Limitations of Elastomeric Constituents in "High Temp" Gasket Materials

Background: A U.S. power station experienced two in-service gasket failures on First Point Extraction Feedwater Heater relief valves. In both cases, the gasket failures followed recent valve overhauls that had been conducted by a highly reputable valve repair contractor. VSP was contacted for technical advice and determined that both gasket failures were caused by the elastomeric components in the gasket material. The cost for repairs in the case of both failures was $3,500, not including Replacement Power Cost Differential. In both cases, the cost of proper gaskets was less than $5.00 each.

VSP Investigation: The first Feedwater Heater that failed operates at 500 psig and 640°F. VSP examined the gasket and confirmed that it was a spiral wound gasket with a mica-graphite filler material (identified by a pink stripe on the OD of the gasket). Due to the elastomeric component in the filler material, VSP recommended that this gasket should only be used in applications at 250°F and below. The manufacturer's catalog advertises this gasket at a much higher temperature, based on testing that does not replicate real-world applications. The second gasket was examined and confirmed to be made from a "high temperature" compressed non-asbestos sheet gasket material. This product is rated in the manufacturer's catalog for continuous service at 650°F, but the gasket failed after four months while operating at only 640°F. Again, VSP recommended that these products should only be used at temperatures of less than 250°F due to the use of elastomeric binders in the gasket material. In addition to improper material selection, the original repair contractor indicated that their normal installation procedures did not call for the use of torque wrenches when installing relief valves.

Problem Resolution: The investigation resulted in several recommendations. First, both gaskets were replaced with spiral wound gaskets using flexible graphite filler (identified by a gray stripe on the OD of the gasket). These gaskets are suitable for temperatures up to 950°F and meet the requirements of this particular utility's gasket and piping standards. Second, the flanged connections were properly torqued by station personnel using torque values and assembly sequences supplied by VSP.

Lessons Learned: Gasket manufacturers have a tendency to overestimate the temperature limitations of their products. The tests used to determine service limitations are often short-duration, physical property tests that do not simulate real-world conditions, and disclaimers are often included in small print below limitation charts for this reason. For best equipment reliability, conservative limits approved by the utility's engineering department should be followed. In addition, acceptable material specifications should be addressed with contractors and suppliers before work takes place in the plant.

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