



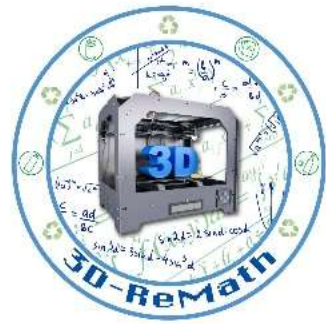
Project code:
2019-1-EL01-KA201-062914

Erasmus+ Call: 2019 - KA2 -



3D printing technology aims students understanding maths and recycling procedure

Intellectual Output 4 (IO4) - Curricula for Recycling technologies & filament



Curricula 3: Recycling technologies



**Waste Management
Laboratory**

**DEPARTMENT OF ENVIRONMENT
UNIVERSITY OF THE AEGEAN**



Erasmus+

This project is funded by the European Union.



Presentation Structure

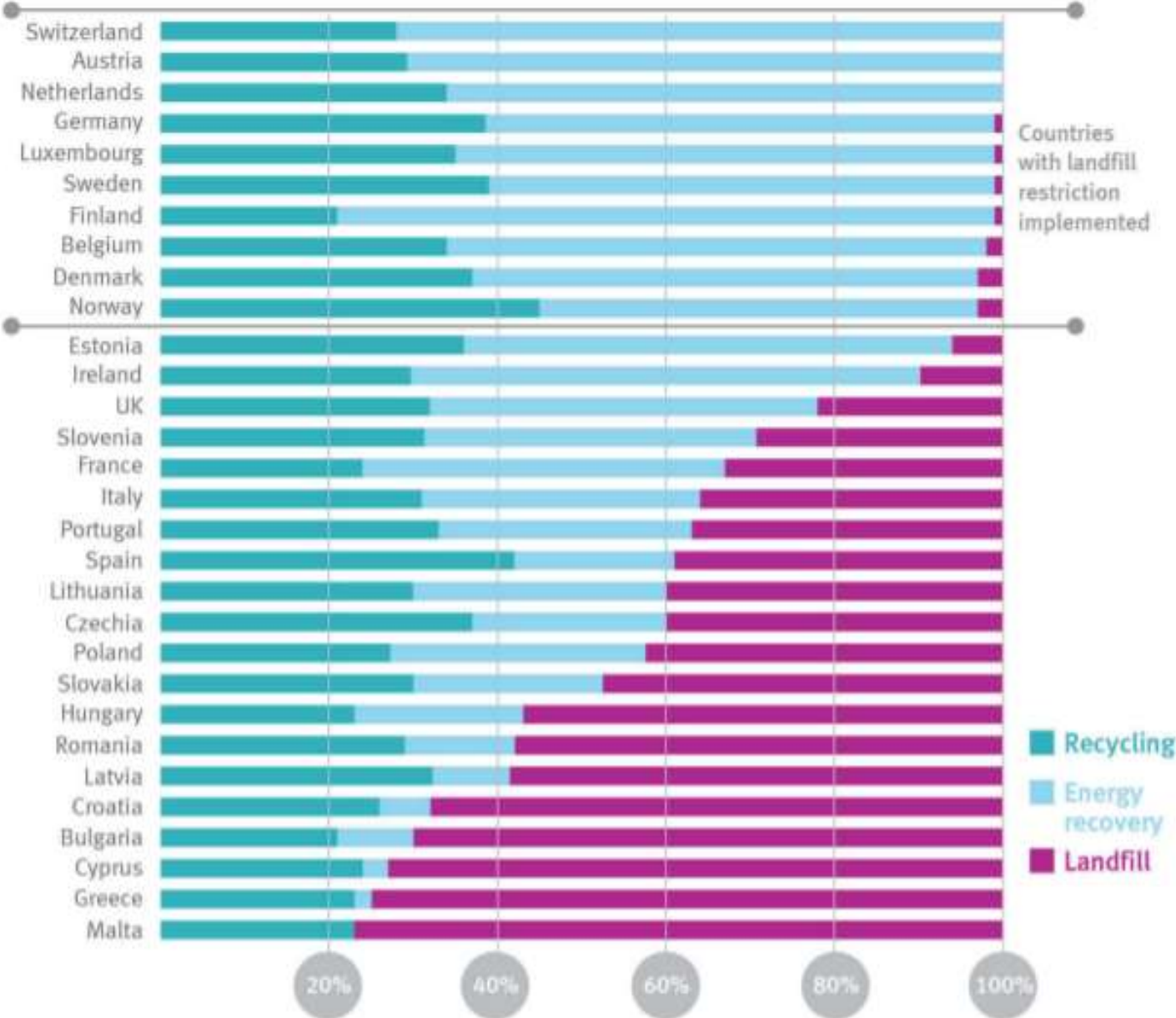
- a) Collection of waste
- b) What is happening after the truck
- c) Recycling Technologies
- d) Mechanical recycling
- e) How does it work?
- f) Mechanical recycling step by step
- g) What are the benefits?
- h) Challenges



The total volume of recyclable materials collected from the beginning of this year until end of September, 2019.



Plastic post consumer waste rates of recycling, energy recovery and landfill per country in 2018



Collection of recyclables

❖ Door to door collection



❖ Municipal collection



<https://greenbestpractice.jrc.ec.europa.eu/node/50>

<https://www.municipalwasteurope.eu/>

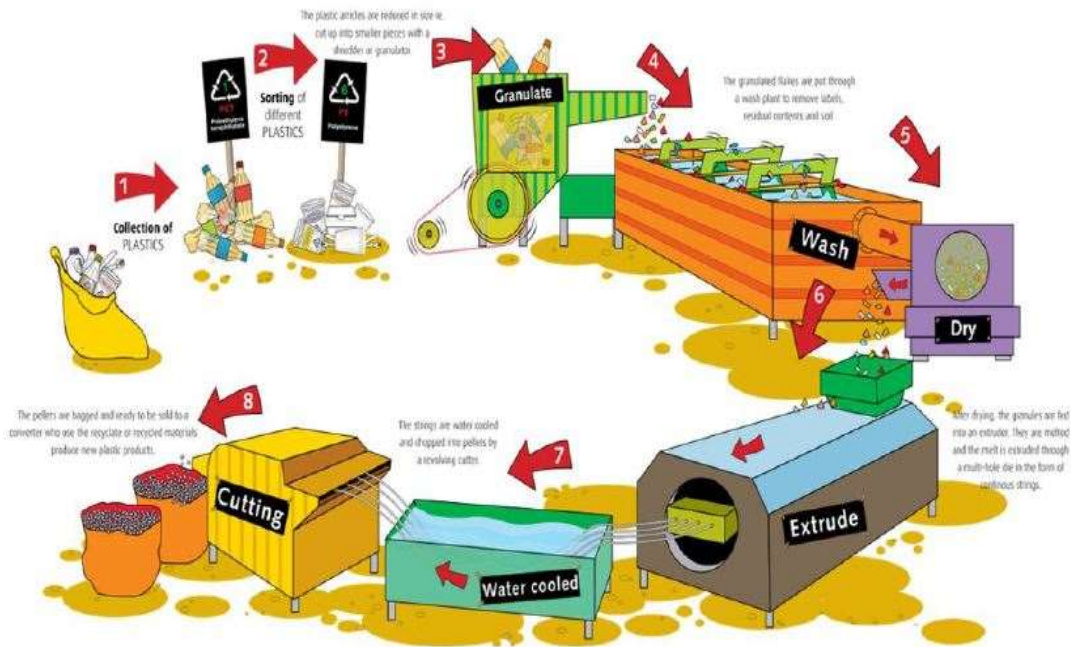
What is happening after the truck?





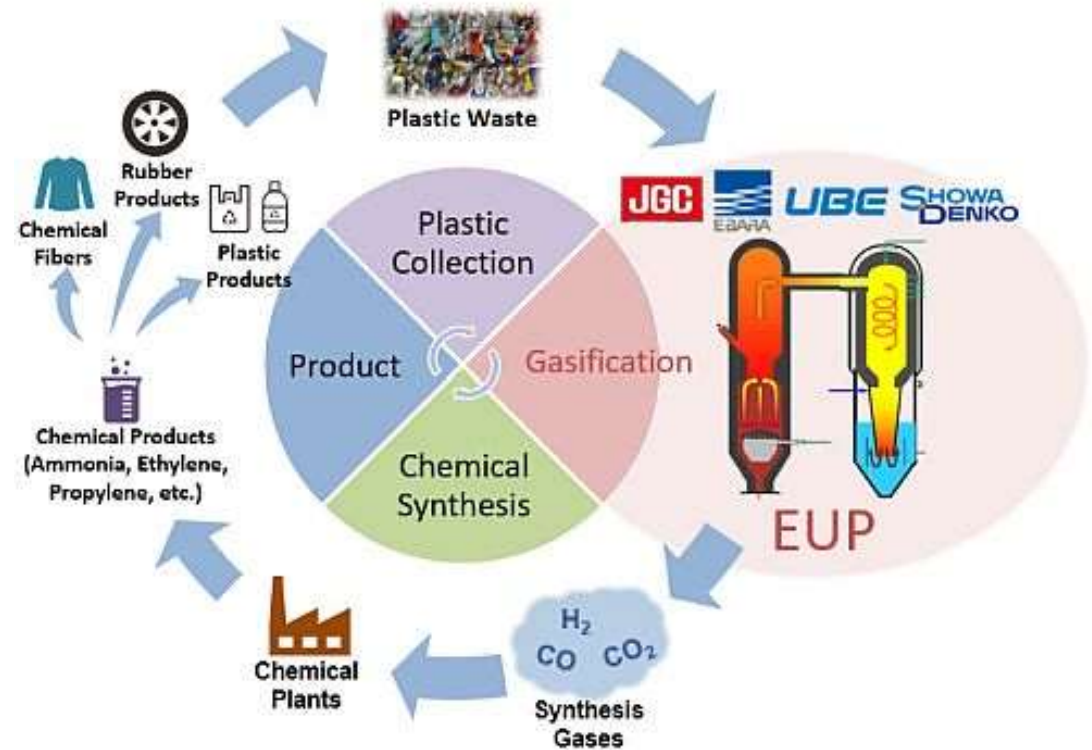
Recycling Technologies

- Mechanical recycling



Source: GRID Arendal, 2019

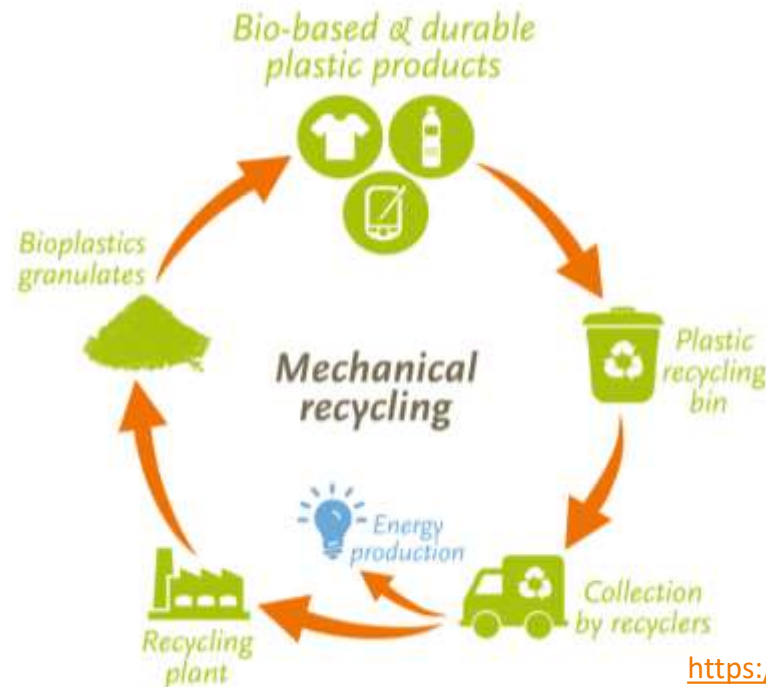
- Chemical recycling



<https://scoopasia.com/jgc-ebara-environmental-plant-ube-industries-showa-denko-start-study-on-collaboration-for-promotion-of-gasification-chemical-recycling-of-plastic-waste/>

Mechanical recycling

Mechanical recycling of plastics refers to the process of **transforming** plastic waste into secondary raw material or products without significantly change in the chemical structure of the material.

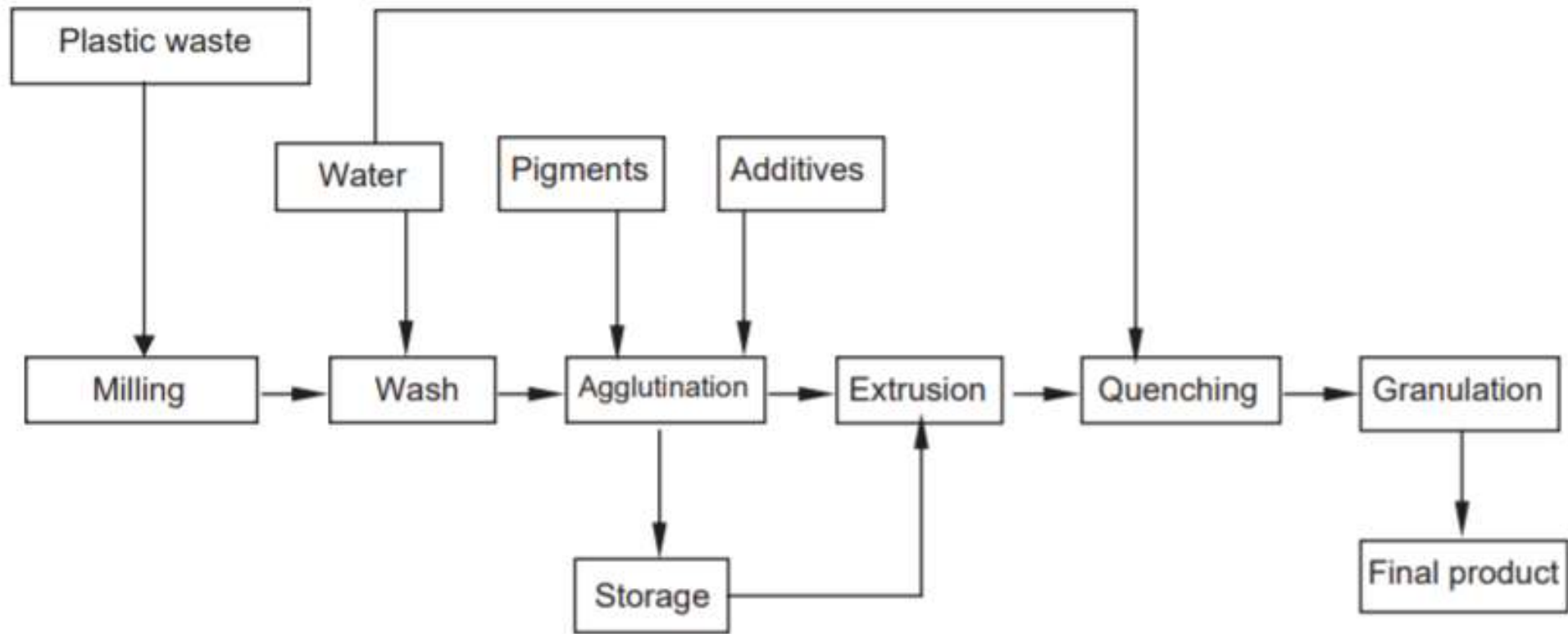


<https://www.european-bioplastics.org/bioplastics/waste-management/recycling/>



How does mechanical recycling work?

Mechanical recycling step by step



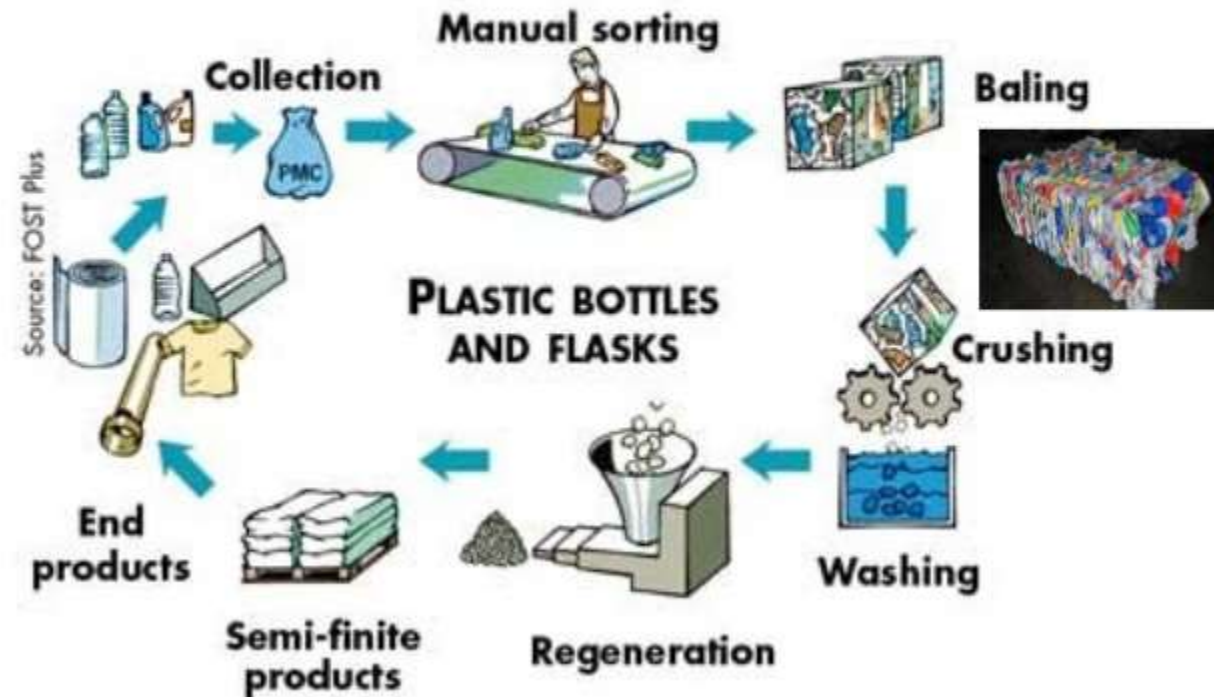
Source: Aznar, M. et.al, 2006

Stages of mechanical recycling

- Sorting
- Cutting/shredding
- Contaminant separation
- Floating
- Milling
- Washing and drying
- Chemical washing
- Agglutination
- Extrusion
- Quenching

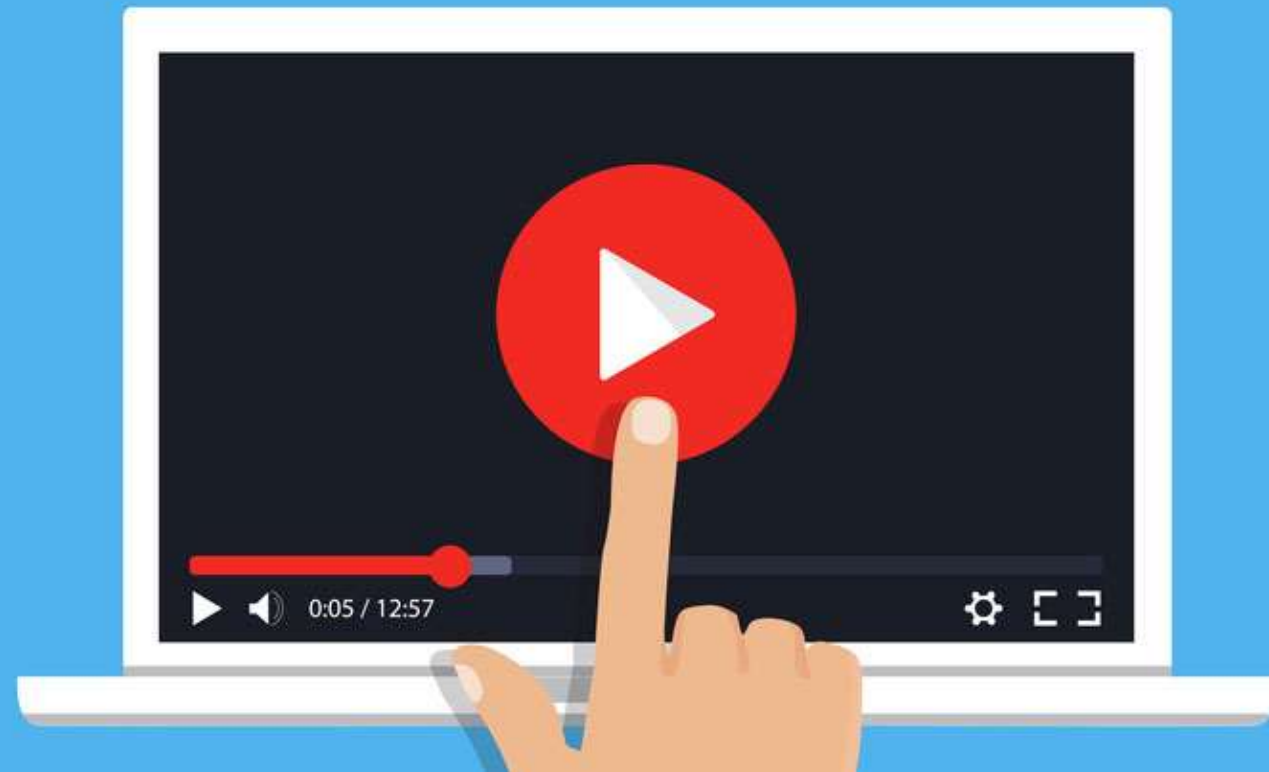
Recycling of HDPE, LDPE and PP

Secondary recycling (or) Mechanical recycling





KEEP
CALM
AND
It's Video
Time



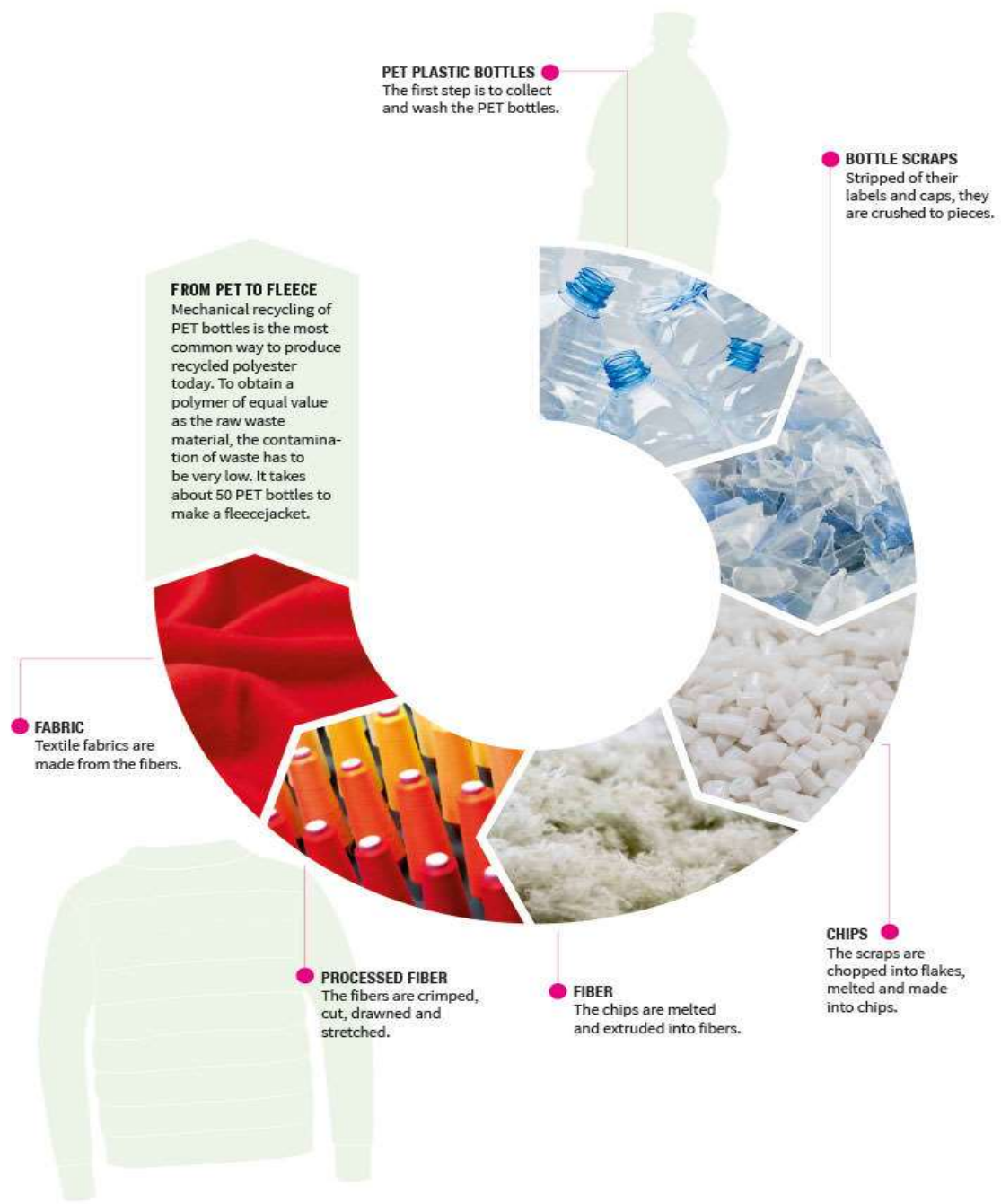
<https://www.youtube.com/watch?v=zyF9Mxlcltw>

&

[https://www.youtube.com/watch?v=zO3jFKiqmHo
&feature=emb_logo](https://www.youtube.com/watch?v=zO3jFKiqmHo&feature=emb_logo)



Mechanical recycling is used for the recovery of pre-consumer (post-industrial) material as well as for post-consumer plastic waste. It is currently the most used method of recycling post-consumer plastic waste in Europe



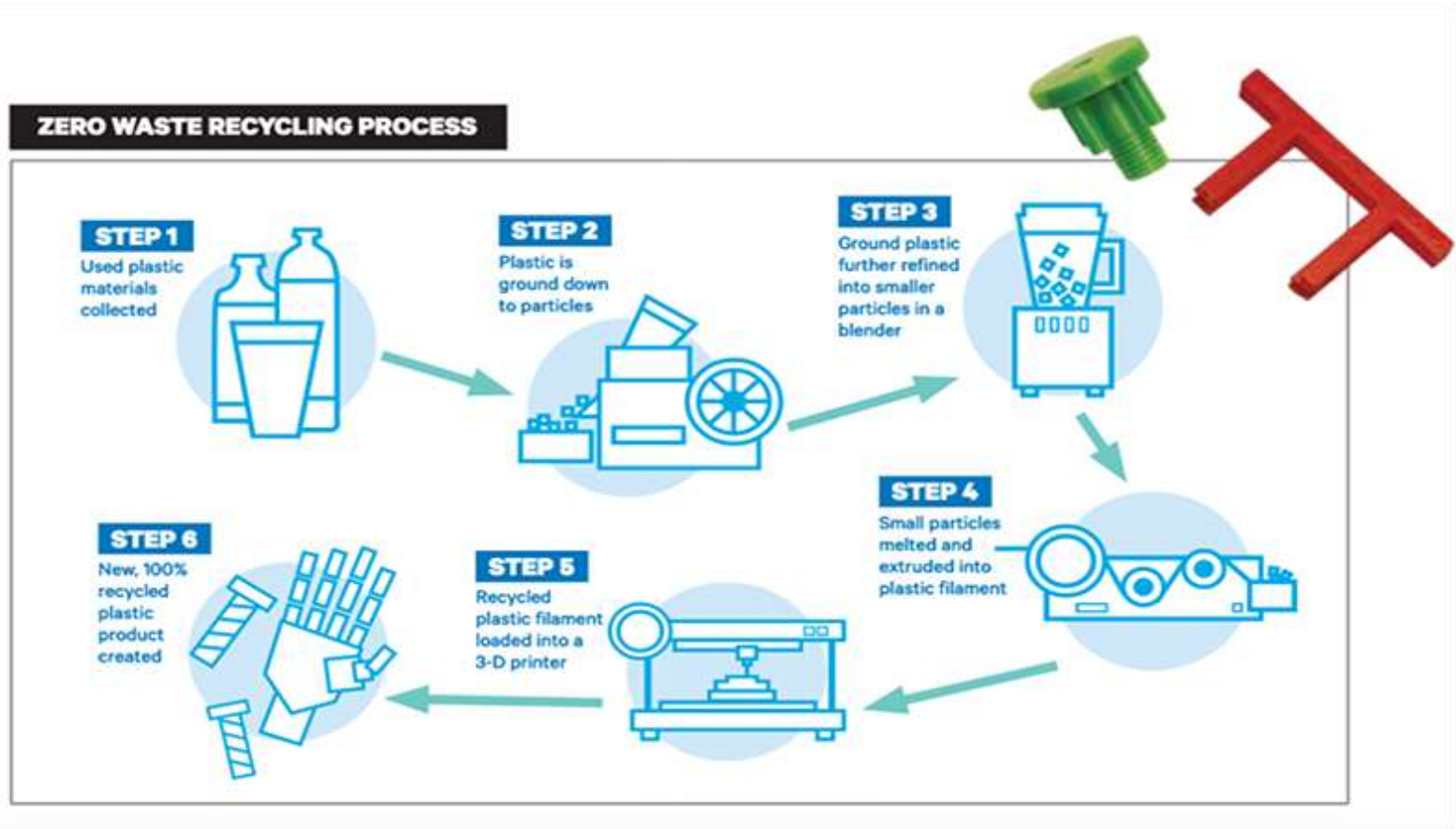


What are the benefits of mechanical recycling?

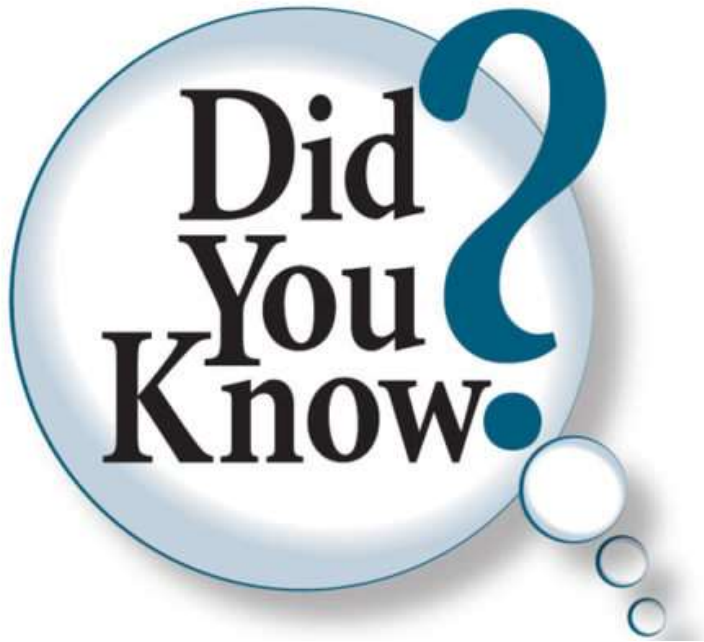


- Conservation of natural resources and energy → production of virgin plastic
- Reduction of plastic waste that ends up in landfills
- Increase the efficiency of new plastic products → the reduction of greenhouse gas emissions and energy savings in recycled versus virgin content product manufacturing

Plastic to filament



<https://www.duq.edu/news/featured-stories/zero-waste-recycling-solutions>



The proper identification of the materials is essential for achieving a maximized purity of recyclates

Challenges



- The quality of plastics collected is usually inconsistent and contaminated → downcycling into lower value items
- Many plastic recycling companies have insufficient standardization, industrialization and operational excellence in their operations
- Only a fraction of ‘recyclable’ used plastic is recycled into the products for which they were originally produced → colorants, additives, and fillers used during plastic production, contamination from consumer use, and yield losses during the recycling process

Challenges



- Recycling process shortens the length of polymer chains, resulting in decrease their quality and, eventually, the need of disposal of the material
- Lower-grade plastic waste, including post-consumer and multi-layered plastic packaging is particularly difficult to separate and treat

Challenges

- Plastic recyclers tend to specialize in one or a limited number of plastic types such as HDPE, LDPE and PP etc.
- In order to guarantee product quality and quantity, plastic recyclers seek plastic waste bales with specific criteria. These often need to be sourced from various countries, which can be challenging due to the different collection schemes and sales methods for plastic waste



References

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Thank you for your time!