podaci uzeti iz referentnih radova i literature.

Podaci u ovom sigurnosno-tehničkom listu odgovaraju našim saznanjima, informacijama i uvjerenjima na dan izdavanja istog. Informacije sadržane u njemu, dane su samo kao smjernice za sigurno rukovanje, upotrebu, postupanje, skladištenje, prijevoz i odlaganje otpada i nisu garancija ili specifikacija kvalitete. Podaci se odnose isključivo na navedenu tvar/smjesu i nisu nužno važeći za istu tu tvar/smjesu ukoliko se ista koristi sa bilo kojim drugim tvarima ili u bilo kojem drugom postupku koji nije specificiran u tekstu.

HR / HR



## Filler's Product Data Sheet



### Product Information

Omya International AG  
P.O. Box  
CH-4665 Oftringen  
+41 62 789 29 29  
+41 62 789 20 77  
www.omya.com

## OMYACARB 1T - AV

PRODUCTION SITE:	AVENZA-CARRARA, Italy (certified ISO 9001, ISO 14001, ISO 45001, ISO 50001)		
SHORT DESCRIPTION OF THE PRODUCT:	Surface-treated, very fine calcium carbonate powder with good dispersion properties, manufactured from a high purity, white marble.		
CHEMICAL ANALYSIS:	CaCO <sub>3</sub>	97.5	%
	MgCO <sub>3</sub>	2	%
	Fe <sub>2</sub> O <sub>3</sub>	0.03	%
	HCl insoluble content	0.3	%
SPECIFIC PRODUCT DATA:	Fineness: <sup>1</sup>		
	• Residue on a 45 µm sieve (ISO 787-7)	0.01	%
	• Top cut (d98%), (Omya GLS 010) <sup>2</sup>	11	µm
	• Median particle size (d50%), (Omya GLS 010) <sup>2</sup>	2	µm
	• Particles < 2 µm, (Omya GLS 010) <sup>2</sup>	48	%
	Optical properties: <sup>1</sup>		
	• Brightness Ry (C/2°, DIN 53163)	95	%
	Moisture ex works (ISO 787-2)	0.3	%
GENERAL PRODUCT DATA:	Loose bulk density (Omya GLS 001)	0.8	g/ml
	pH value (ISO 787-9)	9	
	Oil absorption (ISO 787-5)	24	g/100g
	VO absorption (ISO 787-5)	24	g/100g
MAIN APPLICATIONS :	Rigid PVC application Flexible PVC application Masterbatch and Compound Adhesives and Sealants		
STANDARD PACKAGING:	Bulk bag Bag (paper) of 25 kg on pallets of 1'500 and 1'250 kg		

The information contained in this Product Information Sheet relates only to the specific material designated herein and does not relate to use in combination with any other material or in any process. The information provided herein is based on technical data that Omya believes to be reliable, however Omya makes no representation or warranty as to the completeness or accuracy thereof and Omya assumes no liability resulting from its use or for any claims, losses, or damages of any third party. Recipients receiving this information must exercise their own judgement as to the appropriateness of its use, and it is the user's responsibility to assess the material's suitability (including safety) for a particular purpose prior to such use.

edition: 11.09.2023  
version: 2



Co-funded by  
the European Union

## Colorant's Declaration of Compliance

# NEMARA

**NEMARA RESEARCH S.L.**  
 Passatge Liszt, 7  
 Pol Industrial Can Jardí, 08191 - Rubí, Barcelona  
 Tlf: 935 88 24 84

Rubí, 05/05/2025

### DECLARACIÓN DE CONFORMIDAD

Los polímeros, pigmentos y aditivos en contacto con alimentos se regulan en la UE por:

1. Resolución de 4 de noviembre de 1982 (BOE nº 282 de 24.11.82) y modificada por la orden de 3 de Julio de 1985 (BOE del 12.1.85).
2. Reglamento CE Nº 1935/2004 de 27 de octubre de 2004, sobre los materiales y objetos destinados a entrar en contacto con alimentos.
3. Reglamento CE Nº 2023/2006 de 22 de diciembre de 2006 sobre buenas prácticas de fabricación de materiales y objetos destinados a entrar en contacto con alimentos.
4. Reglamento UE Nº 10/2011 y con sus modificaciones: (UE) 2023/1442 del 11 de Julio del 2023 y (UE) 2023/1627 del 10 de Agosto del 2023, sobre materiales y objetos plásticos destinados a entrar en contacto con alimentos.
5. Resolución AP (89)1 del 13 de septiembre de 1989 adoptada por la Comisión Ministerial del Consejo de Europa sobre el uso de colorantes en materiales plásticos en contacto con alimentos.

Atendiéndonos a lo anteriormente expuesto podemos certificar, que los componentes del colorante/s de la referencia/s por ustedes solicitada/s:

#### **014111 MTB AMARILLO RAL-1016 BIOPBS**

\*Contienen las siguientes sustancias autorizadas según el Anexo I, con LME:

Nº CAS	SUSTANCIA	LME (mg/kg)
110-63-4	1,4-Butanodiol	5
109-99-9	Tetrahydrofurano	0.6
80181-31-3	Ácido 3-hidroxibutanoico-3-hidroxipentanoico, copolímero	0.05
10043-11-5	Nitruro de boro	6

\*El aditivo contenido en el producto mencionado está recogido en el Reglamento (UE) nº 10/2011 con el número FCM 799 [Ref. No 77708, éteres de polietilenglicol (EO = 1-50) de alcoholes primarios lineales y ramificados (C8-C22)] con un LME = 1,8 mg /kg.

\*Contiene sustancia/s del Anexo II sujeta/s a restricciones:

Nº CAS	SUSTANCIA	LME (mg/kg)
7440-50-8	Cobre	5

Cumplen con las siguientes normativas vigentes: Reglamento CE Nº1935/2004, CE Nº2023/2006, UE Nº10/2011 y AP (89)1.

Respecto la migración, es responsabilidad del envasador realizar las pruebas pertinentes, dado el desconocimiento del tipo de resina con el cual puede estar en contacto, de forma que se evite sobrepasar el Límite de Migración Específica en el alimento.

## Colorant's Safety Data Sheet

### FICHA DE DATOS DE SEGURIDAD

(de acuerdo con el Reglamento (UE) 2020/878)

#### 014111-MTB AMARILLO RAL-1016 BIOPBS

# NEMARA

Versión 1 Fecha de emisión: 5/05/2025

Página 1 de 7  
Fecha de impresión: 05/05/2025

#### SECCIÓN 1: IDENTIFICACIÓN DE LA SUSTANCIA O LA MEZCLA Y DE LA SOCIEDAD O LA EMPRESA.

##### 1.1 Identificador de producto.

Nombre del producto: MTB AMARILLO RAL-1016 BIOPBS  
Código del producto: 014111

##### 1.2 Usos pertinentes identificados de la sustancia o de la mezcla y usos desaconsejados.

Colorante masterbatch, uso industrial.

##### Usos desaconsejados:

Usos distintos a los aconsejados.

##### 1.3 Datos del proveedor de la ficha de datos de seguridad.

Empresa: **NEMARA RESEARCH S.L.**  
Dirección: PASAJE LISZT, Nº 7, Pol. Industrial Can Jardí  
Población: 08091 - RUBI  
Provincia: BARCELONA  
Teléfono: 935882474  
Fax: 935885902  
E-mail: info@nemara.eu  
Web: www.nemara.eu

##### 1.4 Teléfono de emergencia: 935882474 (Sólo disponible en horario de oficina; Lunes-Viernes; 08:00-17:30)

#### SECCIÓN 2: IDENTIFICACIÓN DE LOS PELIGROS.

##### 2.1 Clasificación de la sustancia o de la mezcla.

El producto no está clasificado como peligroso según el Reglamento (CE) No 1272/2008.

##### 2.2 Elementos de la etiqueta.

##### 2.3 Otros peligros.

La mezcla no contiene sustancias clasificadas como PBT (Persistente, Bioacumulable y Tóxica).  
La mezcla no contiene sustancias clasificadas como mPmB (muy Persistente y muy Bioacumulable).  
La mezcla no contiene sustancias con propiedades de alteración endocrina.

En condiciones de uso normal y en su forma original, el producto no tiene ningún otro efecto negativo para la salud y el medio ambiente.

#### SECCIÓN 3: COMPOSICIÓN/INFORMACIÓN SOBRE LOS COMPONENTES.

##### 3.1 Sustancias.

No aplicable.

##### 3.2 Mezclas.

Esta mezcla no contiene sustancias con una concentración por encima de los valores establecidos en el Anexo II del Reglamento (CE) 1907/2006 y posteriores modificaciones, que representen un peligro para la salud o el medio ambiente, ni tienen asignado un límite de exposición comunitario en el lugar de trabajo, ni están clasificadas como PBT/mPmB o incluidas en la Lista de Candidatas.

#### SECCIÓN 4: PRIMEROS AUXILIOS.

##### 4.1 Descripción de los primeros auxilios.

Debido a la composición y a la tipología de las sustancias presentes en el preparado, no se necesitan advertencias particulares.

##### Inhalación.

-Continúa en la página siguiente.-



Co-funded by  
the European Union

## FICHA DE DATOS DE SEGURIDAD

(de acuerdo con el Reglamento (UE) 2020/878)

**014111-MTB AMARILLO RAL-1016 BIOPBS**

**NEMARA**

Versión 1 Fecha de emisión: 5/05/2025

Página 2 de 7  
Fecha de impresión: 05/05/2025

Si se para la respiración, solicitar atención médica urgente. Situar al accidentado al aire libre, mantenerle caliente y en reposo, si la respiración es irregular o se detiene, practicar respiración artificial.

### **Contacto con los ojos.**

Retirar las lentes de contacto, si lleva y resulta fácil de hacer. Lavar abundantemente los ojos con agua limpia y fresca durante, por lo menos, 10 minutos, tirando hacia arriba de los párpados y buscar asistencia médica.

### **Contacto con la piel.**

Quitar la ropa contaminada.

### **Ingestión.**

Mantenerle en reposo. NUNCA provocar el vómito.

### **4.2 Principales síntomas y efectos, agudos y retardados.**

No se conocen efectos agudos o retardados derivados de la exposición al producto.

### **4.3 Indicación de toda atención médica y de los tratamientos especiales que deban dispensarse inmediatamente.**

En los casos de duda, o cuando persistan los síntomas de malestar, solicitar atención médica. No administrar nunca nada por vía oral a personas que se encuentren inconscientes.

## SECCIÓN 5: MEDIDAS DE LUCHA CONTRA INCENDIOS.

### **5.1 Medios de extinción.**

#### **Medios de extinción apropiados:**

Polvo extintor o CO2. En caso de incendios más graves también espuma resistente al alcohol y agua pulverizada.

#### **Medios de extinción no apropiados:**

No usar para la extinción chorro directo de agua. En presencia de tensión eléctrica no es aceptable utilizar agua o espuma como medio de extinción.

### **5.2 Peligros específicos derivados de la sustancia o la mezcla.**

#### **Riesgos especiales.**

La exposición a los productos de combustión o descomposición puede ser perjudicial para la salud.

### **5.3 Recomendaciones para el personal de lucha contra incendios.**

Refrigerar con agua los tanques, cisternas o recipientes próximos a la fuente de calor o fuego. Tener en cuenta la dirección del viento.

### **Equipo de protección contra incendios.**

Según la magnitud del incendio, puede ser necesario el uso de trajes de protección contra el calor, equipo respiratorio autónomo, guantes, gafas protectoras o máscaras faciales y botas.

## SECCIÓN 6: MEDIDAS EN CASO DE VERTIDO ACCIDENTAL.

### **6.1 Precauciones personales, equipo de protección y procedimientos de emergencia.**

Para control de exposición y medidas de protección individual, ver sección 8.

### **6.2 Precauciones relativas al medio ambiente.**

Producto no clasificado como peligroso para el medio ambiente, evitar en la medida de lo posible cualquier vertido.

### **6.3 Métodos y material de contención y de limpieza.**

Contener y recoger el vertido con material absorbente inerte (tierra, arena, vermiculita, tierra de diatomeas...) y limpiar la zona inmediatamente con un descontaminante adecuado.

Depositar los residuos en envases cerrados y adecuados para su eliminación, de conformidad con las normativas locales y nacionales (ver sección 13).

### **6.4 Referencia a otras secciones.**

Para control de exposición y medidas de protección individual, ver sección 8.

Para la eliminación de los residuos, seguir las recomendaciones de la sección 13.

-Continúa en la página siguiente.-



Co-funded by  
the European Union

## FICHA DE DATOS DE SEGURIDAD

(de acuerdo con el Reglamento (UE) 2020/878)

**014111-MTB AMARILLO RAL-1016 BIOPBS**

**NEMARA**

Versión 1 Fecha de emisión: 5/05/2025

Página 3 de 7  
Fecha de impresión: 05/05/2025

### SECCIÓN 7: MANIPULACIÓN Y ALMACENAMIENTO.

#### 7.1 Precauciones para una manipulación segura.

El producto no requiere medidas especiales de manipulación, se recomiendan las siguientes medidas generales:

Para la protección personal, ver sección 8.

En la zona de aplicación debe estar prohibido fumar, comer y beber.

Cumplir con la legislación sobre seguridad e higiene en el trabajo.

No emplear nunca presión para vaciar los envases, no son recipientes resistentes a la presión. Conservar el producto en envases de un material idéntico al original.

#### 7.2 Condiciones de almacenamiento seguro, incluidas posibles incompatibilidades.

El producto no requiere medidas especiales de almacenamiento.

Como condiciones generales de almacenamiento se deben evitar fuentes de calor, radiaciones, electricidad y el contacto con alimentos.

Mantener lejos de agentes oxidantes y de materiales fuertemente ácidos o alcalinos.

Almacenar los envases entre 5 y 35 °C, en un lugar seco y bien ventilado.

Almacenar según la legislación local. Observar las indicaciones de la etiqueta. Una vez abiertos los envases, han de volverse a cerrar cuidadosamente y colocarlos verticalmente para evitar derrames.

El producto no se encuentra afectado por la Directiva 2012/18/UE (SEVESO III).

#### 7.3 Usos específicos finales.

Coloración industrial

### SECCIÓN 8: CONTROLES DE EXPOSICIÓN/PROTECCIÓN INDIVIDUAL.

#### 8.1 Parámetros de control.

El producto NO contiene sustancias con Valores Límite Ambientales de Exposición Profesional. El producto NO contiene sustancias con Valores Límite Biológicos.

#### 8.2 Controles de la exposición.

##### Medidas de orden técnico:

<b>Concentración:</b>	<b>100 %</b>
<b>Usos:</b>	<b>Colorante masterbatch, uso industrial.</b>
<b>Protección respiratoria:</b>	
Si se cumplen las medidas técnicas recomendadas no es necesario ningún equipo de protección individual.	
<b>Protección de las manos:</b>	
Si el producto se manipula correctamente no es necesario ningún equipo de protección individual.	
<b>Protección de los ojos:</b>	
Si el producto se manipula correctamente no es necesario ningún equipo de protección individual.	
<b>Protección de la piel:</b>	
EPI:	Calzado de trabajo
Características:	Marcado «CE» Categoría II.
Normas CEN:	EN ISO 13287, EN 20347
Mantenimiento:	Estos artículos se adaptan a la forma del pie del primer usuario. Por este motivo, al igual que por cuestiones de higiene, debe evitarse su reutilización por otra persona.
Observaciones:	El calzado de trabajo para uso profesional es el que incorpora elementos de protección destinados a proteger al usuario de las lesiones que pudieran provocar los accidentes, se debe revisar el trabajo para los cuales es apto este calzado.

### SECCIÓN 9: PROPIEDADES FÍSICAS Y QUÍMICAS.

#### 9.1 Información sobre propiedades físicas y químicas básicas.

Estado físico: Sólido

Color: Amarillo

Olor: No aplicable/No disponible debido a la naturaleza/las propiedades del producto.

-Continúa en la página siguiente.-



Co-funded by  
the European Union

## FICHA DE DATOS DE SEGURIDAD

(de acuerdo con el Reglamento (UE) 2020/878)

**014111-MTB AMARILLO RAL-1016 BIOPBS**

**NEMARA**

Versión 1 Fecha de emisión: 5/05/2025

Página 4 de 7  
Fecha de impresión: 05/05/2025

Umbral olfativo: No aplicable/No disponible debido a la naturaleza/las propiedades del producto.  
Punto de fusión: No aplicable/No disponible debido a la naturaleza/las propiedades del producto.  
Punto de congelación: No aplicable/No disponible debido a la naturaleza/las propiedades del producto.  
Punto/Punto inicial/intervalo de ebullición: No aplicable/No disponible debido a la naturaleza/las propiedades del producto.  
Inflamabilidad: No aplicable/No disponible debido a la naturaleza/las propiedades del producto.  
Límite inferior de explosión: No aplicable/No disponible debido a la naturaleza/las propiedades del producto.  
Límite superior de explosión: No aplicable/No disponible debido a la naturaleza/las propiedades del producto.  
Punto de inflamación: > 60 °C  
Temperatura de auto-inflamación: No aplicable/No disponible debido a la naturaleza/las propiedades del producto.  
Temperatura de descomposición: No aplicable/No disponible debido a la naturaleza/las propiedades del producto.  
pH: No aplicable/No disponible debido a la naturaleza/las propiedades del producto.  
Viscosidad cinemática: No aplicable/No disponible debido a la naturaleza/las propiedades del producto.  
Solubilidad: No aplicable/No disponible debido a la naturaleza/las propiedades del producto.  
Hidrosolubilidad: No aplicable/No disponible debido a la naturaleza/las propiedades del producto.  
Liposolubilidad: No aplicable/No disponible debido a la naturaleza/las propiedades del producto.  
Coeficiente de reparto (n-octanol/agua)(valor logarítmico): No aplicable/No disponible debido a la naturaleza/las propiedades del producto.  
Presión de vapor: No aplicable/No disponible debido a la naturaleza/las propiedades del producto.  
Densidad absoluta: No aplicable/No disponible debido a la naturaleza/las propiedades del producto.  
Densidad relativa: No aplicable/No disponible debido a la naturaleza/las propiedades del producto.  
Densidad de vapor: No aplicable/No disponible debido a la naturaleza/las propiedades del producto.  
Características de las partículas: No aplicable/No disponible debido a la naturaleza/las propiedades del producto.

### 9.2 Otros datos.

No aplicable/No disponible debido a la naturaleza/las propiedades del producto.

## SECCIÓN 10: ESTABILIDAD Y REACTIVIDAD.

### 10.1 Reactividad.

El producto no presenta peligros debido a su reactividad.

### 10.2 Estabilidad química.

Estable bajo las condiciones de manipulación y almacenamiento recomendadas (ver epígrafe 7).

### 10.3 Posibilidad de reacciones peligrosas.

El producto no presenta posibilidad de reacciones peligrosas.

### 10.4 Condiciones que deben evitarse.

Evitar cualquier tipo de manipulación incorrecta.

### 10.5 Materiales incompatibles.

Mantener alejado de agentes oxidantes y de materiales fuertemente alcalinos o ácidos, a fin de evitar reacciones exotérmicas.

### 10.6 Productos de descomposición peligrosos.

No se descompone si se destina a los usos previstos.

## SECCIÓN 11: INFORMACIÓN TOXICOLÓGICA.

### 11.1 Información sobre las clases de peligro definidas en el Reglamento (CE) nº 1272/2008.

No existen datos disponibles ensayados del producto.

- a) toxicidad aguda;  
Datos no concluyentes para la clasificación.
- b) corrosión o irritación cutáneas;  
Datos no concluyentes para la clasificación.
- c) lesiones oculares graves o irritación ocular;  
Datos no concluyentes para la clasificación.
- d) sensibilización respiratoria o cutánea;  
Datos no concluyentes para la clasificación.

-Continúa en la página siguiente.-



Co-funded by  
the European Union

## FICHA DE DATOS DE SEGURIDAD

(de acuerdo con el Reglamento (UE) 2020/878)

### 014111-MTB AMARILLO RAL-1016 BIOPBS

# NEMARA

Versión 1 Fecha de emisión: 5/05/2025

Página 5 de 7  
Fecha de impresión: 05/05/2025

e) mutagenicidad en células germinales;  
Datos no concluyentes para la clasificación.

f) carcinogenicidad;  
Datos no concluyentes para la clasificación.

g) toxicidad para la reproducción;  
Datos no concluyentes para la clasificación.

h) toxicidad específica en determinados órganos (STOT) - exposición única;  
Datos no concluyentes para la clasificación.

i) toxicidad específica en determinados órganos (STOT) - exposición repetida;  
Datos no concluyentes para la clasificación.

j) peligro por aspiración;  
Datos no concluyentes para la clasificación.

#### 11.2 Información relativa a otros peligros.

##### Propiedades de alteración endocrina.

Este producto no contiene componentes con propiedades de alteración endocrina con efectos sobre la salud humana.

##### Otros datos.

No existe información disponible sobre otros efectos adversos para la salud.

## SECCIÓN 12: INFORMACIÓN ECOLÓGICA.

#### 12.1 Toxicidad.

No se dispone de información relativa a la Ecotoxicidad de las sustancias presentes.

#### 12.2 Persistencia y degradabilidad.

No se dispone de información relativa a la biodegradabilidad de las sustancias presentes.  
No se dispone de información relativa a la degradabilidad de las sustancias presentes.  
No existe información disponible sobre la persistencia y degradabilidad del producto.

#### 12.3 Potencial de bioacumulación.

No se dispone de información relativa a la Bioacumulación de las sustancias presentes.

#### 12.4 Movilidad en el suelo.

No existe información disponible sobre la movilidad en el suelo.  
No se debe permitir que el producto pase a las alcantarillas o a cursos de agua.  
Evitar la penetración en el terreno.

#### 12.5 Resultados de la valoración PBT y mPmB.

No existe información disponible sobre la valoración PBT y mPmB del producto.

#### 12.6 Propiedades de alteración endocrina.

Este producto no contiene componentes con propiedades de alteración endocrina sobre el medio ambiente.

#### 12.7 Otros efectos adversos.

El producto no está afectado por el Reglamento (CE) nº 1005/2009 del Parlamento Europeo y del Consejo, de 16 de septiembre de 2009, sobre las sustancias que agotan la capa de ozono.  
No existe información disponible sobre otros efectos adversos para el medio ambiente.

## SECCIÓN 13: CONSIDERACIONES RELATIVAS A LA ELIMINACIÓN.

#### 13.1 Métodos para el tratamiento de residuos.

No se permite su vertido en alcantarillas o cursos de agua. Los residuos y envases vacíos deben manipularse y eliminarse de acuerdo con las legislaciones local/nacional vigentes.  
Seguir las disposiciones de la Directiva 2008/98/CE respecto a la gestión de residuos.

-Continúa en la página siguiente.-



Co-funded by  
the European Union

## FICHA DE DATOS DE SEGURIDAD

(de acuerdo con el Reglamento (UE) 2020/878)

### 014111-MTB AMARILLO RAL-1016 BIOPBS

# NEMARA

Versión 1 Fecha de emisión: 5/05/2025

Página 6 de 7  
Fecha de impresión: 05/05/2025

#### SECCIÓN 14: INFORMACIÓN RELATIVA AL TRANSPORTE.

No es peligroso en el transporte. En caso de accidente y vertido del producto actuar según el punto 6.

##### 14.1 Número ONU o número ID.

No es peligroso en el transporte.

##### 14.2 Designación oficial de transporte de las Naciones Unidas.

Descripción:

ADR/RID: No es peligroso en el transporte.

IMDG: No es peligroso en el transporte.

ICAO/IATA: No es peligroso en el transporte.

##### 14.3 Clase(s) de peligro para el transporte.

No es peligroso en el transporte.

##### 14.4 Grupo de embalaje.

No es peligroso en el transporte.

##### 14.5 Peligros para el medio ambiente.

No es peligroso en el transporte.

Transporte por barco, FEm - Fichas de emergencia (F - Incendio, S - Derrames): No aplicable.

##### 14.6 Precauciones particulares para los usuarios.

No es peligroso en el transporte.

##### 14.7 Transporte marítimo a granel con arreglo a los instrumentos de la OMI.

No es peligroso en el transporte.

#### SECCIÓN 15: INFORMACIÓN REGLAMENTARIA.

##### 15.1 Reglamentación y legislación en materia de seguridad, salud y medio ambiente específicas para la sustancia o la mezcla.

Compuesto orgánico volátil (COV)

Contenido de COV (p/p): 0,5 %

Contenido de COV: 4,217 g/l

El producto no está afectado por el Reglamento (UE) No 528/2012 relativo a la comercialización y el uso de los biocidas.

El producto no se encuentra afectado por el procedimiento establecido en el Reglamento (UE) No 649/2012, relativo a la exportación e importación de productos químicos peligrosos.

Clase de contaminante para el agua (Alemania): WGK 1: Poco peligroso para el agua. (Autoclasificado según Reglamento AwSV)

##### 15.2 Evaluación de la seguridad química.

Se ha llevado a cabo una evaluación de la seguridad química del producto.

#### SECCIÓN 16: OTRA INFORMACIÓN.

Clasificación y procedimiento utilizado para determinar la clasificación de las mezclas con arreglo al Reglamento (CE) nº 1272/2008 [CLP]:

Peligros físicos Conforme a datos obtenidos de los ensayos

Peligros para la salud Método de cálculo

Peligros para el medio ambiente Método de cálculo

Se recomienda utilizar el producto únicamente para los usos contemplados.

Abreviaturas y acrónimos utilizados:

- Continúa en la página siguiente. -



## FICHA DE DATOS DE SEGURIDAD

(de acuerdo con el Reglamento (UE) 2020/878)

**014111-MTB AMARILLO RAL-1016 BIOPBS**

# NEMARA

Versión 1 Fecha de emisión: 5/05/2025

Página 7 de 7  
Fecha de impresión: 05/05/2025

AwSV: Reglamento de Instalaciones para la manipulación de sustancias peligrosas para el agua.  
CEN: Comité Europeo de Normalización.  
EPI: Equipo de protección personal.  
WGK: Clases de peligros para el agua.

Principales referencias bibliográficas y fuentes de datos:

<http://eur-lex.europa.eu/homepage.html>

<http://echa.europa.eu/>

Reglamento (UE) 2020/878.

Reglamento (CE) No 1907/2006.

Reglamento (CE) No 1272/2008.

La información facilitada en esta ficha de Datos de Seguridad ha sido redactada de acuerdo con el REGLAMENTO (UE) 2020/878 DE LA COMISIÓN de 18 de junio de 2020 por el que se modifica el anexo II del Reglamento (CE) n.º 1907/2006 del Parlamento Europeo y del Consejo, relativo al registro, la evaluación, la autorización y la restricción de las sustancias y mezclas químicas (REACH).

La información de esta Ficha de Datos de Seguridad del Producto está basada en los conocimientos actuales y en las leyes vigentes de la CE y nacionales, en cuanto que las condiciones de trabajo de los usuarios están fuera de nuestro conocimiento y control. El producto no debe utilizarse para fines distintos a aquellos que se especifican, sin tener primero una instrucción por escrito, de su manejo. Es siempre responsabilidad del usuario tomar las medidas oportunas con el fin de cumplir con las exigencias establecidas en las legislaciones.

-Fin de la ficha de datos de seguridad.-



Co-funded by  
the European Union

## Colorant's Technical Data Sheet

# NEMARA

**NEMARA RESEARCH S.L.**  
 Passatge Liszt, 7  
 Pol Industrial Can Jardí, 08191 - Rubí, Barcelona  
 Tlf: 935 88 24 84

### FICHA TÉCNICA

05-05-2025

**REFERENCIA:** 014111  
**DESCRIPCIÓN:** MTB AMARILLO RAL-1016 BIOPBS

#### CARACTERÍSTICAS GENERALES

**ESTABILIDAD TÉRMICA\*:** 140-160°C  
**SOLIDEZ A LA LUZ\*:** 7-8  
**ADITIVOS:** No  
**METALES PESADOS:** No  
**DIARILIDAS:** No

#### ESPECIFICACIONES Y REGULACIONES

**MATERIAL DE USO RECOMENDADO** PBS  
**DOSIFICACIÓN ACONSEJADADA** 2%  
**TOLERANCIA AL COLOR**  $\Delta E \leq 1.5$

#### ALMACENAJE

Se recomienda almacenar en un lugar seco y ventilado, a temperatura ambiente o inferior a 50°C y protegido de la luz solar.

#### OBSERVACIONES

(\*) Los valores indicados para estabilidad térmica y solidez a la luz corresponden a valores teóricos basados en la información facilitada por nuestros proveedores. Estos valores no se obtienen mediante pruebas y/o análisis en el producto.

Los datos e informaciones contenidos en este documento no tienen valor contractual. Los valores, procesos e informaciones técnicas son válidos para los usos y aplicaciones determinados en cada caso, pudiendo sufrir alteraciones en función de los ensayos y usos desarrollados por el comprador. Es responsabilidad del comprador realizar las pruebas necesarias para confirmar la funcionalidad del producto en sus aplicaciones y equipos. Asimismo, es necesario validar que las especificaciones del producto son las solicitadas por el comprador. En ningún caso NEMARA será responsable de los daños, reclamaciones, indemnizaciones, compensaciones u otras consecuencias negativas que pudieran causarse al destinatario por la incorrecta utilización de los datos o informaciones facilitadas.


IT-01/7306/2000

©2023 NEMARA RESEARCH S.L.  
 CIF: B59194928



Co-funded by  
the European Union

## Annex V: REMEDIES Cups Chemical Analysis



 Pack-Lab	<b>PACK-LAB</b>	<b>FORMULAR E-308/02</b>
	Platonos 52, 56224, Thessaloniki, Greece <a href="mailto:paraskevopoulos@packlab.gr">paraskevopoulos@packlab.gr</a> , T: +30 2313 096497	
	<b>TEST RESULTS REPORTING PROCEDURE</b>	

### TEST REPORT 25167

<b>Company</b>	National Institute of Chemistry
<b>Company's address</b>	Hajdrihova 19, SI-1000 Ljubljana, Slovenia
<b>Contact person</b>	Uros Novak
<b>Sampling made by</b>	Customer
<b>Sample structure</b>	Plastic
<b>Sample description</b>	Yellow ready cups 500 ml 05-2025
<b>Production date</b>	01/05/2025
<b>Batch number</b>	052025
<b>Sample condition upon receipt</b>	Good
<b>Sample internal code</b>	25167
<b>Date of receipt</b>	05/05/2025
<b>Period of analysis</b>	13/05/2025 – 02/06/2025




Photo of sample

VERSION	EDITION	COMPILED	APPROVAL	ISSUE DATE	CONFIDENTIAL	 
1	5	QAM	LABORATORY MANAGER	27/11/2024	Page 1 of 14	



Co-funded by  
the European Union



 <b>Pack-Lab</b>	<b>PACK-LAB</b>	<b>FORMULAR E-308/02</b>
	Platonos 52, 56224, Thessaloniki, Greece <a href="mailto:paraskevopoulos@packlab.gr">paraskevopoulos@packlab.gr</a> , T: +30 2313 096497	
	<b>TEST RESULTS REPORTING PROCEDURE</b>	

### ANALYSIS REQUIRED

Type	Method	Simulant	Testing conditions	Side in contact with simulant	Notes
<b>Overall migration article filling (Repeated contact)</b>	EN 1186-3:2022	C (ethanol 20 % v/v)	2 hours 70 °C	INNER	-
<b># Specific migration elements (Compliance with EC 10/2011) (Repeated contact)</b>	PB-204 ed. 7	C (ethanol 20 % v/v)	2 hours 40 °C	INNER	-
<b># Specific migration primary aromatic amines (PAA) (Compliance with EC 10/2011) (Repeated contact)</b>	SPE and HPLC-DAD following DIN EN 14362-1:2017-05	B (Acetic Acid 3 % w/v)	2 hours 40 °C	INNER	-
<b># Specific migration non-intentionally added substances (NIAS)</b>	GC-MS/FID PB-501 ed. II	C (ethanol 20 % v/v)	2 hours 40 °C	INNER	-
<b># Odour (Repeated contact)</b>	DIN 10955:2024	Water	2 hours 40 °C	INNER	Sensory analysis - scoring method (6 assessors)
<b># Flavour (Repeated contact)</b>	DIN 10955:2024	Water	2 hours 40 °C	INNER	Sensory analysis - scoring method (6 assessors)


# Analysis performed by external, ISO 17025 accredited laboratory

\* Method out of scope of accreditation

VERSION	EDITION	COMPILED	APPROVAL	ISSUE DATE	CONFIDENTIAL	  Testing No. of certificate 1265
1	5	QAM	LABORATORY MANAGER	27/11/2024	Page 2 of 14	



Co-funded by  
the European Union

 <b>Pack-Lab</b>	<b>PACK-LAB</b>	<b>FORMULAR E-308/02</b>
	Platonos 52, 56224, Thessaloniki, Greece <a href="mailto:paraskevopoulos@packlab.gr">paraskevopoulos@packlab.gr</a> , T: +30 2313 096497	
	TEST RESULTS REPORTING PROCEDURE	

## RESULTS

### Overall migration

Simulant: C (ethanol 20 % v/v), 1<sup>st</sup> migration

Testing conditions: 2 hours, 70 °C

Units: mg/dm<sup>2</sup>

Analysis	Result	Mean value	Expanded uncertainty	Limit set by (EC) 10/2011 legislation
1	4,9	4,7	2,0	-
2	4,8			
3	4,5			

Simulant: C (ethanol 20 % v/v), 2<sup>nd</sup> migration

Testing conditions: 2 hours, 70 °C

Units: mg/dm<sup>2</sup>

Analysis	Result	Mean value	Expanded uncertainty	Limit set by (EC) 10/2011 legislation
1	2,1	1,8	2,0	-
2	1,4			
3	1,8			

Simulant: C (ethanol 20 % v/v), 3<sup>rd</sup> migration

Testing conditions: 2 hours, 70 °C


Units: mg/dm<sup>2</sup>

Analysis	Result	Mean value	Expanded uncertainty	Limit set by (EC) 10/2011 legislation
1	1,6	1,6	2,0	10,0
2	1,9			
3	1,3			

VERSION	EDITION	COMPILED	APPROVAL	ISSUE DATE	CONFIDENTIAL	 
1	5	QAM	LABORATORY MANAGER	27/11/2024	Page 3 of 14	



Co-funded by  
the European Union

 <b>Pack-Lab</b>	<b>PACK-LAB</b>	<b>FORMULAR E-308/02</b>
	Platonos 52, 56224, Thessaloniki, Greece <a href="mailto:paraskevopoulos@packlab.gr">paraskevopoulos@packlab.gr</a> , T: +30 2313 096497	
	TEST RESULTS REPORTING PROCEDURE	

### Specific Migration

Simulant: C (ethanol 20 % v/v), 1<sup>st</sup> migration

Testing conditions: 2 hours, 40 °C

Units: mg/Kg


Specific migration results expressed in mg/kg applying the real surface to volume ratio in actual use (500 ml)

Analysis for elements (Compliance with EC 10/2011)	Result	Limit set by (EC) 10/2011 legislation
Lithium	< 0,005	-
Sodium	< 0,100	-
Magnesium	< 0,050	-
Aluminum	< 0,050	-
Potassium	< 0,100	-
Calcium	0,090 ± 0,018	-
Chromium	< 0,005	0,01
Manganese	< 0,005	-
Iron	< 0,005	-
Cobalt	< 0,005	-
Nickel	< 0,005	-
Copper	< 0,005	-
Zinc	< 0,005	-
Arsenic	< 0,002	-
Cadmium	< 0,002	-
Antimony	< 0,005	-
Barium	< 0,005	-
Lanthanum	< 0,005	-
Europium	< 0,005	-
Gadolinium	< 0,005	-
Terbium	< 0,005	-
Mercury	< 0,005	0,01
Lead	< 0,005	0,01
Sum of lanthanide - Eu, Gd, La, Tb	< 0,005	-

VERSION	EDITION	COMPILED	APPROVAL	ISSUE DATE	CONFIDENTIAL	  <small>Testing No. of certificate 1265</small>
1	5	QAM	LABORATORY MANAGER	27/11/2024	Page 4 of 14	



**Co-funded by  
the European Union**

 <b>Pack-Lab</b>	<b>PACK-LAB</b>	<b>FORMULAR E-308/02</b>
	Platonos 52, 56224, Thessaloniki, Greece <a href="mailto:paraskevopoulos@packlab.gr">paraskevopoulos@packlab.gr</a> , T: +30 2313 096497	
	TEST RESULTS REPORTING PROCEDURE	

Simulant: C (ethanol 20 % v/v), 2<sup>nd</sup> migration

Testing conditions: 2 hours, 40 °C

Units: mg/Kg


Specific migration results expressed in mg/kg applying the real surface to volume ratio in actual use (500 ml)

Analysis for elements (Compliance with EC 10/2011)	Result	Limit set by (EC) 10/2011 legislation
Lithium	< 0,005	-
Sodium	< 0,100	-
Magnesium	< 0,050	-
Aluminum	< 0,050	-
Potassium	< 0,100	-
Calcium	< 0,050	-
Chromium	< 0,005	0,01
Manganese	< 0,005	-
Iron	< 0,005	-
Cobalt	< 0,005	-
Nickel	< 0,005	-
Copper	< 0,005	-
Zinc	< 0,005	-
Arsenic	< 0,002	-
Cadmium	< 0,002	-
Antimony	< 0,005	-
Barium	< 0,005	-
Lanthanum	< 0,005	-
Europium	< 0,005	-
Gadolinium	< 0,005	-
Terbium	< 0,005	-
Mercury	< 0,005	0,01
Lead	< 0,005	0,01
<b>Sum of lanthanide - Eu, Gd, La, Tb</b>	< 0,005	-

VERSION	EDITION	COMPILED	APPROVAL	ISSUE DATE	CONFIDENTIAL	  <small>Testing No. of certificate 1265</small>
1	5	QAM	LABORATORY MANAGER	27/11/2024	Page 5 of 14	



Co-funded by  
the European Union

 <b>Pack-Lab</b>	<b>PACK-LAB</b>	<b>FORMULAR E-308/02</b>
	Platonos 52, 56224, Thessaloniki, Greece <a href="mailto:paraskevopoulos@packlab.gr">paraskevopoulos@packlab.gr</a> , T: +30 2313 096497	
	<b>TEST RESULTS REPORTING PROCEDURE</b>	



Simulant: C (ethanol 20 % v/v), 3<sup>rd</sup> migration

Testing conditions: 2 hours, 40 °C

Units: mg/Kg


Specific migration results expressed in mg/kg applying the real surface to volume ratio in actual use (500 ml)

Analysis for elements (Compliance with EC 10/2011)	Result	Limit set by (EC) 10/2011 legislation
Lithium	< 0,005	0,6
Sodium	< 0,100	60
Magnesium	< 0,050	60
Aluminum	< 0,050	1
Potassium	< 0,100	60
Calcium	< 0,050	60
Chromium	< 0,005	0,01
Manganese	< 0,005	0,6
Iron	< 0,005	48
Cobalt	< 0,005	0,05
Nickel	< 0,005	0,02
Copper	< 0,005	5
Zinc	< 0,005	5
Arsenic	< 0,002	0,01
Cadmium	< 0,002	0,002
Antimony	< 0,005	0,04
Barium	< 0,005	1
Lanthanum	< 0,005	0,05
Europium	< 0,005	0,05
Gadolinium	< 0,005	0,05
Terbium	< 0,005	0,05
Mercury	< 0,005	0,01
Lead	< 0,005	0,01
<b>Sum of lanthanide - Eu, Gd, La, Tb</b>	< 0,005	0,05

VERSION	EDITION	COMPILED	APPROVAL	ISSUE DATE	CONFIDENTIAL	  <small>Testing No. of certificate 1265</small>
1	5	QAM	<b>LABORATORY MANAGER</b>	27/11/2024	Page 6 of 14	



Co-funded by  
the European Union

 <b>Pack-Lab</b>	<b>PACK-LAB</b>	<b>FORMULAR E-308/02</b>
	Platonos 52, 56224, Thessaloniki, Greece <a href="mailto:paraskevopoulos@packlab.gr">paraskevopoulos@packlab.gr</a> , T: +30 2313 096497	
	<b>TEST RESULTS REPORTING PROCEDURE</b>	

**Simulant: B (acetic acid 3 % w/v), 1<sup>st</sup> migration**



**Testing conditions: 2 hours, 40 °C**

**Units: mg/Kg**

**Surface to volume ratio used for the analysis: 7,2 dm<sup>2</sup>/kg**


**Surface to volume ratio used for results: 6,0 dm<sup>2</sup>/kg**

<b>Analysis for primary aromatic amines, PAA</b> (Compliance with EC 10/2011)	<b>Individual result - Sum of "more amines"</b>	<b>Limit set by (EC) 10/2011 legislation Individual - Sum value of "more" amines</b>
<b>Listed in Appendix 8 to entry 43 of Annex XVII of regulation (EC) 1907/2006</b>		
2-Methoxy-5-Methylaniline, Benzidine, Thiodianiline, 2,4,5-Trimethylaniline, 2-Amino-4-nitrotoluole, 2-Naphthylamine, 3,3'-Dichlorbenzidine, 3,3'-Dimethoxybenzidine, 3,3'-Dimethyl-4,4'-diaminodiphenylmethane, 3,3'-Dimethylbenzidine, 4,4'-Oxydianiline, 4,4-Methylen-bis-(2-chloraniline), 4-Amino-2',3-dimethyl-azobenzene, 4-Aminobiphenyle, o-Anisidine, 2,4 Diaminoanisole, 2,4 Diaminotoluole, o-Toluidine, p-Aminoazobenzole, p-Chloraniline, 4-Chlor-o-toluidine, 4,4-Dia- minodiphenylmethane, 1,3-Phenylendiamine	< 0,002 - < 0,01	0,002 - 0,01
<b>More amines</b>		
2,4 Dichloraniline, 2,4 Dinitroaniline, 2,6 Dimethylaniline, 2-Methyl-5-Chloraniline, Aniline, 1,5- Dia- minonaphthaline, 2,4 Dimethylaniline, 2,5 Dimethoxy-4-chloraniline, 2-Methoxy-4-nitroaniline, 2-Methoxy-5-Chloraniline, 3-Amino-4-methoxybenzanilide, 3-Amino-4-methylbenzamide, p-Toluidine, 2-Nitroaniline, o-Phenetidine, Dimethyla- minoterephthalate, 2-Chloraniline		

VERSION	EDITION	COMPILED	APPROVAL	ISSUE DATE	CONFIDENTIAL	  Testing No. of certificate 1265
1	5	QAM	<b>LABORATORY MANAGER</b>	27/11/2024	Page 7 of 14	





**Co-funded by  
the European Union**


 <b>Pack-Lab</b>	<b>PACK-LAB</b>	<b>FORMULAR E-308/02</b>
	<b>Platonos 52, 56224, Thessaloniki, Greece</b> <u><a href="mailto:paraskevopoulos@packlab.gr">paraskevopoulos@packlab.gr</a></u> , T: +30 2313 096497	
	<b>TEST RESULTS REPORTING PROCEDURE</b>	

**Simulant: B (acetic acid 3 % w/v), 2<sup>nd</sup> migration**  
**Testing conditions: 2 hours, 40 °C**  
**Units: mg/Kg**  
**Surface to volume ratio used for the analysis: 7,2 dm<sup>2</sup>/kg**  
**Surface to volume ratio used for results: 6,0 dm<sup>2</sup>/kg**

<b>Analysis for primary aromatic amines, PAA</b> (Compliance with EC 10/2011)	<b>Individual result - Sum of "more amines"</b>	<b>Limit set by (EC) 10/2011 legislation Individual - Sum value of "more" amines</b>
<b>Listed in Appendix 8 to entry 43 of Annex XVII of regulation (EC) 1907/2006</b>		
2-Methoxy-5-Methylaniline, Benzidine, Thiodianiline, 2,4,5-Trimethylaniline, 2-Amino-4-nitrotoluole, 2-Naphthylamine, 3,3'-Dichlorbenzidine, 3,3'-Dimethoxybenzidine, 3,3'-Dimethyl-4,4'-diaminodiphenylmethane, 3,3'-Dimethylbenzidine, 4,4'-Oxydianiline, 4,4-Methylen-bis-(2-chloraniline), 4-Amino-2',3-dimethyl-azobenzene, 4-Aminobiphenyle, o-Anisidine, 2,4 Diaminoanisole, 2,4 Diaminotoluole, o-Toluidine, p-Aminoazobenzole, p-Chloraniline, 4-Chlor-o-toluidine, 4,4-Dia- minodiphenylmethane, 1,3-Phenylendiamine	< 0,002 - < 0,01	0,002 - 0,01
<b>More amines</b>		
2,4 Dichloraniline, 2,4 Dinitroaniline, 2,6 Dimethylaniline, 2-Methyl-5-Chloraniline, Aniline, 1,5- Dia- minonaphthaline, 2,4 Dimethylaniline, 2,5 Dimethoxy-4-chloraniline, 2-Methoxy-4-nitroaniline, 2-Methoxy-5-Chloraniline, 3-Amino-4-methoxybenzanilide, 3-Amino-4-methylbenzamide, p-Toluidine, 2-Nitroaniline, o-Phenetidine, Dimethyla- minoterephthalate, 2-Chloraniline		

VERSION	EDITION	COMPILED	APPROVAL	ISSUE DATE	CONFIDENTIAL	  <small>Testing No. of certificate 1265</small>
1	5	QAM	LABORATORY MANAGER	27/11/2024	Page 8 of 14	



 <b>Pack-Lab</b>	<b>PACK-LAB</b>	<b>FORMULAR E-308/02</b>
	<b>Platonos 52, 56224, Thessaloniki, Greece</b> <b><a href="mailto:paraskevopoulos@packlab.gr">paraskevopoulos@packlab.gr</a>, T: +30 2313 096497</b>	
	<b>TEST RESULTS REPORTING PROCEDURE</b>	

**Simulant: B (acetic acid 3 % w/v), 3<sup>rd</sup> migration**



**Testing conditions: 2 hours, 40 °C**

**Units: mg/Kg**

**Surface to volume ratio used for the analysis: 7,2 dm<sup>2</sup>/kg**


**Surface to volume ratio used for results: 6,0 dm<sup>2</sup>/kg**

<b>Analysis for primary aromatic amines, PAA</b> (Compliance with EC 10/2011)	<b>Individual result - Sum of "more amines"</b>	<b>Limit set by (EC) 10/2011 legislation Individual - Sum value of "more" amines</b>
<b>Listed in Appendix 8 to entry 43 of Annex XVII of regulation (EC) 1907/2006</b>		
2-Methoxy-5-Methylaniline, Benzidine, Thiodianiline, 2,4,5-Trimethylaniline, 2-Amino-4-nitrotoluole, 2-Naphthylamine, 3,3'-Dichlorbenzidine, 3,3'-Dimethoxybenzidine, 3,3'-Dimethyl-4,4'-diaminodiphenylmethane, 3,3'-Dimethylbenzidine, 4,4'-Oxydianiline, 4,4-Methylen-bis-(2-chloraniline), 4-Amino-2',3-dimethyl-azobenzene, 4-Aminobiphenyle, o-Anisidine, 2,4 Diaminoanisole, 2,4 Diaminotoluole, o-Toluidine, p-Aminoazobenzole, p-Chloraniline, 4-Chlor-o-toluidine, 4,4-Dia- minodiphenylmethane, 1,3-Phenylendiamine	< 0,002 - < 0,01	0,002 - 0,01
<b>More amines</b>		
2,4 Dichloraniline, 2,4 Dinitroaniline, 2,6 Dimethylaniline, 2-Methyl-5-Chloraniline, Aniline, 1,5- Dia- minonaphthaline, 2,4 Dimethylaniline, 2,5 Dimethoxy-4-chloraniline, 2-Methoxy-4-nitroaniline, 2-Methoxy-5-Chloraniline, 3-Amino-4-methoxybenzanilide, 3-Amino-4-methylbenzamide, p-Toluidine, 2-Nitroaniline, o-Phenetidine, Dimethyla- minoterephthalate, 2-Chloraniline		

VERSION	EDITION	COMPILED	APPROVAL	ISSUE DATE	CONFIDENTIAL	  Testing No. of certificate 1265
1	5	QAM	LABORATORY MANAGER	27/11/2024	Page 9 of 14	



**Co-funded by  
the European Union**

 <b>Pack-Lab</b>	<b>PACK-LAB</b>	<b>FORMULAR E-308/02</b>
	Platonos 52, 56224, Thessaloniki, Greece <a href="mailto:paraskevopoulos@packlab.gr">paraskevopoulos@packlab.gr</a> , T: +30 2313 096497	
	TEST RESULTS REPORTING PROCEDURE	

### NIAS assessment<sup>1-2</sup>



**Simulant: C (ethanol 20 % v/v)**

**Testing conditions: 2 hours, 40 °C**

**Units: mg/Kg**

Compound Name	Result	Criteria
Unknown substance [RT: 16.2 min; m/z: 42.0, 54.0, 101.0] <sup>3</sup>	0,08 ± 0,04	-
Unknown substance [RT: 39.6 min; m/z: 55.0, 101.0, 173.0] <sup>4</sup>	0,63 ± 0,32	-

- 1) In the applied GC-MS/FID screening method (DB-5 column, detector in EI mode) all identified substances were compared with the NIST library with Match Factor over 80%. The method is semi-quantitative and cannot be treated as equivalent to specific migration.
- 2) RT (Retention Time); MF (Match Factor).
- 3) Substance under definite MF [%]. Best hit: 1,3-Dioxepane, 2-heptyl- [CAS: 61732-92-1; RT: 16.2 min; MF: 78 %].
- 4) Substance under definite MF [%]. Best hit: Succinic acid, di(but-2-en-1-yl) ester [CAS: 1000391-23-3; RT: 39.6 min; MF: 71 %]

VERSION	EDITION	COMPILED	APPROVAL	ISSUE DATE	CONFIDENTIAL	  Testing No. of certificate 1265
1	5	QAM	LABORATORY MANAGER	27/11/2024	Page 10 of 14	



**Co-funded by  
the European Union**

 <b>Pack-Lab</b>	<b>PACK-LAB</b>	<b>FORMULAR E-308/02</b>
	Platonos 52, 56224, Thessaloniki, Greece <a href="mailto:paraskevopoulos@packlab.gr">paraskevopoulos@packlab.gr</a> , T: +30 2313 096497	
	<b>TEST RESULTS REPORTING PROCEDURE</b>	

### Organoleptic properties

**Testing conditions: 2 hours, 40 °C, 1<sup>st</sup> migration**



<u>Analysis</u>	<u>Food simulant</u>	<u>Mean value</u>	<u>Notes</u>
Odour	Water	0,5	-
Flavour	Water	1,5	-

- 0- no noticeable deviation of the odour /flavour.  
 1- barely noticeable deviation of the odour /flavour (hard to define yet).  
 2- weak deviation of the odour /flavour.  
 3- significant deviation of the odour /flavour.  
 4- strong deviation of the odour /flavour (this intensity does not determine the probable maximum)

**Testing conditions: 2 hours, 40 °C, 2<sup>nd</sup> migration**


<u>Analysis</u>	<u>Food simulant</u>	<u>Mean value</u>	<u>Notes</u>
Odour	Water	0,5	-
Flavour	Water	1,5	-

- 0- no noticeable deviation of the odour /flavour.  
 1- barely noticeable deviation of the odour /flavour (hard to define yet).  
 2- weak deviation of the odour /flavour.  
 3- significant deviation of the odour /flavour.  
 4- strong deviation of the odour /flavour (this intensity does not determine the probable maximum).

VERSION	EDITION	COMPILED	APPROVAL	ISSUE DATE	CONFIDENTIAL	  <small>Testing No. of certificate 1265</small>
1	5	QAM	LABORATORY MANAGER	27/11/2024	Page 11 of 14	





**Co-funded by  
the European Union**

 Pack-Lab	<b>PACK-LAB</b>	<b>FORMULAR E-308/02</b>
	Platonos 52, 56224, Thessaloniki, Greece <a href="mailto:paraskevopoulos@packlab.gr">paraskevopoulos@packlab.gr</a> , T: +30 2313 096497	
	TEST RESULTS REPORTING PROCEDURE	

Testing conditions: 2 hours, 40 °C, 3<sup>rd</sup> migration


<u>Analysis</u>	<u>Food simulant</u>	<u>Mean value</u>	<u>Notes</u>
Odour	Water	0,0	-
Flavour	Water	1,0	-

- 0- no noticeable deviation of the odour /flavour.  
 1- barely noticeable deviation of the odour /flavour (hard to define yet).  
 2- weak deviation of the odour /flavour.  
 3- significant deviation of the odour /flavour.  
 4- strong deviation of the odour /flavour (this intensity does not determine the probable maximum).

VERSION	EDITION	COMPILED	APPROVAL	ISSUE DATE	CONFIDENTIAL	 
1	5	QAM	LABORATORY MANAGER	27/11/2024	Page 12 of 14	





Co-funded by  
the European Union

 <b>Pack-Lab</b>	<b>PACK-LAB</b>	<b>FORMULAR E-308/02</b>
	<b>Platonos 52, 56224, Thessaloniki, Greece</b> <a href="mailto:paraskevopoulos@packlab.gr">paraskevopoulos@packlab.gr</a> , T: +30 2313 096497	
	<b>TEST RESULTS REPORTING PROCEDURE</b>	

### Evaluation

Analysis	Food products to come in contact with	Contact conditions	Notes
<b>Overall migration limits</b> set by legislation (EC) 10/2011 (Article 12)	Any food product, for which simulant C is assigned in legislation (EC) 10/2011 (Annex III, Table 2)	<b>OM3 (EC) 10/2011 Annex V, table 3</b> Any food contact that includes hot-fill and/or heating up to a temperature T where $70\text{ }^{\circ}\text{C} \leq T \leq 100\text{ }^{\circ}\text{C}$ for a maximum of $t = 120/2^{(T-70)/10}$ minutes, which are not followed by long-term room temperature or refrigerated storage.	Repeated use
<b>Specific migration limits of elements</b> set by legislation (EC) 10/2011 (Annex II)	Any food product, for which simulant C is assigned in legislation (EC) 10/2011 (Annex III, Table 2)	<b>(EC) 10/2011, Annex V, Point 2.1.4</b> Temperatures up to 40 °C for up to 2 hours.	Repeated use
<b>Specific migration limits of primary aromatic amines (PAA)</b> set by legislation (EC) 10/2011 (Annex II)	All types of food (EC/10/2011, Annex III, point 5)	<b>(EC) 10/2011, Annex V, Point 2.1.4</b> Temperatures up to 40 °C for up to 2 hours.	Repeated use
<b>Specific migration of non-intentionally added substances (NIAS)</b>	Any food product, for which simulant C is assigned in legislation (EC) 10/2011 (Annex III, Table 2)	<b>(EC) 10/2011, Annex V, Point 2.1.4</b> Temperatures up to 40 °C for up to 2 hours.	Check relevant table

**END OF TEST REPORT**

VERSION	EDITION	COMPILED	APPROVAL	ISSUE DATE	CONFIDENTIAL	  Testing No. of certificate 1265
1	5	QAM	LABORATORY MANAGER	27/11/2024	Page 13 of 14	



**Co-funded by  
the European Union**

## Annex VI: REMEDIES Cups Compliance Documents

### REMEDIES 6 Declaration of Compliance by Bio-Mi



bio-mi d.o.o  
Cesta dalmatinskih brigada 17  
51211 Matulji  
Tel: 00 385 (0) 51 583 205  
www.bio-mi.eu

#### Declaration of Compliance

Manufacturer Address	bio-mi ltd. Cesta dalmatinskih brigada 17 51211 Matulji Croatia
Contact	Tel: 00 385 (0) 51 583, 205 bio-mi@bio-mi.eu
Product name	<b>Remedies 6</b>
Date	30.7.2025

#### Statutory regulations and requirements

- *Regulation (EC) No 1935/2004 on materials and articles intended to come into contact with food;*
- *Regulation (EU) No 10/2011 on plastic materials and articles intended to come into contact with food;*
  - *Article 5 Union list of authorised substances 1.*  
*Only the substances included in the Union list of authorized substances (hereinafter referred to as the Union list) set out in Annex I may be intentionally used in the manufacture of plastic layers in plastic materials and articles.*
  - *Article 11 Specific migration limits 1.*  
*Plastic materials and articles shall not transfer their constituents to foods in quantities exceeding the specific migration limits (SML) set out in Annex I. Those specific migration limits (SML) are expressed in mg of substance per kg of food (mg/kg).*
  - *Article 12 Overall migration limit 1.*  
*Plastic materials and articles shall not transfer their constituents to food simulants in quantities exceeding 10 milligrams of total constituents released per dm<sup>2</sup> of food contact surface (mg/dm<sup>2</sup> )*
- *Regulation (EU) No 2023/2006 on good manufacturing practice for materials and articles intended to come into contact with food;*
- *Heavy-metal content according to Directive 94/62/EC*



## Compliance

**Remedies 6** is a thermoplastic compound consisting of PBS (polybutylene succinate) and PHBV (Poly( $\beta$ -hydroxybutyrate- $\beta$ -hydroxyvalerate)) with an addition of additives. All of the constituents are on the Union list of authorised monomers, other starting substances, macromolecules obtained from microbial fermentation, additives and polymer production aids stated in Table 1 and 2 in ANNEX I of Regulation (EU) No 10/2011 with following restrictions.

Constituent	Identification number	Specific migration limit
Tetrahydrofuran	CAS No. 109-99-9	0.6 mg/kg
1,4-butanediol	CAS No. 110-63-4	5 mg/kg
3 hydroxybutanoic acid-3 hydroxypentanoic acid, copolymer	CAS No. 80181-31-3	0.05 mg/kg as crotonic acid
Boron nitride	CAS No. 10043-11-5	6 mg/kg as boron

According to 2008/EC, 2008/84/EC and 2008/128/EC this product the product contains  $\text{CaCO}_3$  which is a Dual Use substance, not classified as hazardous. The Calcium Carbonate in the product doesn't comply with the food additive or flavoring regulations. The  $\text{CaCO}_3$  used in the product is only dedicated to industrial purposes and is not analyzed according to the E170 food additive criteria.

## Declaration

Bio-mi ltd. hereby declares that the product Remedies 6 is produced and complies with the above mentioned regulations and can be used in direct contact with food. The tests were conducted by an external laboratory and the material passed specific migrations tests for Stimulants B and C at 40 °C and 4 h as well as the overall migration with Stimulant C at 70 °C and 4 h.

## REMEDIES 6 Technical Data Sheet by Bio-Mi

**Technical Data Sheet**  
According to regulation (EC) No. 1907/2006



bio-mi Ltd. – Cesta dalmatinskih brigada 17  
Telephone 00 385 (0) 51 583 205 -

www.bio-mi.eu

# Remedies 6 Technical Data Sheet

### General description

Remedies 6 is a range of bio-based, biodegradable and compostable thermoplastic materials developed primarily for injection moulded products such as cups.

### Remedies 6 Material physical and mechanical properties

Property	Method	Typical values*	Ref.
Melting Point	ASTM D 3418	112; 170 °C	pellets
MFR	ISO 1133	22.0 g/10min	190 °C / 2,16 kg
Density	ASTM D792	1.35 g/cm <sup>3</sup>	pellets
Tensile strength at break	ASTM D882	45 MPa	Thin film**
Young Modulus	ASTM D882	950 MPa	Thin film**
Elongation at break	ASTM D882	250 %	Thin film**
Charpy impact strength	ISO 179	46 kJ/m <sup>2</sup>	Unnotched

\*Typical values used as reference only

\*\*Thin film obtained at 150 µm with BUR of 2.0 and DDR of 8

### Processing information and recommendation

General processing conditions are listed in the table below. Recommended processing conditions are between 190 °C and 210 °C. The optimal processing conditions will depend on the end user's process and machine.

Injection moulding	
<b>Pre-drying</b>	See section: <b>Handling and storage</b>
<b>Feed zone</b>	20 – 40 °C
<b>Compression zone</b>	170 – 220 °C
<b>Metering zone</b>	170 – 220 °C
<b>Nozzle</b>	170 – 220 °C
<b>T<sub>melt</sub></b>	170 – 220 °C

### General suggestions

#### **Handling and storage**

Remedies 6 is moisture sensitive material and the original packaging should be opened just before production to avoid gels and loss of properties. If the bags are used partially, it is recommended to reseal them immediately after and use within 3 months. The shelf life of original packaging bags depends on the storage conditions and should be no longer than 6 months at a cool and dry warehouse.



Co-funded by  
the European Union

## Technical Data Sheet

According to regulation (EC) No. 1907/2006



bio-mi ltd. – Cesta dalmatinskih brigada 17

Telephone 00 385 (0) 51 583 205 -

[www.bio-mi.eu](http://www.bio-mi.eu)

Remedies 6 thermoplastics don't need pre-drying if the original packaging is not damaged. If the packaging is damaged, then the material needs to be dried for 2-6 h at 40 °C or until moisture content reaches below 200 ppm.

### Packaging

Remedies 6 in pellet form is originally packed in Al bags of 25 kg and big bags of 600 kg.

### Mechanical recycling and regeneration

Waste scraps from Remedies 6 compounds can be easily recycled using single screw extrusion lines for recycling and regeneration of PE, PP and PET plastics. The addition of regenerated material to the virgin one can cause a reduction of mechanical properties. Bio-Mi recommends adding a maximum of 20 % of recycled content for the extrusion.

### Environment

Remedies 6 is made from renewable resources and from components that are biodegradable and compostable and have TUV certificate OK compost INDUSTRIAL according to EN 13432:2000 standard in compliance with EU Packaging Directive (94/62/EEC).



Co-funded by  
the European Union

## REMEDIES 6 Material Safety Data Sheet by Bio-Mi

**Material Safety Data Sheet**  
According to regulation (EC) No. 1907/2006



**Product: Remedies 6**

bio-mi ltd. – Cesta dalmatinskih brigada 17  
Telephone 00 385 (0) 51 583 205 - www.bio-mi.eu

### SAFETY DATA SHEET

---

#### **SECTION 1: Identification of the substance/mixture and of the company/undertaking**

---

- 1.1 Product identifier** Remedies 6
- 1.2 Relevant identified uses of the substance or mixture and uses advised against**  
Identified uses thermoplastic granules for plastic industry applications  
mainly injection molded products such as cups  
Uses advised against processes not intended for thermoplastic polymers
- 1.3 Details of the supplier of the safety data sheet**  
Supplier bio - mi ltd.  
Address Cesta dalatinskih brigada 17, 51211 Matulji, Croatia  
Telephone 00 385 (0) 51 583 205  
Competent person bio-mi@bio-mi.eu
- 1.4 Emergency telephone number** 01/46 86 919

---

#### **SECTION 2: Hazards identification**

---

**2.1 Classification of the substance or mixture**  
Classification according to Regulation (EC) 1272/2008  
Not classified

**2.2 Label elements**  
Labeling according to Regulation (EC) 1272/2008  
None

**2.3 Other hazards**  
The substances do not meet the criteria for classification as PBT or vPvB. Product forms slippery surfaces in combination with water. The product contains essentially no dust particles in a size range to support dust explosion. The fine dust of this product can form explosive mixtures with air. Contact with molten material may cause burns and abrasions to the skin and eyes.



Material Safety Data Sheet  
According to regulation (EC) No. 1907/2006



bio-mi ltd. – Cesta dalmatinskih brigada 17  
Telephone 00 385 (0) 51 583 205 - www.bio-mi.eu

**Product: Remedies 6**

---

### **SECTION 3: Composition/information on ingredients**

---

#### **3.2 Mixtures**

The mixture of thermoplastic polymers and additives

---

### **SECTION 4: First aid measures**

---

#### **4.1 Description of first aid measures**

- **Following inhalation**

In case of dust inhalation remove the person to fresh air.

- **Following skin contact**

Rinse skin with soap and water. Skin contact with the molten polymer may cause burns and abrasions. In that case, cool the burned part with cold water for at least 5 minutes. Do not remove the material from the skin. It is necessary to seek medical attention.

- **Following eye contact**

Flush immediately with plenty of water for 10 to 15 minutes holding eyelids apart. In case of constant irritation consult a physician.

- **Following ingestion**

Remove any residual product and rinse the mouth with cold water. Drink plenty of water and avoid vomiting. In case of constant consult a physician.

#### **4.2 Most important symptoms and effects, both acute and delayed**

None observed

#### **4.3 Indication of any immediate medical attention and special treatment needed**

None observed

---

### **SECTION 5: Firefighting measures**

---

#### **5.1 Extinguishing media**

Suitable extinguishing media

CO<sub>2</sub>, foam, dry powder, water spray

#### **5.2 Special hazards arising from the substance or mixture**

Material is not classified as flammable. Fire may cause the evolution of CO<sub>x</sub> compounds. Product forms slippery surfaces in combination with water.



**Material Safety Data Sheet**  
According to regulation (EC) No. 1907/2006



bio-mi Ltd. – Cesta dalmatinskih brigada 17  
Telephone 00 385 (0) 51 583 205 - www.bio-mi.eu

**Product: Remedies 6**

### **5.3 Advice for firefighters**

Use approved compressed air breathing apparatus and wear firefighters' protective clothing. Do not empty fire water into drains. Fire residues and contaminated fire water must be disposed according to local regulations.

---

## **SECTION 6: Accidental release measures**

---

### **6.1 Personal precautions, protective equipment and emergency procedures**

Restricted access to contaminated areas, until cleaning work is finished. Personal protection equipment. Avoid contact with skin and eyes. Provide adequate ventilation. Do not breathe dust. Avoid the formation of dust – danger of dust explosion. The product forms a slippery surface with water.

### **6.2 Environmental precautions**

Contain product mechanically for recovery or disposal. Do not allow to enter into drains/surface water/groundwater.

### **6.3 Methods and material for containment and cleaning up**

Clean dry. Avoid the generation of dust. Wash away the remaining material carefully with plenty of water. Treat the recovered material as prescribed in the section on waste disposal (Section 13).

### **6.4 Reference to other sections**

See protective measures under Section 8 and disposal under Section 13.

---

## **SECTION 7: Handling and storage**

---

### **7.1 Precautions for safe handling**

Electrically bond and ground all containers and equipment. Handle material in well-ventilated areas. Avoid the generation of dust – do not breathe dust. The molten material is extremely sticky: handle it with long protective gloves and heat-resistant equipment.

### **7.2 Conditions for safe storage, including any incompatibilities**

Ensure packaging is not damaged. Store away from direct sunlight in a cool (room temperature), dry, well-ventilated area. Keep away from heat sources, flames, spark sources, moisture, acids, bases and oxidizing or reducing agents

### **7.3 Specific end use(s)**

Thermoplastic granules for plastic industry applications



Material Safety Data Sheet  
According to regulation (EC) No. 1907/2006



bio-mi ltd. – Cesta dalmatinskih brigada 17  
Telephone 00 385 (0) 51 583 205 - www.bio-mi.eu

**Product name: Remedies 6**

---

## SECTION 8: Exposure controls/personal protection

---

### 8.1 Control parameters

None

### 8.2 Exposure control

- **General protection and hygiene measures**

When handling chemical substances observe usual precautionary measures.

Keep away from foods and drinks.

When using do not eat and drink. Wash hands after working with the product.

Avoid contact with eyes and skin. Do not breathe dust. Change contaminated, saturated clothing and wash before reuse.

Protective clothing needs to be selected specifically for the workplace, depending on concentrations and quantities of the hazardous substances handled. The chemical resistance of the protective equipment should be enquired at the respective supplier.

- **Respiratory protection**

Wear a dust mask during the formation of dust or when occupational exposure limits are exceeded.

- **Hand protection**

Wear gloves resistant to penetration for normal use and processing. Wearing heat-resistant gloves when handling material at high temperatures is recommended.

- **Eye protection**

Close-fitting protective goggles in a case of dust. Safety glasses are recommended if there is a risk of ejection

- **Body protection**

Working clothes.

- **Environmental exposure controls**

The product does not meet the criteria for classification as hazardous to the environment.

Anyway avoid the dispersion of material in the environment.

---

## SECTION 9: Physical and chemical properties

---

### 9.1 Information on basic physical and chemical properties

Physical state/appearance                      solid



**Material Safety Data Sheet**  
According to regulation (EC) No. 1907/2006



bio-mi ltd. – Cesta dalmatinskih brigada 17  
Telephone 00 385 (0) 51 583 205 - www.bio-mi.eu

**Product name: Remedies 6**

Colour	white yellowish undertone
Odour	odourless
Odour threshold	not available
pH value	not available
Melting point/freezing point	not available
Initial boiling point/range	not available
Flash point	not applicable. The product is solid.
Evaporation rate	not applicable
Flammability (solid, gas)	not flammable
Upper explosive limits	not determined
Lower explosive limits	not determined
Vapour pressure	not applicable
Density	approx 1,35 g/cm <sup>3</sup>
Solubility in water	not applicable
Partition coefficient: n-octanol/water	not available
Ignition temperature	not self-igniting
Decomposition temperature	no information available
Viscosity	not available
Explosive properties	the product itself is not explosive, but fine dust can form explosive mixtures with air
Oxidizing properties	none

#### **9.2 Other information**

None

---

### **SECTION 10: Stability and reactivity**

---

#### **10.1 Reactivity**

No hazardous reactions known if used as prescribed

#### **10.2 Chemical stability**

Stable under normal conditions

#### **10.3 Possibility of hazardous reactions**

The danger of dust explosion in case of dust generation during processing.

#### **10.4 Conditions to avoid**

Avoid the generation of dust. Keep away from sources of ignition.

#### **10.5 Incompatible materials**

No information available.

#### **10.6 Hazardous decomposition products**

No decomposition if used as prescribed.



Material Safety Data Sheet  
According to regulation (EC) No. 1907/2006



bio-mi ltd. – Cesta dalmatinskih brigada 17  
Telephone 00 385 (0) 51 583 205 - www.bio-mi.eu

**Product name: Remedies 6**

---

## SECTION 11: Toxicological information

---

### 11.1. Information on toxicological effects

- **Acute toxicity**

The product is inert and does not pose any hazard to human health for all routes of exposure considered by this class.

- **Skin corrosion/irritation**

Non-irritating to the skin. Possibility of skin injury solely from contact with the material in the molten state.

- **Serious eye damage/irritation**

No eye irritation. Possibility of eye damage in case of contact with the material in the molten state.

- **Respiratory or skin sensitization**

No sensitization expected.

- **Germ cell mutagenicity**

Not to be classified according to composition.

- **Carcinogenicity**

Not to be classified according to composition.

- **Reproductive toxicity**

Not to be classified according to composition.

- **STOT-single exposure**

Not to be classified according to composition.

- **STOT-repeated exposure**

Not to be classified according to composition.

- **Aspiration hazard**

This hazard is not related to the product

- **Other information**

The mixture was classified on the basis of the calculation procedure of the CLP-Regulation (EC) 1272/2008 Annex I.



**Material Safety Data Sheet**  
According to regulation (EC) No. 1907/2006



bio-mi ltd. – Cesta dalmatinskih brigada 17  
Telephone 00 385 (0) 51 583 205 - www.bio-mi.eu

**Product name: Remedies 6**

---

## **SECTION 12: Ecological information**

---

### **12.1 Toxicity**

According to available information the material is not classified as hazardous for the environment. The mixture was classified on the basis of the calculation procedure of the CLP-Regulation (EC) 1272/2008 Annex I.

### **12.2 Persistence and degradability**

Biodegradability is expected.

### **12.3 Bioaccumulative potential**

Bioaccumulation is not expected.

### **12.4 Mobility in soil**

Information not available

### **12.5 Results of PBT and vPvB assessment**

A chemical safety assessment has not been conducted. On the base of information about components, the product does not contain substances considered PBT (persistent, bioaccumulative and toxic) or vPvB (very persistent and very bioaccumulative) in concentration  $\geq 0,1\%$ .

### **12.6 Other adverse effects**

Information not available

---

## **SECTION 13: Disposal considerations**

---

### **13.1. Waste treatment methods**

Any disposal practice must be in accordance with regional, national and local laws and regulations. Do not allow to enter into drains/surface water/groundwater. Any cleaned cardboard packaging can be reused or recycled according to the appropriate modalities available in your area.

---

## **SECTION 14: Transport information**

---

The product is not classified as dangerous good (for transportation)

### **14.1 UN number**



**Material Safety Data Sheet**  
According to regulation (EC) No. 1907/2006

**Product name: Remedies 6**  
Not applicable.



bio-mi ltd. – Cesta dalmatinskih brigada 17  
Telephone 00 385 (0) 51 583 205 - [www.bio-mi.eu](http://www.bio-mi.eu)



**Material Safety Data Sheet**  
According to regulation (EC) No. 1907/2006



bio-mi Ltd. – Cesta dalmatinskih brigada 17  
Telephone 00 385 (0) 51 583 205 - www.bio-mi.eu

**Product name: Remedies 6**

**14.2 UN proper shipping name**

Not applicable.

**14.3 Transport hazard class(es)**

Not applicable.

**14.4 Packing group**

Not applicable.

**14.5 Environmental hazards**

Not applicable.

**14.6 Special precautions for user**

No information available

**14.7 Transport in bulk according to Annex II of Marpol and the IBC Code**

Not applicable.

---

**SECTION 15: Regulatory information**

---

**15.1 Safety, health and environmental regulations/legislation specific to the substance or mixture**

Safety data sheet according to REACH – Regulation (EC) No. 1907/2006. The mixture was classified on the basis of the calculation procedure of the CLP-Regulation (EC) 1272/2008 Annex I.

**15.2 Chemical safety assessment**

A chemical Safety Assessment according to Reg. (EC) No 1907/2006 (REACH) has not been conducted

---

**SECTION 16: Other information**

---

The information contained herein is based on the present state of our knowledge. It does not represent a guarantee of the properties of the product and does not establish a legally valid contractual relationship. All materials may present unknown hazards and should be used with caution and only for identified uses as prescribed in Section 1.

The mixture was classified on the basis of the calculation procedure of the CLP-Regulation (EC) 1272/2008 (Annex I). The classification of ingredients is based on CLP-Regulation Annex VI and manufacturer's data and additional information on the hazardous substances database and the European Chemical Agency.

Abbreviations      PBT = persistent, bioaccumulative, toxic  
                             vPvB = very persistent, very bioaccumulative

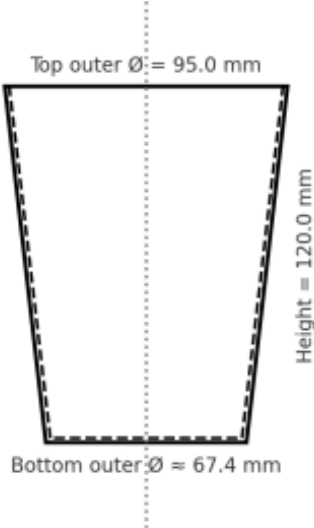


## REMEDIES Cups Product Data Sheet by ANGR

# Product Data Sheet



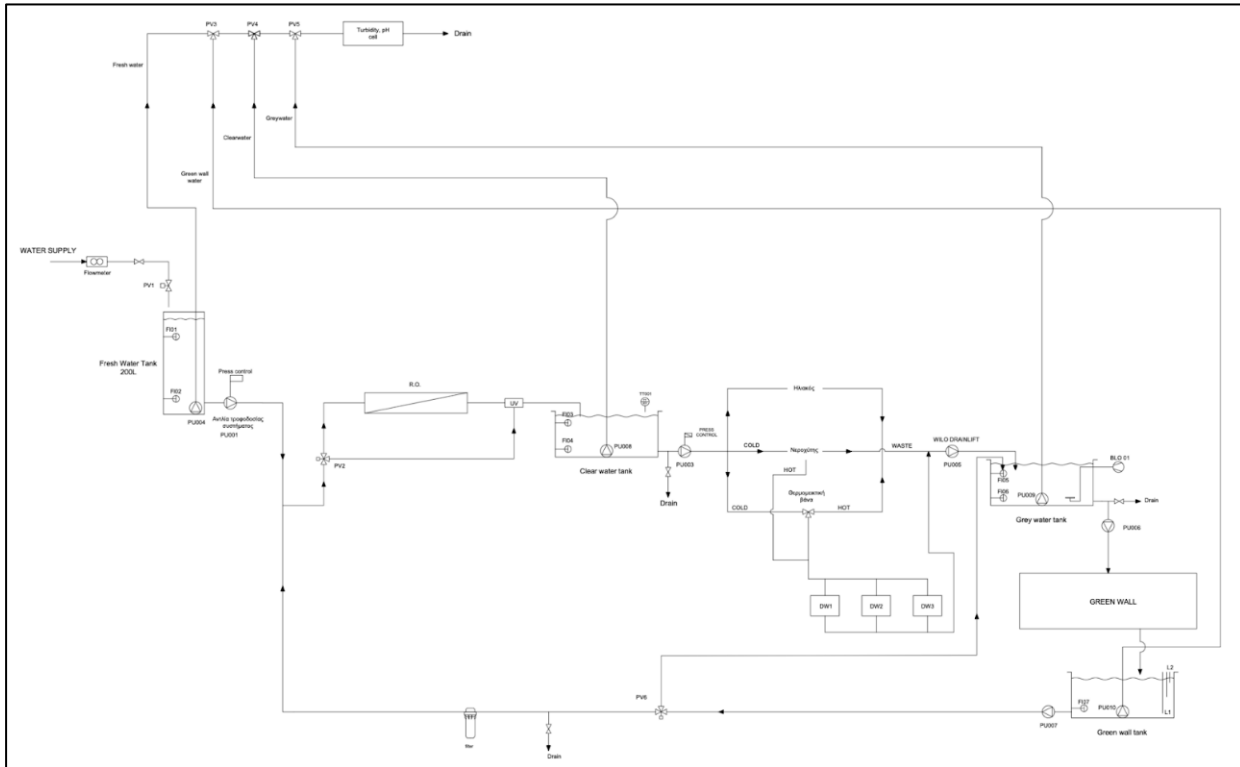
### Product Identification

Designation	Reusable Biobased Cup 50 Cl	
Product Name	REMEDIES Festival Cup	
Manufacturing Process	Injection Molding	
Date of Release	01-08-2025	
	<b>Product Details</b>	
	Type	Rigid
	Max filling volume	550 ml
	Gauge marking	500 ml
	Height	120 mm
	Ø top	95.0mm
	Ø bottom	67.4 mm
	Wall thickness	1.5 mm
	Weight	48g
	Color	Yellow

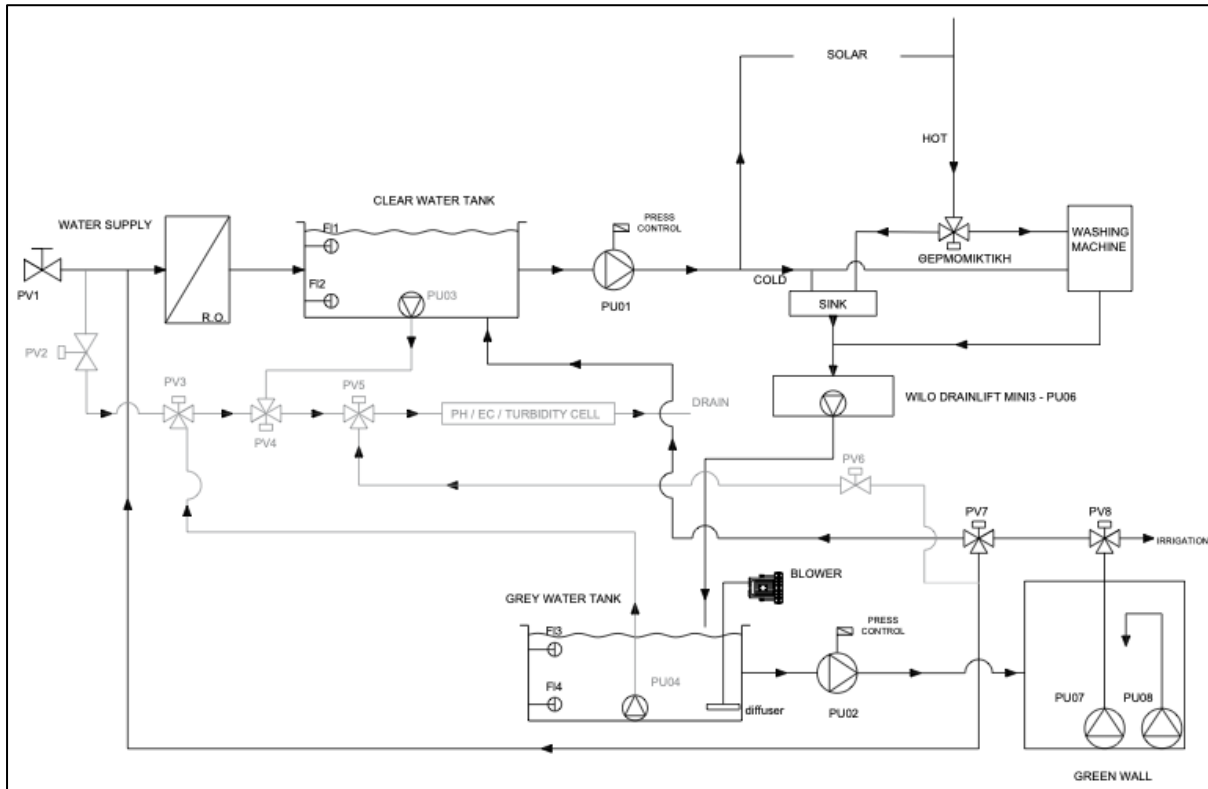
Technical Features		
Raw Materials	Biopolymers (Type 7/Other)	
Application	Beer (≥20% alcohol), short-term contact (up to 2 h)	
Intended Use	Reuse for 135 washing cycles	
EPR	Mechanical Recycling	



# Annex VII: P&ID of the container system with vertECO® by ANGR



## Annex VIII: P&ID of the Isobox system with GRETA™ by ANGR



## Annex IX: Indicative Water Sample Results of the AWG by NTUA

REMEDIES - WP3, T3.2												
Dehumidifier water measurement results												
	Limits drinking water EU Dir. 2020/2184	4/3/2024		6/3/2024		10/3/2024		2/4/2025		3/7/2025		
		Dehumidifier (S1)	Water cooler (S2)	Dehumidifier (S1)	Water cooler (S2)	Dehumidifier (S1)	Water cooler (S2)	Dehumidifier (S1)	Water cooler (S2)	Dehumidifier (S1)	Water Tank (S3)	Water cooler (S2)
pH	≥ 6,5 and ≤ 9,5			6,9	7,6			6,9	7,7	5,8	6,3	6,5
Conductivity (µS/cm, 20°C)	2.500			100,7	306			41,7	239	53,8	46,5	102,2
Alkalinity (mgCaCO3/l)	-			20	117,5			40	210	52	44	96
NO3-N (mg/L)	11,3			1,01	<0,2			0,5	<0,2			
NO2-N (mg/L)	0,15			<0,02	<0,02			<0,02	<0,02			
NH4-N (mg/L)	0,39			0,29	0,34	<0,015	0,32	<0,02	<0,02	<0,02	0,20	<0,02
Cl- (mg/L)	250			<1	5,6			<1	4,5			
SO42- (mg/L)	250			<4	21			<4	19			
F- (mg/L)	1,5			<0,1	<0,1			<0,1	<0,1			
CN (µg/l)	50			<0,01	<0,01			<0,01	<0,01			
Phenols (mg/l)				0,056	0,079							
Na (mg/l)	200			1,3	5,8							
TC (CFU/100 ml)	0	0	0	0	0			0	0			
E. coli (CFU/100 ml)	0	0	0	0	0			0	0			
Enterococci (CFU/100 ml)	0	0	0	0	0			0	0			
OMX 36 (CFU/100 ml)	-	170	105	206	990			0	>3.000			
OMX 22 (CFU/100 ml)	-	>3.000	>3.000	7.400,0	>30.000			0	>3.000			

## Annex X: Breakdown of Festival's Allocation of Activities by ANGR

I. Fixed Settings	II. Operations	III. Brand Zones
A. Stella Maris beach	1) Visitors Side Entry point	6) Samsung AI Experience
	2) <b>Electric Waves/stage 1</b>	7) Jagermeister
	3) <b>Silent Octopus/stage 2</b>	8) Red Bull bar
	4) Cashless vendors	
	5) <b>Bars (Beck's branded)</b>	
B. Tennis stadium	9) <b>Nautilus Arena/stage 3</b>	
	10) Cashless vendors	
	11) <b>Bars (Beck's branded)</b>	
C. Stadium surroundings	12) Cashless vendors	13) Exit
		14) Remedies
		15) Cacao Revolution
D. Plaza	16) <b>Stone bar</b>	17) <b>Beck's Zone</b>
		18) Coca-Cola Photo Tower
E. Round plateau	19) <b>Bars (Beck's branded)</b>	21) Recan Pixelata
	20) Cashless vendors	
F. Pic-nick area	22) Foodland	23) Jack Daniel's
G. Open stage	24) <b>Tesla Main Stage/stage 4</b>	
	25) <b>Bars (Beck's branded)</b>	
H. Tourist info-points	26) Cashless vendors	
I. Parking area	27) Visitors Entry point	
	28) Parking	
J. Surroundings	29) Info-Point	
	30) Ticket Sales	
	31) Accreditations (VIP/Press)	
	32) Lost and found	

## Annex XI: Sea Star Festival DRS Initial Design by ANGR

