

# EPS

Expandable Polystyrene

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 Expandable Polystyrene process**

In 1976 Polimeri Europa (at that time Montedison and then EniChem) started the production in Italy of expandable polystyrene (EPS) using a batch suspension polymerisation technology.

During the following decade a new process, with an inorganic suspending agent, was developed by its R&D in Mantova and then implemented also in another plant in Belgium, which was started up in 1983.

In 1991 a new unit, acknowledging the improved proprietary technology developed meanwhile by Polimeri Europa R&D, was started up in Hungary.

The main features of Polimeri Europa EPS process technology are as follows:

- inorganic suspending agent, which leads to narrow bead size distribution;
- simple process scheme and easy process control;
- single step technology (the impregnation of the beads with pre-foaming agent is made during the polymerisation step);
- very good reactor filling and no need for solvent washing of the reactors;
- easy availability in the world market of the chemicals used in the process;
- flexible and wide product range, developed and fine tuned for any market requirement.

Even if EPS production process is well established, especially in the last decades the market needs, both in terms of quality and environmental impact of EPS, pushed Polimeri Europa R&D to continuously improve its proprietary equipment and optimise its process cycle.

The result of this effort makes Extir® EPS, with its wide product portfolio, as a benchmark within the European scenario.



# TECHNICAL DATA

## Material balance and process economics for typical EPS unit

	<i>per MT EPS</i>
Raw materials	1,010-1,015 kg
Electricity	150 kWh
Demineralised water	1.2 m <sup>3</sup>
Steam	400-500 kg

## Process performance and economics

Assuming 99.9% styrene purity, the typical raw materials and utilities consumption per metric ton of polymer is reported in table above.

The versatility of Polimeri Europa EPS technology makes easily possible to provide convenient solution in a broad range of capacities, from 30 to 50 kt/y. The plant arrangement can be tuned to fit required targets, such as special grades and/or peculiar product range.

### Industrial applications

Polimeri Europa EPS units are on-stream in Italy (1976, 35 kt/y), Belgium (1983, 35 kt/y) and Hungary (1991, 40 kt/y), making Polimeri Europa one of the major European producers of expandable polystyrene. A new EPS unit of 50 kt/y has been licensed in 2004 in the Russian Federation.

### The Extir® EPS product portfolio

Polimeri Europa EPS products are characterized by a unique balance between key properties:

- very good expandability;
- short cycle times and very good fusion;
- fine-tuned design for specific applications.

Within Extir® product portfolio it is possible to find a suitable grade for all the current processing technologies (moulding, transfer, vacuum or blocks), which can cover the following main application.

#### Normal grades

- boxes and containers for marble and food;
- packaging;
- lightened concrete;
- light and heavy blocks.

#### Fire resistant grades

- industrial packaging;
- sheet and blocks for insulation in the building industry;
- wall padding sheets;
- floor bodies;
- disposable forms;
- lightened mortars and bricks.



## PROCESS DESCRIPTION

The Polimeri Europa EPS technology is based on a batch suspension polymerization of styrene, with an inorganic suspending agent. The internal chemicals are dissolved in styrene. This preheated solution is afterwards transferred into a reactor, pre-filled with demi water and suspending agent, under agitation.

Polymerisation starts and continues till, to a certain polymer content, the blowing agent is added. The reaction goes ahead until the residual styrene reaches the target value, according to a proper temperature cycle and recipe. Final bead size is chemically controlled during the polymerisation up to the desired diameter.

The small amount of blowing agent escaping from the polymerisation section is sent to a flare. After polymerisation, EPS bead slurry is cooled to an intermediate temperature and then transferred to pressurised cooling tanks, where it reaches the final discharge temperature. The slurry is then transferred into a bigger slurry tank, capable to contain several batches, in order to get a good homogeneity and to continuously feed the centrifugation section. Wet beads are then still continuously fed to a drier and to the screening section to be classified in the desired grades. All the waste water can be treated by a common biological plant.

Single fractions are temporarily stored in silos and batch wise lubricated with a proper coating recipe. All the residual amounts of the coated fractions (e.g. excess weights of the lubricating section) can be recovered in the slurry tank section.

### Process design advanced features

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

#### Polymerization section

**Proprietary reactor design** able to give narrow bead size distributions; high reactor filling and no need for chemical washing.

**Proprietary suspension system** based on an inorganic agent, able to:

- get an optimal control on bead size distribution and bead internal cellular structure;
- stabilize the small styrene droplets, avoiding the risk of agglomeration during the polymerisation cycle.

**Single step technology** the impregnation of the beads with pre-foaming agent is made during the polymerisation step, thus avoiding a further and expensive steeping phase.

**Wide bead size range** from 0.2 to 3 mm; a typical narrow size distribution (s/x) of 0.18 can be obtained for any bead size.

**Easy availability** in the world market of the chemical used in the process.

#### Coating section

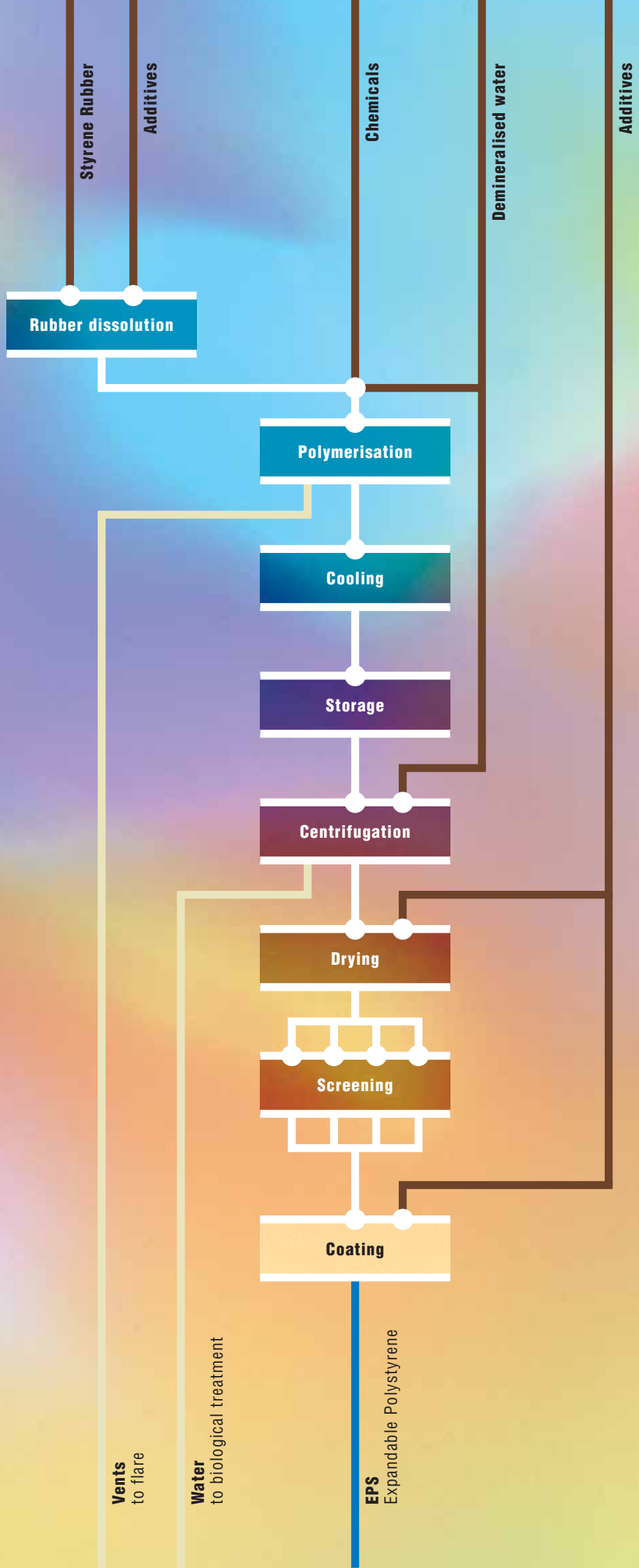
**Highly developed coating deposition technology** able to tailor EPS grades to the desired customer needs.

Easy availability in the world market of the chemicals used in the process.

#### Flexibility

As a consequence of its optimised plant design Polimeri Europa technology can match any possible requirement in term of product portfolio, keeping the polymer quality to the top level.

- Raw materials
- Process sections
- Products
- By products



**Vents**  
to flare

**Water**  
to biological treatment

**EPS**  
Expandable Polystyrene

## Polimeri Europa SpA

A subsidiary of Eni SpA  
Sole shareholder company

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Responsible Care



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