



ARLANXEO

Performance Elastomers

TIRE & SPECIALTY RUBBERS PRODUCT PORTFOLIO

Our synthetic rubber is a key contributor to tire performance, including impermeability, improved resilience and lower rolling resistance. We are also at the forefront of innovation for a variety of high profile special applications.

www.tsr.arlanxeo.com

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TIRE & SPECIALTY

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Versatile performance specialist

The business unit Tire & Specialty Rubbers (TSR) of ARLANXEO is a world-leading supplier of high quality rubbers for the tire industry and for other highly demanding rubber related industries. With a truly global production footprint, TSR has the scale needed to tackle supply driven challenges throughout the entire rubber supply chain. With comprehensive rubber know-how, research and development and application technology under one roof, we offer a broad portfolio of versatile elastomers, such as butyl and butadiene rubbers, that are predominantly used in the production of tires. Our butyl rubber products, such as halogenated butyl rubbers (Halobutyl), are used in the innerliner of tires to provide excellent retention of the desired inflation pressure. Our solution styrene butadiene rubbers (S-SBR), [Buna® VSL](#) and [Buna® SBR](#), and neodymium catalyzed butadiene rubbers (Nd-BR), [Buna® CB](#) and [Buna® Nd EZ](#), are used in treads, sidewalls and other components of tires. Also included in our portfolio are the general purpose emulsion styrene butadiene rubbers (E-SBR), [Buna® SE](#).



Intensive cooperation with customers

We are at the forefront of innovation and production. With research and development centers around the world, we are working closely with our customers to develop products, processes and solutions that meet their continually changing needs. This, coupled with our excellent reputation and reliable deliveries, provides a solid basis for growing strategic cooperations and long-term personal contacts, while striving to establish excellent client relationships.

HIGH-CIS NEODYMIUM BUTADIENE RUBBER

Properties

The **Buna® Nd EZ** family of products is a new generation of high-cis butadiene rubbers that presents a modified polymeric structure enabling remarkable improvements in the processing performance of rubber compounds without sacrificing dynamic properties. This new family of butadiene rubbers catalyzed by neodymium has a very high 1,4-cis content combined with a low 1,2-vinyl content and a narrow molecular weight distribution. Compared to our standard Nd-BR family of products **Buna® Nd EZ** rubbers feature an increased degree of branching.

This increased degree of branching leads to a lower final compound viscosity and improved downstream processing on the mill or extruder. Subsequently the modified structure leads to improved polymer phase distribution and therefore improved filler distribution which results in excellent dynamic properties. These new grades of easy processing Nd-BR overcome the conflict between superior tire properties and challenging processing.

Applications

Typical applications are tires, retreads, conveyor belts and anti-vibration bushings. It can be blended with NR for goods having thick sections thereby providing high resistance to heat induced reversion (such as buffers and truck tire treads), roll covers and belts needing high abrasion resistance and reduced rolling resistance. These new grades of easy processing Nd-BR can be blended with S-SBR to improve abrasion resistance and rolling resistance in tire tread sections. The controlled level of branching also makes these grades more suitable for injection moulded articles compared to the more linear standard grades. Provided that the compounds are formulated and processed correctly, the vulcanizates have excellent resistance to aging, reversion, abrasion and flex cracking with superior low temperature flexibility and high resilience.



Product Portfolio

Name	Production Site	ML (1+4)	Remark	Physical Form
Buna® Nd 22 EZ	Dormagen (DE)	63	modified and long chain branched	in bales
Buna® Nd 24 EZ	Dormagen (DE)	44	modified and long chain branched	in bales

HIGH-CIS NEODYMIUM BUTADIENE RUBBER

Buna® CB

Properties

High-cis butadiene rubbers present a polymeric structure that enables remarkable improvements in the performance of rubber vulcanizates.

ARLANXEO butadiene rubbers catalyzed by neodymium have a very high 1,4-cis content together with a very low 1,2-vinyl content, a relatively narrow molecular weight distribution and a low degree of branching.

Applications

Typical applications are tires, conveyor belts, caterpillar tread blocks, golf balls, footwear soles, V-belts etc. They can be blended with NR for goods having thick sections and requiring high resistance to reversion, besides improving abrasion resistance. The vulcanizates have outstanding resistance to aging, reversion, abrasion and flex cracking, good low temperature flexibility and high resilience.

Product Portfolio

Name	Production site	ML (1+4)	Remark	Physical Form
Buna® CB 22	Cabo (BR), Dormagen (DE), Pt. Jérôme (FR), Orange (US), Singapore	63	highly linear	in bales
Buna® CB 24	Cabo (BR), Dormagen (DE), Pt. Jérôme (FR), Orange (US), Singapore	44	highly linear	in bales
Buna® CB 25	Dormagen (DE)	44	long chain branched	in bales
Buna® CB 29 MES	Dormagen (DE)	37	MES-oil extended	in bales
Buna® CB 29 TDAE	Dormagen (DE)	37	TDAE-oil extended	in bales



■ High-tech for safety,
performance and progression

HIGH-CIS COBALT BUTADIENE RUBBER

Properties

High-cis butadiene rubbers present a polymeric structure that enables remarkable improvements in the performance of rubber vulcanizates.

ARLANXEO butadiene rubbers catalyzed by cobalt have a high 1,4-cis content combined with higher 1,2-vinyl content and a broader molecular weight distribution with an increased degree of branching that allows easy processing during the production of high quality rubber goods.

Applications

Co-BRs can be used in sidewall and tread compounds for tires. Further typical applications are conveyor belts, golf balls, footwear soles, etc. They can be blended with NR for goods having thick sections, high resistance to reversion and high abrasion resistance.

Product Portfolio

Name	Production site	ML (1+4)	Remark	Physical Form
Buna® CB 1221	Orange (US)	53	highly branched	in bales
Buna® CB 1203	Orange (US)	43	branched	in bales
Buna® CB 1220	Orange (US)	40	highly branched	in bales

LOW-CIS LITHIUM BUTADIENE RUBBER

Properties

Low-cis butadiene rubber is a linear polymer used in classical tire formulations around the bead area of the tire. The **Buna® CB 60** grade is star branched to allow the incorporation of high loadings of filler yet allowing excellent processibility in, for example, apex compounds.

Applications

Technical rubber goods, apex areas of the tire, shoe soles and in applications where low temperature flexibility is important.

Product Portfolio

Name	Production site	ML (1+4)	Remark	Physical Form
Buna® CB 60	Pt. Jérôme (FR)	60	star branched	in bales
Buna® CB 55 NF	Pt. Jérôme (FR)	55	linear	in bales
Buna® CB 55 L	Cabo (BR)	51	linear	in bales
Buna® CB 45	Cabo (BR), Orange (US)	45	linear	in bales

BUTADIENE RUBBER FOR PLASTIC MODIFICATION

Properties

ARLANXEO butadiene rubbers for plastic modification are produced by a solution polymerization process which enables the production of very pure, virtually gel-free, very clear and almost colorless products. These rubbers are manufactured either in an anionic process or using Ziegler-Natta catalyst systems. The use of organometallic catalysts produces highly uniform polymers that are particularly suited for use in high impact polystyrene (HIPS) and for the mass-solution polymerization of acrylonitrile-butadiene-styrene resins (m-ABS).

Stabilization Packages

Regarding the different requirements of customers and various regional legislations, ARLANXEO offers a range of different antioxidant systems within its portfolio. These systems are characterised by different abbreviations „T“, „IT“ & „GPT“. For more detailed information please contact your regional technical service representative that can be found on page 15.

Product Portfolio

Name	Production site	Type	SV * (mPas)	ML (1+4)	Physical Form
Buna® CB 70 GPT	Cabo (BR)	Li-BR	250	69.5	in bales
Buna® CB 55 GPT	Cabo (BR)	Li-BR	165	52.5	in bales
Buna® CB 550 T	Pt. Jérôme (FR)	Li-BR	163	54	in bales
Buna® CB 530 T	Pt. Jérôme (FR)	Li-BR	250	68	in bales
Buna® CB 550 IT	Orange (US)	Li-BR	163	54	in bales
Buna® CB 550	Orange (US)	Li-BR	163	54	in bales
Buna® CB 380 IT	Orange (US)	Li-BR	90	38	in bales
Buna® CB 380	Orange (US)	Li-BR	90	38	in bales
Buna® CB 565 T	Pt. Jérôme (FR)	Li-BR – star branched	44	60	in bales

Name	Production site	Type	SV * (mPas)	ML (1+4)	Physical Form
Buna® CB 728 T	Orange (US)	Nd-BR	160	44	in bales

*5,43 % rubber solution in toluene

Macrostructure of Butadiene Rubbers

The use of the different types of polymerization systems influences the macrostructure of the final polymers. They can become either linear or branched which influences

the rheological behavior of the rubber itself, such as in its solution viscosity, Mooney viscosity and cold flow. The properties of HIPS are also significantly affected by the macrostructure of the rubber used.

Name	Type	MWD (Mw/Mn)	ML 4/SV
Buna® CB 380 IT, Buna® CB 380	Li-BR	~ 2.2	~ 0.42
Buna® CB 55 GPT, Buna® CB 550 T, Buna® CB 550, Buna® CB 550 IT	Li-BR	~ 2.0	~ 0.32
Buna® CB 530 T, Buna® CB 70 GPT	Li-BR	~ 2.0	~ 0.27
Buna® CB 565 T	Li-BR - star branched	~ 1.6	~ 1.36
Buna® CB 728 T	Nd-BR	~ 2.0	~ 0.20 - 0.28

BUNA® FX – FUNCTIONALIZED SOLUTION STYRENE BUTADIENE RUBBER (S-SBR)

The Buna® FX product group is a new family of high performance solution styrene butadiene rubbers (S-SBR) that compliments the popular Buna® VSL family. The Buna® FX grades are functionalized with polar end-groups to increase the interaction with silica fillers. This reduces the hysteresis inside the tread compound, thus reducing the rolling resistance of the tire. Traction indicators are also improved.

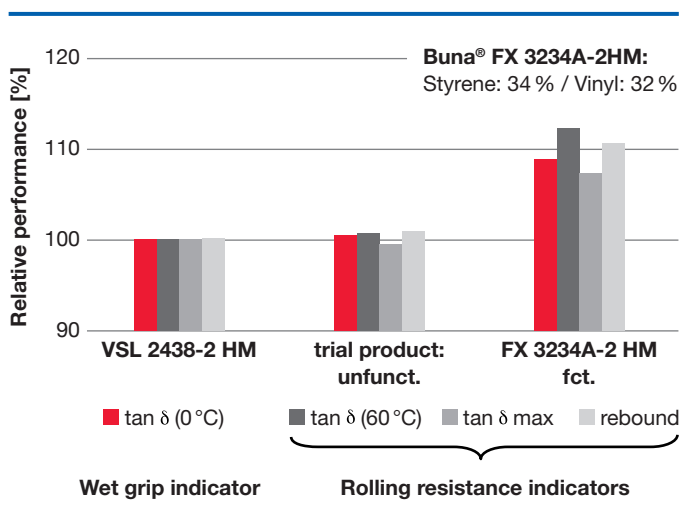
Buna® FX 3234A-2 HM has a Mooney Viscosity of 80 after the addition of 37,5 phr of TDAE oil. The high Mooney imparts excellent treadwear performance. The high styrene content set at 34% imparts a high level of dynamic stiffness making the grade especially suitable for high performance summer tires. The glass transition temperature of the product is -30°C. Buna® FX 3234A-2 has a slightly reduced viscosity to allow easier processing.

Status of the continuous process:

- Specifically suited for high styrene S-SBR grades, but also for all other microstructures
- Fine tuning of tire properties possible



Buna® FX S-SBRs provide significant improvements in tire properties



Product Portfolio

Name	Production site	styrene (%)	vinyl (%)	ML (1+4)	type of oil	oil (phr)	Tg (°C)	Physical Form
Buna® FX 3234A-2 HM	Pt. Jérôme (FR)	34	32	80	TDAE	37.5	-30	in bales
Buna® FX 3234A-2	Pt. Jérôme (FR)	34	32	65	TDAE	37.5	-30	in bales

Properties

Solution vinyl styrene butadiene rubbers have a modified microstructure with a higher vinyl content than for example [Buna® SL](#) grades. Their vinyl and styrene contents increase the Tg values which result in an excellent balance of important properties in tire compounds like handling, traction and rolling resistance, provided that the compounds are formulated and processed correctly. Due to our vast experience with these types of synthetic rubbers, ARLANXEO can offer a broad portfolio of different types of S-SBRs with a wide range in microstructure (vinyl/styrene), varied types of coupling, adjusted glass transition temperature (Tg), targeted functionalizations and Mooney viscosity values. Vulcanizates prepared with these rubbers have excellent resistance to reversion and a distinguished resilience, while keeping flexibility at relatively low temperatures.

Applications

[Buna® VSL](#) Solution SBR's are widely used in passenger tire tread formulations and in particular, high performance tire treads. High vinyl grades, high styrene grades or blends of both are selected depending upon the application requirements of the tire for example, all season tires, winter tires or summer tires. By selecting the correct grade for each of these applications, grip and rolling resistance is enhanced, both being important features on tire labels all over the world. Our offering of TDAE oil extended grades allows for very high molecular weights in the rubber which is vital for excellent treadwear resistance combined with easy processing. Blending with [Buna® CB](#) Neodymium Butadiene Rubber and [Buna® FX](#) grades will improve rolling resistance and treadwear resistance further to optimize the balance of properties required in the tire.

Product Portfolio

Name	Production site	styrene (%)	vinyl (%)	ML (1+4)	type of oil	oil (phr)	Tg (°C)	Physical Form
Buna® VSL 4526-2	Pt. Jérôme (FR)	26	44.5	50	TDAE	37.5	-30	in bales
Buna® VSL 4526-2 HM	Pt. Jérôme (FR)	26	44.5	62	TDAE	37.5	-30	in bales
Buna® VSL 2538-2	Pt. Jérôme (FR)	38	25	50	TDAE	37.5	-31	in bales
Buna® VSL 2438-2 HM	Pt. Jérôme (FR)	38	24	80	TDAE	37.5	-32	in bales
Buna® VSL 3038-2 HM	Pt. Jérôme (FR)	38	30	66	TDAE	37.5	-26	in bales

SOLUTION STYRENE BUTADIENE RUBBER

Buna® SL

Properties

Provided that the compounds are formulated and processed correctly, the vulcanizates have superior resistance to reversion. The low temperature flexibility, resilience and abrasion resistance depend on the polymer's styrene and vinyl content. The low vinyl content provides a low Tg which gives an excellent low temperature flexibility, abrasion resistance and low rolling resistance.

Applications

Buna® SL has excellent properties in the manufacture of tires, retreads, moulded technical parts, injected or extruded goods, surgical goods, shoe soles and automotive industry parts. In tire manufacture it is blended with NR, BR or E-SBR.

Product Portfolio

Name	Production site	ML (1+4)	styrene (%)	type of oil	oil (phr)	Physical Form
Buna® SL 4525-0	Cabo (BR)	45	25	none	-	in bales
Buna® SL 4518-4	Cabo (BR)	45	18	hydrotreated naphthenic	37.5	in bales
Buna® SL 7518-4	Cabo (BR)	75	18	hydrotreated naphthenic	15.0	in bales

STYRENE BUTADIENE LATEX

Taktene® Latex

Properties

Foams produced with Taktene® Latex present good elasticity, rebound and dimensional stability. Asphalt binders modified with Taktene® Latex show elastic properties that reduce rutting (permanent deformation) and fatigue cracking, increase pavement's durability and reduce its maintenance costs. This modification also allows an expansion of the temperature range of service.

Applications

Taktene® Latex is used in the production of gel and non-gel laminated foam, molded foam, lining impregnation, carpet backing, agglomerates of coconut fiber and cork, manufacture of insoles and in modification of asphalt emulsions. Taktene® Latex S 62 F contains no biocide and allows the use in food applications such as production of chewing gum base.

Product Portfolio

Name	Production site	Total Solids (%)	Brookfield visc.	bound styrene (%)	Physical Form
Taktene® Latex S 62	Caxias (BR)	68	800	24	aqueous dispersion
Taktene® Latex S 62 F	Caxias (BR)	68	800	24	aqueous dispersion

Properties

Emulsion styrene butadiene rubbers have a macrostructure with high polydispersions and a low to medium degree of branching. These features make them excellent processing grades allowing a high filler loading incorporation in rubber compounds. Provided that the compounds are formulated and processed correctly, the vulcanizates produced with these rubbers have excellent resistance to reversion, good flexibility at low temperatures, while still maintaining outstanding resilience and abrasion resistance.

Applications

Buna® SE is used in order to achieve excellent resistance to wear and tear besides high resistance to cracking. It processes easily in extrusion and calendering, due to its particular macrostructure. It is used in tires, retreads, conveyor belts, piping, hoses, tubings, carpets, molded products in general and shoe soles.

Product Portfolio

Name	Production site	styrene (%)	ML (1+4)	type of oil	oil (phr)	Stabilisation	Physical Form
Buna® SE 1500	Caxias (BR)	23.5	52	none	-	staining	in bales
Buna® SE 1502 H	Triunfo (BR)	23.5	53	none	-	non-staining	in bales
Buna® SE 1502 L	Triunfo (BR)	23.5	49	none	-	non-staining	in bales
Buna® SE 1723	Caxias (BR)	23.5	50	TDAE	37.5	staining	in bales
Buna® SE 1739	Caxias (BR)	40.0	53	TDAE	37.5	staining	in bales
Buna® SE 1783	Caxias (BR)	23.5	49	RAE	37.5	non-staining	in bales
Buna® SE 1793	Caxias (BR)	23.5	51	TRAE	37.5	staining	in bales
Buna® SE 1799	Caxias (BR)	40.0	55	TRAE	37.5	staining	in bales

STYRENE – BUTADIENE BLOCK COPOLYMERS **Buna® BL**

Properties

Buna® BL grades are solution polymers having high purity and light colour. They have been designed particularly with the shoe sole industry in mind. Buna® BL grades present a high content of block styrene that makes these polymers a good choice for the manufacturing of shoes soles with increased hardness without sacrificing abrasion resistance.

Applications

BL 30-4548 is widely used for manufacturing microporous sheets because of its intrinsic low shrinkage and good cellular uniformity in high and low density compounds. BL XP 7409 is suitable for injection molding application due to its thermoplastic behaviour at higher temperatures allowing the production of injection molded rubber goods. Due to their high hardness Buna® BL grades can also be used in rubber heel formulations.

Product Portfolio

Name	Production site	ML (1+4)	Styrene (%)	Block Styrene (%)	Physical Form
Buna® BL 30-4548	Cabo (BR)	45	48	30	in bales
Buna® BL XP 7409	Cabo (BR)	50	48.5	34.5	in bales



■ A look at the production process for ARLANXEO butyl rubber:
The material before the pressing operation

The major application area for ARLANXEO butyl rubber products is the tire industry, but its unique properties also make it a key polymer for a variety of technical rubber applications. Butyl vulcanizates offer an attractive range of properties including low permeability, high damping, good ageing, chemical resistance and excellent mechanical properties.

Halogenated grades have a rapid cure rate and can be blended with natural rubber (NR) or synthetic rubbers such as nitrile rubber (NBR), styrene-butadiene rubber (SBR), polychloroprene rubber (CR), ethylene-propylene rubber (EPDM), or butadiene rubber (BR).

Key properties of butyl rubber

- excellent ageing stability
- high impermeability to gases
- high resistance to heat
- high hysteresis for energy absorption
- slow vulcanization reactions (low levels of unsaturation)

Key properties of halobutyl rubber

- high impermeability to gases
- improved weather and ozone resistance
- improved chemical resistance
- cure versatility
- faster cure rate with lower amount of curatives
- cure compatibility with unsaturated rubbers
- good adhesion to other types of rubber
- heat resistance

REGULAR BUTYL RUBBER (IIR)



Properties

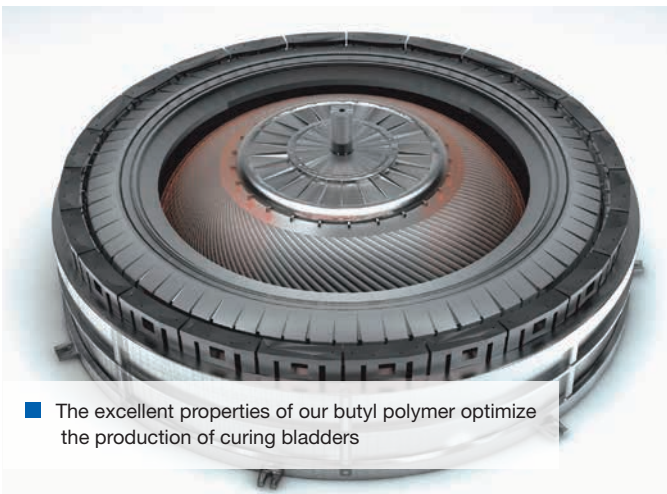
Butyl rubbers are copolymers of isobutylene with small amounts of isoprene. The incorporation of isoprene creates double bonds allowing vulcanization with sulfur and other agents.

Applications

The vulcanizate properties of ARLANXEO X_Butyl® make it particularly suitable for a variety of rubber products, such as tire inner tubes, curing bladders and protective clothing.

Product Portfolio

Name	Production site	Level of unsaturation (mol %)	Mooney viscosity (ML (1+8) 125 °C)	Density (g/cm ³)	Physical Form
X_Butyl® RB 100	Zwijndrecht (BE)	0.90	33	0.92	in bales
X_Butyl® RB 301	Singapore, Zwijndrecht (BE)	1.85	51	0.92	in bales
X_Butyl® RB 402	Zwijndrecht (BE)	2.25	33	0.92	in bales
X_Butyl® RB 101-3 (Food grade)	Sarnia (CA)	1.75	51	0.92	in bales



■ The excellent properties of our butyl polymer optimize the production of curing bladders



■ ARLANXEO butyl rubbers for tire inner tubes meet all requirements



■ Specialty ARLANXEO butyl for chewing gum applications



■ Always the right specialty rubber for adhesive tapes for different purposes

HALOGENATED BUTYL RUBBER (HIIR)



Properties

ARLANXEO halogenated X-Butyl® rubber (bromobutyl and chlorobutyl) is produced in a continuous process by reacting bromine (X-Butyl® BB grades) or chlorine (X-Butyl® CB 1240) with butyl rubber. Halogenation allows co-vulcanization and improved compatibility with other diene rubbers in addition to improvements in the vulcanization rates, state of cure and reversion resistance.

Applications

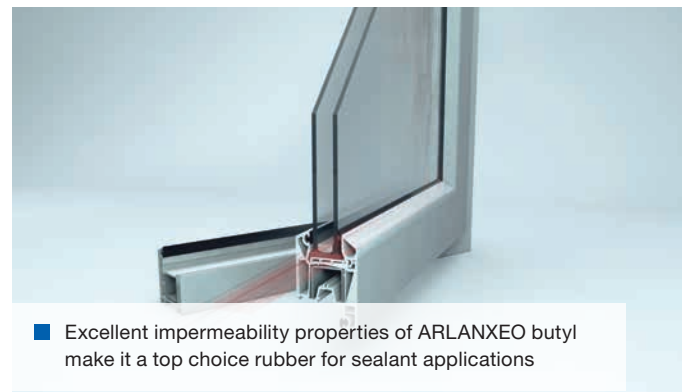
Many of the properties of halobutyl vulcanizates are virtually identical, regardless of the halogen employed. With bromobutyl rubber however, the bromine sites are more reactive, resulting in faster cures and better adhesion to unsaturated rubbers. The versatility of halobutyl rubber has led to a significant growth of its use in a diverse range of tire and non-tire applications.

Product Portfolio

Name	Production site	Halogen content (wt %)	Mooney viscosity (ML (1+8) 125 °C)	Density (g/cm³)	Physical Form
X-Butyl® BB 2030	Sarnia (CA), Singapore, Zwijndrecht (BE)	1.80	32	0.93	in bales
X-Butyl® BB 2040	Sarnia (CA)	1.80	39	0.93	in bales
X-Butyl® BB X2	Sarnia (CA), Singapore, Zwijndrecht (BE)	1.80	46	0.93	in bales
X-Butyl® CB 1240	Sarnia (CA), Zwijndrecht (BE)	1.25	38	0.92	in bales



■ Effective protection through reliable material: High quality ARLANXEO butyl rubbers



■ Excellent impermeability properties of ARLANXEO butyl make it a top choice rubber for sealant applications



■ High quality halogenated butyl rubber from ARLANXEO for pharmaceutical closure applications

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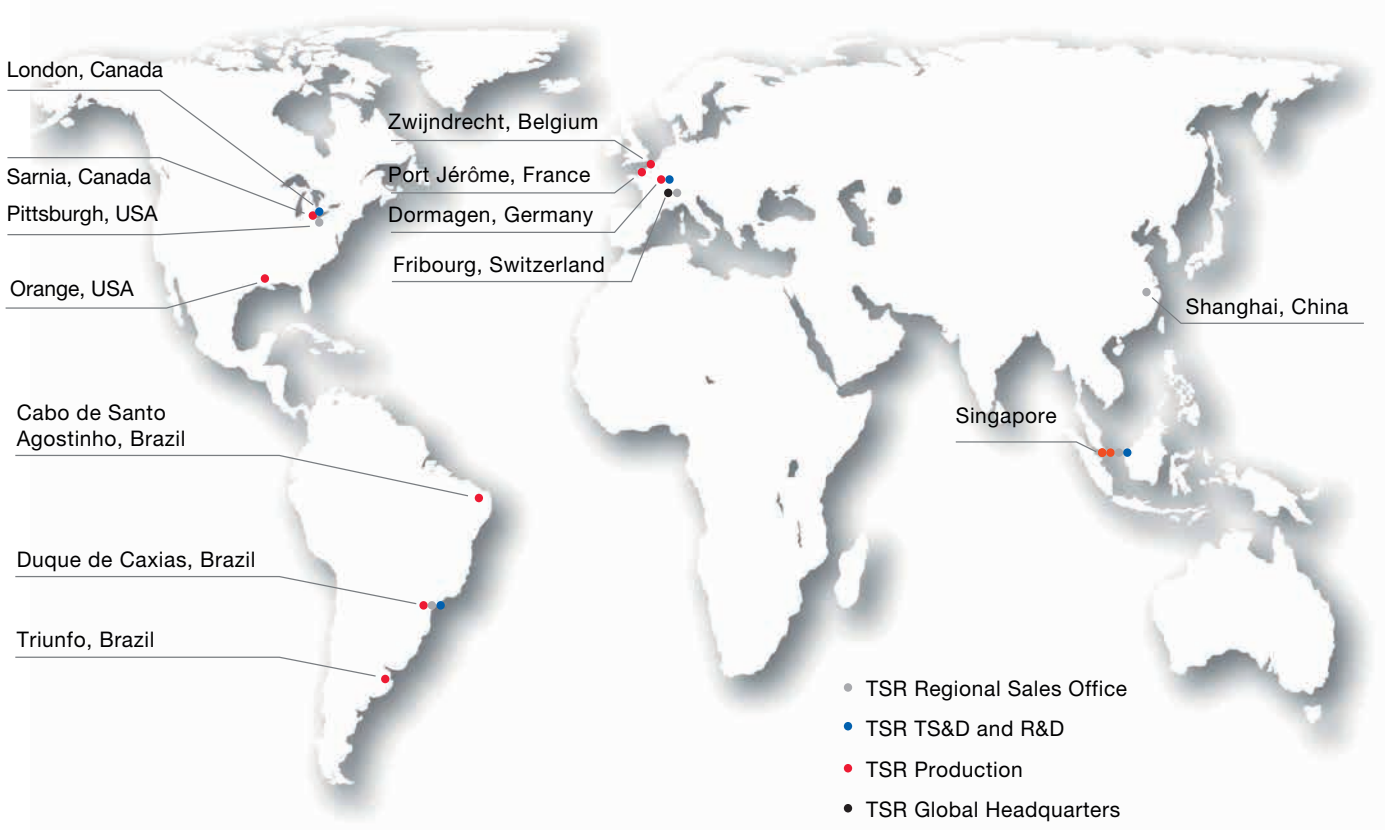
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Tire & Specialty Rubbers production sites, technical centers and offices





Tire & Specialty Rubbers (TSR)
Portfolio/Edition September 2019
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Trial Product:

(VP = Versuchsprodukt = trial product). The information contained herein is merely preliminary. Testing as to properties and applications is not final. Further information, including data which could change or add hazards with use, may be developed by the manufacturer, the user or a third-party institute. Such information may be needed to properly evaluate or use this product. Use is undertaken at the sole risk of the user.

Product Safety:

Relevant safety data and references as well as the possibly necessary warning labels are to be found in the corresponding safety data sheets.

Health and Safety Information:

Appropriate literature has been assembled which provides information concerning the health and safety precautions that must be observed when handling the ARLANXEO products mentioned in this publication. For materials mentioned which are not ARLANXEO products, appropriate industrial hygiene and other safety precautions recommended by their manufacturers should be followed. Before working with any of these products, you must read and become familiar with the available information on their hazards, proper use and handling. This cannot be overemphasized. Information is available in several forms, e.g., material safety data sheets and product labels. Consult us through your ARLANXEO TSR representative.

Regulatory Compliance Information:

Some of the end uses of the products described in this publication must comply with applicable regulations, such as the FDA, BfR, NSF, USDA and CPSC. If you have any questions on the regulatory status of these products, contact your ARLANXEO TSR representative.

The manner in which you use and the purpose to which you put and utilize our products, technical assistance and information (whether verbal, written or by way of production evaluations), including any suggested formulations and recommendations, is beyond our control.

Therefore, it is imperative that you test our products, technical assistance and information to determine to your own satisfaction whether they are suitable for your intended uses and applications. This application-specific analysis must at least include testing to determine suitability from a technical as well as health, safety, and environmental standpoint. Such testing has not necessarily been done by us. Unless we otherwise agree in writing, all products are sold strictly pursuant to the terms of our standard conditions of sale. All information and technical assistance is given without warranty or guarantee and is subject to change without notice. It is expressly understood and agreed that you assume and hereby expressly release us from all liability, in tort, contract or otherwise, incurred in connection with the use of our products, technical assistance and information.

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The current range of synthetic rubbers from ARLANXEO:

The most suitable compounds for tires of all kinds. From cars to high-speed motorcycles, from trucks to gigantic construction vehicles, from bicycles to aircraft tires. In addition, in the spotlight: Our perfected range of specialty rubbers for a variety of very different and most demanding applications.

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