Chemical Polarity of Closed-Cell Elastomeric Foam Insulation

Closed-cell structured elastomeric foam insulation is widely recognized for its consistent performance managing thermal heat gain/loss and preventing condensation. But did you know that there are actually *two different types* of closed-cell elastomeric foam rubber used in the manufacture of insulation?

Ethylene Propylene Diene Methylene (EPDM) and Nitrile Butadiene Rubber (NBR)/PVC are the two distinct polymeric blends that are used to make closed-cell elastomeric foam insulation. Despite their virtual identical appearance, the molecular structures of EPDM and NBR/PVC insulation differ in ways that significantly impact key performance attributes. Most notably, NBR/PVC has a molecular structure that is defined as "polar" while EPDM is defined as "non-polar."

Favorable Impacts of Non-Polarity in Insulation

Chemical polarity defines how a material will react under various environmental conditions that are highly relevant to the selection of mechanical insulation.

A polarized chemical structure is "hygroscopic," meaning that it *attracts* water molecules from the surrounding environment. When subjected to severe moisture infiltration, the cells of a polar material can collapse, thereby breaking down the insulation and reducing its thermal insulating efficiency. A telltale sign is the presence of black slime on the insulation skin. Polar insulations can also degrade due to environmental exposures to heat, moisture, UV, ozone and oxygen.

Alternatively, "non-polar" EPDM insulation is "hydrophobic", meaning that it does *not* induce or react with moisture in its environment. Due to its saturated chemical structure, EPDM is less reactive to UV and ozone so it degrades at a slower rate than NBR/PVC insulations. EPDM's chemical structure is also inherently microbial-resistant since it does not provide a food source for microbes.

In summary, it is important to understand the chemical polarity and resulting performance characteristics of EPDM and NBR/PVC when specifying closed-cell elastomeric foam insulation for mechanical systems in order to maximize product life cycles costs for building owners.

For an in-depth analysis, please download our whitepaper: "Chemical Polarity and Its Impact on the Performance of Elastomeric Foam Insulation."