ASME VIII Division 2 Fatigue Evaluation of Dehydrator Vessels for Offshore Oil Platform

The study evaluates the design of a dehyrator vessel for exposure to thermal fatigue loading to determine conformance to ASME VIII Division 2. The evaluation of the vessel under cyclic transient temperature loading required the use of finite element analysis methods. Design temperature is 550 °F [288 °C] and design pressure is 875 psig [6.03 MPa]. The vessel is fabricated from SA 516 70N carbon steel plate and clad with alloy 825.

The model includes the top and bottom nozzles, top & bottom heads and shell and skirt to study the impact of the applied thermal steady state and transient thermal loadings. All nozzles incorporate thermal heat shields. In addition, the top head has an additional insulated liner with 5/8" gap extending down 36" into the vessel. The uninsulated liner extends to approximately 6 inches above the shell to bottom head weld. Support media is installed in the bottom head and straight flange. Silica gel adsorbent fills the vessel nominally to the top the cylinder and part of the top head. The insulating effect of the adsorbent has been utilized in this analysis.

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