

E L A S T O M E R S

Europrene®

SOL B/R

S - S B R



versalis



Europrene®

SOL B/R S-SBR

BACKGROUND

Solution polymerized SBR (S-SBR) was developed in the 1960's as an alternative to emulsion SBR (E-SBR). It offers many advantages, including the ability to manufacture tailor made polymers for the tyre industry and other markets, in terms of micro and macro structure. Versalis R&D based in Ravenna, Italy, has refined these products to create an extensive portfolio. The first S-SBR production line was built in Grangemouth (UK) in 1995, based on batch process technology. This was followed in 1999 with an additional production line based on continuous technology.

PROCESS

Solution polymerized styrene-butadiene rubber is obtained by the anionic polymerization of styrene and butadiene initiated by lithium alkyls in hydrocarbon solvent. The distribution of the styrene units in the polymer chain results in either Block or Random copolymers. This is controlled by the use of a suitable modifier. The finishing process consists of solvent stripping and stabilization with non-staining antioxidant(s). The extender oil is added where required. The resultant polymer crumb is then dried, baled, packaged.

SUSTAINABILITY

All grades in portfolio are available with ISCC Plus Certification: "Bio Attributed (BA)" and "Bio-Circular Attributed (BCA)" products made from bio naphtha, and "Circular Attributed (CA)" made with a "recycled oil" (r-Oil), a pyrolysis oil obtained from the chemical recycling process of mixed plastic waste.

BA, BCA and CA raw materials can be used in production processes together with traditional raw materials. In order to attribute sustainability characteristics to the final product, Versalis applies the Mass Balance approach, an acknowledged methodology that ensures that the sustainability characteristics of the alternative raw material, mixed with traditional naphtha, correspond to those of the final product.

They guarantee identical performance, quality and properties, as they do not differ in chemical composition and physical-mechanical performance from standard products.

MAIN PROPERTIES

Block and Random S-SBRs impart very different properties to the polymer and are used in different applications. Block S-SBRs have a lower styrene content than Random S-SBRs and are more suitable for calendering and extrusion processes. They are also used for bitumen modification and for the production of adhesives and High Impact Polystyrene (HIPS) and ABS resins. Random S-SBRs provide a versatile platform for the manufacturing of a “tailored” product by varying macro and microstructure. This means that polymers can be produced with different glass transition temperature (Tg), which in turn will influence important properties such as good processability, rolling resistance, grip and abrasion. These properties make random S-SBR particularly useful in the tyre sector. Random S-SBR technology can be further enhanced by the use of polymer chain coupling and chain branching. This can result in materials with enhanced properties, allowing easier incorporation and dispersion of fillers.

GRADE SELECTION

Random S-SBR are produced in Grangemouth-UK and Ravenna-Italy plants. Block S-SBR are produced in Grangemouth-UK plant. Block S-SBR grades are designated with “SOL B” and Random grades with “SOL R”. Grades produced by a continuous polymerization process is indicated with an additional prefix “C”.

Europrene® SOL B

- Europrene® SOL B 1205: used in Technical Rubber Goods, including flooring and footwear, adhesives and bitumen modification.

Europrene® SOL R

- Europrene® SOL R C2525: is a dry random S-SBR and is the solution grade alternative to the E-SBR grade Europrene® 1502. Its low Tg also make it suitable for low rolling resistance tyre compounds including agro-tyres.
- Europrene® SOL R 72614: oil-extended grade designed to provide an excellent balance between processability and final properties.
- Europrene® SOL R C 2564-T: oil-extended grade designed to give enhanced processability with a good balance of dynamic properties.
- Europrene® SOL R C 3737: oil-extended grade designed for high wet grip and low rolling

resistance silica compounds for HP/UHP tyre treads.

- Europrene® SOL R C3743: oil-extended grade designed for excellent balance between grip and rolling resistance for HP/UHP tyre treads.
- Europrene® SOL R C3555: oil-extended grade with premium processability enhancing grip and rolling resistance of HP/UHP tyre treads
- Europrene® SOL R 74618 T: medium vinyl grade oil extended with TDAE, designed to provide an excellent balance of grip, rolling resistance and abrasion resistance for UHP tyre treads.

Europrene® SOL R functionalized

Product portfolio is expanding to functionalized S-SBR grades for both carbon blacks and silica, based on batch technology, with an enhanced balance of grip, low rolling resistance and better abrasion resistance:

- Europrene® SOL R X 72616: high vinyl grade, providing excellent balance between wet grip and rolling resistance for summer, all-season and winter tires.
- Europrene® SOL R X 71420: low vinyl/low styrene grade addressing most of tyre tread requirements for both car and truck. It can be used in agro tyre applications.

GRADE LIST

Partial block types

GRADE	BOUND STYRENE %WT	BLOCK STYRENE %WT	MOONEY VISCOSITY ML (1+4) 100 °C	VISCOSITY CP 5% STY 25°C	MAIN APPLICATIONS
Europrene® SOL B 1205	26	50	-	-	Calendered and extruded Technical Rubber Goods, flooring, footwear, adhesives, bitumen modification, HIPS manufacturing
Agon® SOL X C 283	11	8	-	35	Construction, polymer modification

Random dry types

GRADE	BOUND STYRENE %WT	VINYL CONTENT %WT	MOONEY VISCOSITY ML (1+4) 100°C	MAIN APPLICATIONS
Europrene® SOL R C2525	26	24	54	Carbon black based compounds for low rolling resistance tyre treads, mechanical goods, footwear
Agon® SOL R X FZ 360	15	32	60	Silica- based compounds for winter and all season tyres
Agon® SOL R X FZ 595	27	59	61	Silica- based compounds for premium summer and all season tyres



Random oil extended types

GRADE	BOUND STYRENE %WT	VINYL CONTENT ⁽¹⁾ %WT	MOONEY VISCOSITY ML (1+4) 100 °C	OIL		MAIN APPLICATIONS
				TYPE	P.H.R.	
Europrene® SOL R 72614	25	64	55	TDAE	37.5	Silica-based compounds for low rolling resistance tyre treads, winter tyre treads
Europrene® SOL R C2564-T	25	64	50	TDAE	37.5	
Europrene® SOL R C3737	36.5	38	75	TDAE	37.5	Silica-based compounds for high grip and low rolling resistance type treads (HP/UHP)
Europrene® SOL R C 3743	36.5	43	75	TDAE	37.5	Silica-based compounds for high grip and low rolling resistance tyre treads (HP/UHP)
Europrene® SOL R XC 3555 T	35	55	75	TDAE	37.5	Silica-based compounds for ultra high performance tyre treads
Europrene® SOL R 74618 T	35	58	60	TDAE	37.5	UHP tyre tread compounds
Agon® SOL R X 73521	35	58	80	TDAE	25	Tyre tread compound for HP/UHP tyres. It shows enhanced balance between grip and rolling resistance

(1) Referred to butadiene portion

Functionalised random types

GRADE	BOUND STYRENE %WT	VINYL CONTENT ⁽¹⁾ %WT	MOONEY VISCOSITY ML (1+4) 100 °C	OIL		MAIN APPLICATIONS
				TYPE	P.H.R.	
Europrene® SOL R X 72616	21	63	68	-	-	Functionalised for silica premium tyre treads compounds with low rolling resistance
Europrene® SOL R X 71420	15	48	58	-	-	Car and trucks tread compounds, winter tyres and agro tyres

(1) Referred to butadiene portion

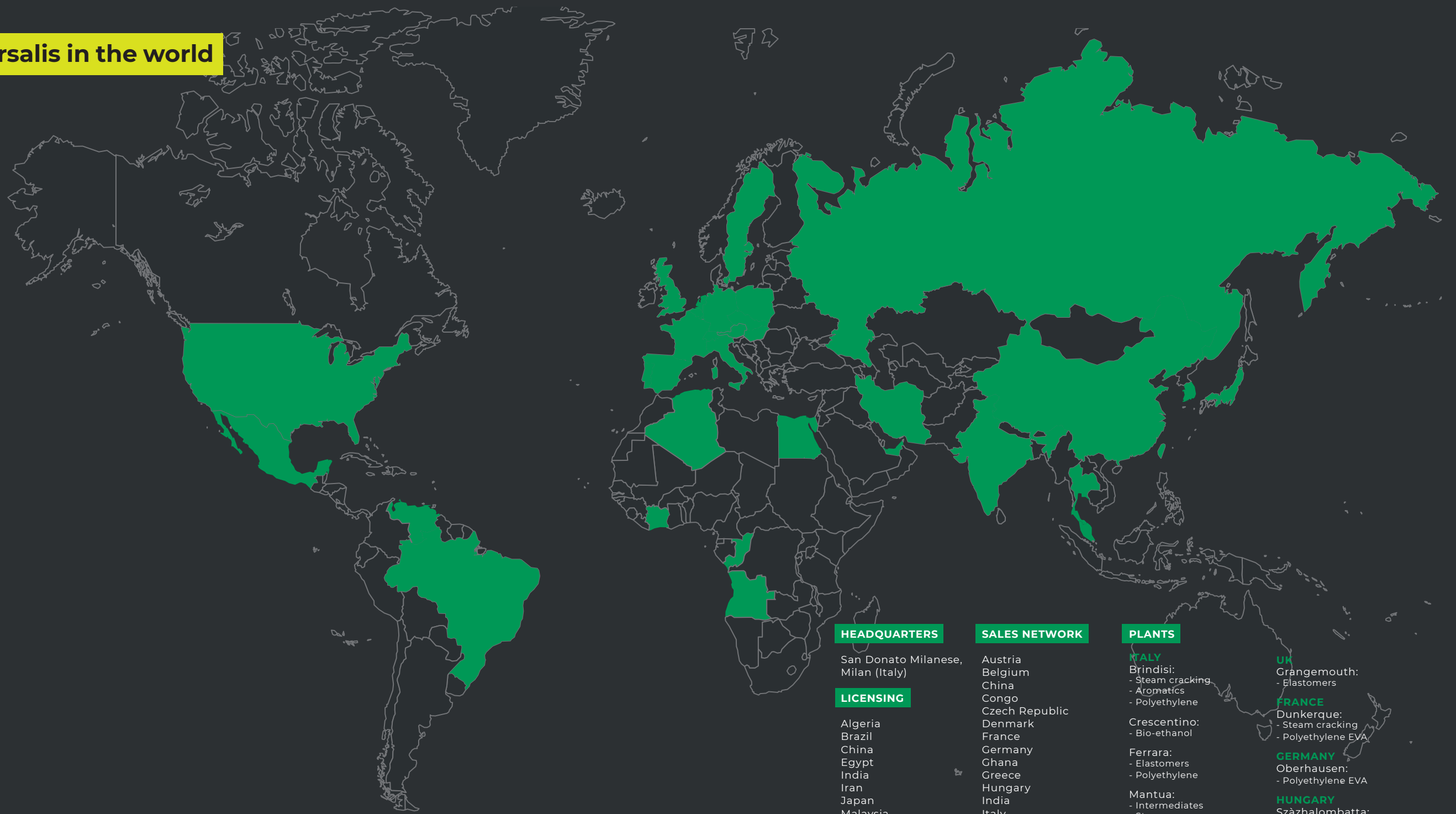
STORAGE AND PACKAGING

The Europrene® SOL grades should be stored in a vented, dry area at a temperature between 20°C and 30°C with the avoidance of exposure to direct sunlight. The shelf life of Europrene® SOL grades is 12 months minimum.



GRADE	PACKAGING	DIMENSION (mm)	NOMINAL NET WEIGHT (kg)		PHYSICAL FORM	BALE DIMENSION (mm)	BALE WEIGHT (kg)	BALES TOTAL	BALES X LAYER	FILM TYPE
Europrene® SOL B 1205	Returnable metal crate	1465x1150xh1123	990		Bales	660x330xh200	33	30	6x5	PE
Agon® SOL X C 283	Returnable metal crate	1465x1150xh1123	1080		Bales	660x350xh200	30	36	6x6	PS
Europrene® SOL R C 2525	Returnable metal crate	1465x1150xh1123	990		Bales	660x330xh200	33	30	6x5	PE
Agon® SOL R X FZ 360	Returnable metal crate	1465x1150xH1123	1260		Bales	660x350xh200	35	36	6X5	PE
Agon® SOL R X FZ 595	Returnable metal crate	1465x1150xH1123	12060		Bales	660x350xh200	35	36	6X5	PE
Europrene® SOL R 72614	Returnable metal crate	1465x1150xh1123	990		Bales	660x330xh200	33	30	6x5	PE
Europrene® SOL R C2564-T	Returnable metal crate	1465x1150xh1123	990		Bales	660x330xh200	33	30	6x5	PE
Europrene® SOL R XC 3555 T	Returnable metal crate	1465x1150xh1123	990		Bales	660x330xh200	33	30	6x5	PE
Europrene® SOL R 74618 T	Returnable metal crate	1465x1150xh1123	990		Bales	660x330xh200	33	30	6x5	PE
Agon® SOL R X 73521	Returnable metal crate	1465x1150xH1123	840		Bales	660x350xh200	28	30	6X5	PE
Europrene® SOL R C3737	Returnable metal crate	1465x1150xh1123	990		Bales	660x330xh200	33	30	6x5	PE
Europrene® SOL R C3743	Returnable metal crate	1465x1150xh1123	990		Bales	660x330xh200	33	30	6x5	PE
Europrene® SOL R X 72616	Returnable metal crate	1465x1150xh1123	1260		Bales	660x330xh200	35	36	6x6	PE
Europrene® SOL R X 71420	Returnable metal crate	1465x1150xh1123	990		Bales	660x330xh200	33	30	6x5	PE

Versalis in the world



HEADQUARTERS

San Donato Milanese,
Milan (Italy)

LICENSING

Algeria
Brazil
China
Egypt
India
Iran
Japan
Malaysia
Portugal
Qatar
Romania
Russian Federation
Slovak Republic
South Korea
Spain
Taiwan
USA
Venezuela

R&D

ITALY
Ferrara
Mantua
Novara
Porto Torres
Ravenna
Rivalta Scrivia

SALES NETWORK

Austria
Belgium
China
Congo
Czech Republic
Denmark
France
Germany
Ghana
Greece
Hungary
India
Italy
Mexico
Poland
Portugal
Romania
Russian Federation
Singapore
Slovak Republic
South Korea
Spain
Switzerland
Sweden
Turkey
United Arab Emirates
(VPM, a joint venture
with Petrochem/Mazrui
Energy Services)
UK
USA

PLANTS

ITALY

Brindisi:
- Steam cracking
- Aromatics
- Polyethylene

Crescentino:
- Bio-ethanol

Ferrara:
- Elastomers
- Polyethylene

Mantua:
- Intermediates
- Styrene
- Styrenics

Porto Marghera:
- Recycled polymers

Porto Torres:
- Elastomers
- Renewable chemistry

Priolo:
- Steam cracking
- Aromatics

Ragusa:
- Polyethylene EVA
- Butadiene

Ravenna:
- Elastomers

UK

Grangemouth:
- Elastomers

FRANCE

Dunkerque:
- Steam cracking
- Polyethylene EVA

GERMANY

Oberhausen:
- Polyethylene EVA

HUNGARY

Százhalombatta:
- Styrenics

SOUTH KOREA

Yeosu (LVE, a joint
venture with Lotte
Chemical):
- Elastomers

Versalis is focused on establishing itself as a solution provider, offering a range of increasingly market-oriented products at an international level. The company is present in the APAC region through its Shanghai-based subsidiary, Versalis Pacific Trading; in Mumbai, India; in Singapore; and in South Korea through LVE, a joint venture with Lotte Chemical.

Versalis can also count on subsidiaries Versalis Americas – with offices in Houston, Texas – and Versalis Mexico. Furthermore, Versalis serves the oil and gas industry with offices in Ghana and in Congo, with its portfolio of oilfield chemicals. Thanks to a widespread sales network, distributors and sales agents, Versalis can serve all markets worldwide.



versalis

Versalis spa

Piazza Boldrini, 1
20097 San Donato Milanese (MI) - Italy
Ph. 0039 02 520.1

info.elastomers@versalis.eni.com
versalis.eni.com

Technical service

technicalmanagement@versalis.eni.com

