Vibration Test Facility

Vertical Vibration Table

Horizontal Vibration Table
Typical Vibration Test Setup

- Vibration Table
- Head Expander
- Insert Assembly
- Clamp Pressure Line
- Clamp
- Pressure Line
- Vibration Table
- Head Expander
- Clamp
Reduction in Internal Pulser Wear as Improvements were Implemented
Connectors Before Thermal Exposure
Connectors After Thermal Exposure

- High Temperature Exposure of electrical connectors in a saturated steam environment caused severe degradation of the Viton rubber. This was demonstrated and an alternate material was selected by closed-cavity testing.
Pulser Poppet Shaft Extension is Reduced by Wear Debris in Control Valve

![Graph showing the relationship between Poppet Shaft Extension and Number of Pulses. The graph compares Improved Solar and Standard Solar models. The y-axis represents Shaft Extension in inches, ranging from 0 to 0.4 inches. The x-axis represents Number of Pulses, ranging from 0 to 400,000. The graph includes a data point indicating 100,000 cycles equals 35 hours.](image-url)
Poppet Shaft wear and Rubber Boot Damage Commonly Observed with Boot Design
Tapered Roller Bearing

- Top image is with latest design improvements after 207 hours of HT/HP testing

- Bottom image shows severe galling damage to original design after 29 hours of HT/HP testing
Angle Plate Bearings and Race

- Original design with stamped cage, and standard bearing ball and race materials after 29 hours of HT/HP testing
Angle Plate Bearings and Race

- Latest Design with machined cage, silicon nitride balls, and M50 races after 207 hours of HT/HP testing
Positive Displacement Pump
Piston Return Springs

- Top image shows springs after 207 hours of HT/HP testing with latest design improvements.

- Bottom image shows worn and broken springs from an earlier design after HT/HP testing.
Positive Displacement Pump
Piston Return Springs

- Springs and Piston Anti-rotation spider after 207 hours of HT/HP testing with latest design improvements