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in the ENI Southern Neighbourhood region

Introduction to “intentionally added” microplastics, focus on personal care products: State of the art and potential measures

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‘Intentionally added’ microplastics

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‘Intentionally added’ microplastics have diverse technical functions and are used in various consumer, professional, agricultural and industrial products, including in:

- agriculture and horticulture (in fertilisers and plant protection products);
- cosmetic products (both rinse-off and leave-on products);
- detergents and maintenance products (e.g. as fragrance encapsulation in laundry detergents and fabric softeners as well as in products for cleaning and polishing);
- paints, coatings and inks (in professional and consumer uses);
- chemicals used in the oil and gas sector;
- construction;
- medicinal products;
- medical devices; and
- food supplements and medical food.

Table 2.3 Microplastics with intentional use in products (non-exhaustive)

Polymer	Abbreviation	No of product categories
Polyethylene	PE	4
Polymethylmethacrylate	PMMA	4
Polytetrafluoroethylene	PTFE	4
Polyamide	PA (PA6, PA6.6, PA6.12, PA12)	4
Polyurethane	PU	3
Styrene/Acrylates copolymer		3
Melamine-formaldehyde resin	MF	3
Urea-formaldehyde resin	UF	3
Polypropylene	PP	2
Polyacrylonitrile	PAN	2
Expanded polystyrene	EPS	2
Poly-ε-caprolactone	PCL	2
Polyethylene terephthalate	PET	1
Polycarbonate	PC	1

more than 130 synthetic polymers

Source: Amec Foster Wheeler Environment & Infrastructure UK Limited, 2017

Microplastics suggested for further evaluation

Type	Justification for selection
Polyethylene PE	High market share Many applications (4 categories) Low concern reactive functional groups (RFG) Least hazardous polymer
Polyurethane PU	High market share Many applications (3 categories) High concern reactive functional groups RFG Most hazardous polymer
Polymethylmethacrylate PMMA	Many applications (4 categories) High concern RFG High level hazardous monomer
Polyamide PA	Many applications (4 categories) Low-medium level of hazardous monomer
Styrene/Acrylates copolymer	Many applications (3 categories) High concern RFG High level hazardous monomer

Information on Reactive Functional Groups (RFG) according to Deloitte 2014[22].
Information on hazard classification according to Lithner et al. 2011[23].

Source: Amec Foster Wheeler Environment & Infrastructure UK Limited, 2017

Table 2.5 Microplastic functions in different products

Function	Products
Abrasive/exfoliating	Cosmetics, detergents, industrial blasting abrasives
Emulsifier, suspending agent	Cosmetics, detergents, paints
Binding	Cosmetics, paints, inks, concrete
Filler	Construction (wall and joint fillers, self levelling compounds/screeds)
Control release of ingredients	Pharmaceuticals (nanocapsules), cosmetics, fertilisers, crops, detergents (enzymes)
Film forming	cosmetics, polishing agents
Surface coating	paper making, polishing agents,
Improved chemical and mechanical resistance	Coatings, paints, floor coatings, polymer cement
Fluid absorbents	nappies, water retainer for farming, agriculture, horticulture

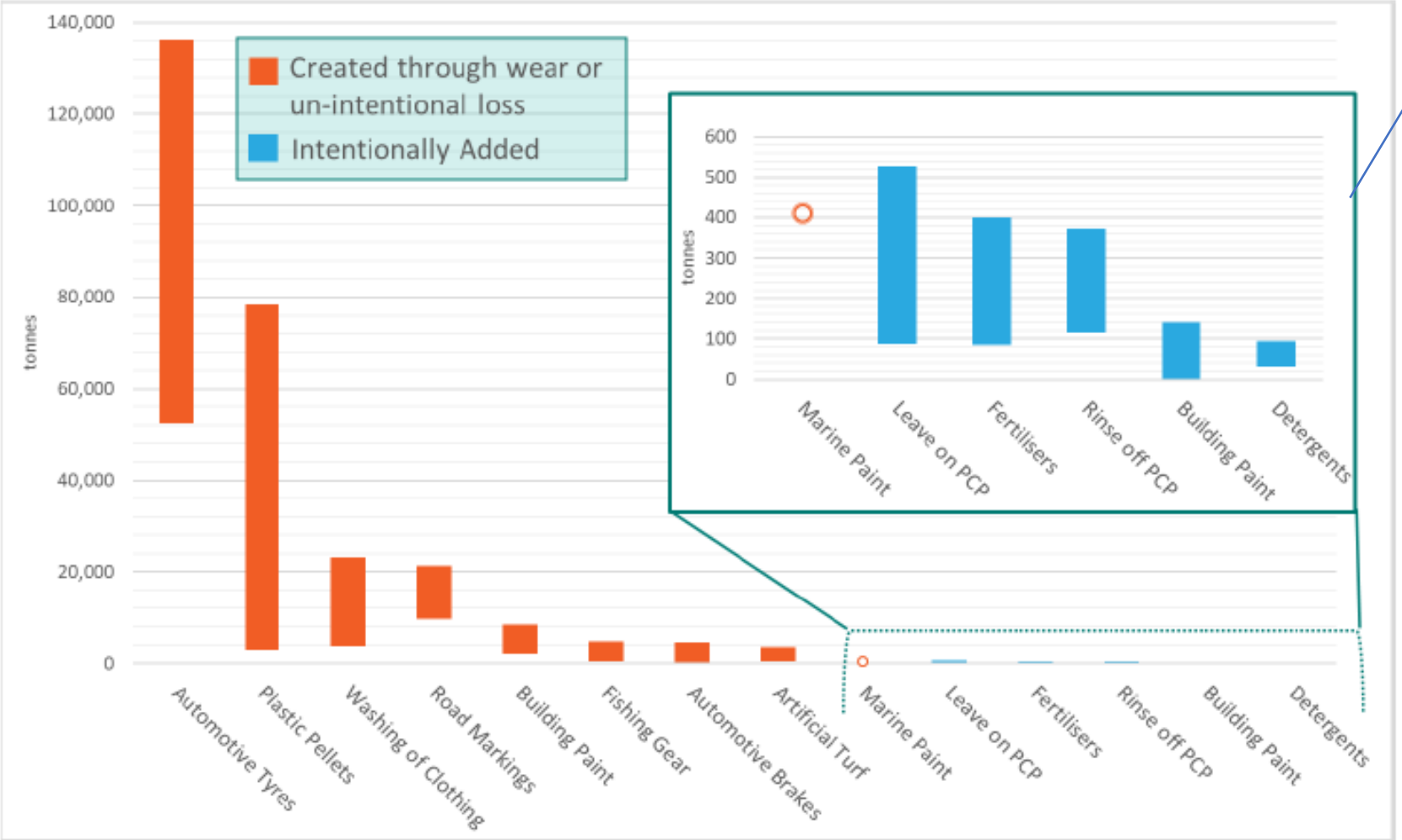
Source: Amec Foster Wheeler Environment & Infrastructure UK Limited, 2017

‘Intentionally added’ microplastics

- Releases of microplastics to the environment can occur through various pathways, principally via **wastewater** and/or **municipal solid waste**. Certain microplastics are **deliberately released** directly to the environment i.e. uses in agriculture and horticulture.
- The availability of **alternatives** for the different uses also varies
- Large differences in the proportion of the microplastics in products that will be released, e.g:
  - rinse-off cosmetic (e.g. scrubber gel): 100%
  - Leave-on cosmetic (e.g. Sun cream): 15-90%
  - Paint: 1,5%

Source: ECHA, 2019

Figure 2 – Annual Emissions of Microplastics to Surface Water (Upper and Lower Ranges)[3]



Source: Eunomia and Amec Foster Wheeler modelling

Emissions of intentionally added microplastics in EU:
~ 36 000 tones per year

Six times the present size of the 'Great Pacific Garbage Patch'
Or
Releases of microplastics that could occur per year from
about **10 billion plastic bottles.**

The REACH restriction proposal (EU)

REACH is the European Regulation on Registration, Evaluation, Authorisation and Restriction of Chemicals.

REACH COMPLIANCE

ECHA (European Chemical Agency) submitted a restriction proposal comprising three types of measures:

- a **restriction on the placing on the market** of microplastics on their own or in mixtures where their use will inevitably result in releases to the environment, irrespective of the conditions of use
- a **labelling requirement** to minimise releases to the environment for uses of microplastics where they are not inevitably released to the environment but where residual releases could occur if they are not used or disposed of appropriately
- a **reporting requirement** to improve the quality of information available to assess the potential for risks in the future

The REACH restriction proposal (EU)

- The proposed restriction is estimated to result in a cumulative emission reduction of approximately 400 000 tonnes of microplastics over the 20 year period following its entry into force (a **reduction of 85-95%**) at a cost of approximately **€9.4 billion**.
- The proposed restriction is considered to be **proportionate** to the risk. Its cost-effectiveness is similar to REACH restrictions that have been decided previously. The proposed restriction is considered **affordable** for the impacted supply chains.

Focus on personal care products (PCP)

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- The measure is justified for ‘microbeads’ contained in **rinse-off products** (i.e. microplastic with an exfoliating or cleansing function) with **no transitional arrangements** as industry is expected to have voluntarily phased out their use by 2020.
- The measure is also justified for **other rinse-off and leave-on cosmetic products**, with respectively **four- and six-year transitional periods**, based on the similarity to the cost-effectiveness of previous restrictions for substances with similar concerns and affordability for supply-chains.

Potential alternatives to microbeads

- Waxes: beeswax, rice bran wax, jojoba waxes.
- Starches derived from corn, tapioca and carnauba.
- Seaweed.
- Silica.
- Clay.
- Walnut powder.
- Other natural compounds.

Further readings

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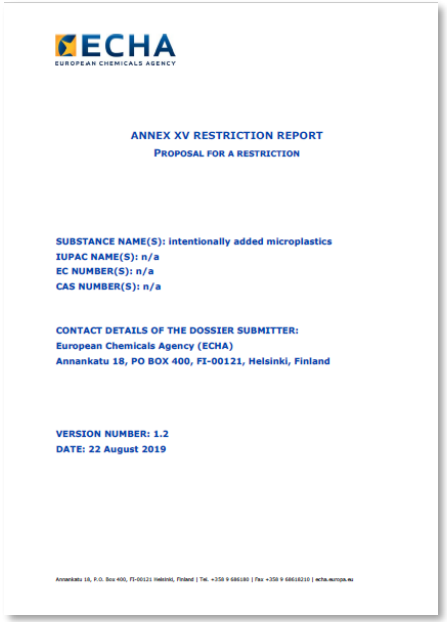
- ECHA, 2019. ANNEX XV RESTRICTION REPORT PROPOSAL FOR A RESTRICTION



ECHA
EUROPEAN CHEMICALS AGENCY

ANNEX XV RESTRICTION REPORT
PROPOSAL FOR A RESTRICTION

SUBSTANCE NAME(S): intentionally added microplastics
IUPAC NAME(S): n/a
EC NUMBER(S): n/a
CAS NUMBER(S): n/a

CONTACT DETAILS OF THE DOSSIER SUBMITTER:
European Chemicals Agency (ECHA)
Annankatu 18, PO BOX 400, FI-00121, Helsinki, Finland

VERSION NUMBER: 1.2
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- Amec Foster Wheeler Environment & Infrastructure UK Limited, 2017. Intentionally added microplastics in products. Final report for the European Commission

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European Commission (DG Environment)
Intentionally added microplastics in products
Final report

October 2017
Amec Foster Wheeler Environment & Infrastructure UK Limited

Guest speakers on “intentionally added” microplastics

- Jeroen Dagevos, Plastic Soup Foundation
- Raquel Santos, Spanish National Association of Perfumery and Cosmetics

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Thank you for your attention!