

Post consumer bottles recycling technologies

Claudio Celata
Managing Director, Assocomplast

THE basic criteria of the so-called sustainable development more and more address the plastic and rubber processors to use raw materials from renewable sources and to reuse scrap that otherwise could have polluting effects, imposing complex disposal operations.

In particular post consumer bottles recycling is a technology commonly used, especially in Europe and in the United States. In the last years made in Italy has improved assuring applications in several sectors. The survey that follows includes some recent innovations introduced by three Italian manufacturers specialized in this field.

Some families of co-rotating extruders developed by ICMA SAN GIORGIO are specifically devoted to the recycling process. These machines can be used in several fields, from the recovery of single polymers (PA, PET etc.) to that of miscellaneous post-consumer materials. The extruders are both traditional and with high torque - the latter to transmit a higher torque than the first but with the same size and speed that result in production benefits in particular with materials requiring a high specific energy.

A line (the sixth) for the recovery of packaging PP sheet has been recently supplied to an important German converter. The line features gravimetric dosing units, special automatic belt sreenchanger, underwater cutting system and screw geometry optimized for this specific application. In addition, a particular venting system has been designed to grant a high compound quality, resulting in a key element in this kind of application.

A plant based on a 70-mm HT extruder for the recovery of flakes from PET bottles has also been recently supplied to an Italian processor. As is well known, PET tends to absorb humidity and it has to be dried and dehumidified before being processed, otherwise a hydrolysis process starts at the plant inlet.

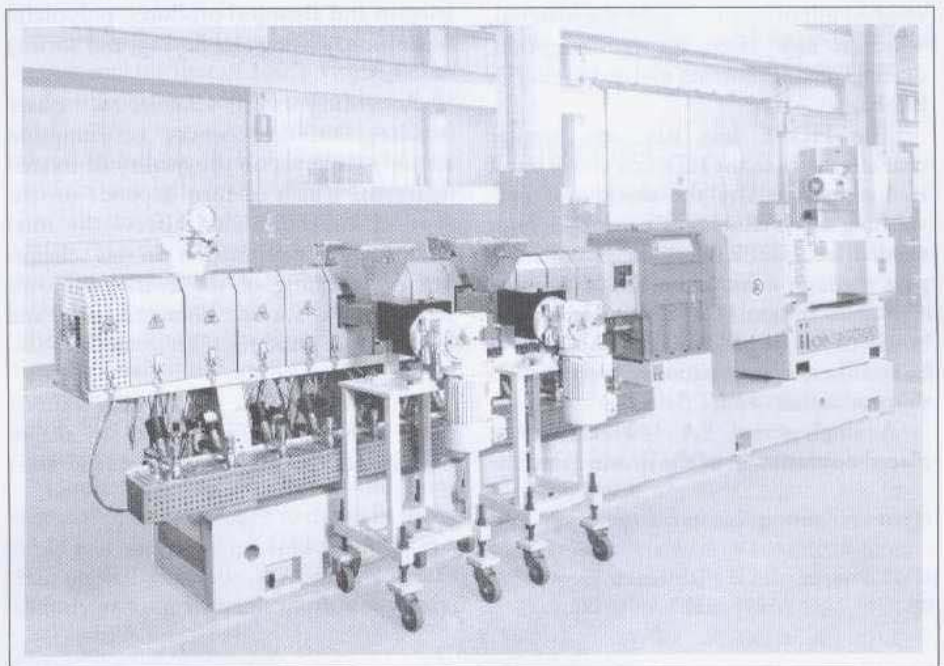
After grinding, cleansing and dosing the machine the flakes can be directly treated thanks to the use of suitable co-rotating extruders, thus eliminating the drying and dehumidifying phase. The resulting compound can be therefore blended with virgin PET or used to produce bottles by the sandwich system (for instance: 3 layers of reclaimed material externally coated with a virgin layer) or coextruded sheets for

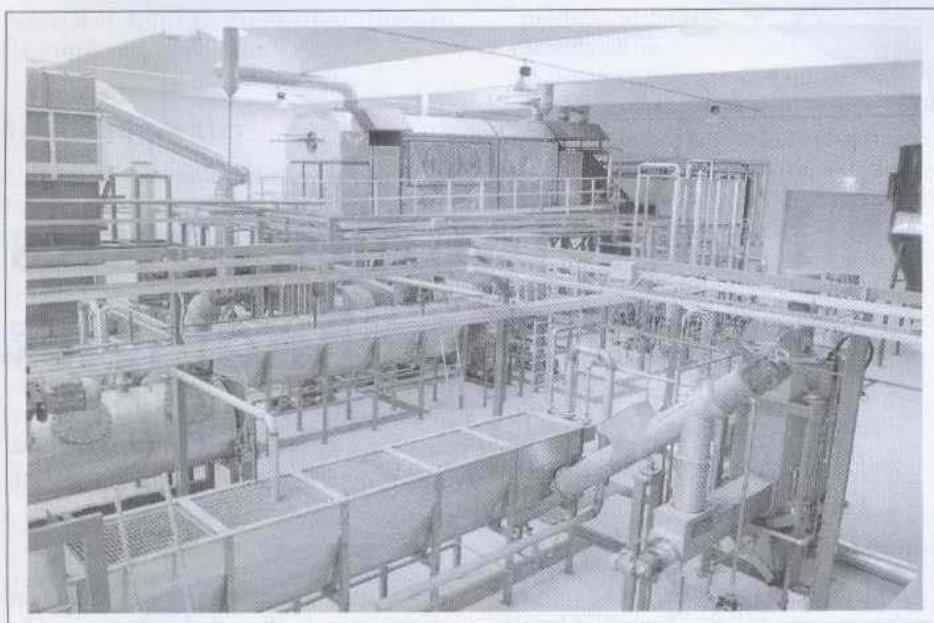
food trays by thermoforming. The main advantage of this technology is the possibility to recycle the material starting from flakes of bottles coming from separate collections with consistent energy savings.

www.icmasg.it

A complete recycling plant, with 2 units for handling PET bottles and HDPE containers and ensuring an output up to 2,000 kg/h, was recently supplied by AMUT to Intercontinental Recycling (UK).

The washing lines are fed by two material streams, from municipal and industrial postconsumer collection, previously separated into their different





fractions by an upstream sorting plant. The lines can also be fed with homogeneous material bales.

The PET line yields high quality flakes which can be used in bottle-to-bottle processes following treatment with IV regrading and vacuum purification systems. The process flow includes a hot pre-washing system that also removes the labels and prepares the bottles for the NIR detector inspection.

The material is wet ground and, after a pre-floating treatment, the flakes enter a friction and hot washing station where glue, paper and other impurities are removed. A final tank separates out any residual impurities and rinses the material, which is now ready for centrifugation, drying, mixing, sorting and packaging in big-bags.

The HDPE line has very similar characteristics to the PET line above but it is distinguished by the absence of pre-washing and NIR detection, which are not needed for HDPE recycling. Containers pass through a friction and hot washing station to obtain HDPE suitable for the bottle-to-bottle process. The line can also be readily and automatically converted to the production of PET flakes.

A single-screw EA 180 extruder is placed downstream of the line to grind the

flakes into a ready-to-use material. Both lines also feature closed washing circuits equipped with filters to maintain high water quality.

www.amut.it

The solutions presented by SOREMA (a division of PREVIERO) for washing PET post-consumer bottles focused mainly on the reduction of water and energy consumption required for the process, while keeping the quality of the final product high. The process scheme typically includes feeding, hot pre-washing, quality control, wet or dry grinding, intensive hot washing with friction and chemical products, polyolefin separation, rinsing and drying, and sorting of flakes.

According to this scheme, each phase requires "utilities" whose consumption sensibly depends on the quality of treated materials, which in turn depends on the type of collection that affects the total quantity of contamination. In this scheme, hot pre-washing of the bottles removes most of the surface contamination and labels before grinding, with advantages also for secondary sorting.

The contact of the bottles with water at 85°C removes labels (except for shrink ones), and the presence of caustic soda

makes the paper a pulp, facilitating the washing of the external bottle surface. Although this process provides good quality results, the increased thermal energy costs have led to the development of a cold process based on the removal of labels through high speed mechanical friction and aerodynamic separation. The process takes place in water to exploit the advantage of surface cleaning and to eliminate shrink labels, which are mechanically ripped from the bottles.

At this point, water consumption and treatment have to be taken into account, since today these are highly sensitive issues and one of the crucial aspects in technological choices. From an environmental point of view, reducing water consumption and discharge to a minimum can be useful, whilst in terms of process costs the more efficient result has to be considered between the use of fresh water and the treatment of discharging and waste water.

As water is becoming more and more expensive, the so-called "closed-to-zero-discharge" system was developed to treat the water in a closed circuit and completely reintroduce it into the plant, except the quantity lost in the sludge from the separate treatment of solids or evaporated. Figures have shown a decrease in water consumption from 1,500 to 60-90 litres per 1 ton of flakes produced.

The system includes two circuits: one for water with chemicals continuously recirculated and mechanically filtered to eliminate solids, and one for concentrating the impurities into a minimum water fraction which is in turn concentrated in an evaporator.

To keep the system efficient, independent circuits have been fitted between the line sections, thus minimising the water transfer between them. Moreover, this solution requires a smaller quantity of inorganic products for water treatment and drastically reduces the quantity of sludge which, together with solid waste, are treated to compact them and reduce the quantity of water.

www.sorema.it