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Chemical Polarity of Closed Cell Elastomeric Foam Insulation

Closed cell elastomeric foam insulation is widely recognized for its consistent performance with managing thermal heat gain/loss and condensation due to it closed-cell structure when insulating mechanical systems.

A fact that is not well-known is that there are two different types of elastomeric foam rubber. In a side-by side comparison, it's difficult to tell the difference.

One insulation type is an Ethylene Propylene Diene Methylene (EPDM) and the other a Nitrile Butadiene Rubber (NBR)/PVC polymeric blend. Although both types are widely available and specified, EPDM and NBR/PVC are chemically & structurally different down to the molecular level.

Chemical polarity, or the chemical structure of an insulation, defines how a material will react under various environmental conditions.

For example, NBR/PVC is defined as "polar". A polarized chemical structure is "hygroscopic", meaning that it attracts water molecules from the surrounding environment. When subjected to severe moisture infiltration, cells can collapse thereby breaking down the insulation and reducing its thermal insulating efficiency. A telltale sign is the presence of black slime on the skin. Polar insulations can also degrade due to environmental exposures to heat, moisture, UV, ozone and oxygen. Of greatest concern is the emission of cyanide gas when NBR/PVC insulations burn due to the nitrogen and carbon presence within its chemical structure.

Alternatively, EPDM insulation is defined as "nonpolar" and is thereby "hydrophobic", meaning that it does not induce or react with moisture present in its environment. Due to its saturated chemical structure, EPDM is also less reactive to UV and ozone so it degrades at a slower rate over time 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's 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 click here to view or download Aeroflex USA's EPDM White Paper titled "Chemical Polarity and Its Impact on the Performance of Elastomeric Foam Insulation".