EFFECTS OF OPERATING TEMPERATURE ON ELASTOMERIC INSULATION PRODUCTS

Standard elastomeric closed cell foam insulation products are comprised of a polymeric blend of nitrile butadiene rubber (NBR) and polvinyl chloride (PVC). Elastomeric insulations are cross-linked polymeric materials. General recommended use temperature ranges are published as -70°F to 220°F. These products are susceptible to physical property changes (particularly in continuous exposure applications) when exposed to extreme temperatures, but these changes do not affect the thermal performance of the product.

When the products are exposed to low temperatures, they immediately become stiff and eventually rigid as the temperature falls below -40°F. This change in state does not affect the thermal performance of the product. These physical property changes are reversible as the ambient temperature increases.

When elastomeric insulations are exposed to elevated temperatures, they gradually become stiff and rigid (based on exposure time and temperature). The changes in physical properties do not affect the thermal performance of the product. The change is limited to the inner core or ID of the insulation material as the product creates a temperature gradient through the wall thickness, thus protecting the outer section from exposure to high temperatures and their effects. These physical property changes are irreversible.

What causes this hardening of the elastomeric product when exposed to elevated temperatures? During the aging process, oxidation creates free radicals, attacking the double bonds and the acrylonitirle portion of the polymeric blend which further crosslinks the elastomer and causes hardening / embrittlement. This process is a time / temperature related reaction. At relatively low temperatures (180°F) over a long period of time, the product will show signs of hardening. At higher temperatures the process is accelerated. At temperatures above 250°F, the process is greatly accelerated causing dramatic hardening of the product in relatively short time.

Applications in which the insulation in sheet form is in direct contact with the hot surface, i.e. tanks, ducts or large diameter pipe would be more susceptible to the effects of temperature than on a pipe application where there would be more of an air gap between the insulation and the pipe.

Tests have shown that this hardening process does not affect the thermal performance of the product. Since most thermal applications are static applications, the hardening has no effect on the performance of the product in the application. However, the effects of continuous elevated temperatures on elastomeric insulation should be taken into consideration when specifying the product.