

ABS

Acrylonitrile
Butadiene Styrene
copolymers

Proprietary
process technology



polimeri europa



POLIMERI EUROPA PRODUCTION TECHNOLOGIES NOW AVAILABLE FOR LICENSING

Polimeri Europa

Polimeri Europa – the petrochemical company of Eni – manages the production and marketing of Basic Chemicals, Polyethylene, Elastomers and Styrenics.

With its 17 production sites throughout Europe and a widespread sales network, Polimeri Europa can present itself to the intermediates, thermoplastic resins and elastomers market as a sound and comprehensive supplier whose key strength is its integration. From raw materials to production plants, from research laboratories to technology, through to the interface with the market which can turn to a single source with the certainty of finding solutions to its requirements not only in terms of products, but also in terms of assistance and service. Thanks to the definition of the e-commerce and the logistic portal express, Polimeri Europa can offer to its customers the opportunity to use their tailored made e-shopping and logistics. Saving time and money.

On the basis of its first hand experience, Polimeri Europa can also license its proprietary production technologies aiming to satisfy the even more specific customers needs.

Polimeri Europa's commitment to quality, improvement and innovation continues, as does its pledge to promote sustainable growth with regard to the community and the environment.

Licensing

Proprietary process technologies

Phenol and derivatives

PBE-1 Zeolite catalyst based Cumene *
Phenol, Acetone, Alkylphenylstyrene *
Isopropyl Alcohol Acetone hydrogenation *
Isopropyl Alcohol to Cumene *
PBE-1 Zeolite catalyst
TS-1 Titanium silicalite catalyst based
Ammoxidation

DMC and derivatives

Dimethylcarbonate
via Carbon Monoxide and Methanol *
Dimethylcarbonate / Diphenylcarbonate *

Polyethylene

LDPE
HDPE
EVA

Styrenics

PBE-1 and PBE-2 Zeolite catalyst based
Ethylbenzene
Styrene monomer
GPPS
HIPS
EPS
ABS continuous mass polymerization
SAN

Elastomers

e-SBR
s-SBR
SBS / SB / LCBR
Polybutadiene

Proprietary catalyst technologies

Titanium silicalite
PBE-1 Zeolite
PBE-2 Zeolite

* Co-licensing in cooperation with Lummus Technology

Introduction to Polimeri Europa ABS technology

Polimeri Europa (at that time Montedison and then EniChem) has been producing ABS via traditional emulsion process since 1963. At the end of the '80s, Polimeri Europa started the production of ABS via a continuous mass process, in Mantova (Italy) in two new units, acknowledging the improved proprietary technology developed meanwhile by its R&D and extensively used in HIPS and GPPS production since the 70's. In 2005, Polimeri Europa decided to concentrate only on continuous mass ABS in Mantova site.

The main features of Polimeri Europa continuous mass ABS process technology are as follows:

- Proprietary, accurate process and mechanical design of key equipment (reactor, devolatilizer).
- Simple process scheme and easy process control.
- Flexible technology allowing tailor-made solutions for specific needs, in terms of plant capacity and product range.
- Minimum quantity of foreign materials introduced in the process.

After a complete switch from emulsion to continuous mass process, Polimeri Europa is now in the position to offer a well balanced Sinkral® product portfolio, a benchmark within the European scenario.

From emulsion to continuous mass process

The commercial production of ABS started at the end of the 50's and, for at least two decades, it has been carried out via traditional emulsion process only. Emulsion process, being a discontinuous technology, while flexible and useful for the synthesis of particular materials (for example glossy ABS), presents undoubted problems either from the operational and financial viewpoint. In recent decades environmental issues have been becoming clearer and increasingly unavoidable in relation to the quality of the finished product (monomers and residual substances) and production features (quantity and quality of effluents, emissions in the workplace, etc.).

The continuous mass production process does not use raw materials or additives outside the reaction (such as water in the previous aforementioned processes), and thus allows a drastic reduction in the quantity of emissions.

This technology is thus normally conceived as a closed cycle; everything which has not reacted at the end of the polymerization section is separated out in the devolatilization section, condensed and feed once again at the entrance to the system.

Only a minimal amount of purge discharge, is made necessary to remove impurities from the system that cannot be polymerised and non-polymerisable matters that otherwise would tend to accumulate.



TECHNICAL DATA

Material balance and process economics for typical ABS unit

	<i>per MT ABS</i>
Raw materials	1,010-1,020 kg
Electricity	180-210 kWh
Steam (Low pressure 4 bar g)	400-550 kg
Fuel	20-40 kg

Fields of applications

Extrusion	
Medium and high impact	Refrigeration, sanitary, transport, industrial packaging and furnishing profiles
Very high impact	Extrusion of thick sheets for sanitary and transportation sector
Ultra low gloss (matt surface)	Extrusion/co-extrusion and matt furnishing profiles
Injection moulding	
Very high flow, high gloss and toughness	Small domestic appliances, toys and telephones
High flow, high gloss, medium heat resistance	Washing machines, dishwashers and electrical components
High heat resistance	Automotive industry, either for internal and external components

The Sinkral® ABS product portfolio

The strengths of Polimeri Europa Sinkral® ABS, produced via continuous mass technology, are here summarised:

- Lower yellowness: as a consequence of the total absence of polymerisation additives, the continuous mass process ABS has an intrinsic light base colour but, more important, a smaller colour change due to processing residence time and temperature.
- Higher thermal stability: being the continuous mass process a “clean” one, where no polymerisation latex additives, soaps, emulsifiers etc. are involved, polymer degradation reactions are more difficult to occur.
- Lower volatiles content: the very low residual monomers content related to continuous mass process technology has, as a consequence, a very low emission of volatile molecules during processing and very low migration in food application.

The flexibility of Polimeri Europa Technology allows to manufacture all main ABS grades, suitable for the most challenging fields of application.

Process performance and economics

For all the reasons mentioned earlier, the Polimeri Europa ABS technology minimizes the effects of raw materials and chemical impurities on the process and product structural parameters. Assuming 99.9 percent styrene purity, the typical raw materials and utilities consumption per metric ton of polymer is reported in table.

Industrial applications

Polimeri Europa ABS units, based on proprietary continuous mass technology, are on-stream in Italy (1989, 25 kMTA; 1991, 40 kMTA).



PROCESS DESCRIPTION

The Polimeri Europa ABS technology is based on a continuous mass peroxide-initiated polymerization of styrene in a rubber-styrene solution.

Rubber, after being ground in a mill, is dissolved in styrene in a proper section and then added with chemicals and co-monomer (acrylonitrile) in a mixing section.

The mass reaction occurs in the presence of solvent, and it can begin in the same section, in a CSTR reactor.

This mixture is thus fed to the polymerization section, generally composed by a sequence of two/three plug-flow reactors; the reaction thermal profile is controlled by diathermic oil circulating inside internal coils.

The whole reaction section arrangement is selected case-by-case, in order to meet specific requirements.

At the end of reaction train, the polymer solution is sent to a devolatilizing section, under vacuum, in two stages in sequence.

The monomer, the co-monomer and low-boiling compounds are removed from the polymer, which is finally sent to the pelletizing unit. The heat is provided by the diathermic oil system.

The vapor mixture, after condensation, is constantly recycled to the mixing section. Noncondensed vapors/inert gases from the vacuum system and liquid organic purge from the condensation section are recovered as fuel in a furnace, where diathermic oil for the process is heated.

Process design advanced features

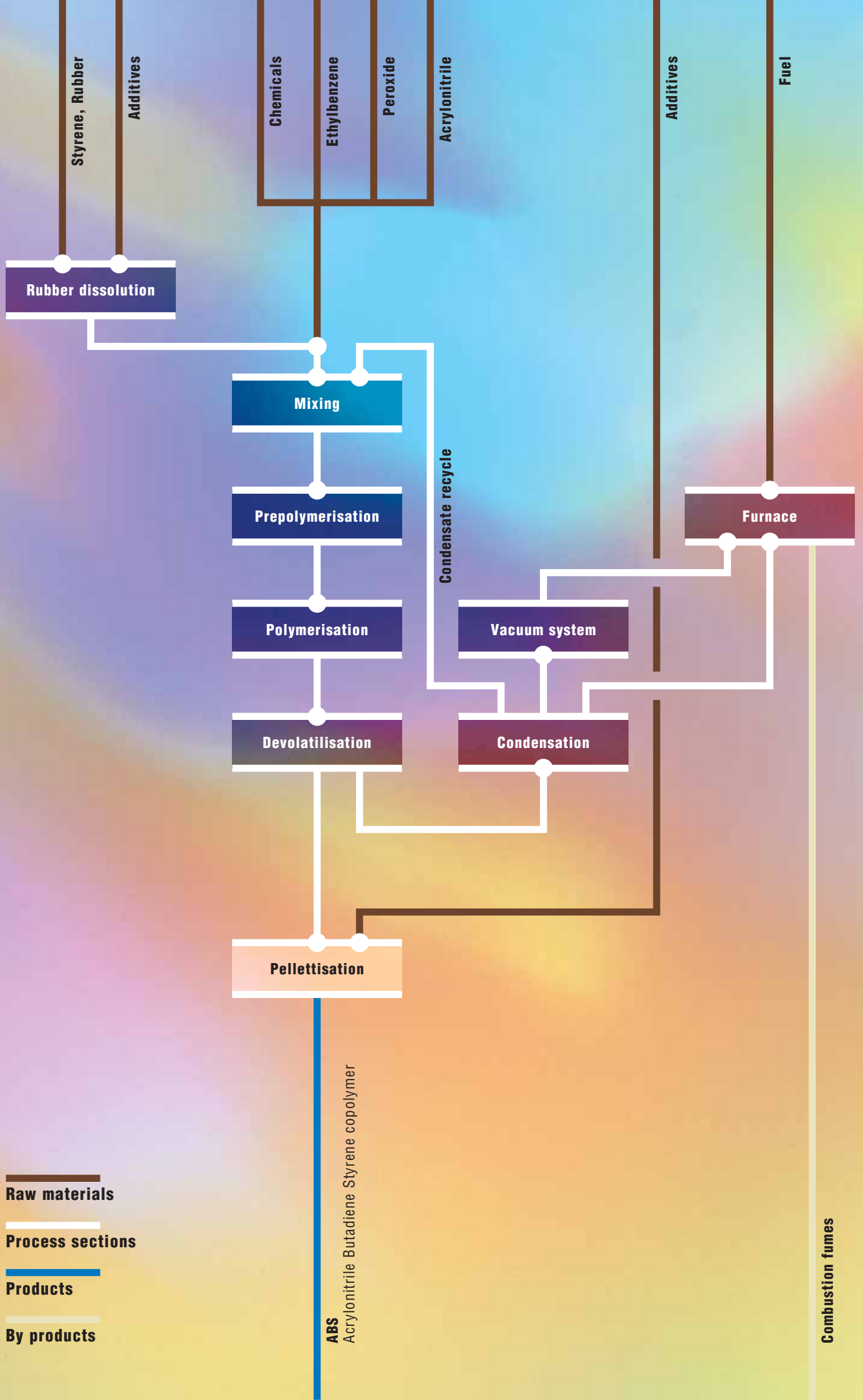
Even if the process scheme basically calls to mind the most common current technologies, the Polimeri Europa ABS technology is unique, being provided with the following proprietary advanced design features:

Polymerization section

The main items are full plug-flow reactors (PFRs); thanks to agitation and a high specific thermal exchange surface area, they are characterized by very precise control of the thermal reaction profile. Any specific need in terms of product quality/portfolio can be matched by tuning reaction train arrangement. In this way, it is possible to achieve maximum control of the morphology of the disperse phase, together with good efficiency of the catalytic grafting reaction. This synergy allows to optimise the balance between production rate and polymer quality.

Devolatilization section

This involves two-stage operation, with high heat and mass transfer rates at very low residence times. This combination of factors leads to a very efficient monomer and organic matter removal even at relatively low temperature (where polymer chain degradation and cross-linking of the rubber phase are minimized) and without the addition of water or other stripping agents.



Raw materials

Process sections

Products

By products

ABS

Acrylonitrile Butadiene Styrene copolymer

Combustion fumes

Polimeri Europa SpA

A subsidiary of Eni SpA
Sole shareholder company

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Responsible Care



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