California Gasket and Rubber Corporation Presents

The Los Angeles Rubber Group, Inc Chemical Resistance of Elastomers

The following chemical resistance evaluation of various elastomers has been assembled by The Los Angeles Rubber Group,Inc based on the published literature of various polymer suppliers, rubber manufacturers and sources including:

- Asahi Glass
- Bayer
- Copolymer Rubber and Chemical Corporation
- Cytec
- Dow Corning Corporation
- DuPont Dow Elastomers
- Dyneon
- Federal Mogul Corporation
- Goodyear Tire and Rubber Company
- Handbook of Plastics and Elastomers, Harper
- Hutchinson
- Malaysian Rubber Bureau
- Parker Seal Company
- Precision Rubber Products Corporation
- Thiokol Corporation
- Uniroyal
- Zeon

The criteria used for the ratings were primarily volume swell resistance, compression set resistance, and in addition, aging resistance. For the most part the ratings were arrived from specific data or general agreement of the above sources. When no data or agreement was found, the ratings were arrived at by theory and analogy. In some cases they are the considered opinion of experienced compounders. We cannot guarantee their accuracy nor assume responsibility for their use.

Several factors must always be considered when using a rubber part in service. The most important as we see them are:

a. **The temperature of service.** Higher temperatures increase the effect of all chemicals on polymers. The increase varies with the polymer and the chemical. A compound quite suitable at room temperature might fail miserably at elevated temperatures.
b. **Conditions of service.** A compound that swells badly might still function well as a static seal yet fail in a dynamic application.
c. **The grade of polymer.** Many types of polymers are available in different grades that vary greatly in chemical resistance.
d. **The compound itself.** Compounds designed for other outstanding properties may be poorer in performance in a chemical than one designed especially for fluid resistance.

In light of these factors, it is always best to test.

Each polymer is rated for use in individual chemicals at room temperature. Where multiple chemicals are in use, refer to the rating of the most aggressive fluid when evaluating polymer performance. Polymers are rated as:

1. Recommended. Little or minor effect, 0-5% volume swell where applicable.
2. Minor to moderate effect. Rubber parts probably still useful in most applications, 5-10% volume swell where applicable.
3. Moderate to severe effect. Rubber parts useful in some static applications only. 10-20% volume swell where applicable.
4. Not recommended.

--- No data available or insufficient evidence.

TLARGI wishes to thank DuPont Dow Elastomers for their assistance in updating this chemical resistance guide.

	Material	Chemical Group	Generally Resistant to	Generally Attacked by
NR, IR	Natural rubber, Isoprene	Polyisoprene	Most moderate wet or dry chemicals, organic acids, alcohols, ketones, aldehydes	Ozone, strong acids, fats, oils, greases, most hydrocarbons
SBR, BR	Butadiene, Styrene butadiene	Styrene, Butadiene Copolymer, Polybutadiene	Similar to natural rubber	Similar to natural rubber
IIR	Butyl	Isobutylene, Isoprene, polymer	Water and steam	Petroleum solvents, coal, tar, solvents, aromatic hydrocarbons
EPM, EPDM	Ethylene propylene	Ethylene Propylene copolymer and terpolymer	Water, steam and brake fluids	Mineral oils and solvents, aromatic hydrocarbons
NBR	Nitrile	Butadiene, Acrylonitrile copolymer	Many hydrocarbons, fats, oils, greases, hydraulic fluids, chemicals	Ozone, ketones, esters, aldehydes, chlorinated and nitro hydrocarbons
HNBR	Hydrogenated nitrile	Butadiene, Acrylonitrile copolymer	Similar to NBR but with improved chemical resistance and higher service temperature	Ozone, ketones, esters, aldehydes, chlorinated and nitro hydrocarbons
CO_1, ECO	Epichlorohydrin	Epichlorohydrin polymer and copolymer	Similar to nitrile with ozone resistance	Ketones, esters, aldehydes, chlorinated and nitro hydrocarbons
CR	Neoprene	Chloroprene polymer	Moderate chemicals and acids, ozone, oils, fats, greases, many oils, and solvents	Strong oxidizing acids, esters, ketones, chlorinated, aromatic and nitro hydrocarbons
CSM	Hypalon®	Chlorosulfonated polyethylene	Similar to Neoprene with improved acid and ozone resistance	Concentrated oxidizing acids, esters, ketones, chlorinated, aromatic and nitro hydrocarbons
CM, CPE	Tyrin®	Chlorinated polyethylene	Similar to Neoprene with improved acid and ozone resistance	Concentrated oxidizing acids, esters, ketones, chlorinated, aromatic and nitro hydrocarbons
AU, EU	Urethane	Urethane polymer	Ozone, hydrocarbons, moderate chemicals, fats, oils, greases	Concentrated acids, ketones, esters, chlorinated and nitro hydrocarbons
T	Polysulfide	Organic polysulfide polymer	Ozone, oils, solvents, thinners, ketones, esters, aromatic hydrocarbons	Mercaptons, chlorinated hydrocarbons, nitro hydrocarbons, ethers, amines, hetercocyclics
Si, VMQ	Silicone	Organic silicone polymer	Moderate or oxidizing chemicals, ozone, concentrated sodium hydroxide	Many solvents, oils, concentrated acids, dilute sodium hydroxide
FSI, FVMQ	Fluorosilicone	Fluorinated organic silicone polymer	Moderate or oxidizing chemicals, ozone, aromatic chlorinated solvents, bases	Brake fluids, hydrazine, ketones
TFE/P	Tetrafluoro-ethylene-propylene	Fluorinated copolymer	Steam, amines and amine corrosion inhibitors, caustics, high pH media, wet sour gas, oil	Aromatic hydrocarbons, chlorinated solvents, ethers, limited in low temperatures
ACM	Polyacrylate	Copolymer of acrylic ester and acrylic halide	Ozone, extreme pressure, lubricants, hot oils, petroleum solvents, animal and vegetable fats	Water, alcohols, glycols alkali, esters, aromatic hydrocarbons, halogenated hydrocarbons, phenol
FKM #1	Fluoroelastomer	Standard fluorocarbon dipolymer 66% fluorine	All aliphatic, aromatic and halogenated hydrocarbons, acids, animal and vegetable oils	Ketones, low molecular weight esters and alcohols and nitro-containing compounds
FKM #2	Fluoroelastomer	Standard or specialty type fluorocarbon. Typically, >66% fluorine	Same as FKM#2. Greater chemical resistance	Ketones, low molecular weight esters and nitro-containing compounds
	Zalak®	Proprietary fluorocarbon	Greater resistance to acid, base, alcohol, amine and ethers than FKM	Nitrogen-containing compounds
FFKM	Perfluoroelastomer	Fully fluorinated fluorocarbon	Best fluid resistance of any elastomer	Fluorocarbon-containing refrigerants cause minor effects