SEPARATION AND IDENTIFICATION OF MICROFIBERS IN THE WASTEWATERS OF TEXTILE FINISHING PROCESS

Separation and Identification of Microfibers in the Wastewaters of Textile Finishing Process

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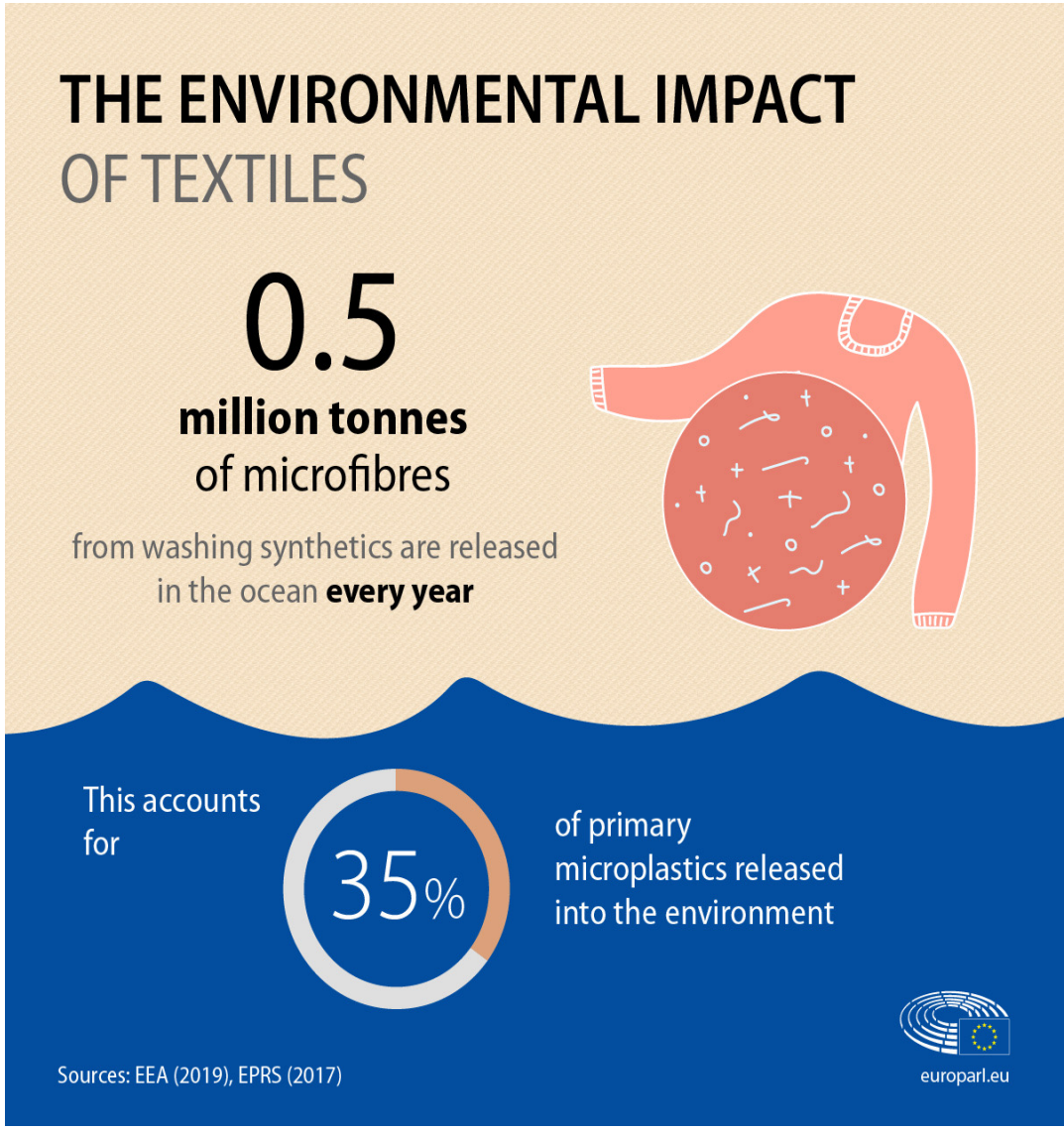
INTRODUCTION

PLASTICS

- The most common type of **marine litter,** comprising **60% to 80%** of all, is plastic particles.
- The worldwide output of thermoplastics is predicted to reach 445,250 million metric tons in 2025.
- There are numerous industries that use plastic, with the **textile industry** being among the **most prevalent**.
- Worldwide textile fiber production reached 108 million metric tons in 2020, with **synthetic fibers** accounting for about **62%** of the total.
- While **60%** of the synthetic fibers produced are **buried** or **disposed** of as waste after use, it can take up to **100 years** for these fibers to **decompose** and **disappear** in nature.

MICROPLASTICS

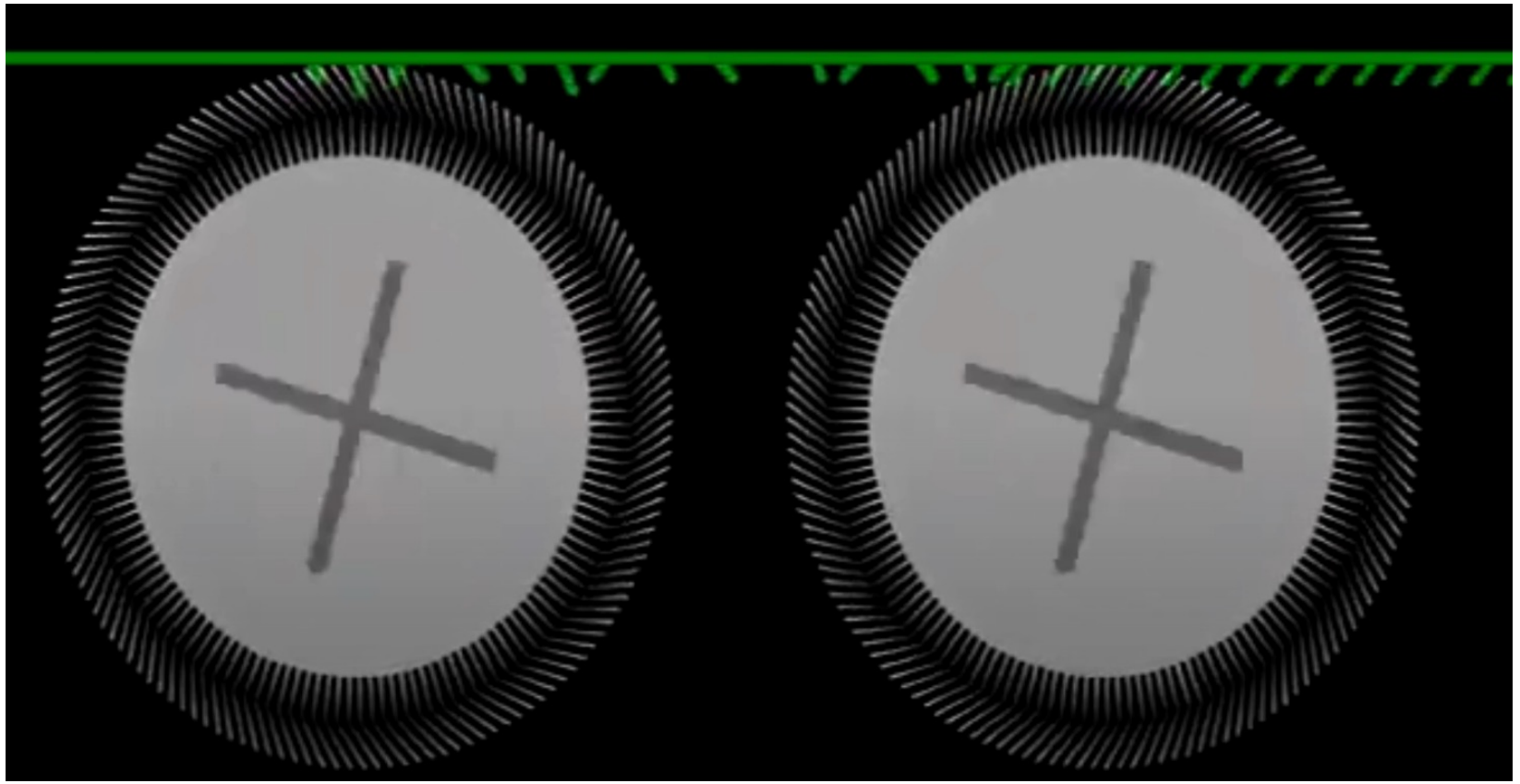
- **Microplastics** are particles smaller than **1 mm** according to ISO/TR 21960 and particles up to **5 mm** in size according to scientific literature.
- There are two different categories of microplastic sources: **primary** and **secondary.**
- **Fibers** and **fragments** make up to **80%** of all MPs in the seas.
- Textile microfibers are a subset of microplastics.
- **85-99%** of MFs can be removed during the wastewater treatment process.
- MPs released into nature can accumulate in marine species and be transported to **higher trophic levels**.



IMPACTS OF MICROPLASTICS

- SEAFOOD
- SALT
- MILK
- HONEY
- DRINKING WATER
- AIR

BIANCALANI



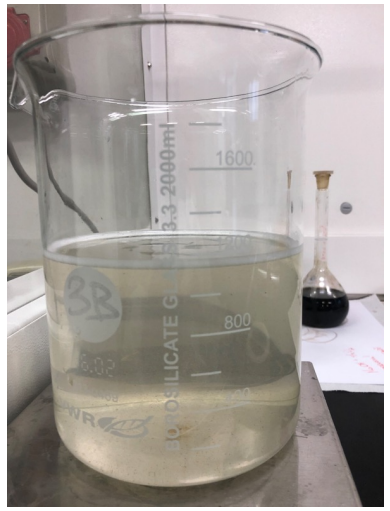
- Biancalani is a textile finishing machine which contains a raising procedure that involves removing a fiber layer from the fabric’s surface to give it a hairy surface or generate a pile.
- However, the fibers emerging from this finishing machine remove with the wastewater and lead to the formation of a high concentration of MFs in the wastewater.

AIM OF THE STUDY

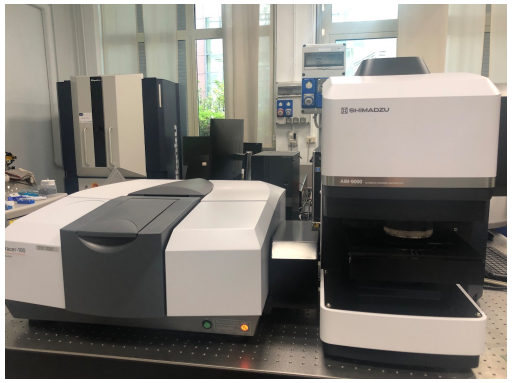
The aim of this study is to determine and separate the MFs released from the textile finishing machine used to give a soft touch to the fabric in a textile factory.

EXPERIMENTAL STUDY

1. Pretreatment and filtration of wastewater: The 15% hydrogen peroxide was used to pretreat the 1 L samples for 5 days at 25 °C. After pretreatment, the filtration process was done with a 0.7 µm pore-size glass fiber filter, then dried overnight at 40 °C.

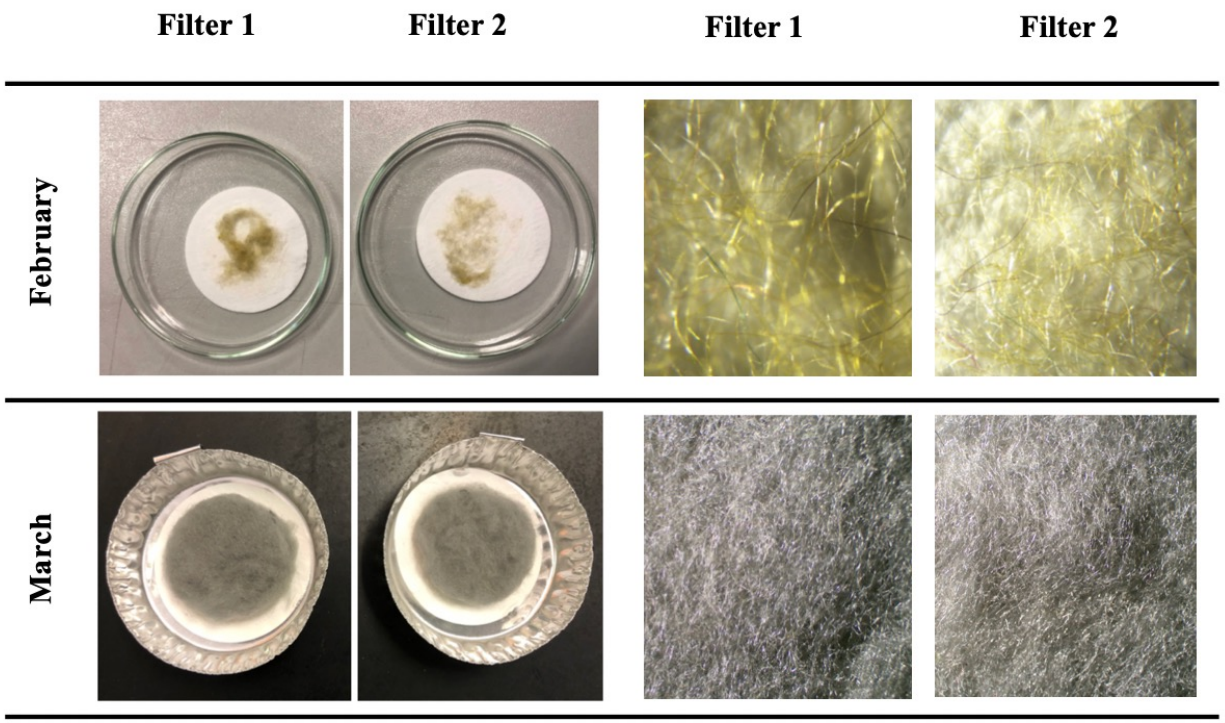


2. Analysis of Microfibers: After filtration and drying, each filter was weighed with a precision balance. An optical microscope was used to examine the GF filters. The microfibers were characterized using a Micro-FTIR at 700–4000 cm^{-1}.



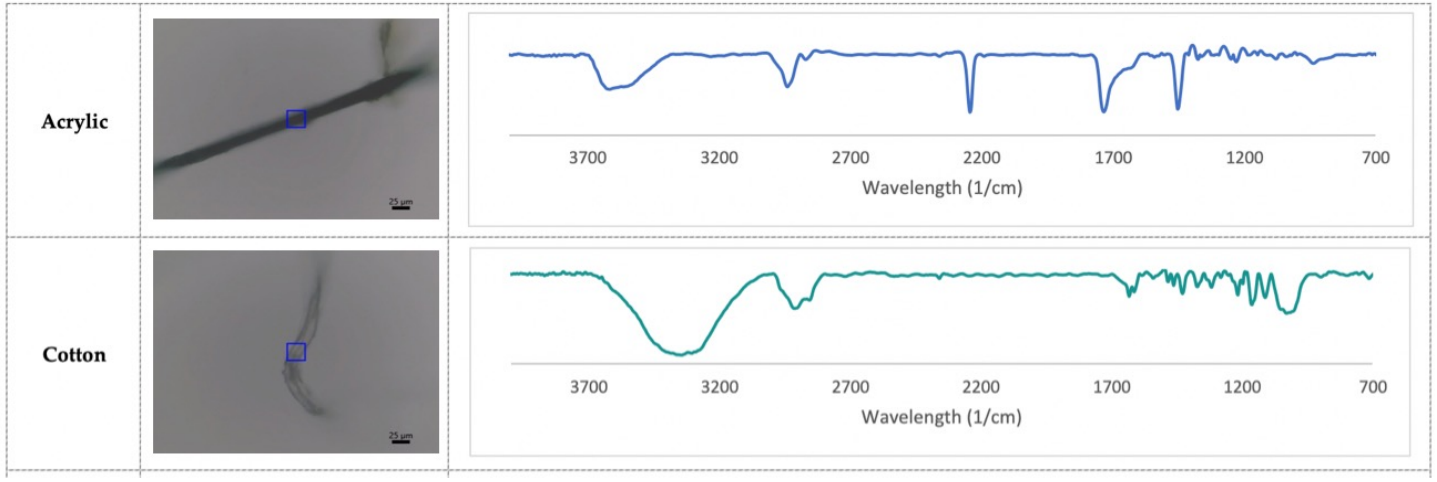
RESULTS

MICROSCOPE



- When the MFs filtered from the February and March wastewater samples were weighed, it was discovered that the samples contained 0.058 g/L and 0.25 g/L MFs, respectively.

μFTIR



CONCLUSION

- This study aims to separate and identify MFs in wastewater resulting from a finishing process.
- Wastewater samples from the factory were processed with 15% H_2O_2 at 25 °C for 5 days, and then the treated wastewater was filtered.
- MFs accumulated on the filter were examined both by microscope and micro-FTIR and their weights were determined.
- Examining the 1 L wastewater samples collected on various days reveals how much MFs (0.058 - 0.25 g/L) get into the wastewater from even just one finishing machine.
- This preliminary study on MF identification and separation will provide guidance to plan and improve the process of separating MFs from the wastewater of textile companies in the future.

THANK YOU!