

WP5 update - June 2025

Quality and safety

Deliverables

- D5.1 – Decontamination equipment and technologies (design and specifications) ✓
- D5.2 – Post use functional properties of RPP with materials database  August 2025
- D5.3 – Report on migration modelling, contaminants abs., barrier evaluations  August 2025
- D5.4 – Database of microplastic properties and relationship modelling exterior  February 2026
- D5.5 – Pilot line for cleaning of reusable packaging ✓

Objectives

- Development of the approach for risk assessment and management of reusable packaging after use.
- Assessment of the functional properties and safety of reusable packaging after multiple cycles of reuse/cleaning.
- Quantification of microplastic release throughout the life cycle.
- Optimisation and integration of cleaning technologies in a cleaning pilot line which will demonstrate the capacity of packaging developed in WP3 and tested in WP5 to remain functional after at least 20 cycles of reuse up to 300 cycles.

Key Activities

- 1st design of decontamination equipment based on specifications from T1.3.
- Safety / Successful decontamination of RPP after use with the target of 100 ppm (contamination level to be achieved after washing and disinfection stages).
- Identification of mitigation measures for microplastics, particularly regarding exposure of RPP and cleaning water.
- Cleaning Pilot Line engineering and commissioning

? Key Research Questions

- What are the factors influencing the ageing of reusable packaging over the course of different use cycles?
- Is it possible to use new technologies to detect the most dangerous substances, especially on washing lines?
- How can we safely manage the misuse and use of detergents?

Intermediary results

Task 1

- Used packaging has been collected from each use case to characterize the organic residues and the microbiological contamination.
- Based on these results, specific cleaning and disinfection procedures have been developed and tested by visual inspection and against microbial contamination by microbiological analysis for each use-case.
- The best protocol has been selected to completely remove organic material and achieve a reduction of microbial contamination of more than 90%.

General proposed protocol:

Phase	Products	Dose (%w/w)	T ₂ (°C)	Time (s)
1	Betelene DB30	2.0	60	60
2	Mida SAN 328 EC	3.0	60	60
3	Dectocide CDB + Mida AF 622 EM	5.0 + 0.2	60	120
4	Relavit Rinse H	0.0002	60	20

Task 2

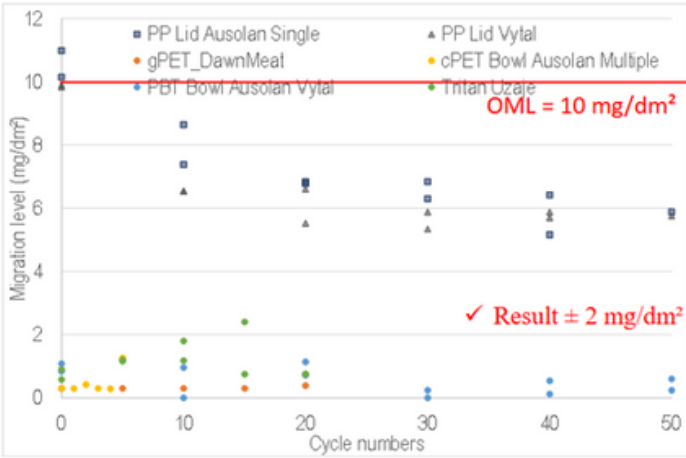
Aging tests based on environment : Thermal / Immersed (H2O) / Chemically Immersed (1%v detergent in H2O)
It aims to evaluate the evolution of raw materials in different aging environment that can be encountered during its usage.
Those evolutions will be compared to some materials aged by LNE in order to explain some of the degradation that could be seen.

Task 3

- 1- Aging test: accelerated and worst-case conditions
- Simulant: Oil + Sudan III at 0.1 g/L (for DawnMeat) and 0.5 g/L (for others)

Use-case	Materials	Contact with simulant (Oil + Sudan III)	Washing	Drying
Dawn Meat 20 cycles	PETg (tray)	3.02 h @ 65 °C at 0.1 g/L	Laboratory protocol (45 min up to 50 °C) including pre-wash (cold), wash (50°C), rinse (cold) and final rinse (50°C) Getinge Lancer Detergent LLL (NaOH base)	10 min @ 70°C
Ausolan single and Vytal 50 cycles	PBT (Bowl) PPc (Lid: no simulant)	58.8 h @ 55°C at 0.5 g/L 1.7 h @ 100°C no simulant		
Ausolan multiple 5 cycles	cPET (bowl and lid)	2h @ 175°C at 0.5 g/L		
Uzaje 20 cycles	Tritan	3.47h @ 90°C at 0.5 g/L		

- 2- Overall migration tests on new and aged materials / packaging
- Simulant: isooctane
- Ratio 6 dm²/ 1kg



- 3- Migration modelling for determination of required residual concentrations in RPP for chemical safety :
 - Worst-case scenarios
 - Molecular weights ranging from 100 to 1000 g·mol⁻¹
 - Threshold determined based on the TTC approach for genotoxic substances (0.15 ppb for food application and 83 ppm for house-case products)

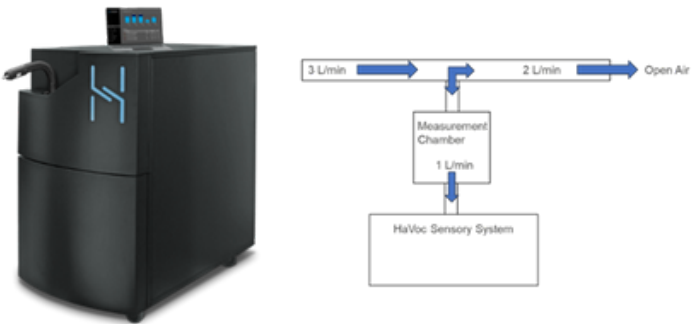
Maximum residual content (mg/kg) of substances in packaging after washing / decontamination step to be compliant with threshold (0.15 ppb) derived by TTC

substances	Vytal_tray	Vytal_lid	Ausolan _s _tray	Ausolan _s _lid	Ausolan _u _tray	Ausolan _u _lid	Dawn Meat	Asevi_bottle	Asevi_cap	Uzaje
M1	6.1E-01	1.8E-02	1.2E+00	1.1E-01	1.4E-02	1.6E+03	1.7E+02	1.2E+03	1.4E+03	2.1E+01
M2	1.0E+00	4.1E-02	4.7E+00	3.4E-01	3.1E-02	6.5E+03	7.1E+02	1.4E+03	2.5E+03	8.4E+01
M3	6.7E+00	8.7E-02	1.4E+01	9.0E-01	6.5E-02	2.0E+04	2.2E+03	2.2E+03	4.3E+03	2.6E+02
M4	1.7E+01	1.8E-01	3.8E+01	2.2E+00	1.3E-01	5.4E+04	5.8E+03	3.5E+03	7.0E+03	7.0E+02
M5	4.2E+01	3.6E-01	9.1E+01	5.1E+00	2.6E-01	1.3E+05	1.4E+04	5.4E+03	1.1E+04	1.7E+03
M6	9.2E+01	7.0E-01	2.0E+02	1.1E+01	5.1E-01	2.9E+05	3.1E+04	8.1E+03	1.6E+04	3.7E+03
M7	1.9E+02	1.4E+00	4.2E+02	2.3E+01	9.8E-01	6.0E+05	6.5E+04	1.2E+04	2.4E+04	7.8E+03
M8	3.8E+02	2.5E+00	8.4E+02	4.5E+01	1.8E+00	1.2E+06	1.3E+05	1.7E+04	3.4E+04	1.6E+04
M9	7.4E+02	4.7E+00	1.6E+03	8.6E+01	3.4E+00	2.3E+06	2.5E+05	2.3E+04	4.7E+04	3.0E+04
M10	1.4E+03	8.5E+00	3.0E+03	1.6E+02	6.1E+00	4.3E+06	4.6E+05	3.1E+04	6.5E+04	5.5E+04

- Invalidation of the initial indicator of 100 ppm residual concentration
- Case-by-case indicator for residual content

Task 4

- System for on-site measurements completed
- Proof of concept measurements are planned, and method is developed



Impact & Outcomes

This WP will contribute to the work of European standardization bodies by sharing lessons learned from the plastic packaging reuse project".

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