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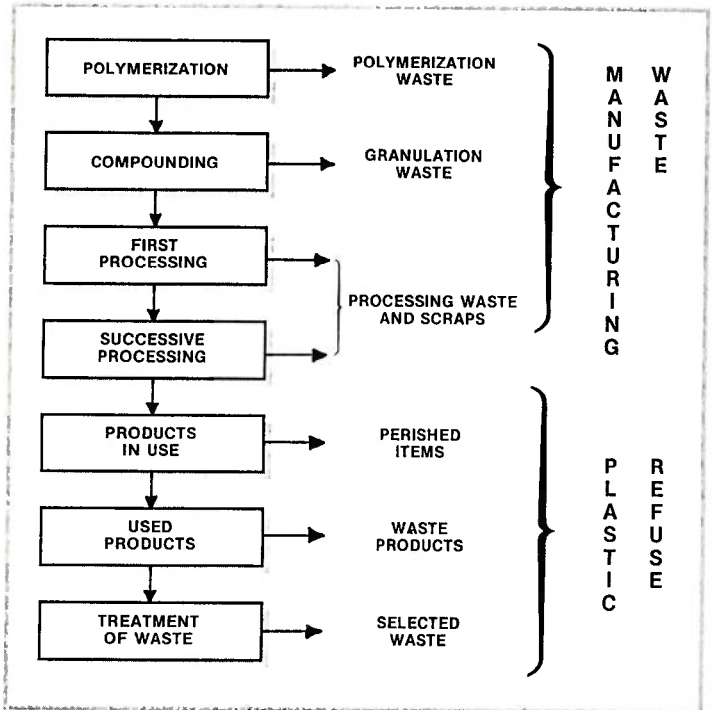
SUPPLY SOURCES FOR POLYOLEFIN RECYCLING

Disposable products, those which last less than one year on average, make up for just under 70% of the total consumption of virgin polyolefinic materials in Italy. This category includes most packaging and agricultural film, as well as a number of throwaway items such as medical and hygienic products (syringes, nappies, dishes, pens etc.).
The remainder of the total is regarded as long life goods, whose average life varies a lot, given that they go from products with a lifecycle of a few years (for example footwear), to others which are used for at least 20 years (such as components used in the building industry).
It is interesting to note that the consumption of virgin plastics only corresponds in a very rough way to the total consumption of plastic products in Italy. The manufacturing of goods uses many other raw materials, such as recycled, fillers and reinforcements, as well as various additives necessary in formulation.
There is also a flow of net export (exports minus imports) of products made of plastic only, as well as plastic parts combined with other products, such as household appliances, furniture, footwear etc. not forgetting the various types of packaging used for these items.
Roughly, we can estimate the polyolefin waste "resource" at approximately 1,1 million tons consisting of disposable products, plus an indefinite quantity (certainly much less than the above figure) of plastics incorporated into durable goods.
In wanting to give an order of scale to the latter it can be thought that they are about 200,000 tons, given that the amount of polyolefins used in the production of durable goods over past years was much lower compared to the amount used nowadays.
According to government sources, the national average of plastics contained in municipal solid waste (MSW), excluding bulky items and therefore the majority of durable goods, is close to 7.5%.
Two thirds of 1.5 million tons of plastics included in MSW should be polyolefins and this means 1 million tons approximately.
The second valuation is not very much different from that regarding disposable products (1.1 million tons). The difference is explainable by the fact that a part of the disposable items is collected and reclycled, whereas some of the discarded durable goods (especially small sized items), end up in solid urban refuse.
It is impossible to calculate more accurately the amount of material available for recycling, since very few surveys in this direction have been carried out in our country.

Recycled quantities

In this case also amounts to be calculated are difficult to identify. A start can be made by distinguishing at which point in the product lifecycle waste is produced. People who are not directly involved in this field often mix-up the various sources of waste, confusing polymerization waste in the chemical industry with that produced by processors, or otherwise forgetting successive processing which often takes place away from the manufacturing plant.
A typical example is the waste produced during packaging, such as bottles crushed during bottling or film torn during palletization. The common denominator between all of these wastes is homogeneity and "cleanliness".
The estimation of 1.3 million tons of polyolefin waste obviously does not include factory waste which is probably at least 300,000 tons. This is because the most part of this waste is recycled inside the factory that produced it.
Waste derived from successive processing, and away from the plastics processor as, for example, on packaging lines, is normally returned to the processor himself for recycling. So, as almost all factory waste is recycled it counts as an unavailable source. If we consider pure plastic waste, the present situation is as follows.



Waste from products in use

We refer in this case to the replacement of a plastic component of a durable product in the course of its lifecycle, for instance the car fuel tank or bumper, or returnable goods which are broken accidentally, such as bottle crates, for example.
In packaging used for transport, normally collection and recycle are done within the distribution network. Not only does recycling take place of items which have deteriorated in the Italian "stock", but also multinational companies often send their broken crates and pallets from abroad to recycle them (sometimes selling them as scrap or as part exchanged with "new" products).
The organisation of the exchange system is very poor, except for car batteries, for which a compulsory consortium exists. This is due to the high dispersion of products and the difficult of collecting more than a few kilos from the same place each time. Basically, it should not be impossible to organise some sort of waste collection, using the technical assistance network existing in all main companies.
Nowadays, industry and distribution companies can be counted on as being more sensitive to recycling problems.

Used products

At the end of their lifecycle all products become part of the waste "resources". These cover a much wider area than so far discussed since they include all polyolefin applications.
In some cases recycling is or-

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ganised as a closed circuit, for example, used PE/EVA shoe moulds or PP spooling cones. It is the processor who collects them when delivering new ones. The old ones, are reground and re-used for making new products. However, these are only exceptions, as they refer to products which are re-used in a factory.
There are also various large and small collection circuits, mainly regarding polyethylene film. The most part of agriculture sheet is now collected after use, often together with the empty sacks for fertilizer and other farm chemicals.
Heat shrink and stretchable films for palletization and other types of prepackaging film are collected from large distribution centres. Consequently it is calculated that at least 200 tons per year (probably more like 250-300 tons) of polyethylene film follow the recycling way.
Amongst other extruded products only small amounts of raffia (woven sheets for covering textile bales), and irrigation pipes are collected and recycled, whereas it is fairly common to collect electrical cables, from which the plastic coating (PVC and to a small extent PE) is separated from copper for recycling.
A modest amount of injection moulded products are also recycled. These include car batteries (as already mentioned), some products destined for agriculture and industry, for example boxes, baskets, seedbeds, pots, and restaurant/bar tables and chairs (garden type, made of polypropelene), for outside use.
We can also mention the agreement made between some producers of waste disposal banks and other containers and the various agencies in charge of collecting the waste to return it for recycling purposes. The amount of recycling in this instance is still negligible since collection banks have not been around for long.
It is worth remembering that collection and recycling points already exist for large blow moulded containers made with high molecular weight HDPE, for washing up bottles, chemicals and car products, which are not destined for domestic use.
A very rough estimation of the total quantity of products recycled at the moment is 350 tons per year of polyolefins (including waste from products still in use).

Selected waste

Here we refer to waste which has been subject to whatever sort of treatment, including differentiated collection amongst those possible.
There are already differing experiences of differentiated collection using roadside waste containers, as well as door-to-door, or liquid only containers, or commingled plastics.
Plastics are in some cases recycled together, or separated according to the type of polymer. The amount recycled is still insignificant, but it is bound to increase rapidly when the Italian municipal administrations do comply with law regarding recycling, which includes polyethylene incorporated in multilayer laminates.
Other projects are underway which will contribute to increase the collection of selected waste for recycling. One project (RECAP) is relative to the car industry, and it proposes to study the vehicles disassemblying and the redesign of various components as to make easy separation and recycling of plastic parts.
For household appliances similar studies are being carried out in relation to the PP components of dishwashers and washing machines. We must also remember the possibility of separating polyolefin films directly from MSW.
There are two plants doing this in Italy, one already working in Perugia and another one being built in Lazio with capacities of 6-7 and 9-10 tons a day respectively. In short, about 25-30% of waste polyolefins are being collected and recycled in Italy.

From now on

Which are the best ways to increase the availability of further refuse for recycling? First of all we must say that so far the production system has concentrated in optimizing the following open flows: resources product consumer.
The organisation of this flow in industrial countries is very efficient. Advanced technology has been developed not just to improve the utilization of resources and products, but also by using cumulative experience, sophisticated management know-how of flows; just-in-time is only one example of this.
Now we need to apply the advanced technology and sophisticated know-how to the organisation of the return path. Moreover, our experience is that it is not possible to solve all the problems relative to waste separation at "end of the line". The more heterogeneous the material become, the more expensive it is to separate its various components (metal, paper or cardboard, inert material, plastics etc).
There is also a limit both qualitative and quantitative by differentiated waste collection through means of waste banks and other containers. In fact, even this method is an afterthought. In other words the impression is that everything that is economically possible in the present circumstances in terms of recycling has already been done (or at least started).
To go any further it will be necessary to intervene directly on how things are done and how differing products are utilized, if the most important and critical factor is to be borne upon which is the organisation of the "return path".
The concept of design for recycling was started as a possible answer to all these problems. It is a task which is simultaneous with product conception, taking into account both production and product lifecycles, as well as the system by which the return of the used product will be organized and managed as well as the technology used for recycling the various materials.
The current research already mentioned, which is being carried out according to different types of products, relates to the disassembly and recycle of all materials used in their production.
They are very complex projects which require the cooperation of different subjects, each one with a specific knowledge (for example raw material producers, product manufacturers, machinery manufacturers, refuse collection agencies, commercial networks etc).
Inevitably, the role of the recycler is at stake, he either chooses to "grow" culturally, and to become a protagonist of these new projects which are aimed at redesigning the world of objects, or he will confine himself to the limited world of the recycling systems which exist today.

Investment in waste

Ecoplast, the recycling division of Cabot Plastics International, have announced at a press conference held on February 12 in Brussels that they are investing 20 million dollars in building two new recycling plants and acquiring two existing facilities. The purchase of the SIMA recycling facility at Tilburg (Belgium) has brought Ecoplast additional expertise in the recycling of polystyrene and given the company a foothold in the Netherlands. This plant has been operating for ten years, specialising in the processing of disposable drinking cups, flower pots and trays. Potential output is 1,500 ton per year.
The existing French plant bought by Ecoplast is at Saint-Sauveur-en-Rue in the Rhône-Alpes region, one of the country's most important centres of plastics processing. It has a potential output of 6,000 tons per year and currently handles mainly agricultural film, bags and industrial waste.
The new facility in France is located on a green field site beside the Rhône at Andance (Ardèche). It will have a capacity of 17,000-20,000 tons of waste material. An advanced water treatment system will be incorporated for environmental reasons. Initially, the material processed will be mainly industrial waste from plastics processors in the region, but Ecoplast intend to develop systems for handling post-consumer waste as soon as possible.
In Germany a new recycling plant is to be built and operated. Negotiations have started with Trienekens Entsorgung, one of the country leading companies in waste treatment. The plant will be built near Düsseldorf and will be able to process up to 20,000 tons/year.
Trienekens will collect and sort the material for the plant; it will be mainly waste material sorted out according to the German Dual System, while Ecoplast will reprocess it and market the