



Overview – Test Overview – Nuclear Power Valve Bonnet Pressure Seal Accelerated Life Test and U.S. Naval Nuclear Valve Qualification Test

Test Specimen: EGC Thermafoil Graphite & Metal Pressure Seal for Control Valve Bonnet Sealing

Following is a brief overview of accelerated life testing performed for qualification of EGC's flexible graphite and metal composite high-pressure bonnet seal.

During the past several years testing has been performed major public utility at their nuclear power facility located in the Southwestern U.S. A test unit was set up to perform accelerated 25-year life cycle testing of EGC's Thermafoil pressure seals in a simulated 15", 900 lb. class main steam header shut-off valve. Five EGC pressure seals have been tested under cyclic load and temperature conditions for a total of 200 hours per seal. This 200 hour total test time per seal was comprised of 25 cycles of 8-hour duration for both pressure and thermal excursions. For each cycle the seal was partially loaded using the bonnet bolting, then pressurized and zeroed. The test environment was 2,250 psig saturated steam and during the cycle the body temperature was increased from ambient to 700°F, and then maintained at 700°F through the balance of the test cycle. The cavity OD and ID were approximately 16" and 14" respectively. Throughout all test conditions and cycles using EGC Thermafoil pressure seals, zero leakage and no failures have been recorded. This test regimen remains ongoing today in an effort to determine the ultimate usable life of EGC Pressure Seals.

During qualification testing performed by the U.S. Navy at Northrup Grumman's Newport News Standard Navy Valve Yard for nuclear valve qualification, EGC Graphite Pressure Seals were subjected to numerous potential failure modes. The bonnet cavity was modified to test sealing capability under the following extreme field conditions: 1) Oversize body cavity condition ranging from .030" to .060", 2) Out-of-round body cavity of .060" and 3) Marred mating surfaces having a .030" deep x .080" wide groove machined in the body at the seal location. For each potential failure mode, EGC Graphite Pressure Seals conformed and sealed to the cavity conditions and continued to function at zero leakage. Subsequently, EGC Pressure Seals were approved and specified by the U.S. Navy for their standard nuclear steam valve designs.