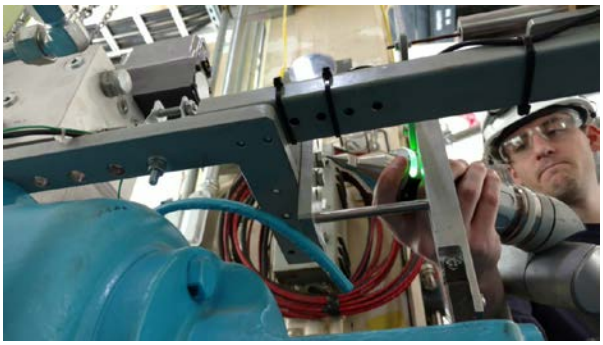
Mechanical Solutions and Services

Features

- Customized, engineered mechanical retrofit solutions for fossil, combined cycle, simple cycle, renewable, hydro or nuclear generating plants
- Individual mechanical component upgrades
- Comprehensive suite of mechanical services
- Dedicated mechanical solutions project team



Overview

Emerson's Automation Solutions Power and Water project organization includes a dedicated team focused on mechanical solutions and services that improve equipment operation, performance and reliability for fossil, combined cycle, simple cycle, hydro, renewable or nuclear power generators.

Emerson's mechanical solutions group provides a complete range of capabilities — everything from full conversion of older, low-pressure, mechanical governor controls to installation of modern, high-pressure hydraulic controls, trip system upgrades, electronic overspeed protection and mechanical bolt replacement to simple LVDT, servo valve, speed sensing and vibration monitoring system replacements.

The team can act as a Main Automation Contractor (MAC-EPC) to manage a project with full-scope mechanical and electrical installation and commissioning services.

In addition to the team's extensive experience designing, fabricating and testing both complete hydraulic and electric actuator systems for large steam turbines, they have also completed hundreds of feed-pump turbine control modernizations, turbine protection system upgrades and enhancements, hydro turbine mechanical-to-electronic governor conversions and hydraulic actuator rebuilds.

To deliver the highest quality, the group uses the latest PCMM 3D laser scanning technologies to perform as-built site verification, reverse engineer OEM components and execute installation design.

Comprehensive service and support options are available to ensure continued optimal performance of any Emerson installed mechanical solution.

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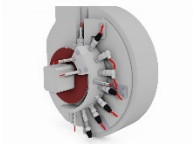
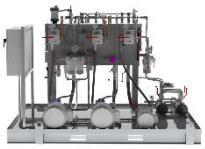
Retrofit Solutions

Emerson's turbine mechanical solutions are designed for long-term reliability and performance improvements by preventing nuisance trips, limiting fluid contamination issues and reducing unplanned outages. Each fully documented solution is customized to accommodate customer-specific scope requirements, schedule restrictions and budget constraints.

Emerson Mechanical Retrofit Solutions	
Component	**Description**
MHC to EHC conversions	Modernizing low-pressure mechanical-hydraulic control equipment to Emerson's high-pressure electro-hydraulic (EHC) system increases reliability and performance through exact valve positioning and faster response times to megawatt load, speed setpoint or open/close/trip commands. Installing a simplified EHC design decreases maintenance frequency and costs. Mechanical diagnostics are integrated with the Ovation™ control system, improving the ability to troubleshoot emerging issues. Use of PCMM 3D laser scans enable seamless integration of new and existing equipment with the available footprint which minimizes field modifications and reduces installation time.
Electronic overspeed protection	Emerson's electronic overspeed protection solution provides precise speed, zero-speed and creep control that helps to protect the turbine from potentially damaging overspeed events. A redundant, failsafe design reduces nuisance trips and improves reliability. Options are available to retain existing sensors or to integrate custom senor brackets with OEM equipment to help meet budget and schedule constraints.
Trip upgrades	Trip upgrade solutions reliably and quickly depressurize the trip header to prohibit turbine overspeed conditions. Emerson's fault-tolerant design uses 2-out-of-3 voting to decrease nuisance trips. Online testing with pressure feedback to the control system eliminates the need for an actual turbine trip. Optional manual trip handle installations provide emergency hydraulic trip capability for enhanced protection. Hydraulic or lube oils filters can be added to the solution for removing particulate contamination thus reducing the risk of equipment damage.
Digital hydro governor retrofits	Emerson's hydro governor retrofit solutions replace outdated mechanical control, feedback links and devices with modern hydraulics and instrumentation. Wicket gate control is improved through accurate, repeatable and responsive reaction to setpoint and frequency changes. Use of redundant hydraulic control and tripping functions increase mechanical system reliability. A simplified design uses fewer signal converters between the control system and field instrumentation which reduces communication risks and maintenance costs.
Vintage OEM part replacement	PCMM 3D laser scanning technology generates high-quality measurements of vintage OEM parts for site verification, reverse engineering and installation design. The scans are used to manufacture cost-effective 'drop-in' replacements for obsolete parts. Installing equivalent, yet new equipment, preserves previous investments, reduces the risk of failure and enables continued plant operation. The replacement parts are supported by Emerson's comprehensive lifecycle service programs, eliminating expensive service calls and long wait times typically associated with the older equipment.
Position feedback upgrades	Emerson's position feedback upgrades provide accurate and repeatable valve stroke position feedback with high-speed response times that improve turbine control and safety. Single, duplex or triplex redundancy reduces the risk of unplanned downtime. The modern feedback design easily integrates into OEM assemblies, eliminates obsolescence issues, protects equipment and reduces maintenance costs.

Engineered Components

Emerson's mechanical equipment is engineered using industry leading technologies that meet API standards as well as field-proven Ovation control strategies and services to maintain peak performance. Each mechanical component or assembly includes a comprehensive engineering drawing package or manual.

Emerson Mechanical Engineered Components		
Component	**Description**	
Accumulator assembly	Equipped with an expandable bladder that separates oil and gas to provide rapid response during pressure fluctuations. The assembly is available in 5-60 gallon configurations and includes a support stand, pressure vessel, safety manifold and customer connection points. Custom configurations are also available.	
Duplex filter assembly	Provides filtration to decrease fluid contamination which reduces unplanned outages caused by hydraulic system failures and increases the hydraulic control valve's lifecycle. Duplex design allows for online filter switching without loss of protection. The assembly includes filter housing, filter elements and differential pressure indication. Custom filtration levels and instrumentation are available.	
Hydraulic actuator assembly	Uses hydraulic horsepower to accurately and quickly position the turbine steam valves. Integrated quick close circuits facilitate rapid valve closure upon a turbine trip condition. The assembly includes a cylinder, manifold, servo valve, LVDTs, quick close solenoid, logic valves and removable orifice. Assemblies can be customized to meet customer-specific installation restrictions and performance criteria.	
Speed sensing assembly	Measures turbine rotor rotational speed using passive or active speed probes. Normally configured in a tri-plex orientation with 2-out-of-3 voting for turbine speed or overspeed protection. The assembly includes a custom bracket, speed sensors, cables and mounting hardware.	
Hydraulic power unit	Uses two redundant pressure-compensated pumps to provide actuator assemblies with a constant source of pressurized hydraulic fluid for steam valve positioning. The unit also removes particulate contamination and cools the hydraulic fluid. The HPU Includes hydraulic fluid reservoir, pump motors, pumps, accumulators, filters, reservoir heater, heat exchanger, air/breather – moisture separator and drip pan. Each HPU can be customized to meet customer-specific hydraulic needs and installation constraints.	
Pressure status manifold	Monitors critical pressure (or vacuum) headers. Provides the control system with three independent analog inputs for use in 2-out-of-3 voting logic to generate trip signals based on header status. The manifold includes pressure transmitters, needle valves and test points.	
Testable dump manifold	Provides online rapid de-pressurization of a turbine trip header through a 2-out-of-3 configuration. The manifold also allows for online testing. The fully redundant manifold includes solenoid valves, control cover, needle valves, pressure transmitter, logic valves, removable orifice and test points.	

Emerson Mechanical Engineered Components		
Component	**Description**	
Turbine manual trip handle	Manually de-pressurizes the turbine trip header. The assembly comes with directional valve and control, limit switch, hydraulic flushing procedure, initial setup and installation.	
Digital hydro governor	Provides accurate hydro governor control for increased ramp rates, reduced startup times and faster response to grid load changes. Simplified design decreases maintenance time and cost. Digital hydro governor retrofits can include LVDTs, speed sensing assemblies, hydraulic filters, trip manifold, proportional valves, and pressure or level transmitters. Can be fully customized to meet customer requirements.	

Services

Emerson's commitment to mechanical solutions does not end with commissioning. A variety of lifecycle services provide economical options to keep the installed mechanical equiment operating reliably and safely.

Emerson's mechanical experts provide comprehensive support for maintaining existing equipment, refurbishing parts, benchmarking governor performance, governor testing or long-term service for newly installed systems.

As the OEM designer, fabricator and installer, Emerson is uniquely qualified to provide timely expert service and technical assistance. The mechanical retrofit group has immediate access to the original system design information including specifications, calculations, drawings and installed test data as it relates to Emerson equipment.

Emerson mechanical engineers use the as-installed design data to develop and effectively execute a comprehensive long-term maintenance strategy for efficient and secure operation of the mechanical equipment without negatively impacting production.

Emerson Mechanical Services	
Service	**Description**
Mechanical Component Services	
Accumulator services	In-service accumulators may have difficulty maintaining constant pressure resulting in pressure fluctuations or surges. Adding new or rebuilding existing hydraulic accumulators can eliminate these issues, resulting in significant energy savings and increased equipment life. Emerson can provide new accumulators or refurbish existing accumulators (including bladder, diaphragm or piston types) to maintain constant and consistent hydraulic pressure and flow. Accumulator accessories are also available.

Emerson Mechanical Services	
Service	**Description**
Actuator services	Preventative maintenance of in-service actuators is an important component in the overall success and performance of the hydraulic system. An actuator nearing the end of its recommended service life can experience a host of issues that degrade turbine performance such as slow valve trips, seal failures, fluid leakage, fluid contamination and binding. Emerson's actuator services rebuild, test and verify operation per original design performance criteria. Complete actuator overhauls, cleaning and component replacement services are also available. Spare actuators can be provided to shorten maintenance time during an actuator swap-out.
Filtration services	Long-term hydraulic fluid condition and contamination control is of the utmost importance on today's high-pressure hydraulic control systems. Although a great deal is known about the reduction and prevention of contamination access into hydraulic systems, it has been estimated that as much as 70% of hydraulic system failures are due to poor fluid conditions. Emerson's standard filtration system includes high and low pressure duplex filter assemblies that house Emerson filter elements. Emerson experts can provide neutralization filtration, filter inspection and filter replacement services to maintain hydraulic fluid performance.
Hydraulic power unit services	Emerson can replace, service, upgrade or rebuild existing hydraulic power units and electro-hydraulic (EH) skids including pumps, motors and instrumentation. Our preventative maintenance recommendations can help eliminate leaky pumps or hoses, inconsistent EH system pressure, obsolete instrumentation and EH fluid contamination.
Servo valve rebuild or exchange	Servo valves that have been in service for an extended amount of time can experience performance issues such as erratic and deteriorating position control. Emerson can rebuild existing or supply new servo valves to improve position control, valve open/close performance and trip response reliability.
Field Support	
Scheduled or emergency site services	Experienced Emerson engineers can be scheduled to support outages, system upgrades, equipment performance evaluations, equipment testing, system inspections, component cleaning, flush setup and valve trip time recording. Emergency services are also available.
Additional Services & Support	
On-site spare parts	On-site inventories of mechanical hardware components provide immediate access to key spare parts which will minimize downtime when faced with equipment malfunctions or component failures.
Training	Qualified instructors conduct comprehensive on-site training to plant maintenance, engineering and operations personnel on all aspects of the Emerson-supplied turbine control and mechanical solution.

Emerson Mechanical Services	
Service	**Description**
Reverse engineering with 3D scanning	Emerson offers reverse engineering services that use cutting-edge PCMM 3D scanning technology to model OEM mechanical components and accurately manufacture custom “drop-in place” mechanical and hydraulic solutions.
Turnkey (EPC) services	Emerson can provide full installation scope services including site management, electrical & mechanical construction services that assist with meeting applicable local and federal standards, installation services, system commissioning and field engineering support.
Expanded scope services	Our mechanical experts can provide expanded services to accurately define project scope including pre-bid site walk downs, specification assistance, pre-project engineering design and demolition/installation engineering studies. If required, an Emerson foreman can be assigned to manage craft labor.
Maintenance agreements	Select services can be bundled into a customized maintenance agreement to meet plant, staff and budget needs.

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