



Summary of large bore cylinder repairs

Bethlehem Jacking Cylinders

- 18", 19" and 24" bore x 72" stroke hydraulic tie rod cylinders used by self elevating offshore drilling rigs to raise the rig to drilling mode and to lower for towing purposes.

Marine Riser Tensioner Cylinders

- 80K, 100K, 120K, 160K, 200K and 250K air over oil hydraulic cylinders used to stabilize sub-sea BOP and drillstring.

Liebherr Crane Cylinders

- Boom
- Telescopic
- Crowd cylinders

Bauxite Bucket elevator Cylinders

- 560mm Bore x 5,600mm Stroke Hydraulic cylinder.

Steel Mill Cylinders

- Furnace Tilt Cylinders
- Turning cylinders
- Racking Cylinders

Challenges

- Larger diameters with very tight tolerances for seal and bearing areas.
- Weight of components for disassembly, inspection, machining, welding, assembling and testing.
- Larger surface areas to inspect for structural integrity.
- Exotic materials that were originally used in manufacture that have increased tensile strength and yield.
- Specialized seals.

Solutions

- Constructed larger fixtures to handle cylinders and their components
- Invested in heavy lift bridge cranes.
- Designed and built hydraulic cylinder test stands with large volume oil reservoirs.
- Invested in digital inspection tools and material identification equipment.
- Redesigned function test of the cylinders to measure seal and bearing friction.
- Invested in large capacity lathes, mills and drills.
- Continuous on the job training for mechanics and machinists.
- Complete JSAs/JRAs and repair procedures.
- Continued customer feedback.