

WESTINGHOUSE THROTTLE VALVE SEAT UPGRADE

By Mechanical Dynamics & Analysis

The generic problems associated with the original Westinghouse designed Throttle Valve seat have been solved, applied and proven in service by MD&A.

Our “Pinned Seat” design eliminates the following generic problems:

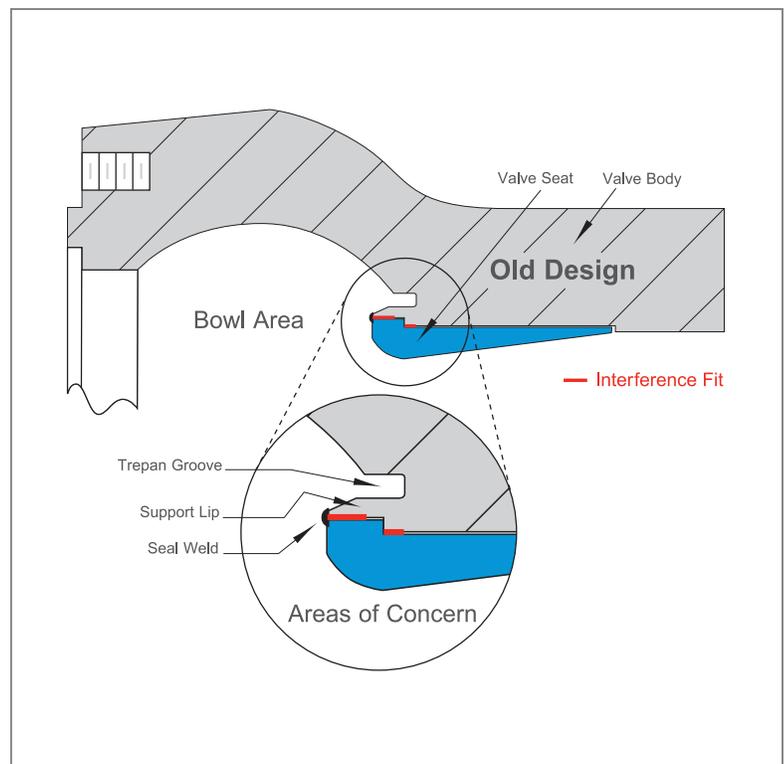
- Cracked Seal Welds
- Loosening Shrink Fits
- Cracking Of The Trepan Groove
- Steam Leakage Due To Improper Disk To Seat Alignment

Problem Definition:

The original seat is held in position and aligned by a $\frac{1}{2}$ " to $\frac{3}{4}$ " thick support lip that protrudes out from the trepan groove (OD) and seat bore (ID). The seat is shrunk into this fit and is seal welded in place. The seat to casing shrink fits are all at the inlet end, while the seat tail end is unsupported. This original design puts a tremendous amount of differential expansion and mechanical forces on the localized and thin support lip area.

During cyclic operation, the lower mass seat will thermally expand and contract faster than the massive valve chest, causing the support lip welds to fatigue crack over time. The differential expansion between the seat and valve casing reduces the shrink fit which in turn puts more stresses onto the seal weld. Once the seat loses its interference fit, the seat is only being held in place by the seal weld. The seal weld by design is only meant to hold the seat in place during a severe thermal cycle, where the seat could (for a short period of time) lose its shrink fit. The cross-sectional area of the seal weld is not thick enough to permanently hold the seat in place without the shrink fit. This is what causes the seal weld to crack.

Also, after the seal weld is cracked the seat can move, resulting in steam leakage between the seat and the casing and also between the seat and disc. The yielding of the lip also puts bending stresses into the trepan groove area resulting in cracking.



MECHANICAL DYNAMICS & ANALYSIS

For more information on this product or service please contact MD&A at 314-880-3000.

MD&A Engineered Design Addresses These Issues:

The tested and proven MD&A “Pinned Seat” design eliminates all the generic problems associated with the original seat design and incorporates the following benefits by:

- 1) Eliminating the support lip and most of the trepan groove, thereby removing trepan groove stress concentration areas
- 2) Moving the seat interference fits further downstream into the chest, where the chest wall is thicker and will not yield, helping to eliminate future trepan groove cracking
- 3) Adding an interference / sliding fit to the tail end of the seat, which greatly reduces the stresses on the front end shrink fits
- 4) Increasing the new seat-to-casing interference contact area, equalizing stresses along the body and reducing overall stresses on the front-end interference fits
- 5) Adding multiple radial pins which take the place of the seal weld as noted in the original design. These radial pins not only hold the seat in-place during severe thermal cycling but also eliminate differential expansion cracking problems along the old seal weld by eliminating the need for the seal weld altogether

This upgrade can be installed as a turnkey project by MD&A staff during a normal overhaul time schedule.

