Dominion Engineering, Inc.

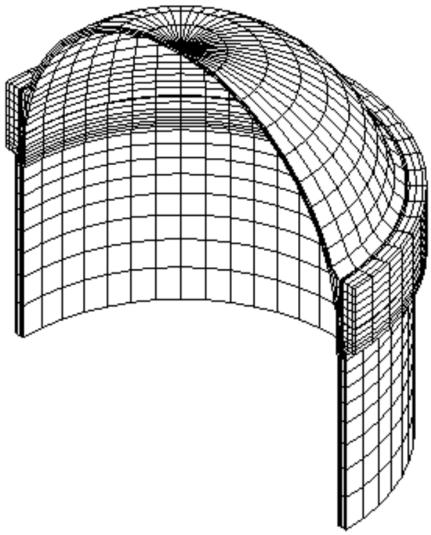
Optimized Reactor Vessel Tensioning

Background

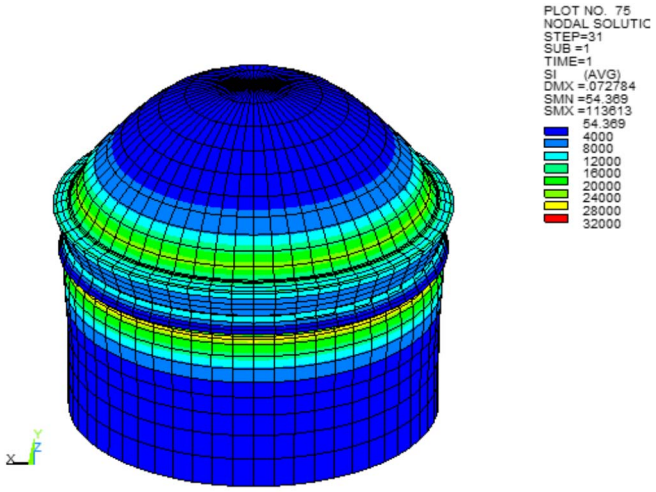
PWR and BWR reactor vessel heads have traditionally been tensioned with multi-pass procedures using several hydraulic tensioners. Typically two to three passes are required to achieve OEM stud elongation tolerances, including time consuming adjustment passes. This process impacts the critical path outage schedule and results in significant radiation exposure to workers.

Description

Through analysis, DEI developed optimized tensioning procedures which allow reactor vessel tensioning to be achieved in a single pass, justify increased stud elongation tolerances, and minimize the travel distance that each tensioner must be moved around the head (typically reducing this travel distance by a factor of three). These optimized tensioning procedures typically save 8-12 hours of critical path time during refueling outages and reduce radiation exposure to workers during tensioning activities. DEI has developed optimized tensioning procedures for more than 80 PWRs and BWRs worldwide, including 75% of US nuclear plants.



FEA modeling used to develop optimized reactor vessel tensioning procedures



Industry Experience

- DEI optimized tensioning procedures are in use at 80 PWRs and BWRs worldwide
- This includes 75% of US nuclear plants, as well as non-US customers
- This includes vessels fabricated by most major reactor vessel manufacturers (CE, B&W, CBI, RDY)

Benefits

- Outage schedule savings of 8-12 hrs (typical)
- Reduced radiation exposure to workers during reactor vessel tensioning / detensioning
- Tensioning achieved with fewer passes (typically in a single pass, vs. 2-3 passes for conventional procedures)
- Reduced tensioner travel distance (typically reduced by a factor of 3 compared to conventional procedures)
- Greater stud elongation tolerances justified through analysis
- FEA models can also be used to justify operation with one or more studs damaged or out of service

For more information, contact John Broussard (*jbroussard@domeng.com*), or Dale Vines (*dvines@domeng.com*)

12100 Sunrise Valley Drive, Suite 220 ■ Reston, VA 20191 ■ PH 703.657.7300 ■ FX 703.657.7301