



Health risk assessment in plastic recycling and product development processes

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Aim of the task

Health and safety risks within the recycling chain were mapped with emission measurements and exposure assessments for the plastic recycling processes and products.

Analytical methods

Detection of volatile organic compounds (VOCs) in working environment and analysis of volatile contaminations in recycled plastic using thermodesorption-GC-MS method (Figure 1).

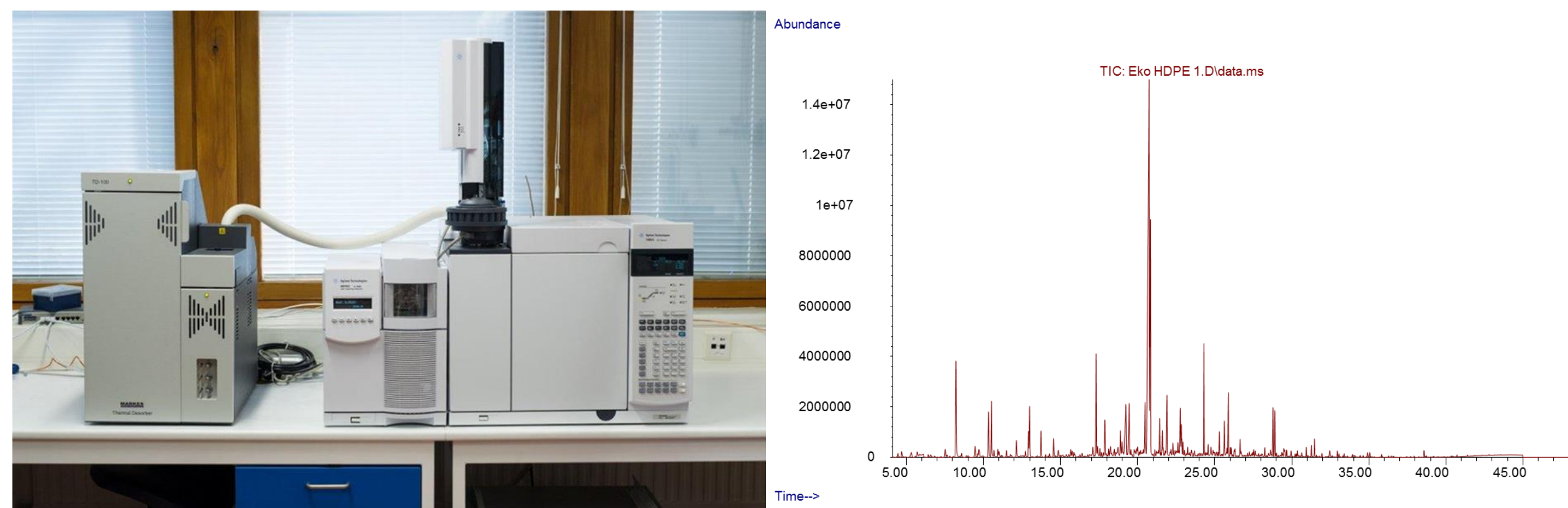


Figure 1. Left: Thermodesorption-Gas Chromatography-Mass Spectrometer (TD-GC-MS). Right: Volatile profile of rHDPE with chemical contaminations.

Detection of microbial contamination and endotoxins in working environment using an ELISA-based assay (Figure 2).



Figure 2. Left: ELISA-based assay for detection of endotoxins. Right: Results of the ELISA assay.

Detection of aerosols, microbes and particles from indoor air in working environment during the recycling processes and plastic/composite manufacturing (Figures 3 and 4).

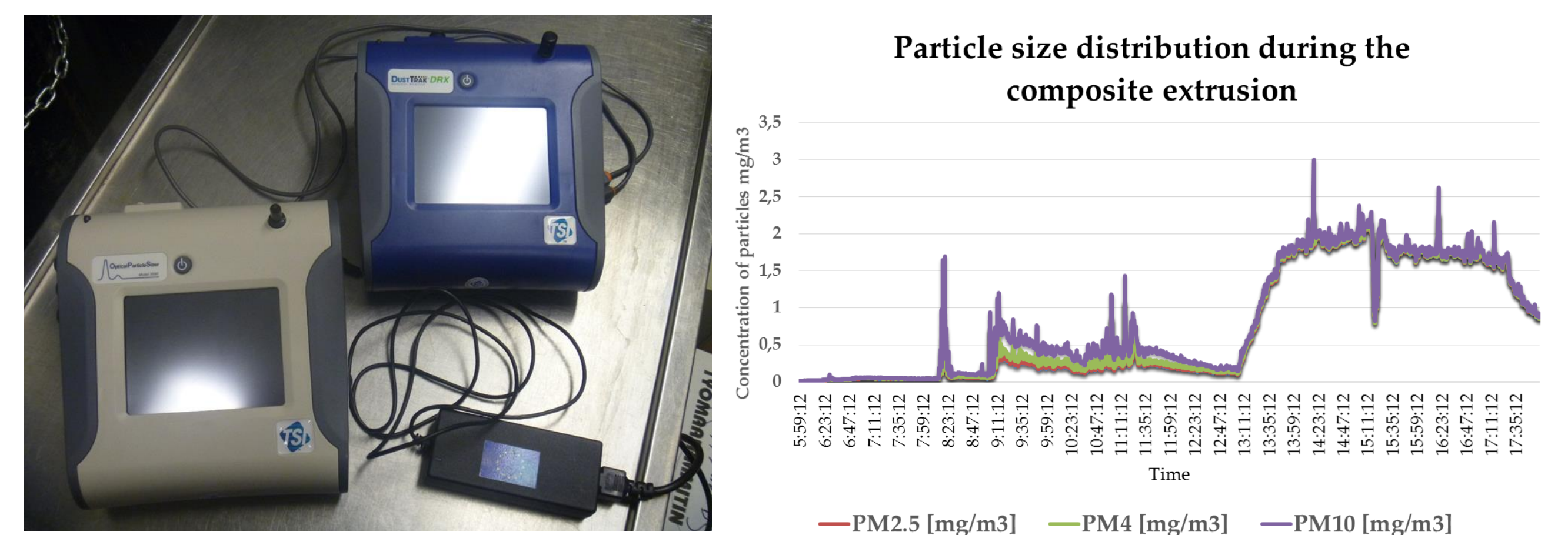


Figure 3. Left: Optical Particle Sizer and Dust Trak DRX aerosol monitor. Right: Particle size distribution and concentration in indoor air at the working area during the composite manufacturing.

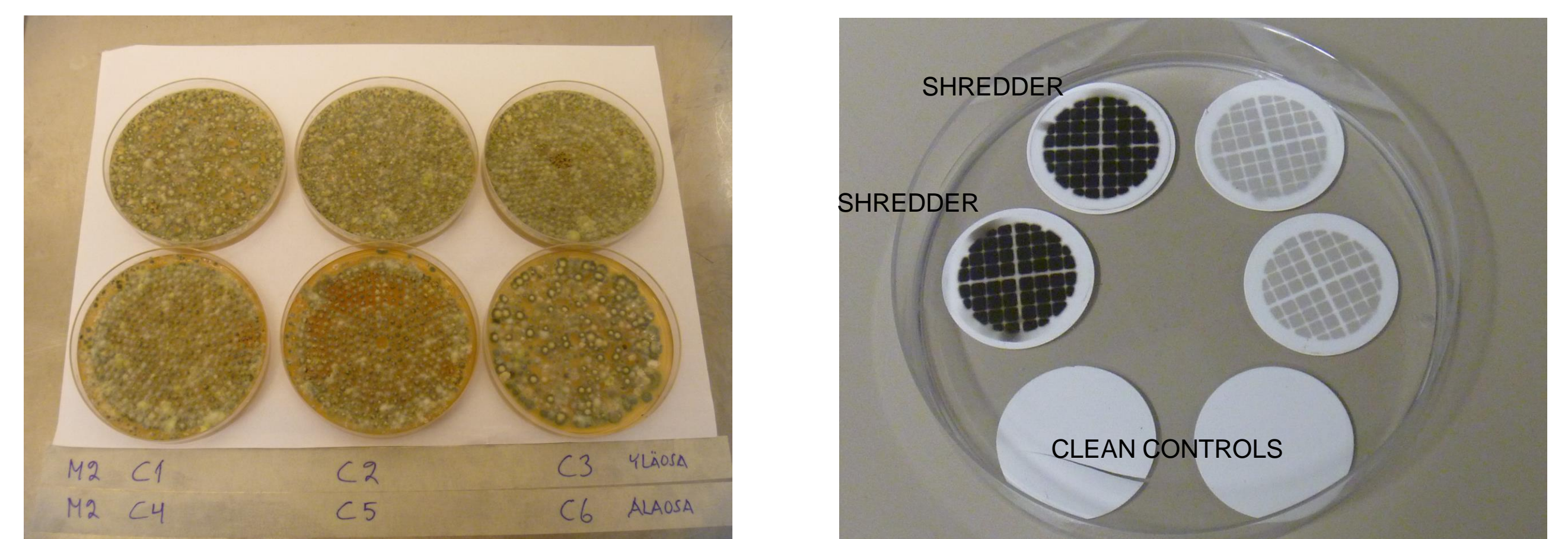


Figure 4. Cultured microbe samples (left picture) and filtered particle samples (right picture) from indoor air next to the plastic waste shredder.

Results and implementation

Recycled waste materials may contain hazardous additives and biological or chemical contaminants which may affect the safe use of these materials.

Contaminants can cause a variety of negative human health effects if hazardous substances enter into the recycling processes and accumulate in the products.

Waste management and recycling workers may be exposed to hazardous substances when sorting and processing unsafe plastic waste materials.

When microbes, particles or VOC and SVOC emissions were detected during the plastic recycling processes, occupational health and safety measures were applied to decrease them.

