Bag to Bag Polyethylene Recycling

Plastic Tour of 2022
by Joe Ackerman.

Bottle-to-Bottle. Bag-to-Bag. It is shorthand for recycling plastic without downcycling. Post-consumer low density polyethylene film (LDPE) is a dastardly product that is very hard to recycle, mostly due to its thickness (something 50 microns thick is hard to shred), its elasticity (it gets stretched in the shredder), and its level of contamination: a bag may weigh 2 grams but have 4 grams of grease and goo on it. For this reason, LDPE film has a negative value: you have to pay someone to process it, so paying someone to take it off your hands. In Austria, the price is about 200 euros per tonne. This is what opens the system to fraud and environmental crime: the money can be pocketed and the "problem plastic" is shipped to some landfill off-shore and it conveniently disappears.

Dominik Schneeberger, the manager of Walter Kunststoffe in Wels, Austria, knows how to recycle Bag-to-Bag successfully. He can spot high contamination in a bale from across the yard and this comes from being in the business for 20 years.

He says aluminum foil/PE layered bags are the major culprit and the worst bales come from the Netherlands, whereas the best come from his neighbour, LAVU, where the majority is separated at source rather than being co-mingled with other materials. Shredding a bale of PE film takes a lot of time and consumes high amounts of energy.

The huge round jaws of the shredder were still hot to the touch, even though the machine had been off for five hours due to routine service work. Shredding is the first step in processing the annual capacity of 35,000 tonnes of films at the recycling plant in Wels.

A second shredding is needed to produce the desired small flake. Then comes washing to remove the huge range of contaminants. The keys, stones and euros that the magnet did not remove collect at the bottom of the water tank (yes, that's what happened to your car keys!). The operation here recycles 90% of their water via settling and flocculation. A centrifuge as well as a filter press are needed to remove the water before a drying stage. From here it is piped into the heater/extruder which reduces it to a viscous liquid. Even though it begins to melt at 100 C, the in-line 100 micron filter operates better with hotter liquid, so standard temperature for PE is 200 C.

The contaminants are continually removed from the filter and consist of other plastics (PET, PVC) and organic material such as hair, wood etc. None of these things are identifiable because they are encased in grey plastic. The fate of this is the waste to energy furnaces, producing electricity. Glues and label inks produce gases at this temperature and a degassing step is needed also. Additions of colour or plasticizers can be made at this stage through ports in the extruder pipe.

As the spaghetti-like plastic comes out of the extruder, a cutter trims it to produce small pellets. These are simultaneously carried away and cooled by water and collected in a bin after which they are dried and bagged.

Today, the plant was producing black pellets that would supply a facility making garbage bags, buckets and construction film. Due to the increasing ecological awareness of the EU, Walter Kunststoffe will continue to be an important company in the future and will also be ready for upcoming projects.

http://www.walter-kunststoffe.com/content/en/start/

Dr Joe Ackerman manages the Sustainability in Action Facility at the University of Manitoba. He was sponsored by the Department of Biosystems Engineering to travel to Europe in 2022 to learn what technologies are being used to recycle plastic.