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SEALING TECHNOLOGIES®

an EnPro Industries company

Technical Bulletin

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From: Applications Engineering cc:

Subject: Monomers – the building blocks for polymers

This bulletin is written to discuss the issue of damage to gaskets caused by polymerization of monomers inside the gasket structure, commonly known as "popcorning". We will also make some general recommendations that will help handle this issue.

Gasketed joints sealing monomer type materials are a special, sometimes difficult application requiring special care and careful gasket selection. Monomers are chemicals that can become polymers when combined with themselves or with other monomers. In order for polymerization to occur, the appropriate environment variables must exist, some of which are discussed later in this letter. Examples of monomers are materials such as styrene, which becomes polystyrene, vinyl chloride, which becomes polyvinyl chloride, or materials such as methyl methacrylate or adipic acid. The problems occur when the monomers permeate the gasket and polymerize inside, expanding, splitting, and/or blistering the gasket itself. This damage is known as popcorning.

Few elastomers are recommended for use in monomer service, so rubber gaskets and rubber-bound CNA gaskets are not recommended. Even though all GYLON® styles are compatible and resistant to monomers, Garlock recommends GYLON Styles 3510 and 3530 as the preferred gaskets. The superior sealability (high resistance to permeation) of these gaskets offer the best defense against popcorning. We should mention that while 3530 has higher compressibility for less-than-perfect flanges, many applications will not allow the use of a black gasket.

In addition to gasket selection, proper gasket compression is essential. An under-compressed gasket will be more permeable, and more susceptible to popcorning. Gaseous services are usually more problematic than liquid monomer service, since the gas will penetrate the gasket more readily. So a vessel lid gasket might be up above the liquid level, but may actually be more readily popcorned. The low available compressive stress found in a sight glass, for example, can also make those services tough to seal.

Another area where popcorning is somewhat common is the uncompressed edge of the gasket at the ID. Problems have been eliminated by cutting the gasket ID larger so that the ID is compressed between the flanges. We have also seen gasket damage at the ID where it appeared that the fluid flow may have caused physical damage to the gasket ID. In this

situation, the gasket ID was smaller than the flange ID, allowing the flow to "beat up" the gasket edge.

Lastly, as previously mentioned, environment variables are involved in the polymerization of the monomers that are not always obvious; these factors may make one gasket popcorn while another gasket in the same service does not. One such variable is the temperature across the width of the gasket. Gasket temperature is not only affected by the fluid temperature, but also by the variations in heat loss from one joint to another (radiation from the joint). Those variations in heat loss affect the gasket temperature, so that all gaskets in a system may not be operating at the same temperature. Gasket compressive load can easily vary due to differences in installation torque, or bolt conditions, or flange and pipe alignment. Polymerization can also be caused by changes in system pressure and/or light exposure.

The result of all these variables is that an evaluation of a gasket material in a limited number of flanged joints may lead to incorrect conclusions about that gasket's resistance to monomers. The utmost care should be used to ensure that adequate gaskets be tested, or that gasket conditions for the test be identical in all respects.

And of course, the right gasket at the right compressive load will help a lot!

Please feel free to contact Applications Engineering should you require anything further.