



Catalogue of
**products for the
Rubber Industry**



Let's invent the future

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Introduction

For several years now, Repsol has been immersed in a process of transformation and diversification of its businesses with the aim of leading the energy transition. Today, it is the first company in its sector to support the Kyoto Protocol, the first to issue a green bond, as well as the first to set the goal of becoming a **net zero emissions** company by 2050 with intermediate targets for reducing its Carbon Intensity Indicator in 2020, 2025, 2030 and 2040.



The Repsol Commitment Net Zero Emissions by 2050

To achieve net zero emissions by 2050, Repsol is committed to a model that integrates all technologies for decarbonization, based on improving efficiency, renewable power generation, products with a low, neutral or even negative carbon footprint, circular economy, industrial innovation and the development of new solutions based on digitalization.

Repsol Lubricantes Y Especialidades, S.A., is the Repsol Group's company devoted to the research, development, production and marketing of high valueadded products derived from oil.

The company has a solid client-orientated policy driving through continuous improvement, deepening in the development of products for different applications with the purpose of fulfilling all the legal and specification requirements and collaborating closely with customers to improve their process and product performance, as well as customized products.

Repsol has:

- **Production Centres** throughout Spain.
- The most leading-edge **Technology Laboratory**, forefront of R&D&I worldwide (Repsol Technology Lab).
- The most **specialized international staff** and **technical experts**.

The company has a clear commitment to **Quality Management and Constant Improvement**, orienting its work at further-reaching goals such as **Total Quality**.

With a strong presence in the technical rubber and tire manufacturers, commercializing the following products for this market:

- Extender oils:
 - Paraffinic oils
 - Aromatic oils
 - Bioextensoils
- Anti-ozone waxes
- Process aids



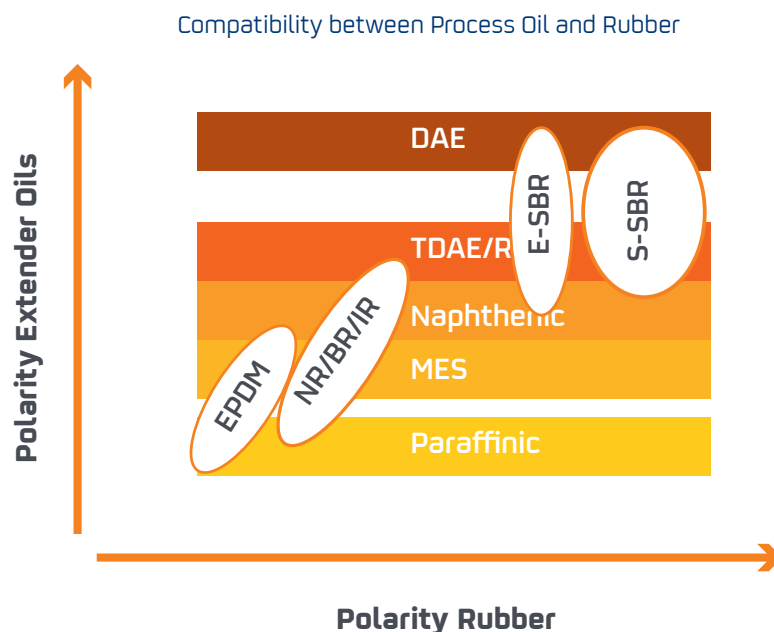
Extender Oils EXTENSOIL

The extender or process oils are generally added to the compounds during rubber processing to reduce their viscosity, to make easier their preparation and manufacture during the lamination and extrusion operations, as well as improving the fillers dispersion.

The use of these extender oils improves the final properties of the vulcanized product in the following aspects:

- Decreasing in stiffness and failure.
- Increasing the shear strength.
- Improving the Dynamic properties

Repsol offers a line of extender oils for the rubber industry, under the name of **EXTENSOIL**, with different polarities to be compatible with different rubbers.



Compliance with regulation

Repsol extender oils are committed to Health, safety and environment and fulfill the regulation of products for tire.

Paraffinic extender oils and **TDAE, RAE** and **MES** have low toxicity, which enable mixtures to be manufactured from rubbers without the loss of properties, but with the highest toxicological guarantee, in compliance with the legislation in force.

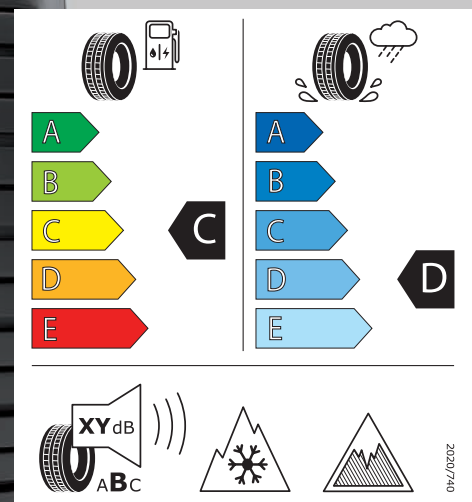
European Directive 2005/69 of the European Parliament demands that the tires commercialized in the EU from 1st January 2010 should contain in their formulation extender oils that must fulfill the criteria of non carcinogenicity:

- Extract DMSO [IP-346] < 3%, [has been proved latest every 6 months].
- Sum of 8 PAH's [Polycyclic Aromatic Hydrocarbons] < 10 ppm.
- B@P [Benzo-@-pyrene] < 1 ppm.

This directive has been integrated in the **REACH** Regulation [EC 1907/2006, Annex XVII, entry 50] where is collected the harmonization of analytical methodology for determining PAH's under the EN 16143 method of application from 2017.

Repsol extender oils have a specific impact in the three main characteristics in the tyre labelling that has been updated, 1 May 2021, in the new tyre labelling legislation in Europe [EU reg 2020/740]:

- Rolling Resistance [fuel consumption]
- Wet grip
- Abrasion Resistance

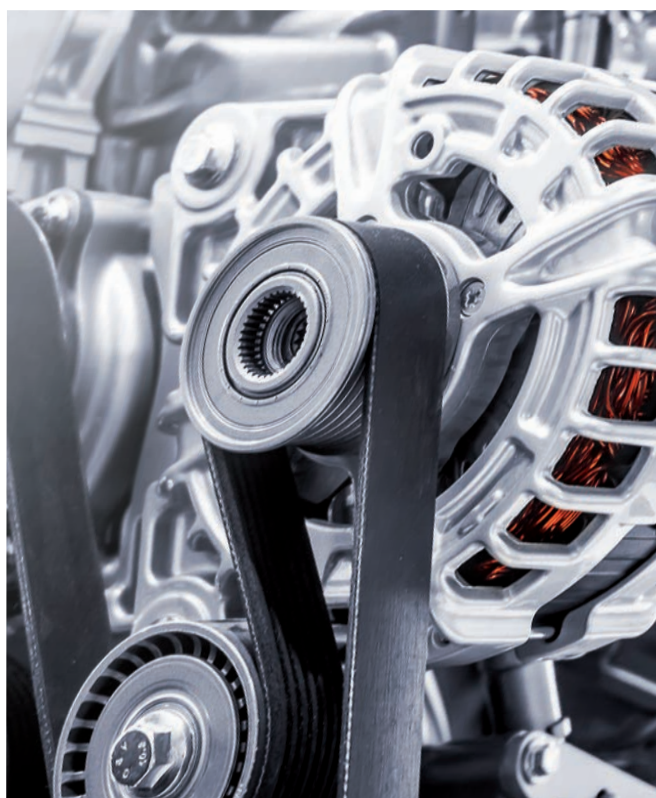


Paraffinic Extender Oils Extensoil

Paraffinic Extender oils are suitable for non-polar rubbers like EPDM to different applications like seals, O-rings, rubber component by injection or molded. Repsol has a wide range of paraffinic extender oils that cover all the viscosity and density customer needs.

CHARACTERISTICS	UNITS	METHOD	VALUE/RANGE							
			180	51	200	270	265E	265	21	29
Density at 15°C	Kg/l	ASTM D1298	0,865	0,870	0,875	0,885	0,890	0,890	0,908	0,902
Viscosity at 100°C	cSt	ASTM D445	2,9-3,6	3,9-4,4	5,0-5,5	8	10-12	11-13	30-33,5	34-39
Viscosity at 40°C	cSt	ASTM D445	12	20	32	62	100	115	485	620
Flash Point	°C	ASTM D92	> 180	> 185	>200	>225	>230	>230	>280	>290
Colour	-	ASTM D1500	< 1,0	< 1,5	< 1,5	< 2,5	< 3,5	< 3,5	< 5,5	< 5,0
Aniline Point	°C	ASTM D611	92	92	94	96	103	103	108	108
Sulphur	%w	ASTM D4294	0,7	0,80	0,85	1	1,1	1,2	0,8	1,3
Pour Point	°C	ASTM D97	< -9	< -9	< -9	< -9	< -6	< -9	< -6	< -9

Unless otherwise indicated, the values in the table must be considered as typical or indicative. For detailed values please contact Technical Assistance Department.



Aromatic Extender Oils Extensoil

Aromatic Oils are very suitable to extend polar rubbers, and Repsol recommend for high styrenic rubbers, like SBR, the **TDAE** and **RAE** due their excellent compatibility and low toxicity.

MES is the extender oil for choice for less polar rubbers like NR or BR in the tire innerliner or where the customer needs less heating requirements due their lowest Pour Point.

CHARACTERISTICS	UNITS	METHOD	VALUE/RANGE						
			1996 TDAE	14 RAE	14-E RAE	50C RAE	1170 RAE	3920 RAE	1471 MES
Density at 15°C	Kg/l	ASTM D1298	0,950	0,955	0,968	0,975	0,925	0,955	0,910
Viscosity at 100°C	cSt	ASTM D445	16-21	65-85	45-60	45-65	8-13	34-44	13-17
Flash Point	°C	ASTM D92		>270	>230	>220	190	200	
		ASTM D93	>220						>220
Aniline Point	°C	ASTM D611	< 80	< 75	< 100	< 80	< 80	< 80	85-100
Pour Point	°C	ASTM D97	39	25-35	45	< 45	6	20	< 0
PCAs ≤ 2,9	%p	IP-346	√						√
PAHs < 10 mgr/kg		EN-16143	√	√	√	√	√	√	√
1-@-Benzozpyrene < 1ppm		EN-16143	√	√	√	√	√	√	√
MI (AMES TEST)	%	ASTM E 1687		√	√	√	√	√	

TDAE: Treated Distillate Aromatic Extract; RAE: Residual Aromatic Extract; MES: Mild Extract Solvent; MI: Mutagenic Index.

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Bioextensoil

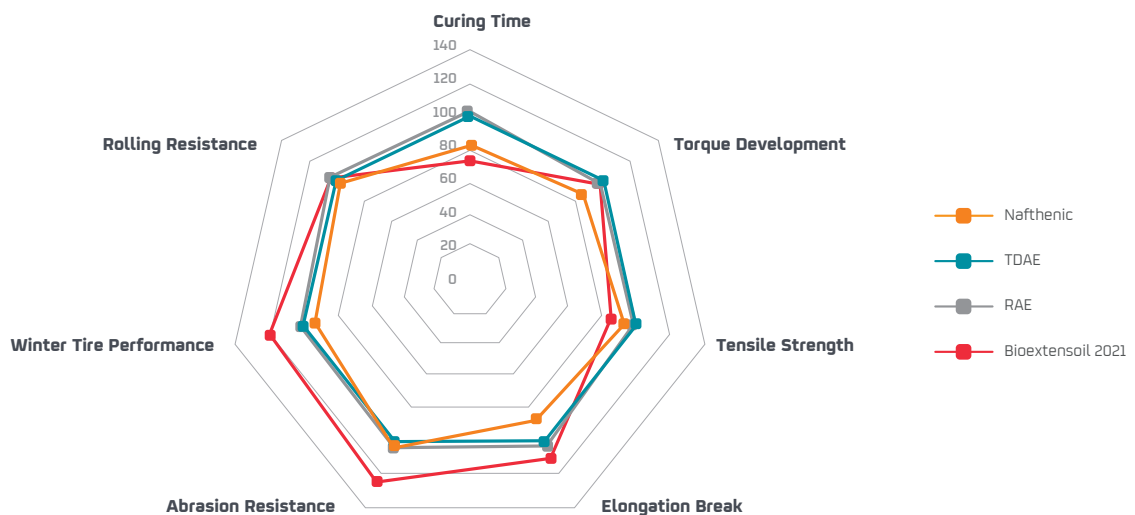
Repsol has developed a new product range of sustainable process oils to contribute to reduce the Carbon footprint in the tire and rubber processing, using a non-mineral oil, under the brand Bioextensoil that enhance the Repsol portfolio of extender oils giving:

- Sustainability, reduce CO2 emissions
- Do not compete with food market
- Fulfill PAH regulations
- Similar Tire performance or even better for Winter Tires
- Good filler dispersion
- New opportunities to develop new formulations with different performances

Comparing to conventional mineral Process Oil, this new sustainable oil has:

- Reduced curing time
- Similar Mechanical Properties
- Higher Elongation at break
- Higher Abrasion Index
- Lowest Payne Effect
- Competitive Rolling Resistance
- Promising properties for Winter Tires

Advantages of Bioextensoil vs conventional process oils



Data obtained from internal results on tire SBR/BR formulations

Repsol is committed to our customer sustainability targets and contribute to them developing tailor made Sustainable Process Oils according to our customer requirements.

Within the Repsol Sustainable Process oil product range we highlight the Bioextensoil 2021



Bioextensoil 2021

Bioextensoil 2021 is a sustainable oil with very low PAH content, very low S content, obtained from non-mineral sustainable sources.

Due to its nature, it is especially suited for formulating pneumatic parts that require a high glass transition temperature, guaranteeing high braking performance. Its plasticizing nature means that it can improve the processing in the extrusion process.

It meets the requirements of Directive 2005/69/EC on limiting the marketing and use of certain hazardous substances and preparations (polycyclic aromatic hydrocarbons) in extender oils and in tire.

Technical features

CHARACTERISTICS	UNIT	METHOD	VALUE
Density at 15 °C	kg/l	ASTM D 4052	0.980
Viscosity 100°C	cSt	ASTM D 445	35
Flash point	°C	ASTM D 93	>200
Sulphur	%, P	ASTM D4294	0,3 – 0,4
PCA's	%, P	IP – 346	2,9 max.
Pour Point	°C	ASTM D-97	+12 typical
Tg	°C	IT-LAB-103	-63
TAN	Mg KOH/g	ASTM D-664	50 - 100



In our environmental commitment, we promote the use of extender oils of sustainable origin for the rubber industry

Anti-ozone Waxes REDEZON

Repsol has developed a huge anti-ozone line under the brand REDEZON that are specially designed to avoid the ozone attack to unsaturated rubber parts in static conditions. These products are used by technical rubber and tire manufacturers all over the world due to their high technical quality and possibility of adapting the product to the highest technical requirements.

When the Ozone attacks the rubber surface small cracks perpendicular to the deformation direction appear and progress causing a useless tire.

To be really effective an anti-ozone wax must fulfill:

- Effective protection of the tire surface against the ozone during the first stage of the tire production and the customer storage conditions that is temperature, humidity and time.
- No “blooming” that is an undesired colored layer in the tire surface, caused by several variables but usually related with an excess of paraffin in the surface or a paraffin wax with a non-controlled migration speed.

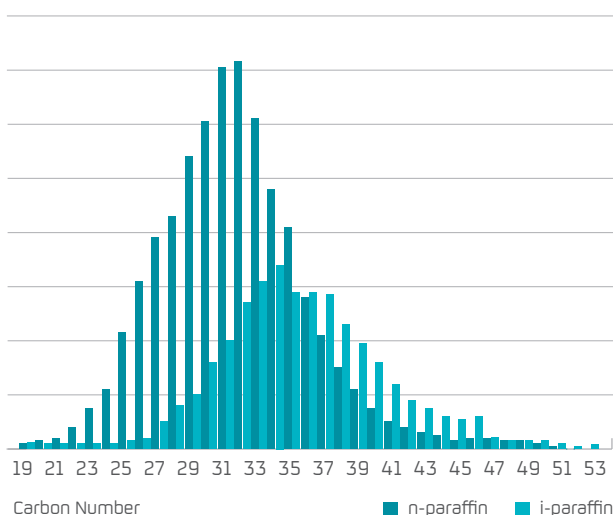
The Company has more than hundred formulation of Redezon® due to more than 30 years working very close to the customers and developing tailor-made products according the customer need.

The REDEZON portfolio is composed by standard product solutions or tailor-made blending, each one with the desired molecular weight, hydrocarbon distribution and molecular structure, providing maximum protection for specific operation conditions.

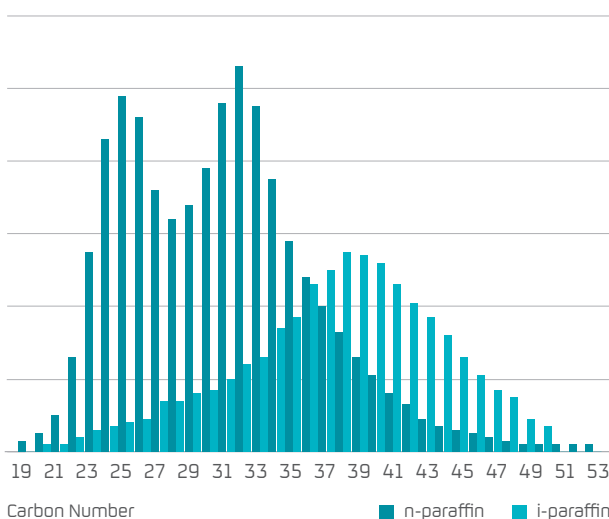
In this sense, Repsol, is known for its:

- Development of tailor made, anti-ozone waxes, optimizing the formulation with the proper selection of normal paraffins and iso-paraffins, guaranteeing an optimized migration rate within the range of operation temperatures.
- High technically knowledge in the mechanism of paraffin behavior that enables the continuous development of new anti-ozone products with high quality and high efficiency.
- Highly experienced worldwide technical support, as a result of its official approval and commercialization by the majority of tire manufacturers.

Monomodal REDEZON

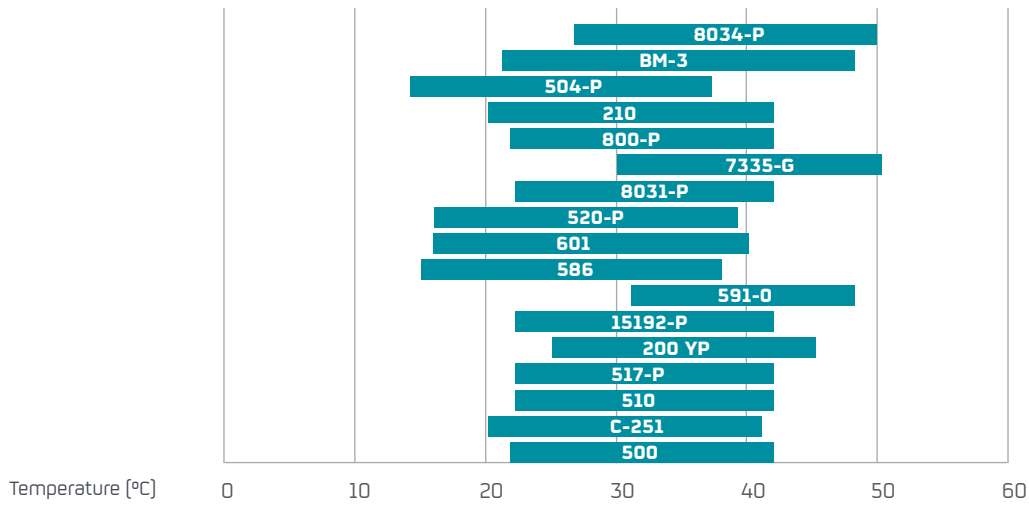


Bimodal REDEZON

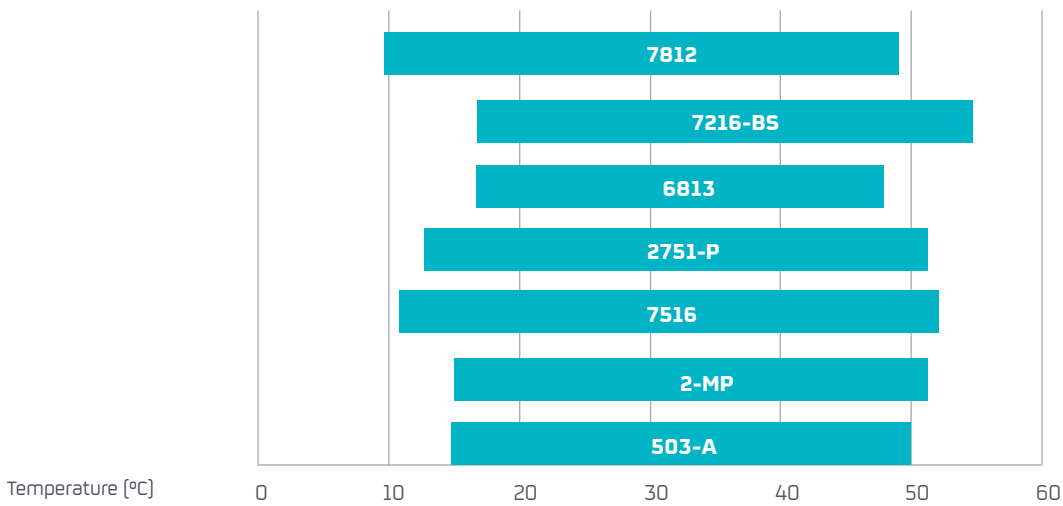


Hydrocarbon distribution and molecular structure are carefully designed in the REDEZON to give the best solutions

Monomodal REDEZON



Bimodal REDEZON



The broad portfolio of Redezon permit chooses the product that offers the maximum protection. Bimodal distribution gives wider range of temperature protection using only one product.



REDEZON	CONGEALING POINT [°C] ASTM D-938	MELTING POINT [°C] ASTM D-127	VISCOSITY AT 100°C [CST] ASTM D-445	N-PARAFFIN [%]	CARBON DISTRIBUTION	C _{MAX}	NOTES
2-MP	61 - 67		5,0 - 7,0	63,0 - 73,0	Bimodal	C26; C32	
200-YP	70 - 76		8,5 - 9,5	80 - 90	Monomodal	C33	
210	65 - 75		7,0 - 8,0	58 - 69	Monomodal	C32	NEW
2751-P	61 - 67		5,5 - 7,5	65 - 75	Bimodal	C25; C32	NEW
500	63 - 69*		5,5 - 7,5	54,4 - 74,5	Monomodal	C32	
503-A	61 - 67		6,5 - 7,2	70 - 80	Bimodal	C26; C32	
504-P		70 - 80	6,0 - 8,0	75 - 85	Monomodal	C27	1
510	60 - 69		5,0 - 6,5	70 - 85	Monomodal	C32	
517-P		69 - 75	8,0 - 10,0	56 - 66	Monomodal	C32	
520-P	64 - 69		5,0 - 7,0	70 - 85	Monomodal	C29	
586	55 - 63*		5,5 - 8,0	73 - 83	Monomodal	C28	
591-O	72 - 82		12 - 18	37 - 53	Monomodal	C32	
601	58 - 64		4,5 - 6,5	70 - 80	Monomodal	C30	
6813	65 - 71		7,0 - 8,0	70 - 80	Bimodal	C25; C32	NEW
7216-BS	69 - 75		8,5 - 13,0	64 - 76	Bimodal	C26; C35	NEW
7335-G	70 - 76	75 - 85	8,0 - 11,0	55 - 65	Monomodal	C34	High Gloss
7516	68 - 78		7,8 - 9,8	65 - 75	Bimodal	C26; C31	
7812	64 - 70		6,0 - 8,0	72 - 79	Bimodal	C25; C32	
800-P		75 - 85	7,5 - 11,5	54,5 - 74,5	Monomodal	C32	NEW
8031-P		75 - 85	9,0 - 12,0	55 - 65	Monomodal	C32	
8034-P	70 - 80		10 - 14	47 - 57	Monomodal	C35	NEW
15192-P	65 - 72		8,0 - 11,0	75 - 85	Monomodal	C32	
BM-3	65 - 75	81 - 91	9,0 - 13,0	59 - 65	Monomodal	C33	
C-251		65,1 - 71,3	5,5 - 6,9	65 - 75	Monomodal	C31	

1.- AL-504-P is a variety that comply FDA 172.886

* ASTM D-87

Unless otherwise indicated, the values in the table must be considered as typical or indicative. For detailed values please contact Technical Assistance Department.

The Redezon listed in the Table are the most representative of Repsol portfolio. If you do not find the appropriate Redezon or need other requirements we can offer you another one of our complete portfolio or design one tailor made.

Process Aids RYLEWAX

Repsol commercializes process aids under the name of **RYLEWAX**.

These **RYLEWAX** products act as process aids in the manufacture of rubber improving processability, reducing time and energy during mixing without modifying its final properties.

The characteristics of **RYLEWAX** products lead to compound improvement by working on different points:

- Increase in plasticity of the raw mixture.
- Decrease in viscosity of the mixture.
- Increase in extrusion speed (outlet speed).
- Improving final aspect, making easier its demoulding.
- Improvement in the dispersion and homogeneity of the fillers.

Non-polar Process aids based in Polyethylene wax, like Rylewax P, Rylewax 739, Rylewax AV and Rylewax MV have different characteristics to be suitable with customer requirements and are recommended for reducing blend viscosity and considerably improving parts extrusion and injection, or as a binder for use in masterbatches and as a rheology modifier in both solid and liquid lubricants.

Polar Process aid based in paraffin wax and fatty acids, like Rylewax 16, is recommended for polar polymers in order to improve flow properties in the blends by reducing friction between polymer chains (internal lubrication) and decreasing friction with metal parts (external lubrication), thus preventing heat loss and resulting in increased efficiency during extrusion. In the processing of natural rubbers (NR) or synthetic rubbers (SBR, NBR, CR and EPDM), or PVC because Rylewax 16 improves compound dispersion and decrease viscosity in the blend without affecting end properties. It is ideal for injection, extrusion or calendaring processes.

CHARACTERISTICS	UNITS	METHOD	VALUE/RANGE				
			RYLEWAX P	RYLEWAX 16	RYLEWAX 739	RYLEWAX MV	RYLEWAX AV
Melting Point	°C	ASTM D127	100 - 110	typically 100	100 - 110	101 - 107	95 - 105
Dropping Point	°C	ASTM D-3954				110 - 118	100 - 110
Penetration	mm/10	ASTM D1321	8 - 12		8 - 12	0 - 3	3 - 8
Viscosity Bookfield at 150°C	cP	IT-LAB-138	> 10		> 10	26 - 40	< 100
Density	g/cc	ASTM D-792	0,91 - 0,94	0,92 - 0,94	0,91 - 0,94	typically 0,94	0,91 - 0,94
Molecular Weight		GPC	< 2000		< 2000	typically 1500	typically 1500
Color		visual	White		White	White	White
Acidity	mg KOH/gr	Calculation	0	< 35	0	0	0

Unless otherwise indicated, the values in the table must be considered as typical or indicative. For detailed values please contact Technical Assistance Department

Technical support and development

The Specialties area of Repsol is fully oriented towards its clients, making available all of its human and material capacities for innovation: the Technical Support and Development team and the Repsol Technology Lab research center, which are equipped with the most advanced means to carry out their purpose.

The functions of the Technical Support and Development team include:

- Providing technical advice to clients.
- Developing new products conjointly with clients on notable projects.
- Promoting consistent quality and competitiveness of products.
- Constantly establishing and updating technical specifications.
- Detecting the market's demands and needs.
- Giving training courses to both staff and clients.
- Taking part in and cooperating with national, international, public and private entities and institutions related with its field of activity.

The Technical Assistance and Development team of Repsol cooperates with the clients to search for solutions which have specific requirements.

This commitment to development and innovation through cooperation is translated into a competitive advantage for both parties.



Quality, Safety, Environment and Energy Efficiency

Quality

We are advancing progressively towards Excellence, following the quality model appropriate to the different geographic environments in our activities, through periodical self-assessments, identification of improvement areas, establishment of programs based on teamwork, and participation of the entire organization.” We apply the quality management principles in line with the current ISO 9001 and IATF 16949 Norms.



Safety

Our goal is to carry out all our activities by considering the health and safety of people as essential values. In our commitment to people, we are advancing progressively towards excellence, carrying out systematic improvement actions, in line with the challenges and objectives of each business/area according to the criteria of the current ISO 45001 norm.



Environment and Energy Efficiency

- All our complexes and subsidiaries carry out their activities according to the Environmental and Energy Efficiency Management System criteria of the current ISO 14001 and ISO 50001 Norms.
- We are committed to energy efficiency to achieve our greenhouse gas emissions, energy intensity, and carbon intensity reduction plans and objectives.
- We are carrying out soil and underground water control actions that serve as preventive measures against subsoil contamination.
- In the complexes and subsidiaries, we carry out control, treatment, and operational monitoring actions.



Customer service and Specialized Products commercial network

Our extensive network of experts in Specialized Products is at your disposal at our headquarters at Calle Méndez Álvaro 44, Madrid, so that you can place your orders as comfortable and easily as possible. You can contact us by email:



especialidades@repsol.com



REPSOL

Let's invent the future