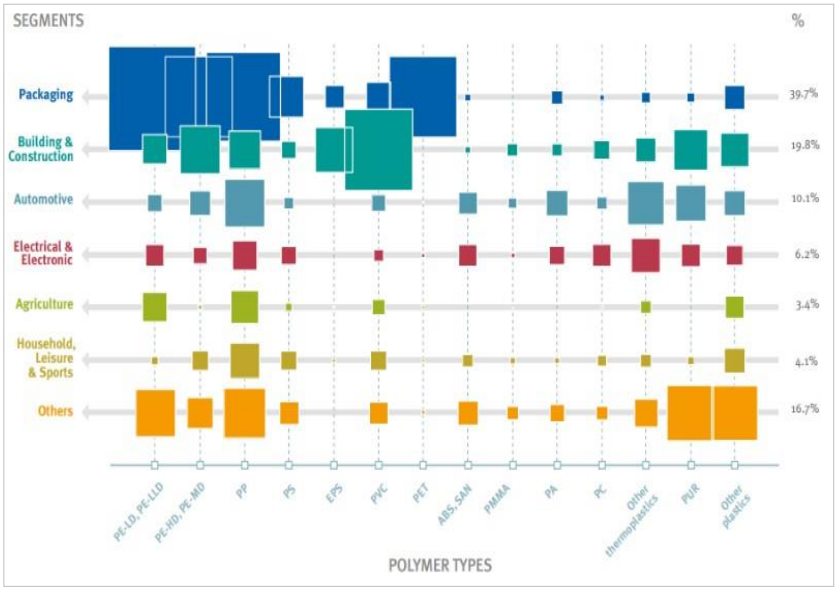
Environmental impact of recycled plastics

Humans realise that the release of plastic particles and its ingredients are released into the environment substantially. In the meantime we do not know what the impact may be. More and more scientists are studying this. This factsheet summarises on what is currently known about the impact of **recycled plastic products** to the environment.

Most plastics that are used for recycling are polyolefins (PE and PP types). They are by far mostly used. On top of that, all other bulk plastics do not float (unless they contain air like foams or bottles), so that plastics that are extracted from water typically have a high Polyolefine content as well. A substantial part of all these plastics is used for packaging applications. Typically, these materials are therefore thin-walled (e.g. films) and often developed for food-contact purposes.



Micro-particles

Usually, nano- and micro particles (NMP's) are considered as plastics that are smaller than 5 mm. The particles originate from textiles and from the surface of all kinds of plastic products. Although polyolefins are typically inert to most materials, it is unknown yet whether these particles could be harmful. Products from recycled plastics will reduce the release of microparticles:

- By recycling plastics, it is avoided that the material is released and broken down into the environment.
- Typically, products from recyclates are massive, with much less surface per volume. The average thickness of a foil is 0,02 mm, while for a construction material from recycled plastics this is approximately 30 mm. The total surface area that is exposed to the environment is therefore reduced up to 2000 times.

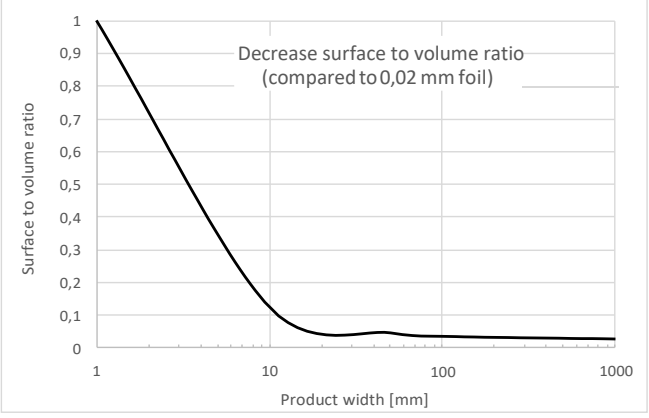


Figure 2: Surface to volume ratio decreases with increasing product width.

Leaching of inorganic molecules

Another potential hazard is that chemicals are released when the material dwells in a wet environment for a longer period of time. This process is called leaching. It was researched that leaching concentrations in a plastics dump area were not significantly higher than in the reference area, and well below threshold limits [2]. The extreme low values were also found by tests performed by DEKRA on recycled plastic products for many types of metal (according to EN 71-3: 2013 +A1: 2014).

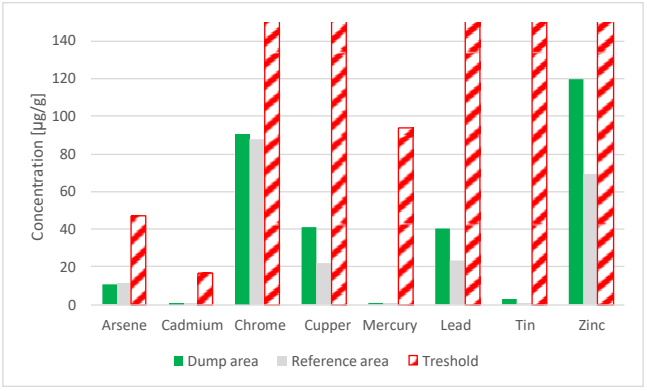


Figure 3: Inorganic leaching was not found in earlier studies.

By exposing a large surface area of a recycled PE/PP blend to seawater in combination with UV, rainwater and a drying stage (Q-UV tests), all at 50°C during 120 days, it was concluded that tiny amounts of only Natrium, Magnesium, Aluminium and Silicium were released [5]. This is not harmful.

Leaching of organic molecules

Research on the release of different Volatile Organic Components (Oxigonated VOC, Chlorinated VOC, Alkanes, Alkenes, Monoaromatics, Acrylonitriles) during processing of recycled ABS, PS, PE, PP, PVC, PA and PC in a factory showed comforting results. It was concluded that no health risks occur when processing PP and PE materials [4], which is in line with conditions in regular (virgin) plastics processing plants. For recycled plastics the presence of different types of ftalates was measured [3]. As far as measurable, determined values were far beyond threshold values according to REACH XVII. In aforementioned study [5] DSC and FTIR tests were done to identify organic traces in Q-UV treated material. However no harmful traces were found.

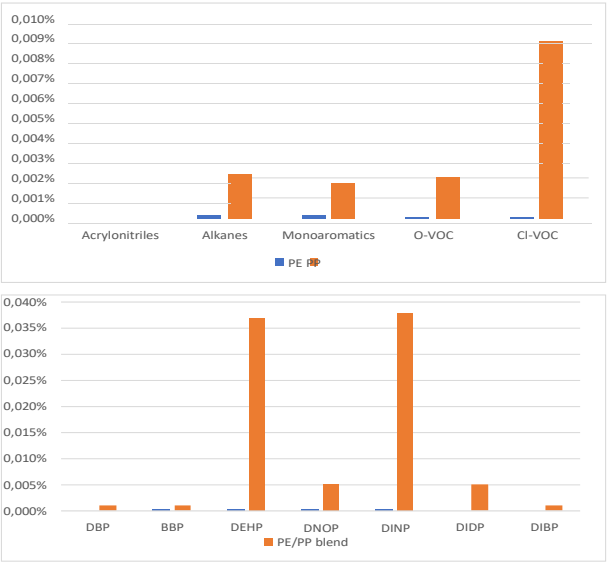


Figure 4: Presence of organic components is minimal.

Conclusions

Based on what is currently known, the impact of polyolefine waste products on the environment is reduced when they are recycled. Hardly any potentially harmful traces can be measured, and if any, they are far below legislative threshold values. The leakage of theses traces into the environment is further reduced due to an increase in surface to volume ratio in recycled products, as is also the case for the release of micro particles in thicker walled products.

Sources

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