



The ENTeR project: additional pilot case “Textile waste coming from medical devices concerning COVID-19 emergency”

The COVID-19 pandemic has revealed the urgent need for large number of disposable textile medical devices both for the healthcare workers (surgical gowns, medical masks, respirators, surgical drapes, gloves) as well as for the citizens (protective face masks). The dramatic increase in their use is leading to significant increase of waste production.

The additional pilot case of the ENTeR project “Textile waste coming from medical devices concerning COVID-19 emergency” aims to define a potential new way for medical textile waste management in order to favour their recycling and /or reuse. The aim is to study the medical textile waste materials (material, chemicals, biological contamination), to define current procedures for medical textile waste management, to study removal of chemicals and biological decontamination, to evaluate economic and environmental benefits of it’s reuse / recycling and to create guidelines and best practices for a new and more sustainable waste management.

Waste from pandemic: a challenge for new solutions

In general, the single-use PPE and other medical devices shall be discarded in a way to avoid the risk of spreading infection. This hospital-grade waste is discarded according to the strict standard infection control precautions protocols. The most effective way how to dispose the infectious waste to prevent spreading of disease is incineration at high temperatures (more than 1000 °C) at hazardous incineration plants. The waste decontaminated e.g. by microwave decontamination or autoclaving as well as the disposed face masks from public may be burned in municipal waste incineration plant. Landfilling of the healthcare waste is prohibited in Czech Republic.

During a pandemic the demand for disposing of waste PPE is increasing. According to World Health Organisation (WHO), in 2018 only 15% of hospital waste material around the world was considered dangerous (10% infectious and 5% hazardous because of its chemical or radioactive properties). (1) During a pandemic, in all countries we can see an exponential growth in the infectious waste generated by hospitals or care homes; for example, the official data from Spain indicate the growth of the healthcare waste from the two worst-affected regions – Madrid and Catalonia – by 300 and 350%, respectively. (1)

COVID-19 emergency is changing the waste stream due to the large use of protective medical devices (in particular medical masks) by citizens with a waste that is generated outside the usual medical structures and that doesn’t follow the usual disposal procedure but is collected with the urban waste.

Speaking about the respiratory protection for public, in Czech Republic we are obliged from 19th March 2020 to wear respiratory protection equipment (masks, respirators) in public places. Due to the lack of the disposable products on a market, people in Czech Republic started to sew the face masks from textile fabrics. These textile masks can be washed and used repeatedly and, thus, the waste increase can be expected much lower than in other countries where the textile masks are not used so often. But – apart of that – some amount of disposable face masks is also used by people in Czech Republic and is discarded as a municipal waste.

Around the world, the high amount of single-use face masks or gloves is littering the streets, shopping carts, parking lots, sea, beaches or green parks, however it is not so often in Czech Republic (with respect to lower consumption by public because of the use of reusable textile masks). The discarded masks and plastic gloves used during the COVID-19 pandemic may threaten the wildlife. This causes the risks not only for human health, but also for environment. If only 11 percent of used masks are not properly disposed of, 10 million of them will end up in the sea, rivers or beaches which will especially threaten fish and turtles in the Mediterranean Sea, according to the World Wide Fund for Nature (WWF). (2) The disposable gloves or surgical masks are made from the polymeric materials which are not biodegradable. The bright colours of latex gloves and masks can be mistaken as food by birds, turtles and other marine mammals. (3)



Photo by Claudio Schwarz on Unsplash

This situation is definitely a new challenge for the waste management. Replacing the single-use PPE with reusable (decontaminated between uses) or recyclable would reduce amount of waste. Around the world, the experts are studying the possibilities of re-use or recycling of PPE. Bellow, we can mention several examples of the sustainable innovations or studies.

The Sterimelt technology, developer by the Thermal Compaction Group (TCG) from Wales, is able to process a wide range of uncontaminated polypropylene nonwoven disposable PPEs of any colour; the resulting polypropylene blocks can be than resold to the plastic industry to be recycled. In the UK, the number of hospitals have recently purchased their own Sterimelt recycling units to carry out the in-house recycling of their disposed PPEs. (4)

In Korea, the Korea Advanced Institute of Science and Technology (KAIST) research team has developed a nano-filter which can be used as part of the face masks. The common single-use face masks are made from three or four layers of non-woven textiles fixed together. The inner

layer is a common non-woven fabric, which is mainly used to absorb the moisture and moisture released by the wearer; the outer layer is a waterproof non-woven fabric, which is mainly used to isolate the liquid sprayed by the patient; the filter layer in the middle serves as a barrier against germs; for the middle layer, also the nano-fiber membrane may be used increasing the filtering efficiency thanks to its ability to filter very small particles. These common face masks are not reusable and shall be discarded after use. The face masks with the nano-filter developed by KAIST are reusable and can be hand washed more than 20 times; the inner filter can also be replaced. (5)

The researchers from TU Delft (Netherlands) in collaboration with Van Straten Medical B.V. developed a new way of sterilizing used respiratory masks and testing their quality. The researchers developed a specific protocol for transport and disinfection: the used masks are collected and tightly closed by institutions in a dedicated garbage bags and disinfected with alcohol in a container; containers are collected by a special transport. In a disinfection room, each mask is individually inspected and marked by staff in special protective clothing. Then, the masks are laminated in a bag a sterilised at 121 degrees for 15 minutes. Each mask can be recycled up to five times. The researchers have also tested the flow and filtering parameters of masks after the procedure; the results are promising. The repeated use of the masks can be an alternative for the shortage of mouth masks and increasing demand of hospitals and care institutions during the coronavirus crisis. (6)

In the US, the car manufacturer Ford is producing the reusable gowns made from air bags materials which can be washed up to 50 times. The University of Nebraska is testing decontamination of medical masks using the ultraviolet light, to prolong their life span and therefore, to reduce waste. (7)

- (1) <https://www.euractiv.com/section/coronavirus/news/coronavirus-waste-burn-it-or-dump-it/>
- (2) https://www.idnes.cz/zpravy/zahranicni/koronavirus-ve-svete-italie-rouska-gumove-rukavice-neporadek-na-ulici.A200526_064107_zahranicni_chtl
- (3) <https://www.independent.co.uk/environment/coronavirus-face-mask-bird-death-recycle-environment-conservation-a9475341.html>
- (4) <https://www.indexnonwovens.com/en/news/moving-recycling-into-the-operating-room-133>
- (5) <https://www.medica-tradefair.com/en/News/News from the Editors/Recyclable face masks to better protect against corona>
- (6) <https://www.youtube.com/watch?v=PumeDykuJt0>
- (7) <https://www.dw.com/en/coronavirus-plastic-waste-polluting-the-environment/a-53216807>