Interaction tests

SmartSeal External is bi-component epoxy, moldable for specific applications in refrigeration and air conditioning. The choice of which specific epoxy resins was performed following various mechanical resistance tests and interaction with refrigerating gases and lubricants.

Preliminary Test:

The selected Epoxy mixture is the one that showed no loss of its structural characteristics if immersed for 3 months in different mixtures:

Typical mixtures of washing liquids such as naphtha, tetrachloroethylene, hexane and heptane.

These mixtures are composed of lubricants such as POE, PAG, PAO, ALCHYL BENZENE and NAFTENIC type MINERALS. These lubricants were added with different refrigerants to represent the various chemical families: R12, R22, R134a, R410A, R600, R744, R1234yf. These mixtures were kept at 104°F, 40°F and -2°F for 3 months.

The reticular structure of SmartSeal External has been observed, and no variation has been found. Tensile and bending tests were performed to observe any changes in physical chemical performance.

The selected compound has been applied to different holes, including 5 MM (.20 inches), and placed at 104°F for 3 years at a pressure of 400 psi.

Real Application Test:

The product thus selected, after passing the compatibility tests, was tested on 28 systems. Four systems for each type of gas sampled. R12, R22, R134a, R410A, R600, R744, R1234yf. Different systems for refrigeration, AC and automotive with the appropriate lubricant. These are left in operation with 0.1 mm, 0.3 mm, 2mm, and 5 mm holes. The check is performed every 1000 hours of work and the test was performed for 3000 hours of work. All system passed the test. A system by type with a leak of 2 mm is still under test today after more than 800 days, 19200 hours, without pressure losses.

The other systems have been dismantled and the conditions of the product have been studied. The mechanical resistance characteristics did not change, as did its elasticity.

The gas chromatographic analysis of the refrigerant and the IR analysis of the lubricant does not show the presence of Epoxy resin as a pollutant. No increase in the percentage of gas decay was observed. There is no increase in acidity in the Lubricant nor loss of its chemical-physical characteristics.

Real Test with Smart Seal Additives:

Systems repaired by External with 3 mm holes have included additives with other products: SmartSeal, Smart Shot Cool Enhancer, No Acid, and Super Dry. The possible interaction between the additives and External was observed, No variation was observed in the action of the products. External after disassembly does not show appreciable variations.

In conclusion, this procedure, experimental and applicative led to select the best Epoxy components for an application in systems with refrigerant gases and various lubricants. Resistance to common washing liquids and technological applications of Additivation. It showed a high degree of resistance to R744 and chemical pressures over a wide temperature range.

Dr. Mattavelli Paolo

R&D Manager