Specialists in Seals & Service

Hi-Tech Seals Inc.®

Low Temperature Material vs. Materials with Low Temperature Capabilities

Don't Understand the Difference?...Let us Help

With our head office in the northernmost major metropolis in North America, Edmonton, AB, we at Hi-Tech Seals are no strangers to the unique demands encountered by sealing products in cold temperatures. Low temperature performance may be one of the most misunderstood and misleading differentiators when comparing various elastomers. Not only does a rubber product become less flexible and more brittle at lower temperatures, it also undergoes a certain degree of contraction, decreasing overall compression and seal force.

Most common methods to obtain low temperature capabilities within any given family of elastomer is through modification of both hardness and ingredient composition. Both will inherently create detrimental features to the seal's overall performance, which needs to be considered for the application as a whole. Through the lowering of durometer, a rubber can retain a certain level of elasticity when temperatures drop below the typical threshold of any given elastomer. Yet, this added elasticity will decrease the pressure handling capability of the seal, and increase the likelihood of premature failure through extrusion. Modification of ingredients to create a lower temperature class of material will more than likely decrease high temperature handling capabilities, as well as decrease a material's ability to resist certain chemical attacks.

Published tests of low temperature handling capabilities typically use a brittleness evaluation. The material's lowest breaking result when impacted at a given temperature will be used for presentation to clients. This result would typically be indicative of a static seal, at uniform pressure, which was engaged at an ambient temperature, and subsequently entered a low temperature environment. Unfortunately, this test holds very little relevance or correlation to true low temperature sealing performance where a seal may be required to move dynamically against mating surfaces, and retain sealability against variable pressures. For a true indicator of low temperature seal performance, the glass transition temperature or 10% retraction test result should be considered.

Through a holistic approach to your specific application, Hi-Tech Seals is able to recommend a material that will not only optimize your performance while encountering the low temperatures, but also provide a solution that will provide superior sealing performance across the full breadth of the potential environment. Our knowledge and experience with an excess of 12 different elastomer families, and hundreds of custom compounds gives us a unique ability to tailor our solution to best suit your needs.