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PREVENTIVE MAINTENANCE AND TURNAROUNDS

FCC Maintenance Improvement Review

REFCOMM
ROTTERDAM
30 September–3 October 2019

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Equipment Reliability

1. **Minimizing** the total downtime during a turnaround. Knowing what to do before the turnaround is an essential piece for improved reliability.

2. **Maximizing** the elapsed time between turnarounds will impact the up-time and profitability of the unit.

3. **Maintaining** reliable performance of the equipment by reducing or eliminating unscheduled downtime.

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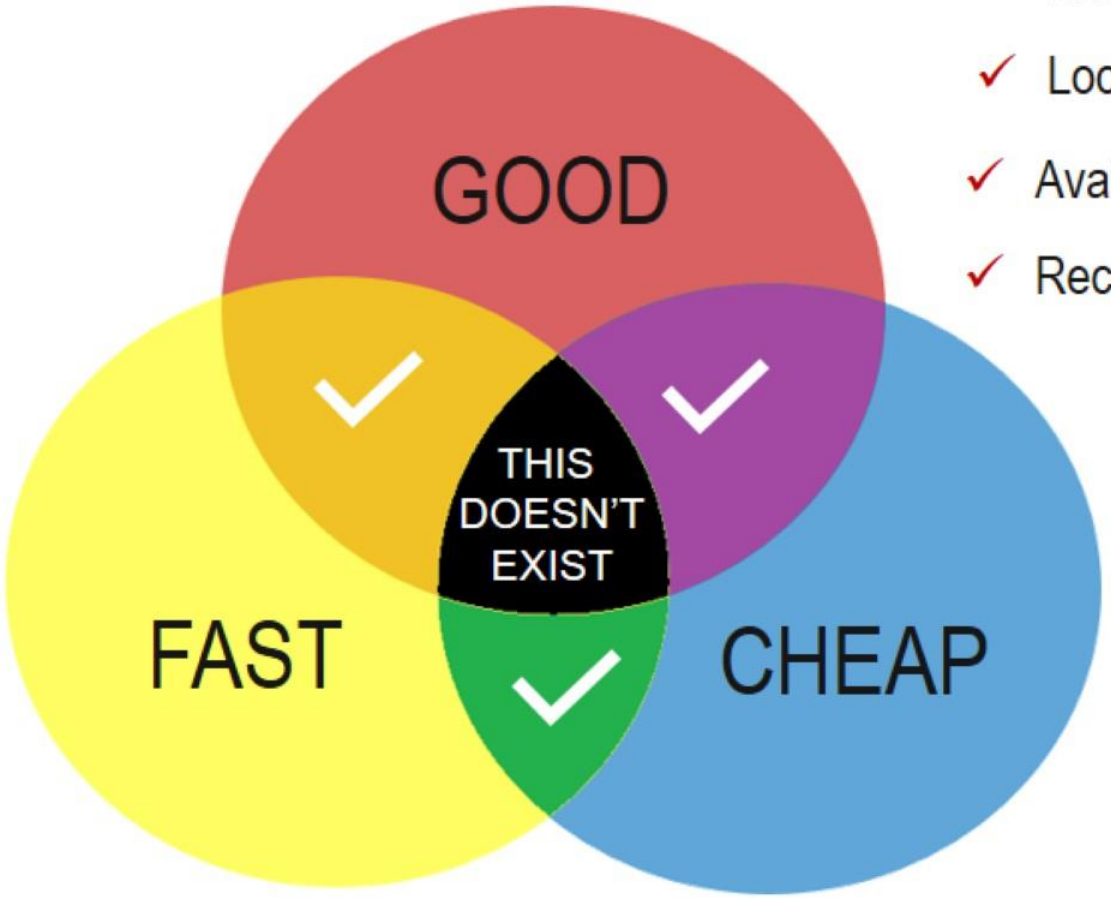
When Developing an Equipment Reliability Plan



- ✓ Know Your Equipment Performance
- ✓ Location of Capable Personnel
- ✓ Availability of Replacement Parts
- ✓ Record Keeping and Documentation

FCC Valve and Controls Inspection and Maintenance

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Annual On Site Equipment and Performance Inspections

- **Ongoing Maintenance Support and Assistance**
- **Valve & Actuator Engineering Support**
- **Turnaround Planning and Scheduling**

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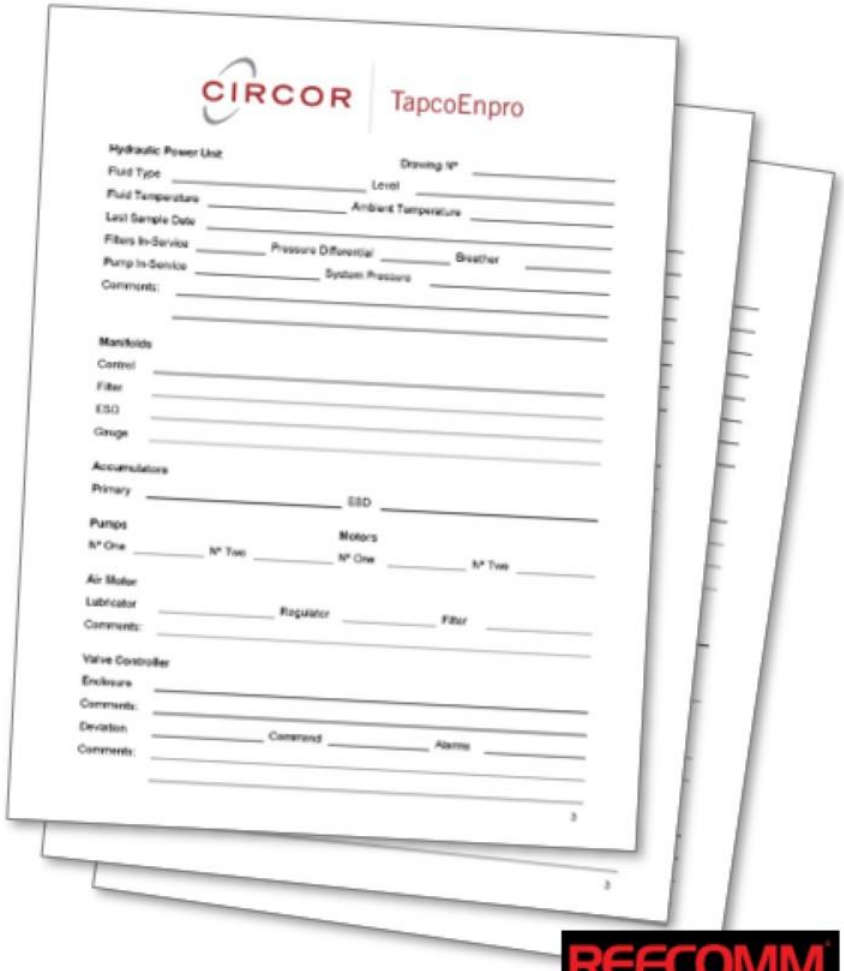
Annual On Site Equipment and Performance Inspection

- ✓ Review operating data
- ✓ Interview refinery staff
- ✓ Assist with troubleshooting
- ✓ Perform inspection
- ✓ Review spare parts inventory
- ✓ Provide refresher training
- ✓ Provide a formal report



Actuator / Hydraulic Power Unit Inspection and Maintenance

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Preventive Maintenance Check Points

Mechanical inspection

- ✓Any missing fasteners
- ✓Hydraulic cylinder bolting
- ✓Traveling block coupling torque

Visual inspection points

- ✓ Visual signs of leaking
- ✓ All Indicators
- ✓ Hose conditions and connections
- ✓ Cable entrees and condition
- ✓ Junction boxes secured
- ✓ Actuator covers on the actuator

Functionality testing

- ✓ Emergency Shut Down circuit
- ✓ Motor control circuit
- ✓ Limit switches
- ✓ Air motor testing (If applicable)

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Preventive Maintenance Check Points

Fluid Sampling

- The purpose of Hydraulic Fluid sampling is to achieve the highest level of equipment performance and reliability by checking the condition and the contamination level of the fluid.

- Based on the fluid analysis result, benchmarks can be established and systems with critical levels will be identified.

Actuator / Hydraulic Power Unit Inspection and Maintenance

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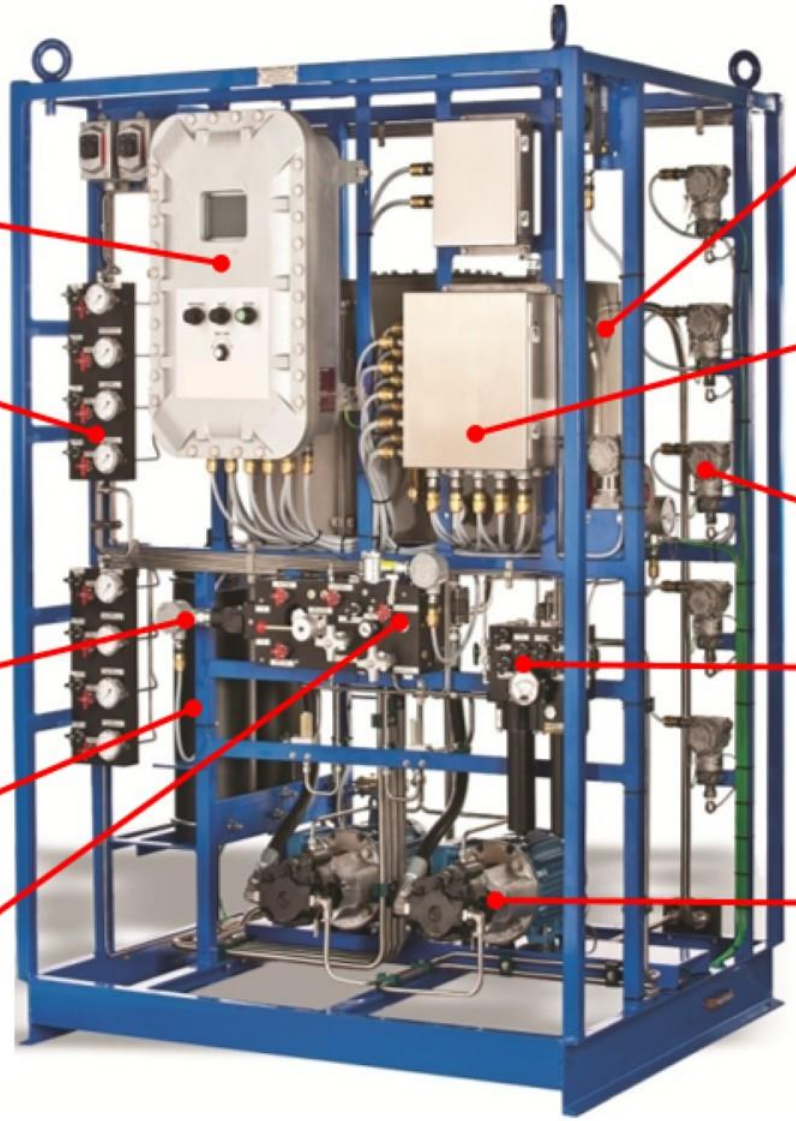

Slide and Plug Valve Inspection and Maintenance

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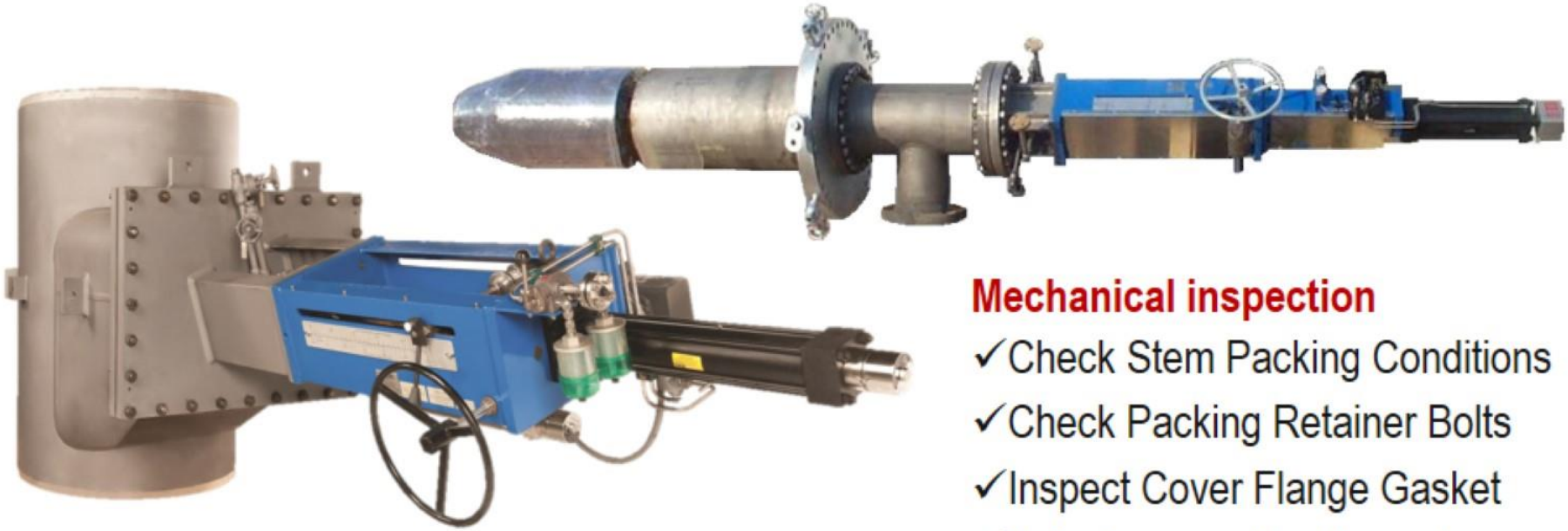

Stem Purge

- ✓ Ensure correct purge media
- ✓ Record purge Supply pressure

Guide Purge

- ✓ Ensure correct purge media
- ✓ Record purge supply pressure

Mechanical inspection

- ✓Check Stem Packing Conditions
- ✓Check Packing Retainer Bolts
- ✓Inspect Cover Flange Gasket
- ✓Actuator mounting flange torque
- ✓Actuator rod and stem coupling torque

Functionality Test

- ✓Actuator Manual Gear

Slide and Plug Valve Inspection and Maintenance

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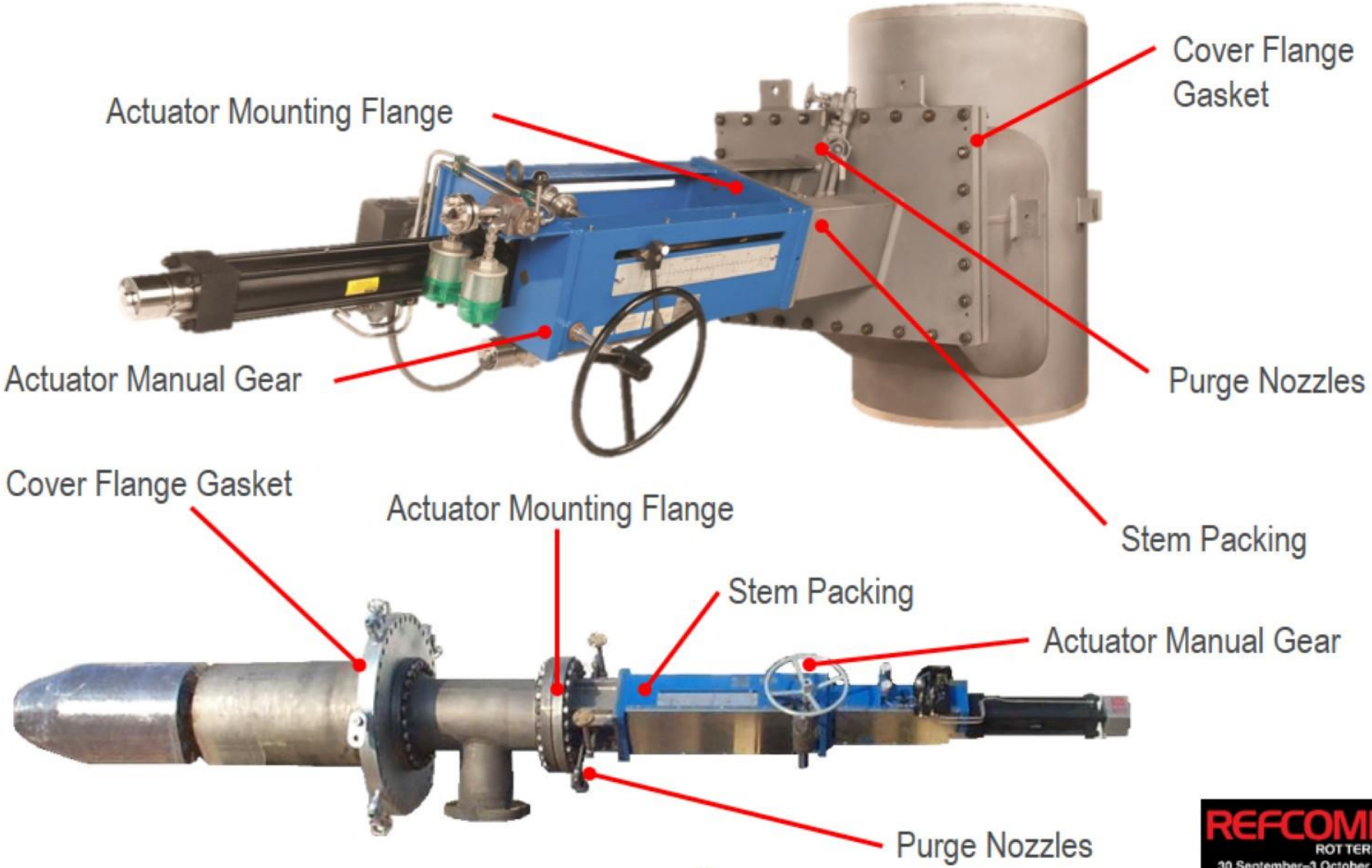

Actuator / Hydraulic Power Unit Turnaround

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Turnaround Activities

- ✓ Drain And Flush
- ✓ Replace Filters
- ✓ Replace Hydraulic Fluid
- ✓ Clean and Inspect all Valves
- ✓ Re-Charge Accumulator
- ✓ Rebuild Hydraulic Cylinder

Actuator / Hydraulic Power Unit Turnaround

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Turnaround Activities

Mechanical inspection

- ✓ Hydraulic cylinder bolting
- ✓ Traveling block coupling torque
- ✓ Actuator mounting flange torque
- ✓ Actuator rod and stem coupling torque
- ✓ Manual gear functionality

Functionality testing

- ✓ Solenoid valves
- ✓ ESD system
- ✓ Motor control circuit
- ✓ Limit switches
- ✓ Valve stroke calibration
- ✓ Complete system functionality testing at completion of activities.

Slide and Plug Valve Turnaround

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Turnaround Activities

Cover Flange Assembly

- ✓ Identify and mark all piping connections
- ✓ Seal and cap all open purge and sealant injection ports
- ✓ Inspect stem and replace as necessary
- ✓ Verify all stuffing box internal parts against drawing and repack according to specifications

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Turnaround Activities

Slide Valve Assembly

- ✓ Ensure work area is clean and any hazards identified and eliminated
- ✓ Locate and mark all piping connections
- ✓ Identify all internal parts against the drawings
- ✓ Inspection conditions of internals
- ✓ Remove and replace internals as needed utilizing safe practices
- ✓ Torque all internal bolting.
- ✓ Record torque value
- ✓ Install disc

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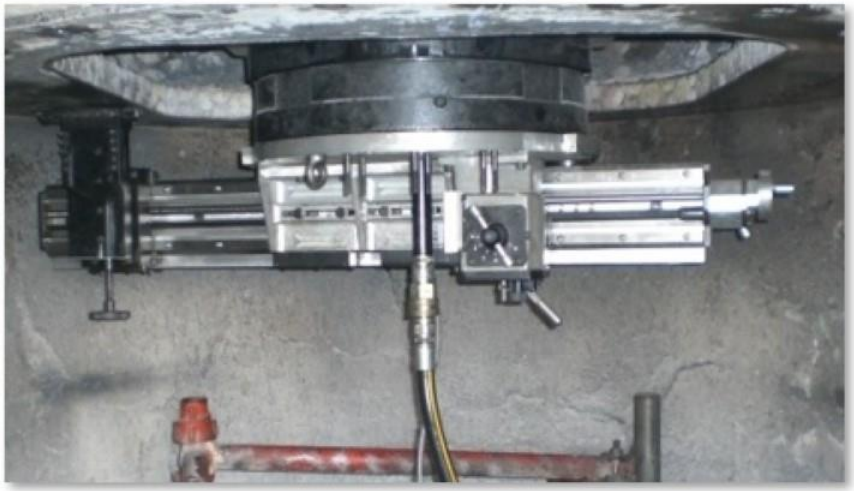
Turnaround Activities

On-Site Machining

Once the valve parts have been removed with the inspection and assessment complete, the gasket surface of the orifice seating can be machined to ensure all planes are parallel and square to original manufacturers tolerances and the new gasket will be seated correctly.



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Turnaround Activities

Slide Valve Assembly (continued)

- ✓ Check cold set clearances and record having Customer sign off
- ✓ Install Kaowool on bonnet gasket
- ✓ Rig and install cover flange
- ✓ Install all cover flange bolts and torque to specified values

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Post Turnaround Activities

The most efficient method for training personnel on valve maintenance, troubleshooting or possible repair is to instruct your team on the job and within your own facility by conducting a maintenance seminar held immediately following the turnaround while all events are still current.

Operators

Instrument Technicians

Mechanics

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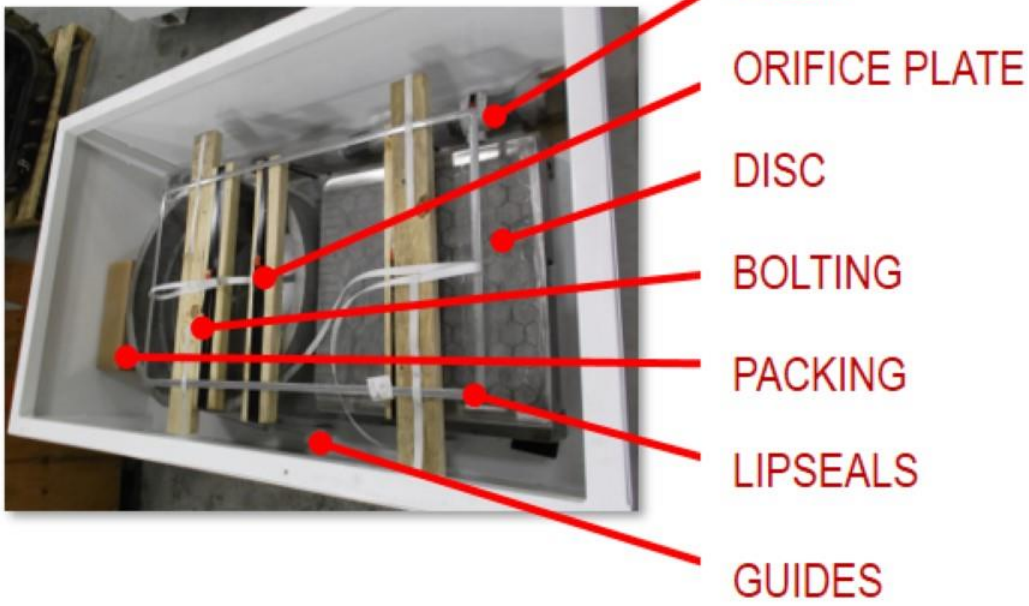
Reusable Long Term Storage Containers



- ✓ No lost or misplaced components
- ✓ Reduce possible damage to parts
- ✓ Store new parts ready for turnaround
- ✓ Replace used parts into boxes

- ✓ Easy shipping for shop repair
- ✓ Convenient warehouse handling
- ✓ Uncomplicated moving and storage

Customer Service Program

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We are an aftermarket service company who can handle your needs throughout the world with the emphasis on safety, quality and "on time" completion with manufacturing and full service locations in the Americas, Europe, Middle East, Asia, India and the Pacific Rim.

Thank You