Services and Solutions

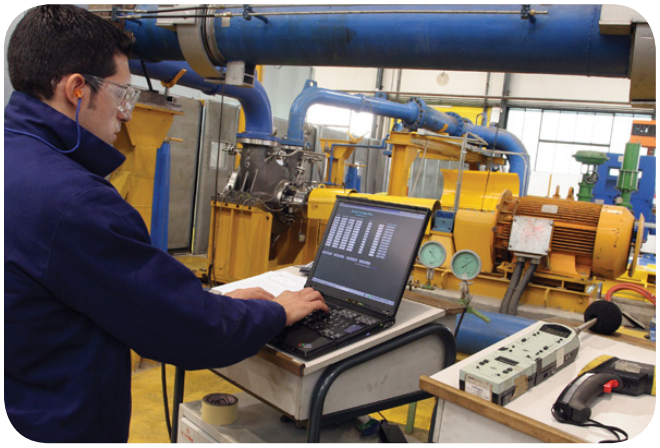
Reliability services

Reliability Assessment

The Reliability Assessment is a comprehensive evaluation of a plant's rotating equipment to identify potential issues that contribute to low mean time between repair (MTBR), loss of containment, unsafe working conditions or production issues.

Flowserve methodology is founded on reliability-centered maintenance (RCM) and failure mode and effects analysis (FMEA) fundamentals. Reliability Assessments are performed by Pump Systems Assessment Professionals (PSAPs) on a targeted selection of equipment – typically pumps that are known to have problems, either from amaintenance or performance perspective.

Flowserve utilizes a cross-functional group of engineers with robust rotating equipment expertise to maximize effectiveness in executing assessments. Flowserve PSAPs will audit reliability, safety and production processes to establish a detailed action plan for issue resolution and reliability improvement to achieve optimal plant performance.



Objectives

- Perform equipment and system audits to identify areas for improvement regarding reliability, safety and production issues
- Review Preventative Maintenance/Predictive Maintenance programs and compare to industry best practices
- Provide a comprehensive understanding of equipment and system performance by gathering essential sensor data to evaluate where the equipment is operating compared to the design point
- Provide a final report that includes issues identified, performance results and recommended improvement solutions

Value

Improve safety

By ensuring industry best practices are in place, plants use a 'Safety First' approach committed to operating in a responsible manner that prevents accidents and protects the safety and health of employees, customers, the public and the environment.

Improve efficiency of operations

By evaluating the condition and performance of rotating equipment and establishing clearly defined operational control limits consistent with API 691, plant equipment runs at its best efficiency point (BEP), which contributes to overall efficiency of operations.

Reduce downtime and improve reliability

By ensuring proper PM/PdM practices are in place, plant equipment availability is improved, which drives increased productivity and profits.

Lower cost of ownership

By improving equipment reliability, maintenance costs decrease and equipment life span increases, resulting in a reduced total cost of ownership.

Five-step assessment process

Reliability services offering matrix

Reliability Service Actions	Audit	Assessment	Program
Equipment Database Data Collection	✓	✓	✓
Field Walk-down of Asset(s)	✓	✓	✓
Progress Review Meeting	✓	✓	✓
Visual Observation Recommendations	✓	✓	✓
Vibration Data Collection		✓	✓
Flow Measurements		✓	✓
Failure History Review		✓	✓
Operational FMEA		✓	✓
Define Operating Control Limits (Operating Road Map)		✓	✓
Pump Performance Test		✓	✓
Energy/Reliability Review		✓	✓
Preventative and Predictive Maintenance Program Reviews		✓	✓
Gap Strategy Review (per Scope)		✓	✓
Final Recommendations Report With Applicable ROI		✓	✓
Sustainability Program and Training Recommendations			✓
Data Management (ERP/CMMS) Extraction and Flowstar Upload			✓
Industry Reliability Metrics Benchmarking Through Flow-star.net			✓
Implementation Plan Workshop			✓
	Transactional	**Transactional**	**Contractual (3 – 5 yrs)**

Reliability partnership

Flowserve

- Review equipment condition, system performance and failure history
  - Perform visual audit, noting corrective actions to be taken concerning the rotating equipment
  - Collect incomplete equipment data
  - Perform equipment performance testing
- Perform an operational FMEA for targeted equipment
- Review PM/PdM programs
- Supply a detailed report, including:
  - Opportunities to improve equipment condition and performance
  - Gaps in existing PM/PdM programs
  - Solutions for chronically problematic equipment and systems using Return on Investment (ROI) projections

Customer

- Supply Flowserve access to available detailed information to review and understand current equipment performance (failure history, P&IDs, IOMs, data sheets, pump curves, startup/shutdown procedures, etc.)
- Support with appropriate permits and access to site equipment
- Make necessary changes to equipment and system for performance testing, including: insulation removal, operation of pump at different points, installation of gauges and scaffolding
- Provide Flowserve access to cost details in order to calculate ROI analysis

Flowserve performs Reliability Services for the following industries and on the applicable machinery types listed, regardless of the OEM:

Industries served: Chemical Processing; Oil & Gas; Power Generation; Refining; Mining

Machinery types: API 610 Pumps; API 611 General Purpose Steam Turbines; API 612 Special Purpose Steam Turbines; API 614 Lubrication Shaft Sealing and Controlled Oil Systems; API 675 Positive Displacement – Controlled Volume Pumps; API 676 Positive Displacement – Rotary Pumps; API 677 General Purpose Couplings; API 682 Shaft Sealing Systems for Centrifugal and Rotary Pumps; API 685 Sealless Pumps

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