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APPLiA input to the Call for Evidence on Microplastic pollution

Summary

This paper reflects the Home Appliance contribution to the **Call for evidence** for an impact assessment on the **microplastics pollution initiative**, launched by the European Commission on November 30th, 2021. In particular, APPLiA would like to raise a few important considerations on the proposal to introduce microplastics filters for *washing machines*, *washer-dryers* and *tumble dryers*.

The home appliance sector is fully committed to contributing to solving the issue of microplastics release into the environment. Nevertheless, we believe that the impact assessment shall evaluate important specifications to ensure that the **objectives of the initiative are fulfilled**. Furthermore, the impact assessment shall carry out an environmental evaluation outlining the balance between health risk, environmental hazard and climate impacts.

We have divided the paper into **four sections**. **Part I** will provide a general overview of the issue; while **Parts II and III** will focus on product specific considerations; finally, **Part IV** will summarize our main conclusions and recommendations. The paper also contains an **Annex** which reports a qualitative analysis of the mass flow done by APPLiA.

Washer-dryers currently on the market work based on a technology that can be either the one used for the washing machines or for the tumble dryers.

PART I

General remark on microplastics

1. A close look to Microplastics

Researchers have identified about 70 different sources of primary and secondary microplastics[1]. While the origin of these plastics is clear, (e.g. vehicles tyre dust, pellet spills, synthetic textiles, building paints, road paints, cosmetics and marine paints), the amount of emissions of microplastics in marine and non-marine environments is still a matter of discussion. An additional element that amplifies the significant complexity to the issue, it is the particle size of microplastics (see Figure 1). As a matter of fact, all kinds of plastics items can degrade to **micro** and **nano** particles making it difficult to assess the quantity of microplastics in the environment.

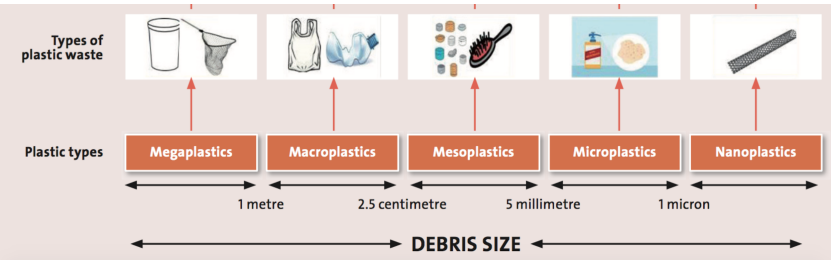

Figure 1. Diagrammatic representation of different types of plastics[2]

If we specifically look at a single source, the textile contribution to the release of microplastics was highly addressed by academia but large uncertainty still remains.

For instance, the study done by IUCN[3], which claimed that 35% of the overall emission of microplastics comes from the textile, was strongly criticised due to the fact that it based its assumption on a not realistic scenario. Differently in more recent times, many studies indicate that synthetic microfibers released from textile clothes as a result of washing processes (among others), correspond to a minor part of the overall pollution caused by plastics[4]. In addition, more recent researches[5] conducted with household washing machines under conditions closer to real-life demonstrate that the **overall release of microplastic fibres in the water may be drastically lower than first indicated by initial studies relying on lab tests**.

[1] Bertling, Jürgen.; Bertling, Ralf; Hamann, Leandra: Kunststoffe in der Umwelt: Mikro- und Makro-plastik. Ursachen, Mengen, Umweltschicksale, Wirkungen, Lösungsansätze, Empfehlungen. Kurzfassung der Konsortialstudie, Fraunhofer-Institut für Umwelt-, Sicherheits- und Energietechnik UMSICHT (Hrsg.), Oberhausen, Juni 2018

[2] "Microplastics in our oceans and marine health", S. Chatterjee and S. Sharma, 2019- link

[3] Boucher, Friot, IUCN, Global Marine and Polar Programme, 2017

[4] Such as "Plastics in the Marine Environment", Eunomia, 2016

[5] Studies conducted for example by M. Sillanpää (2017), C. Jönsson (2018) or F. De Falco (2017)

Airborne emissions from textile may be a very relevant emission pathway, but there is still too little research available. Nevertheless, there are few studies such as De Falco 2020[6], which suggests that the washing phase might have been overlooked if compared to the release of microplastics occurring during wearing. Furthermore, recently a study on the possible release of microplastics into the environment when using air-vented tumble dryers was published[7] (more information under part III).

Due to the **precautionary principle**, policy makers feel the urgency for actions. We understand the focus on washing machines and tumble dryers as they have a key role in the life cycle of textiles, even if the origin of the fibers is from the textiles. If legislation is deemed required in this area, we urge caution as the legislation must be overall effective and require retention solutions (such as filters) that work in practice when used by consumers.

In order to guarantee a sound scientific basis for any decision, more research is still needed. Therefore, the home appliance industry has been supporting various publicly funded research projects such as Minshed, RUSEKU, and TextileMission.

2. The role of home appliances

Taking in consideration the full life cycle of textiles, washing and drying are inevitable parts of a textile's use phase. Therefore, APPLiA is aware that the release of microfibers in the environment might be reduce with the help of household washing machines, washer-dryers and tumble dryers.

Microfiber emission reduction technologies such as filtration are in infancy. There are severe constraints when it comes to the mechanical and maintaining functions of washing machines and washer-dryers. The **retention measures** such as filtration **will most likely** influence the water and energy consumption of the appliances, but also programme duration, and creating additional waste and may have a climate impact. Lastly, even by facilitating all necessary communicational and educational resources, it cannot be taken for granted that **consumers** will be willing to change their habits in using washing machines, washer-dryers and tumble dryers.

Nevertheless, on this latter point, **tumble dryers work slightly differently**. These appliances are already equipped with filters and consumers have to clean those filters to ensure that the machine will continue to function properly. Although it's difficult to assess how actually consumers are disposing of what collected by the filter of tumble dryers, it must be acknowledged that those appliances already catch the fibers and consumers are somehow cleaning those filters.

More detailed information is provided under part II and III.

[6] Francesca De Falco, Mariacristina Cocca, Maurizio Avella, Richard C. Thompson. Microfiber Release to Water, Via Laundering, and to Air, via Everyday Use: A Comparison between Polyester Clothing with Differing Textile Parameters. Environmental Science & Technology, 2020; DOI: 10.1021/acs.est.9b06892

[7] Kapp KJ, Miller RZ (2020) Electric clothes dryers: An underestimated source of microfiber pollution. PLoS ONE 15(10): e0239165. https://doi.org/10.1371/journal.pone.023916

PART II

Washing machines

1. Findings from APPLiA Literature Review

Facing a plethora of scientific data and worrying extrapolations on the overall emission of microplastic from textiles, APPLiA commissioned the Research Institutes of Sweden (RISE) to carry out a **literature review on the microplastic emission from textile laundry**.

RISE is a research institute, which has a lot of experience in the field of textile research and microplastics. It has been involved in specific research projects on microplastics (e.g. MinShed) and has conducted research for the Swedish government on the efficiency of microplastic filtering devices.

The main purpose of this critical review was to collect and compare current published data on the release of microplastic/microfibers (MP/MF) from textiles during laundry.

Among others, the main findings highlighted in the study are the following:

- The values for MF shedding are **higher for the experiments performed at lab-scale, compared to evaluations made with consumers washing their laundry,** indicating a harsher treatment. Therefore, it is also concluded that lab-scale results should not be translated or extrapolated to simulate full scale domestic washing machines.
- After carefully defining the experimental conditions, the finding estimates roughly 20-500 mg of MFs per kg polyester textiles being released during 2nd – 5th wash cycles.
- **Textiles show significantly higher fiber shedding during initial washes**, which then stabilizes after a certain amount of wash cycles. Thus, it is not advisable to extrapolate fiber shedding from studies that only performed 1 or 2 washing cycles.
- In order to estimate the overall emission of microfibers released to the water, RISE calculated a bottom-up scenario and reported it in the literature review (available in the annex of the study).
- More research on a broader range of textiles and also on the long-term behaviour of the textiles is needed in order to gain a more reliable statistical base.

2. Requirements for an effective regulation

It may at first seem appealing to require mandatory filters or any other microfiber retention solution (as from hereon called "filter") for washing machines and washer-dryers. However, a filter is a complex component whose installation, operation and maintenance have to be ensured to properly function as intended.

A requirement for filters without the necessary further specifications has a significant risk to miss its intended effect and may give a false political comfort.

In addition, the functionality of filters when in real use in consumers' homes depends on the maintenance by the user, which cannot be enforced by the authorities. The performance needs to be secured by evaluating the performance of the appliances when these are initially placed on the market. If legal

requirements are introduced for washing machines and/or washer-dryers, the essential **technical requirements** should be considered in advance.

Herewith some examples:

1. A filtration **performance requirement** needs to be established for washing machines containing filters specifying the filtration efficiency in % and a lower limit for the particle size to be removed. For the calculation of the filtration efficiency a standardised reference shall be used. In particular, a size of the fibre to be tackled shall be identified, without preventing consumers from being able to use powder detergent.
2. A **measurement methodology** enabling the measurement of the retention efficacy of technological solutions needs to be established.
3. Specifications relating to possible **handling of the filters by consumers** (e.g. whether it would be possible to reuse the filter after cleaning it by consumer and therefore, having the risk that the microfibers are rinsed under running water in the sink, or if it shall be required that filters are disposed of after replacing them).
4. **Potential bypass functionality** of filters needs to be considered if legislation is created.
5. Whether the washing machine and/or washer-dryer can **operate without the filter cartridge** installed in a filter unit.
6. Regardless of the type of solution, the regulation should be **technologically neutral** and shall specify that any solution shall meet the same criteria.
7. **Energy efficiency, duration and other performance requirements** for washing machines and/or washer-dryer will potentially need to be revised. Particularly concerning the ecodesign legislation program duration requirements (EU)2019/2023.
8. Following the above, it should also be noted that currently **ecodesign requirements** apply to washing machines and/or washer-dryers and the introduction of requirements for microplastics filters shall not have the effect that efficient appliance models are phased out from the market.

Additionally, we invite policy makers to consider the outcomes of the webinar organised by APPLiA in January 2021, where different views and opinions were exchanged by different stakeholders and by French legislators.

PART III

Tumble Dryers

1. Airborne emission

While microfibers have been found in oceans and in our seas, recent studies have shown that these fibres were also found in glaciers and other remote areas[8]. Based on the papers and studies so far developed, it seems that the release of microfibers occurs also through air, e.g. when **wearing the clothes** (De Falco, 2020[6]) or when simply drying them outside on our balconies, or from other sources.

In the above-mentioned study (De Falco, 2020), it is suggested that the release of microfibers from wearing the textiles may exceed the release from washing/drying. The latter was also considered in the initial draft report prepared by the consultant running the study on Unintentional release of microplastic on behalf of DG Environment.

APPLiA is monitoring and is assessing in particular what happens during the drying of clothes.

We know that the **washing of laundry** is mainly done using washing machines, especially since modern machines also offer hand wash programmes for delicate textiles. For many it is evident that the microfibers end up in the wastewater (95-98% of total microplastics end up[9]), which is evacuated in the drain, thereby ending up in the sewer and, eventually, in the ocean.

On the other hand, not much is known about the **drying of textiles.**

Not all laundry is dried in a tumble dryer, especially in southern countries and during the summer in other parts of Europe, where **line drying** may be the favourite option given the climate and as it saves energy. In this case the wind will release the loose microfibers in the air and will eventually be washed away by rain, also ending up in the soil and the oceans.

APPLiA has developed a **qualitative assessment of the mass flow** that can help visualise the user phase of the textile (see in the ANNEX).

2. Drying using an appliance

Using a tumble dryer, the release process of microfibers becomes more complex.

Only few studies are available, mainly only on **air-vented dryers** where microplastics could be released in the environment. In this case, fibres are actively blown out of the textiles by the air flow of the drying process. Before releasing the airflow into the environment, it passes through a lint filter.

In the case of **condensing dryers** (including heat pump dryers) the drying air flow runs in a closed circle passing a filter in the appliance. This principle mostly avoids a release of microfibers into the environment although a tumble dryer is not hermetically sealed, which means that a proportion of microfibers can eventually escape from the tumble dryer.

[8] Ambrosini R, Azzoni RS, Pittino F, Diolaiuti G, Franzetti A, Parolini M. First evidence of microplastic contamination in the supraglacial debris of an alpine glacier. Environ Pollut. 2019 Oct;253:297-301. doi: 10.1016/j.envpol.2019.07.005. Epub 2019 Jul 9. PMID: 31323612.

[9] Carr et al., 2016; Magnusson and Norén, 2014; Murphy et al., 2016; Talvitie et al., 2017

Furthermore, lint filters with which tumble dryers are already equipped are needed to collect most of the fibres to avoid the airways of the appliance from getting blocked and lowering the performance of the dryer or causing it to stop operating. Such filters need to be cleaned by the user. Filter cleaning can be done in different ways:

- *dry cleaning* (removing the fluff by hand) and disposing of the fluff in the waste bin. In this case the fluff will be burnt in municipal waste incinerators, which eliminates the microfibers or will end up in a landfill.
- and/or *wet cleaning* (rinsing the filter with streaming water). In this second case microfibers will end up in the sewer.

Furthermore, more and more **heat pump tumble dryers** are placed on the market which are equipped with additional filters, protecting the condenser from clogging. Different **filter technologies** are available:

- *filters which can be dry and/or wet cleaned. Wet cleaning leads to residues ending up in waste water though*; and/or
- *filters with automatic rinsing function* where the residues end up in the sewer.

Filters of tumble dryers have the potential to remove loose fibers from textiles, reducing emission during wearing and the washing cycle. The **TextileMission deliverables**[10] outlined how dryers contribute to stopping the fibres from entering the marine environment. As the graph below shows, the overall emission of 10 washing cycles is lower if each load has undertaken drying cycles. Thus, the dryers already 'remove' the fibres that would otherwise be released during the next washing cycle (see figure 2 below).

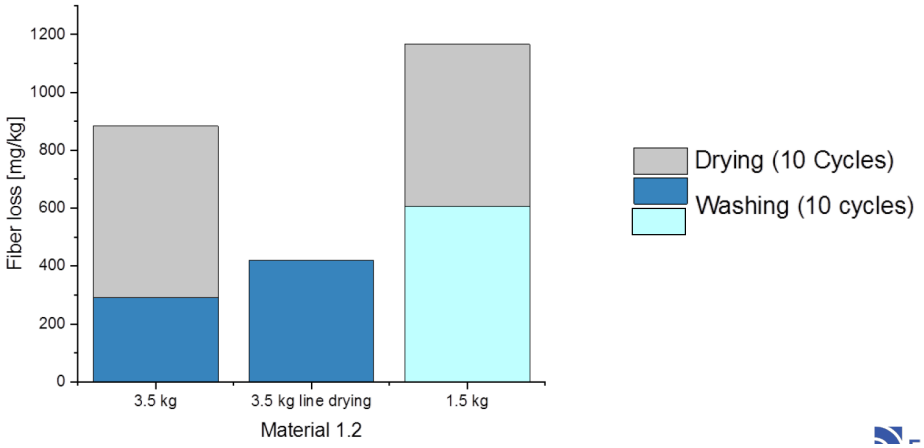

Figure 2. *Textile Microplastics. Addressing the Challenges for Politics, Industry and Research 10th December 2019 | Prof. Dr. habil. Rabe | Prof. Bendt*

It can be concluded that, differently from other types of drying process, tumble dryers may provide a positive contribution to the cause of tackling microplastics. The use of a machine which dries clothes

[10] Reducing textile microplastics – findings from an interdisciplinary research project. Ellen Bendt, Maike Rabe (Niederrhein University of Applied Sciences); Stefan Stolte, Ya-Qi Zhang (TU Dresden); Robert Klauer (VAUDE); Caroline Kraas (WWF Germany); Taher Alrajoula, Alexander Kolberg (BSI e.V.), 2021 https://textilemission.bsi-sport.de/fileadmin/assets/Abschlussdokument-2021/TextileMission_Report_English_Online.pdf

instead of drying by hanging them on a line outside, provides a controlled environment where it is possible to **catch loose microfibers before they are dispersed in the external environment** (water or air).

PART IV

Conclusion

Conclusion and APPLiA recommendations

As a conclusion, APPLiA would like to provide the following recommendations with regard to release of microfibers during washing/drying:

- Further **research on both washing and airborne emission** is required and APPLiA is committed to contribute to the extent possible to the research and improve literature on this topic. We invite policy makers to consider the findings of our literature review for the washing process, and our qualitative mass flow analysis of microplastics release (see Annex).
- Acting only at the use phase without introducing **upstream policies** regarding the textile materials (such as EPR schemes) will not result in solving the issue of microplastics release.
- Establishing legislation without properly setting all the technical requirements has the risk to result in an **ineffective and potentially counterproductive regulation** and eventually microplastics will keep being released into the environment. Introducing new devices on all appliances will come at an economic and resource expense so it needs to be ensured that such devices will function as intended and reduce the amount of fibers released when appliances are used by consumers in practice.
- Requirements should drive technological development aiming at reducing the emission of microplastics to the environment rather than requiring specific single technology (i.e. a mechanical filter). It is the reason why we believe that if there should be a performance requirement, it must be **technologically neutral** to allow further technological development. Any retention or elimination method that serves the purpose should be in scope for the reduction of microfiber release into the environment.
- The difference between the washing and the drying process should be considered. **Tumble dryers can provide a positive contribution to reduce microplastics release into the environment**.
- When considering a policy measure, all the impacts need to be thoroughly investigated in order to assess side effects on **costs, energy and water consumption, duration and overall environmental impact** of introducing new devices newly placed on the market and prevent **inappropriate consumer behaviour**.
- Following the above, it should also be noted that currently **ecodesign requirements** apply to washing machines, washer-dryer, and tumble dryers; a requirement for microplastics rentation shall not phase out the most energy efficient appliances from the market.
- The impact assessment shall carry out an **environmental assessment** outlining the balance between health risk, environmental hazard and climate impacts
- Any requirement must be **measurable**, **verifiable,** and **enforceable**, ensuring the level playing field and that the foreseen environmental protection is taking place in reality.

- Lastly a **standardised measurement method to evaluate the retention performance is needed, whereby a differentiation in the method for washing machines and tumble dryers shall be made.** The manufacturers of home appliances are willing to collaborate with the European Union to develop such methods, e.g. at CENELEC level. For more information on how we are contributing please consult our webpage.

APPLiA remains committed to engage in future discussions to find efficient solutions to tackle the release of microplastics during washing and drying.

APPLiA - Home Appliance Europe represents home appliance manufacturers from across Europe. By promoting innovative, sustainable policies and solutions for EU homes, APPLiA has helped build the sector into an economic powerhouse, with an annual turnover of EUR 53 billion, investing over EUR 1.6 billion in R&D activities and creating nearly 1 million jobs.

ANNEX - Qualitative assessment

Qualitative mass flow analysis of microplastics release

Intro

This flowchart made by APPLiA focuses on a **qualitative assessment** done on the user phase of the textile.

The phases of *production* and *disposal* were not considered, as APPLiA does not have the correct expertise to assess these two technical processes. Finally, it shall be acknowledged that when the textile enters the user phase, it is already carrying a large amount of microparticles, including microplastics.

The **flowchart** is available on our webpage and is freely downloadable.