

Asset Optimization

Electrical Reliability Services



EMERSON. YOUR PARTNER IN ELECTRICAL EQUIPMENT RELIABILITY

In today's competitive environment, it's important to recognize plant asset reliability is at the core of every successful operation. Emerson's Asset Optimization solution brings together a unique combination of world-class services and innovative technologies to help users improve asset availability and performance across the full spectrum of plant assets including mechanical equipment, electrical systems, process equipment, and instruments and valves. We bring the right mix of work processes, expertise, technology and management to deliver the results you are seeking.

Single-Source Solution

As the leading independent electrical testing, maintenance, and engineering service company, you can rely on Emerson's Electrical Reliability Services to exceed your electrical equipment performance goals. From testing for problems that could disable your system to complete project execution, you'll quickly understand how we are a single source solution.

Vision and Promise

Our vision extends beyond your plant's immediate maintenance and repair needs to a larger view that is focused on attaining maximum performance from your plant's assets. This vision, coupled with a full complement of field engineering services, technical services, and technical training, creates a unique combination designed to strengthen your competitive edge.

Asset Optimization

Successful asset optimization relies

on the proper mix of expertise, technology, and people. For more than 35 years, we've developed each segment of this mix to create a complete business solution that works within the framework of your financial and performance expectations.

Trusted Reputation

We've built our reputation on meeting or exceeding your expectations. You expect experienced people assigned to your project. You expect them to respond with technical expertise and proven experience. You also expect responsiveness to your schedule. And that's exactly what we deliver.

Unparalleled Expertise

Our team is comprised of more than 500 of the industry's premier engineers, PE's, technicians, and support professionals. Certified through organizations such as the InterNational Electrical Testing Association (NETA), our technicians

have the expertise and practical experience to accomplish the most complex projects safely and reliably.

Unbiased, Objective Results

As an independent third party company, we are committed to providing objective, unbiased test results and recommendations. As a full member of NETA, you are assured that all testing is performed objectively, according to NETA specifications, using calibrated instruments traceable to the National Institute of Standards and Technology (NIST).

Advanced Technology

Continued investment in advanced technology enables us to utilize the latest preventive and predictive technologies to provide the most advanced and cost-effective maintenance solutions available.

Local Support

Whether it's an emergency or an ongoing project, you need service partners who can respond where



and when you need them. With strategically located Service Centers across the U.S., you'll receive local response with nationwide capability.

Safety

Regardless of location, safety is paramount. All field engineers and technicians undergo rigorous training to ensure their safety and yours. As a result, Emerson

maintains one of the lowest safety ratings in the industry.

Experience that Counts

We have built a solid reputation as the industry leader by providing safe, high quality electrical testing, maintenance, and engineering services for more than 15,000 valued **repeat customers**.

We work with you to improve the availability, safety, and reliability of your power distribution system. With a proven track record in industries such as power, oil & gas, chemical, food & beverage, pulp & paper, manufacturing, healthcare, and telecommunications, our capabilities cover your entire operation.

Examine our resources, expertise, and track record and discover how we can assist your operation with the only results that really count—the bottom line.

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BUILD IN RELIABILITY FROM THE START.

Commissioning is the time to think about asset optimization. It's your chance to do it right from the beginning. Engaging our services to start up the entire electrical distribution system aligns the right equipment and systems to ensure your new operation will reach peak performance quickly and easily. Choosing a single service partner eliminates the problems that occur in a multiple vendor scenario.

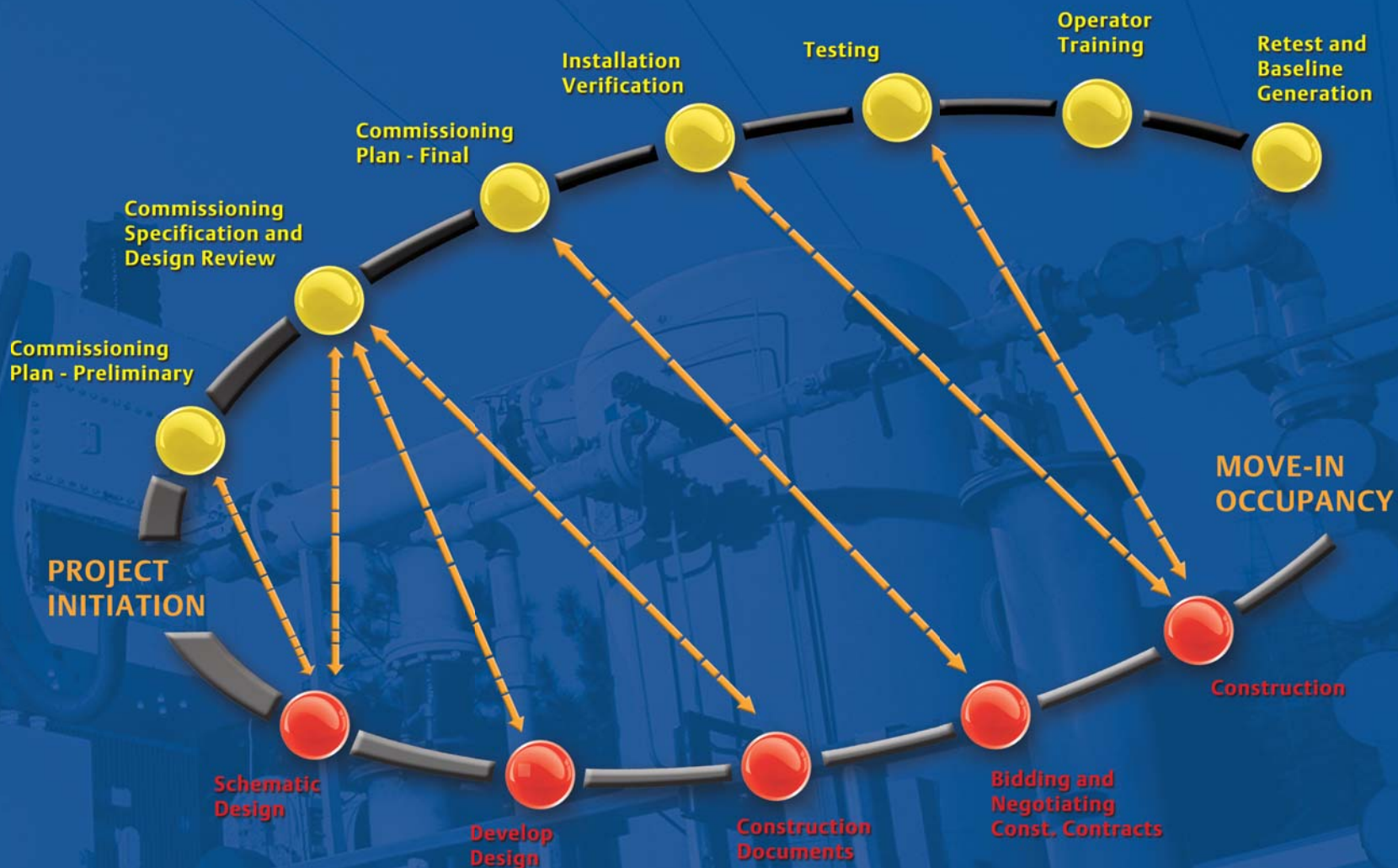
Commissioning and Startup Services

68% of early equipment failures can be traced to design, installation or startup deficiencies. We help you avoid these pitfalls by developing an overall commissioning plan with detailed step-by-step procedures to provide clear guidance. This ensures that newly installed equipment and systems in your new facility meet the design intent and operate efficiently as an integrated system. Properly done, commissioning projects can pay dividends in the form of decreased rework, fewer change orders, lower operation and maintenance costs, and lower utility bills.

Optimum Performance. Minimum Time.

Rely on our team to help yours during a critical startup. Our integrated service package combines the right people and the right resources to deliver the shortest possible startup with maximum performance levels. Our services include:

- Design Review
- Acceptance Testing and Calibration
- Documentation and Manuals
- Personnel Training
- Maintenance



DESIGN CONSTRUCTION PROCESS



PREVENTIVE AND PREDICTIVE MAINTENANCE: THE POWER TO PREDICT

It's undisputed. If you have equipment, you will have problems. In fact, 60% of breakdowns are due to poor maintenance and 25% of fires and explosions are electrically induced. What if you could foresee problems like these — days, or even months before they occur? Predictive and preventive maintenance enables you to do just that. Our reliability-based maintenance solutions combine the best techniques from each of the traditional approaches and provide a comprehensive strategy that enables you to design a plan that will pinpoint maintenance when and where it is needed most.



Preventive Maintenance

An optimized preventive maintenance strategy evaluates the condition of your equipment and determines the most cost-effective and manageable solution to ensure your equipment's overall performance, safety, and reliability. Let us help you design and implement a preventive maintenance strategy that will reduce your overall maintenance costs and the time spent on unplanned maintenance. And more significantly, improve overall reliability throughout your facility. Our services include:

- Transformer Testing
- Circuit Breaker Testing
- Low and Medium Voltage Switchgear Retrofitting

- Switchgear Testing
- Cable Testing
- Protective Device Testing
- Ground Fault Systems Testing
- Standby Generation System Testing
- Infrared Scanning
- Battery Testing and UPS Testing
- 24-hour Electrical Emergency Assistance

Predictive Maintenance

Predictive diagnostics is a window into the future of your equipment's performance. By performing the following, we can identify when a failure may occur so you can plan an outage instead of dealing with an unexpected failure. This information is essential in making the best use of your maintenance dollars.

Electrical Testing provides insight into the physical condition of electrical systems and components.

Oil Analysis examines routine samples of oil for particulates and contaminants that indicate wear.

Thermography detects heat buildup in switchgear, which is often a precursor to failure.

Ultrasonics detect gas leaks, vacuum leaks, valve leaks, and similar problems.

Partial Discharge Testing & Monitoring provides a variety of solutions to effectively monitor the condition of electrical assets.



PARTIAL DISCHARGE TESTING AND MONITORING: DETERMINE THE HEALTH OF YOUR ASSETS

Electrical systems are among the most valuable assets in your plant and can have the biggest impact on your bottom line. Their production and management costs are high, and failures almost always lead to catastrophic losses. Electrical systems are being operated at higher levels, even while systems are aging — which affects both the life and reliability of your assets.

Today's asset managers are facing the increased challenge of maximizing their aging electrical infrastructure with fewer qualified technical in-house resources, stricter regulatory requirements for worker safety, and diminishing maintenance budgets.

Advances in technology, including the use of partial discharge testing, are giving asset managers new approaches to achieve improved reliability and performance of critical assets.

Because partial discharge activity is often present well in advance of insulation failure, asset managers can monitor it over time and make informed strategic decisions

regarding the repair or replacement of the equipment. These predictive diagnostics help companies to prioritize capital and MRO investments before an unexpected outage occurs. Partial discharge testing results can help predict future performance and reliability of critical assets, including:

- Cables, Splices, and Terminations
- Power Transformers and Bushings
- Switchgear
- Motors and Generators

Integrated Partial Discharge Solutions

Emerson's integrated Partial Discharge Testing and Monitoring Solutions include both online and offline testing as well as periodic and continuous monitoring of your electrical assets. Depending on your specific operating requirements and application, Emerson can customize a program to best fit your needs.

- Online Partial Discharge Testing
 - Handheld Survey
 - Periodic Partial Discharge Testing
 - Continuous Online Monitoring
- Ultrasonics
- Offline Partial Discharge Testing
- Tan-Delta
- Very Low Frequency Testing (VLF)



ENGINEERING AND CONSULTATION: IMPROVING SYSTEM PERFORMANCE

What if you could increase revenue just by examining your current assets. Prior to spending one more dollar on any capital investment, take a look at what you already have. By utilizing your existing assets more effectively, you can expect enhanced performance and increased availability.

Life-Extension Services

Life-extension services provide a wide range of retrofit and upgrade solutions to maximize the value of existing equipment while improving overall system performance.

Retrofits add operational flexibility, interchangeability, and communication capabilities to your electrical assets. In many cases, retrofits and upgrades offer new technology at a fraction of the cost of replacement. Our Life-Extension Services include:

- Low and Medium Voltage Circuit Breaker Retrofits, Vacuum and SF₆
- Modernization of Outdated and Under-Rated Equipment
- Automatic Transfer Switch Retrofits
- Solid State Protective Relay Retrofits
- Emergency Circuit Breaker Rentals and Loans
- Replacement Parts

Engineering Studies

Engineering studies verify system protection, fault rating of electrical equipment, and the overall reliability of your system. They are key to uncovering the profit potential in your existing assets or in helping you select electrical equipment if you decide to build a new facility. Using state-of-the-art hardware and software to analyze the needs of your power system and your facility, our power system engineers provide you with critical information to make informed decisions. Our Engineering Studies include:

- Short Circuit Studies
- Coordination Studies
- Harmonic Studies
- Load Flow and Power Factor Studies
- Power System Studies
- Arc Flash Studies
- Reliability Studies

Arc Flash Solutions

Electrical hazards, specifically shock, arc flash, and arc blast can result in serious injury or death to electrical workers. Ensuring worker safety and meeting the challenges of the new arc flash safety requirements can be a difficult task to accomplish without the assistance of outside resources familiar with industry standards and recommended practices. Our Arc Flash Solutions include:

- Arc Flash Hazard Analysis
- Arc Flash Hazard Labeling Plan
- Site Review / Compliance Assessment
- Design Review
- Single-Line Diagram
- Preventive Maintenance
- Short Circuit and Coordination Studies
- Electrical Safety Program Review / Development
- Training
- Personal Protective Equipment Plan
- Optional Annual Re-certification
- Documentation

SMART TURNAROUNDS™ AND OUTAGES: PLAN FOR A BETTER RETURN WITH EMERSON

Equipment begins to deteriorate the first day it is put into operation, making future maintenance inevitable. Since every hour of extended downtime translates into lost profit dollars, it's essential to examine the quickest possible return to operation. Part of this process is choosing a partner with the critical elements in place to serve your turnaround needs. From best-in-class employees to advanced diagnostics, we will be an integral part of your team that delivers improved asset performance and reliability.

Plan for a Successful Turnaround

An effective turnaround strategy starts with effective planning. Let us help you design and implement a Smart Turnaround strategy that will ensure you get the most out of the available time for maintenance. Starting with pre-outage planning, we will conduct preliminary diagnostic testing to evaluate the condition of your equipment prior to the turnaround and determine the most cost-effective and manageable solution to ensure your equipment's overall performance, safety and reliability.

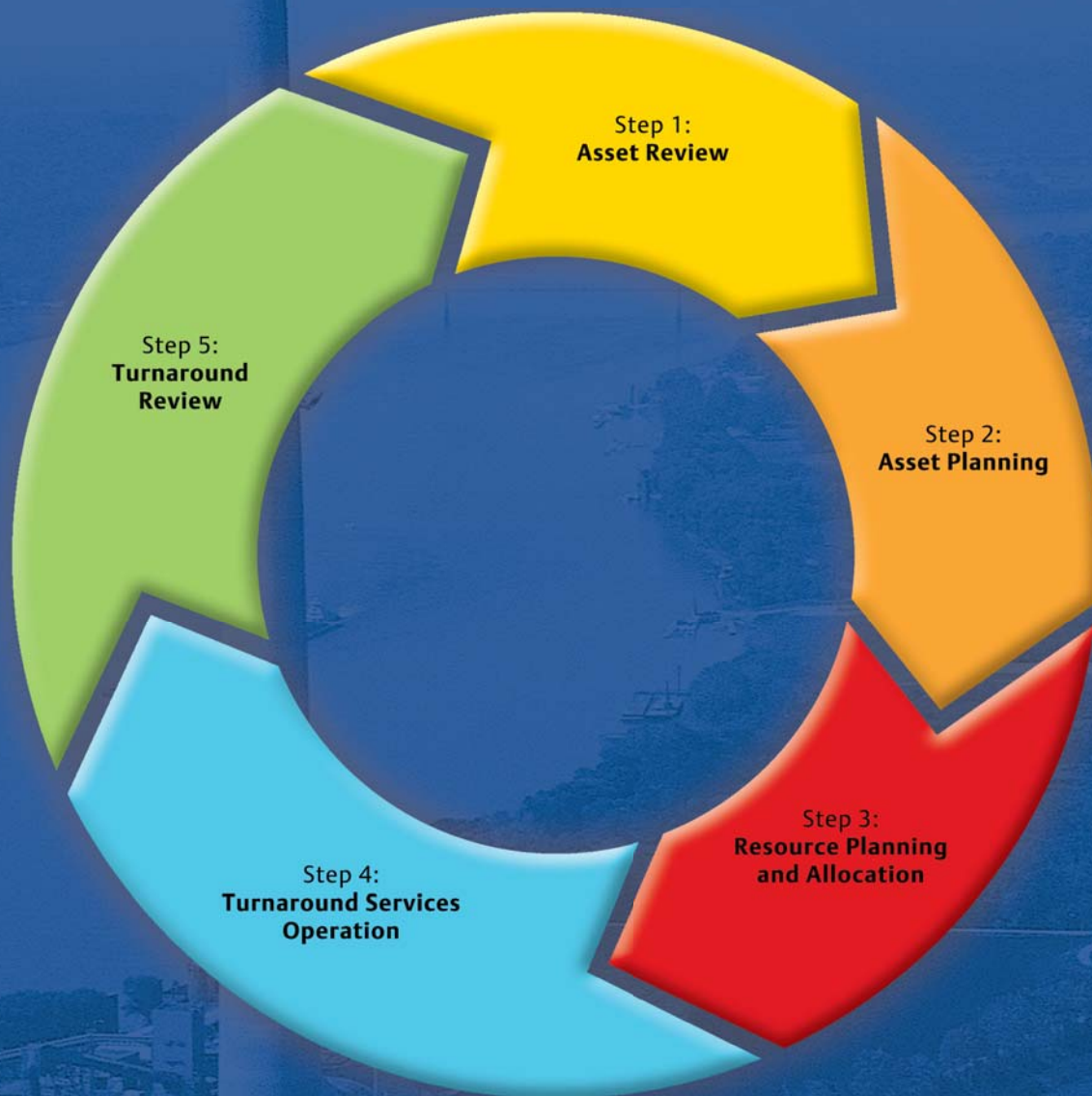
Risk insurance companies demand periodic, predictive electrical inspections and testing to detect deficiencies before they result in unscheduled outages, loss of production, and damaged equipment. During a scheduled outage, it is an ideal time to perform these tests. We inspect, clean, lubricate, calibrate and perform

electrical diagnostic testing on breakers, switches, motors, relays, cables, batteries and transformers to ensure proper performance. Our Smart Turnaround Services include:

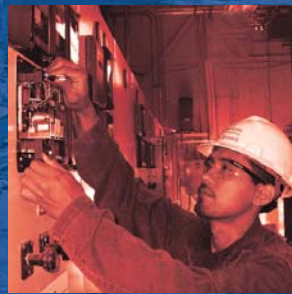
- Pre-Outage Diagnostic Testing
- Clean and torque electrical switchgear
- Repair, refurbish, replace obsolete and defective equipment
- Test and calibrate protective devices
- Test low, medium, and high-voltage equipment
- Test underground cables using partial discharge testing
- Perform power factor and dielectric testing on transformers
- Perform system integration testing

An effective turnaround that accomplishes all planned electrical maintenance activities will:

- **Reduce cost of repairs and downtime**
- **Improve overall system performance**
- **Reduce risk of future equipment failure**
- **Establish baseline record utilized as part of an ongoing maintenance program to enhance the safety, reliability and efficiency through future preventive maintenance**



**ACHIEVE DIRECT MEASURABLE
BOTTOM LINE RESULTS WITH
EMERSON'S SMART TURNAROUND™ PROCESS**





EMERSON HELPS YOU IMPROVE THE PERFORMANCE OF YOUR WORKFORCE

Companies today are relying on fewer people to do more work. At the same time, what companies ask of people and technology is becoming more complex. The need for effective training is more critical than ever to achieve and maintain cost-effective process operations.

EDUCATIONAL SERVICES: MAXIMIZE YOUR HUMAN ASSETS

Creating and training a best-in-class team takes time and financial resources — two things that are typically limited in today's overtaxed workforce. Add the challenges of skilled labor attrition to the mix and you quickly understand the need for effective performance consulting and training.

Educational Services

Trust the experts at Emerson to deliver the most effective training and development to meet today's process challenges. Our Educational Services team has the capabilities and resources to help you get the greatest possible performance from your operation — both plant and people.

Performance Solutions

The performance of your workforce can have a significant impact on your overall operation, maintenance, process equipment — and ultimately your bottom line. To achieve maximum process performance you must start with improving and retaining the performance of your workforce.

Emerson's Performance Solutions program can provide a cost-effective way to ensure your workforce is capable of performing at the highest level of efficiency and safety to eliminate workplace injuries and accidents, ensure compliance with regulatory requirements, and optimize processes and equipment.

You gain a safer environment, retention of top-performing employees, and a reduction in overall costs. Emerson's Performance Solutions team can provide assessments in the following areas:

- Skills and Training Needs
- Personnel Safety
- Policies and Procedures
- Regulatory Compliance
- New Equipment Training
- Maintenance Practices

Training Services

Emerson's Training Services program provides the latest, most cost-effective, and flexible electrical training from industry experts. Our standard and custom training courses can be delivered at your site, our site, or online. Courses are available in the following training areas:

- Electrical Safety
- Arc Flash
- Operational Maintenance
- Certified Technician
- Power Quality
- Specialized Electrical Equipment

Custom Courses

Have a large group that needs to be trained collectively and on your equipment or a specific topic? We can customize instruction around your schedule, online or onsite. Emerson's Educational Services team will work with you to define your needs and develop a course that addresses your facility, systems, operations and policies. Custom training enables you to train more people for a fraction of the cost of traditional training. Stop spending money on training that doesn't address all of your needs.

Classes are scheduled during your employees normal working hours, eliminating any shift differential costs that may be incurred. We come to your site so employee travel and living expenses are eliminated. Your employees will gain the knowledge they need to do their jobs safely and efficiently, while you train twice as many people at an affordable cost.

EMERGENCY RESPONSE SERVICES: HELPING YOU RECOVER

Unexpected failures and natural disasters can pose serious hazards with potentially devastating effects. Startups are challenging enough under the best of circumstances. That's why you need Emerson to deliver the most complete emergency response services available. From initial damage assessment and inspection to equipment repair, refurbishment and replacement, Emerson is your source to get you up and running quickly — ensuring your safe, reliable return to operation.

Emergency Response Services

Emerson's Emergency Response Services are designed to support your recovery objectives. Whether you're looking to assess the damage of your electrical distribution equipment, or ready to conduct startup and commissioning of new or refurbished equipment, we can help. Our Emergency Response Services are conducted according to NEMA guidelines and adhere to NETA / ANSI specifications.

Our Emergency Response Services include:

- Damage Assessment
- Inspection and Testing
- Equipment Repair and Reconditioning
- Replacement Equipment
- Spare Parts Support
- Installation
- Commissioning and Startup
- Emergency / 24 Hour Service

Trust Emerson to deliver industry-leading response and support during your emergency situation. You will receive:

- **Fastest and most cost-effective business resumption**
- **Reduced exposure to risk, ensuring safety of your personnel and equipment**
- **Access to cross-industry, best practices knowledge**
- **Assurance of efficient use of existing personnel and resources**





PERFORMANCE YOU NEED. RESULTS YOU WANT.

From startup to turnaround,
your assets are the means
to a healthier bottom line.
By combining technology,
expertise, and people — you
uncover the potential of
your assets. The result?
Improved plant availability
and increased productivity.

Look to us as your partner.
We'll be with you every step
of the way with the right
combination of technology,
people, and services.
Contact Emerson to realize
the true potential of your
assets.

www.assetweb.com/ers

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