

ORD Problem Solved!

Nuclear Technology

Radiation Resistance

One of the most critical properties of an o-ring being exposed to radiation is its compression set. When a seal is exposed to gamma radiation, compression set is the most severely affected. Elastomers which are compounded for exposure to radiation must also pass stringent quality and material tests. Additionally, the elastomer must be compatible with the contact medium under the working environment (temperature, pressure, etc.). Water and steam are common media in nuclear applications.

Typical nuclear operating conditions are :

Temp: 180°C
Irradiation: 10⁷ rad

In the majority of these applications, the radiation dosage level remains below 10⁶ rad. This is a level normally attained after years of operation. Almost all elastomers suffer little to no change of their physical properties at radiation levels up to 1 M rad (10⁶ rad). However, at 1 x 10⁷ rads, there is a big change

in compression set which can result in leakage. Parker has developed several compounds that resist radiation levels of 10⁷ rad. These materials can provide longer service life and shorter downtime. See below chart for further details. ■



E0740-75 Ethylene Propylene Recommended for Nuclear Applications, black o-ring with temperature range -70° to 250°F

Mumbai, India

Parker Success Story

Application:

Linear o-rings (static)
Media: Nalcool-2000 coolant at max 85°C in standard 2-size.

Problem:

A manufacturer of large engines, mostly for Marine, Naval and Power Plant use, was having problems with the existing fluorocarbon rings displaying erratic service life. Customer came to Parker to find a seal that would last 3000 hours in their application.

Parker Solution:

After careful review, Parker recommended E0740-75. E0740-75 provided extended service life over the local FKM rings being used by the customer.

Result:

Customer is standardizing Parker E0740-75 for their application and is more confident in the performance of their application. ■

Data on Radiation Resistant Compounds

Data on Radiation Resistant Compounds					
Compound	Polymer	Comp. Set @ 10 ⁷ Rads ⁽¹⁾	Max. Temp. ⁽²⁾	Steam & Water Resistance	Silicone Fluid Resistance
S0604-75	Silicone	20.0%	204°C	poor	Poor
N0674-70	Nitrile	24.3%	149°C	OK to 40°C (120°F)	Good
N0741-75	Nitrile	24.3%	149°C	OK to 40°C (120°C)	Good
E0740-75	Ethylene Propylene	28.6%	177°C	Good	Good
S0455-70	Silicone (Hi Temp)	31.4%	177°C	Poor	Poor
E0515-80	Ethylene Propylene	46.6%	149°C	Good	Good
P0642-70	Polyurethane	55.2%	82°C	Poor	Good
V0747-75	Fluorocarbon	66.7%	204°C	Poor	Good

Call Applications Engineering to see if this material will improve the performance of your applications!

Call 859.335.5101 for more details on this or any of Parker's 200+ materials.