

RESEARCH CENTRE

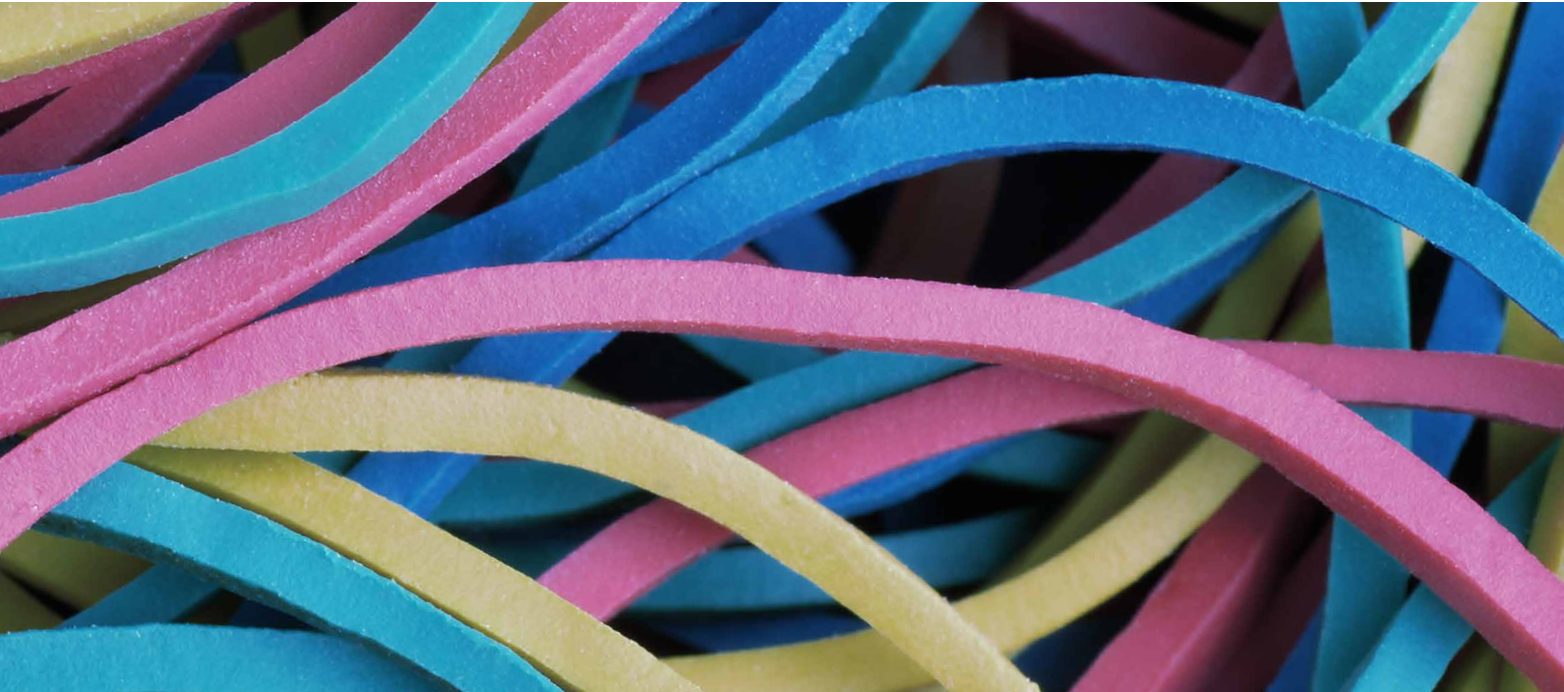
Eni Research Centre in San Donato Milanese has well equipped laboratories with advanced facilities to study, to develop and to complete the characterization of raw materials and final products. The Research Centre of Eni is compliant with UNI EN ISO 9001 for the following activities: "Applied research, technical assistance and laboratory analysis in the energy sector: lubricants, additives, bitumen, special products for automotive and industry" and "Production of pilot plants lubricants, fuels and oil" (EA 34.35 - Certificate No. 676).

QUALITY AND ENVIRONMENT

Eni Refining & Marketing and Chemicals pursues the goal of continuous improvement of products and services through a "Quality Management System" certificated in accordance with the UNI EN ISO 9001: 2008 and uses automated manufacturing plants with the highest quality and environmental standards. The Eni manufacturing plants adopt an environmental management system certified to the ISO 14001 standard.

CUSTOMER SERVICE

For further information on applications and features, please see technical and safety data sheets at [Eni.com](http://Eni.com)



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Eni Clematis rubber process oils



eni

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Eni is a major integrated energy company committed to growth in the activities of exploring, producing, transporting, transforming and marketing oil and gas and their derivatives. Eni operates in 83 Countries around the world, employing more than 84,000 people in all energy sectors in which it is involved.

Eni is the leader operator in refining and marketing of petroleum products in Italy, both in retail and wholesale. Eni Refining & Marketing and Chemicals is engaged in the production and marketing of high quality special products, with advanced performance able to offer solutions to an increasingly, demanding and competitive market.

The customer always has a reliable contact in Eni and the confidence that a solution can be found to any problem by a partner who can quickly provide answers and anticipate the future needs of its customers. Eni takes care of small customers as well as big ones in the same way.

Technology and experience at service of elastomers industry

Rubber process oils (RPOs) are special products, used during the processing and manufacturing of rubber compounds, produced in selected refineries, equipped with specific plants able to yield paraffinic oils and treated aromatic oils.

Eni is one of the most important rubber process oils producer in Europe thanks to the Eni Refining & Marketing and Chemicals Livorno Refinery in Italy. Selected high paraffinic crude oils and other special feedstocks are processed in dedicated plants to produce high quality process oils useful for manufacturing rubber products. Over last years these plants of Livorno Refinery have been implemented and updated in order to improve the quality and the quantity of special products, providing safe oils which have completed and upgraded the products portfolio of Eni.

Process oils can have different roles according to their action during the elastomers and rubber manufacturing cycle:

- **process aids**, when they facilitate the dispersion and the blending of rubber with other blend components (pigments, additives, carbon-black);
- **extender oils**, when they extend rubber improving its processability without altering the physical properties and reducing the cost of rubber compound.

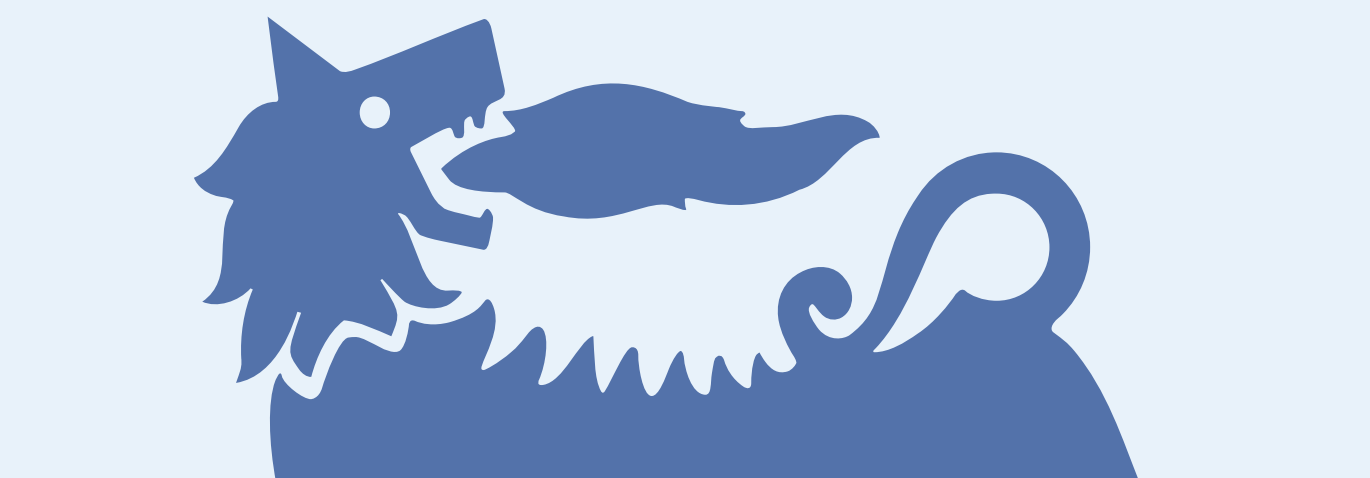
Eni is committed to developing better process oils to support the rubber and tyre industry. Whatever the need or application, Eni can provide the best solution thanks to a full range of process oils, including:

- **paraffinic oils**: suitable for the production of light colour rubbers where colour stability and high oxidation stability are required;
- **aromatic safe oils**: used as extender oils in the production of rubbers and as free oils in the manufacturing of tyres and other rubber goods.

Eni rubber process oils provide high characteristics and performance:

- high **stability**, with a relative inertness towards curing additives;
- remarkable **compatibility** with rubber and rubber blend. The degree of compatibility does indeed play a central role in the adjustment and control of oil migration and crystallization, helping to minimize and to prevent exudation phenomena, without altering the characteristics or changing the color of the blend (see table);
- low **volatility** both during the high temperature production phases and during the storage of the final products;
- suitable **viscosity** and **plasticity behavior** in order to facilitate the blending and dispersion of the fillers and helping the elastomer workability.

| Oil        | Physical properties  | Suitability with rubber   |
|------------|--|---|
| Aromatic   | <ul style="list-style-type: none"><li>• the best compatibility with rubber</li><li>• final rubber product exhibits high strength</li></ul> | <ul style="list-style-type: none"><li>• mainly used as extender oil for SBR (Styrene Butadiene Rubber) and BR (Butadiene Rubber)</li><li>• can also be used for CR and (Chloroprene Rubber) related rubber products</li></ul> |
| Paraffinic | <ul style="list-style-type: none"><li>• good ozone resistance</li><li>• good light stability</li></ul>                                     | <ul style="list-style-type: none"><li>• mainly used as process oil for EPDM (Ethylene Propylene Diene Monomer) and IIR (Isoprene Rubber)</li></ul>  |



Eni Clematis  
rubber process oils for the elastomers industry

Explore the wide Eni special products portfolio for meeting requirements in rubber manufacturing and tyre production:

Eni Clematis TD, classified as TDAE (Treated Distillate Aromatic Extract) is an aromatic safe oil with low content of polycyclic aromatic hydrocarbons (PAHs), produced through a solvent extraction process of traditional distillate aromatic extract (DAE) oil. Eni Clematis TD is a non-labelled process oil used as extender oil in the production of OE SBR and BR and as free oil in the manufacturing of tyres and other rubber goods.

Eni Clematis MS, classified as MES (Mild Extraction Solvate), is an aromatic safe oil produced by a heavy paraffinic fraction with an aromatic content exceeding that one of standard paraffinic oils, but without being labelled as carcinogen. It is used as extender oil in the production of rubbers and in the manufacturing of tyres and other rubber goods.

Eni Clematis RL, classified as RAE LA (Residual Aromatic Extract Low Aromatic), is a safe oil, not carcinogenic with low content of polycyclic aromatic hydrocarbons (PAHs) and low value of mutagenicity index (MI). Eni Clematis RL is a high viscosity, dark green oil manufactured from a solvent extraction of de-asphalted vacuum residue. It offers an alternative to traditional distillate aromatic extract (DAE) products and it is used as extender oil in the production of rubbers and in the manufacturing of tyres and other rubber goods.

Eni’s way of doing business is based on keeping a strong focus on health, safety and environment.

European legislation has been tightened in recent years to protect humans and the environment from the hazardous substances that can be present in extender oils.

According to the stringent new requirements set by the REACH (EC 1907/2006) Regulation in Annex XVII (Item 50), extender oils in tyres must meet the following requirements:

- the sum of 8 specific polycyclic hydrocarbons is limited to a max of 10 ppm;
- a marker PAH, Benzo(a)pyrene, is limited to a max of 1 ppm;
- these limits are considered to be met if the DMSO extract (IP 346) is less than 3% as long as the correlation with the PAH content is checked at least every 6 months;
- vulcanized rubber compounds must not exceed the limit of 0.35% Bay protons (ISO 21461).

Regulation (EC) 1222/2009 is in force since 2012. This tyre labelling system focuses on braking efficiency under wet conditions, fuel consumption and noise reduction, making these paramount criteria when assessing the quality of a tyre.



| Characteristics  | Clematis TD      | Clematis MS       | Clematis RL      |
|--|------------------|-------------------|------------------|
| Density, kg/m³   | 940 - 970        | 895 - 925         | 940 - 1020       |
| Viscosity at 40°C, mm²/s   | 370 - 500        | 160 typical       | --               |
| Viscosity at 100°C, mm²/s  | 17 - 22          | 13 - 17           | 45 - 75          |
| Flash Point, °C  | >240             | >220              | >200             |
| Pour Point, °C   | <30              | <-6               | <33              |
| VGC  | 0.86 - 0.94      | 0.825 - 0.865     | 0.87 - 0.95      |
| Vitreous Transition Temperature, °C  | -45 / -53        | -62 typical       | --               |
| CA/CN/CP   | 23/29/48 typical | 11/19/70-17/13/70 | 30/10/60 typical |
| Refractive Index at 20°C   | 1.52 - 1.54      | 1.495 - 1.505     | 1.54 - 1.56      |
| Sulphur, %wt   | <3               | <2                | <6               |
| DMSO Extract, %wt  | <2.9             | <2.9              | --               |
| Water, %wt   | <0.5             | <0.1              | --               |
| Aniline Point, °C  | 60 - 75          | --                | 45 - 75          |
| Polycyclic aromatic hydrocarbons (PAHs) - benzo(a)pyrene (BaP), mg/kg <sup>(1)</sup> | <1               | <1                | <1               |
| Sum of 8 PAHs, mg/kg <sup>(1)</sup>  | <10              | <10               | <10              |
| Mutagenity Index (Ames mod.) <sup>(2)</sup>  | --               | --                | <0.4             |

(1) Legal limits - Reg. REACH, Annex XVII, Point 50 regarding the extender oils used for the production of tyres or part of tyres. It does not apply to other uses.  
(2) Limit value correlated with lack of classification as carcinogenic - see REACH Registration dossier.

Eni provides also further specific process oils:

Eni Celtis 900, high paraffinic process oils, with excellent anti-stain properties, thermal stability and oxidation resistance. Eni Celtis 900 oils are available in several viscosity grades to cover the widest possible field of applications. Eni Celtis 900 oils are used as process oils in the production of styrene-butadiene rubbers (SBR) and low unsaturation elastomers such as butyl rubbers (IIR) and ethylene-propylene terpolymers (EPDM).

Eni ESAR (130, 90), low viscosity distilled aromatic oils to meet the elastomers industry requirements of high solvency needs when it is possible the use of labelled processes oils.

