HPHT Flange Task Group
Flange Design Methodology

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Agenda

- Summary of Methodology
- API 17TR8 v Surface HPHT
- Bolting
- Fatigue Screening
Summary

1. Determine the suitability of the existing BX gaskets for 20K
2. Use Robert Eichenberg’s formulas from his ASME paper 57-PET-23 “Design Considerations for AWHEM 15,000 psi Flanges” of 1957 and his Journal of Engineering for Industry paper of 1964, to size the Flange and Bolting
3. Use non-linear FEA to determine capabilities of the flange under combinations of loading
Use Eichenberg’s Methods* to Size the Flange

1. Hub Thickness (wall of pipe)
2. Pressure Loading
3. Size and number of bolts
4. Raised face diameter
5. Flange thickness*
   - Used Flange Stiffness Ratio
The Introduction of the Methodology states…

The most straightforward models, methods and criteria were chosen for this design guideline. This was to reduce the number of unknowns and to provide an efficient methodology. If the user decides to add complexity, and therefore unknowns, these should be weighed against the potential changes in the capabilities. i.e. if the introduction of complexity and unknowns has little effect on the calculated capabilities, the usefulness of the additional complexity should be questioned.
API 17TR8

For Surface HPHT we can:

Do less than 10% of the work

Achieve more than 90% of the functionality
Plastic Collapse

API 17TR8
ASME LRFD
Material Specific
217 ft-kips
Local Strain
Ratcheting

API 6X
Limit Analysis
Yield Specific
200 ft-kips
Local Strain
Ratcheting
Serviceability

API 17TR8
Mentions serviceability but provides no guidance.

References DIV 3

Surface HPHT
Should focus on serviceability.
Excessive Deformation.
200 ft-kips
Bolting

- 83% Criterion
- 70% Assembly Stress
- Fatigue Screening
Fatigue Screening

• Are the bolts susceptible to Low Cycle Fatigue failure?
• Will the bolts experience High Cycle Fatigue loading?

• No
• No
Fatigue Screening

• Is Flange Body susceptible to Low Cycle Fatigue failure?
• Will the Flange Body experience High Cycle Fatigue loading?

• No
• No
• No
Surface HPHT

• Can be much easier, much faster and have fewer unknowns than TR8 methods

• In this case it was closer to 1% of the work for 100% of the functionality