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VALUE IMPACT ASSESSMENT OF PROPOSED REVISION 2
TO REGULATORY GUIDE 1.72, "SPRAY POND PIPING MADE
FROM FIBERGLASS - REINFORCED THERMOSETTING RESIN"

1. Background

Prompted by an NRC request for actual test data obtained during qualification tests for RTR piping, the ASME Task Force responded with a summary of results obtained from several companies. The report showed that for the steady pressure HDB (hydrostatic design basis) tests, the ratio of the stress causing failure under the short term burst test to the stress causing failure (leakage) after 100,000 hours ranges from 2.0 to 4.4. For the cyclic test, the ratio of the stress causing failure in the short term burst test to the stress causing failure after 150,000,000 cycles ranges from 5.00 to 13.26.

It is industry practice to apply a factor of 2 to the static HDB (Method B in ASTM 2992) and a factor of 1 to the cyclic HDB (Method A in ASTM 2992). Both test methods are long term tests. However, in the Code Case a factor of 1/2 is applied to the HDB for both methods and this results in a design factor of 10 to 26 for the cyclic method, an apparent overly conservative design factor when compared to Section X which provides a factor of 6 against the short-term burst pressure after 100,000 cycles to design pressure. Essentially, the Section X qualification test is a short-time test because 100,000 cycles takes only 3 days to perform,

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and it is therefore valid to compare the failure stress from it to the short-time burst pressure stress obtained during qualification tests in accordance with ASTM 2992 methods.

Code Case N-155-1 (1792-1) "Fiberglass Reinforced Thermosetting Resin Pipe, Section III, Division 1" will be revised to double the values for SACP and SALP in Table 3611-1 for Designation Codes A through H (cyclic method) for services where the number of full pressure cycles is limited to 100,000 cycles during the design life of the system. For services requiring more than 100,000 cycles, one-half the values shown should be used. Although the spray pond piping is part of a safety-related system and included in the preoperational test program, the guide has been expanded to recommend testing to assure absence of vibration that might invalidate the design assumption of less than 100,000 cycles over the lifetime of the plant.

The attached Figure 2 has been marked to show a 3 to 1 ratio line parallel to the pressure regression line. The HDB is 4400 psi for 50-years and the ratio line intersects this stress value of approximately 100,000 cycles, and at this point the design stress value is halved. Thus, the design factor for that particular pipe would be approximately 15 to 1 for less than 100,000 cycles and 30 to 1 for more than 100,000 cycles.

ASME also recommended that the static pressure qualification (Method B) be acceptable, perhaps by providing a 50% reduction in the stress values given in Table 3611-1.

Value

1. The guide has been prepared so that it will not be affected by the projected change to the Code Case and an additional revision to the guide may be avoided. There may be a slight reduction in the cost of producing the RTR piping when the alternate to present qualification Procedure A (cyclic) is used and the cumulative system cycles are less than 100,000 cycles, as is the case of spray pond applications.
2. The guide is more flexible by making an alternate qualification procedure available to industry.
3. The preoperational testing program provides assurance of conformance with the design assumptions on fatigue life for the piping system.

Impact

There is no impact on review of qualification procedures for spray pond piping systems. Since preoperational testing is already required for safety-related systems there is no impact for verification of absence of vibrations in the piping system. There is no occupational irradiation hazard connected with this system.

3:1 ratio line

FIGURE 2

GROSS DIMENSION
BURST PRESSURE STRESS = 66,685 PSI

