

TECHNICAL INFORMATION

DPR® 400 / DPR® 75 / DPR® 40 / DPR® 35 Liquid Natural Rubber

Product Description

The DPR products are low molecular weight, liquid polymers of natural rubber. The chemical backbone is cis-1,4 polyisoprene from natural rubber.

DPR 400 is the most viscous of the DPR liquid rubbers and accepts the maximum extension of plasticizer and filler. When used as a processing aid, DPR 400 demonstrates slightly higher retention of cured physical properties as compared to the lower viscosity grades of liquid natural rubber.

DPR 75 offers an intermediate viscosity grade within the product line. Its viscosity provides an optimum balance between the lower viscosity needed for easy processing and the thickness required to bind aggregates and other highly loaded systems.

DPR 40 is a low viscosity grade of the DPR liquid rubbers. When used as a processing aid, DPR 40 demonstrates greater reduction in plasticity than the higher viscosity grades of DPR.

DPR 35 offers the lowest viscosity of the product line. It is the easiest product to pour and is the most efficient plasticizer of liquid rubber products. DPR 35 liquid rubber is compatible with many solvents, plasticizers, resins and reinforcements. It increases the polymer's capacity for fillers and improves the acceptance of non-compatible reinforcements.

DPR liquid rubber offers processing flexibility and performance options for a wide range of applications. The DPR products vulcanize at either ambient or elevated temperature with standard curatives for natural rubber. The cure cycles can be as short as a few minutes to as long as several days. The DPR products contain no solvents or additives; and they are compatible with a broad range of solvents, plasticizers, resins and polymers.

Liquid natural rubber improves rubber and polymer compounding and final processing. It acts as a plasticizer to reduce cycle time and energy consumption. Since it cures by the same mechanism as natural rubber, it becomes part of the polymer matrix and remains non-fugitive. This extends the life of the finished products.

DPR liquid natural rubber is available in several grades that vary by average molecular weight. The lower molecular weight grades have lower viscosity.

Typical Applications

DPR liquid rubber provides all the performance properties of natural rubber in a convenient liquid. Liquid rubber performs many functions in a wide range of applications:

- Polymeric binder for grinding wheels and friction products.
- Reactive rubber processing aid
- Reactive vehicle for rubber additives
- Rheology modifier for lubricants
- Polymer base for molding and tooling systems
- Polymer base for electrical encapsulants
- Polymer base for automotive sealants
- Asphalt modifier

DPR liquid rubber has excellent wetting characteristics. It is a superior dispersion aid for many synthetic fibers and other rubber reinforcements. DPR can bind more than ten times its weight in abrasives for grinding wheels and for other abrasive or friction products.

DPR reduces the viscosity of uncured rubber when added at levels of 5-to-20 parts of rubber. This reduces power requirements, improves blend consistency, and reduces the risk of scorching. It can be used with natural rubber and such polymers as polychloroprene, EPDM, polybutadiene, SBR and acrylonitrile-isoprene.

Liquid rubber supports high carbon black loading without the problems associated with fugitive plasticizers. Typical process oils allow high loadings of carbon black, but they reduce the final hardness and they can migrate from the finished product. Liquid rubber allows similarly high carbon black loading and reacts into the final rubber matrix. The cured rubber has superior properties, and it maintains the properties because the DPR does not become fugitive.

DPR liquid rubber improves the stability of heavy-duty lubricants by increasing the resistance to flow on vertical surfaces and by holding dry additives in a more stable suspension.

A minor addition of DPR liquid rubber to asphalt formulations reduces flow at high temperatures and maintains flexibility at cold temperatures. This combination of benefits is unique in asphalt compounds.

DPR Industries offers a *Compounding Guide* with starting point formulations for these and other applications.

Typical Properties

DPR liquid rubber provides many performance properties into the finished polymer system. The attributes result from the inherent properties of natural rubber. The physical characteristics of the liquid polymers include the following:

Attributes	DPR 400	DPR 75	DPR 40	DPR 35	Test Method
Color	Dark brown	Dark brown	Dark brown	Dark brown	Visual
Viscosity, cps @ (38°C/100°F)	400,000	75,000	40,000	35,000	Brookfield
Avg. Molecular Wt.	80,000	45,000	40,000	38,000	GPC
Manufacturing Viscosity Tolerances	270,000 550,000	45,000 95,000	35,000 55,000	25,000 40,000	Brookfield
Density, lb./gal.	7.7	7.7	7.7	7.7	ASTM D1875
Specific Gravity	0.92	0.92	0.92	0.92	ASTM D1875
Volatiles, wt. %	0.16	0.22	0.25	0.46	Wt. Loss, 2 hr @100°C
Ash, wt. %	0.5-1.5	0.5-1.5	0.5-1.5	0.5-1.5	ASTM D1416
Unsaturation, mole%	98	98	98	98	Ozone Analysis
Flash Point, °C	271	255	246	240	COC
Glass Transition Temp., Tg. °C	-65	-65	-65	-65	

Viscosity

DPR liquid rubber is a low molecular weight natural rubber. It's a viscous liquid at typical processing temperatures. The following table indicates the viscosity (cps.) at typical conditions:

Temperature	DPR 400	DPR 75	DPR 40	DPR 35
25°C/77°F	985,000	220,000	122,000	85,000
38°C/100°F	400,000	75,000	40,000	35,000
52°C/125°F	130,000	35,000	16,000	12,500
66°C/150°F	80,000	20,000	8,000	5,500
80°C/175°F	42,000	8,000	3,300	2,300
93°C/200°F	18,000	6,400	2,800	1,900
121°C/250°F	11,000	2,000	1,200	1,000
149°C/300°F	6,000	1,700	600	500

Storage and Handling

DPR products are packaged in 350 lb. 55-gallon steel drums. Store in a dry environment to prevent damage to the drums. The liquid rubber products are stable over a wide temperature range. They are not damaged by freezing temperatures nor are they damaged by occasional short-term exposure to temperatures of 150°F. The shelf life is a minimum of two years in an unopened container.

The DPR products are viscous polymers. Heating the drums lowers the viscosity for easier handling. Vent the drums before heating to avoid pressure build up.

DPR liquid rubber can be compounded with virtually any type of rubber processing equipment. Processing requirements vary with the desired finished properties and with the other formulation ingredients. Refer to the DPR Industries *Compounding Guide* for processing guidelines.

DPR liquid rubber cures by the same mechanism as natural rubber. A slight increase in curative levels may provide optimum performance when using levels above 15-20 phr of DPR. The *Compounding Guide* suggests the curatives and the ratios for a range of compounds.

Packaging

The standard packaging is 350 lb. in 55-gallon, open-head drums. Custom packaging is available.

Health, Safety and Environmental

DPR liquid rubber is sold exclusively for industrial applications. It is a safe polymer when handled with standard industrial practices. Please refer to the *Material Data Safety Sheet* for detailed information.

MANUFACTURING VISCOSITY TOLERANCES

DPR Grade	Viscosity cps (38°C/100°F)
400	270,000 – 550,000
75	45,000 – 95,000
40	35,000 – 55,000
35	25,000 – 40,000

Note: The statements made herein are based on our research and the research of others, and are believed to be accurate. No guarantee of their accuracy is made; however, and the products discussed are sold without warranty, expressed or implied, including warranty of merchantability and fitness for use of this material, and upon condition that purchasers shall take their own tests to determine the suitability of such products for their particular purpose. The user assumes all risk of use or handling, whether or not in accordance with any statements of the supplier. Supplier's liability, if any, for any action arising out of the material being supplied shall be limited to replacement of material. Statements concerning the possible use of these products are not intended as recommendations to use these products in infringement of any patent.

ADDITIONAL INFORMATION

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