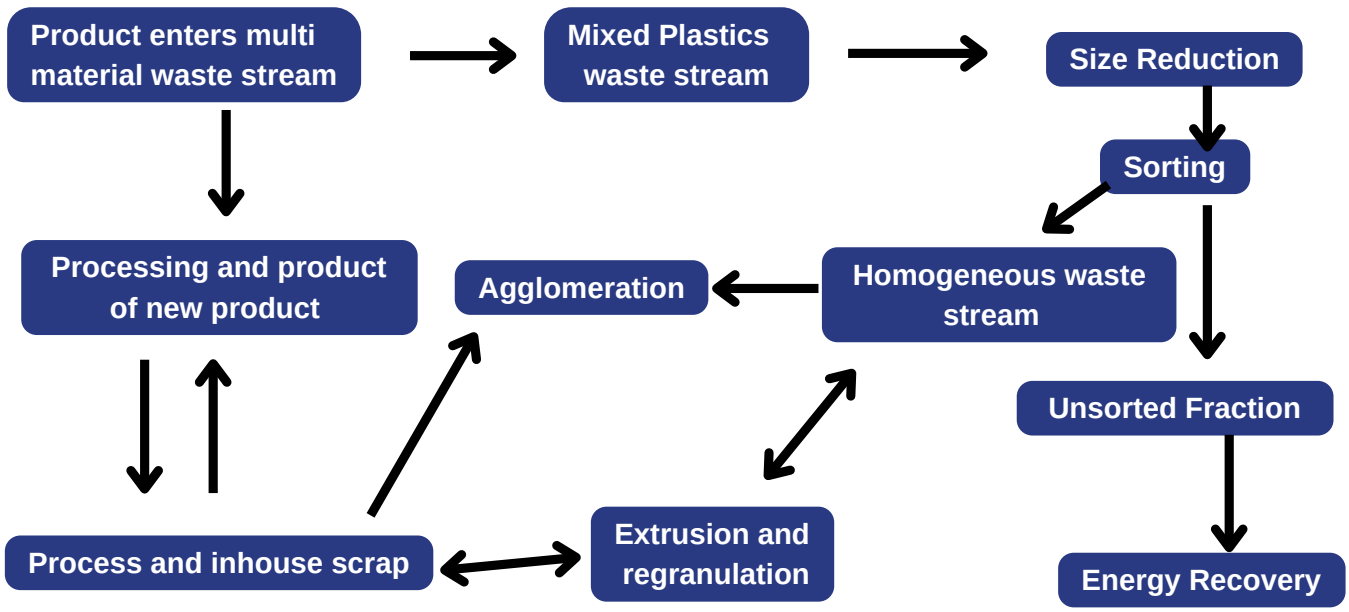
PLASTIC RECYCLING AND EXTENDED PRODUCER RESPONSIBILITY

Manisha Mani
Packaging technologist

Plastics are materials derived from petrochemicals and gases that have substantial benefits in terms of their low weight, durability, and lower cost relative to many other material types. Molding and processing of plastics help produce various products for daily use like furniture, and household items of which major contribution is towards plastics as a packaging material. The majority of the plastic waste generated either end up in landfills or is further processed using a recycling system. This plastic waste may enter water bodies affecting the flora and fauna using microplastics and can have a drastic ecological impact on wildlife, wildlife habitat, and humans. This indicates that plastic production and use are not sustainable throughout the value chain of the natural environment.

Plastic recycling started late in the 1970s, although many recycling units are working towards the production of sustainable plastics with advanced technologies of, sorting and reprocessing recyclable plastics a need for consumer responsibility towards strategic use and disposal of plastics is still felt. As the threat of more regulation from the environmental movement grew, the plastics industry responded with lobbying to preserve their business interests. An increase in globalization has led to cheaper and more effective means of the recycling process with increased awareness. As the difficulty in global trading became eminent, local recyclers and processing took birth. Extended producer responsibility schemes have been proposed which would tax plastic producers to subsidize recyclers.



WASTE PROCESS
CYCLE OF PLASTIC

Plastic waste is categorized as Industrial scrap and Post-Consumer waste. Plastic waste majorly consists of thermoplastic polymers which can be remelted and reprocessed again and usually enter the recycling stream. Thermosets are a little difficult to recycle though there are recent advancements in the mechanical recycling of thermoset polymers to produce a composite with binding agents. Polyolefins like HDPE (19.8%), LDPE (13.9%), PP (19.1%), PET (10.8%) constitute to nearly 50% of the total plastic waste. Multilayer structure with fibers (15.7%) is more difficult to recycle hence it is mainly recycled into composites.

Collection and sorting are the main crucial steps in plastic waste recycling. Plastic waste after collection is sent to a material recovery facility where this waste is cleaned and sorted to form bales for further processing after its sale to the convertors. Density separation, electrostatic separation, and sensor-based separation are used to segregate plastic waste distinguishing it on parameters like density, color, and material of construction.

In closed-loop, or primary recycling, used plastic is endlessly recycled back into new items of the same quality and sort and it contributes to a circular economy. Closed-loop recycling is usually adopted in case of recycling PET bottles again into PET bottles where material identification and sorting are much easier. In open-loop recycling the plastic. In open-loop recycling, also known as secondary recycling, or downcycling, the quality of the plastic is reduced each time it is recycled, so that the material is not recycled indefinitely and eventually becomes waste. It is the most common type of plastic recycling. The recycling of PET bottles into fleece or other fibers is a common example and accounts for the majority of PET recycling. In feedstock recycling, also called chemical recycling or tertiary recycling, polymers are reduced to their chemical building blocks (monomers), which can then be polymerized back into fresh plastics. In theory, this allows for near-infinite recycling; as impurities, additives, dyes, and chemical defects are completely removed with each cycle. Thermal depolymerization and chemical depolymerization are the two types of Feedstock recycling. Plastic that does not make a systematic way to the recycling chain is used to produce synthetic fuels using means of incineration and pyrolysis process. Life-cycle analysis shows that plastic-to-fuel can displace the production of fossil fuels and result in lower net greenhouse gas emissions (~15% reduction).

Extended Producer Responsibility (EPR) is key to solving this problem and transitioning towards a circular economy. It supports waste management and incentivizes changes in packaging design. It is a strategy to add all of the environmental costs associated with a product throughout the product life cycle to the market price of that product. EPR is based on the principle that manufacturers (usually brand owners) have the greatest control over product design and marketing and have the greatest ability and responsibility to reduce toxicity and waste. EPR may take the form of reuse, buyback, or recycling program. EPR may be implemented in many forms of which the rules can be mandatory, negotiated or voluntary. Circular plastics economy has remained elusive despite decades of concerted advocacy and public outcry. Despite all efforts voluntary contribution from industry is highly encouraged to drive the circular plastic economy.