Achieve Your Safety Goals – Protect People and the Environment

Minimize significant time and cost barriers that keep you from improving overall plant safety.
Industry Facts

You Need to Know

COMPLY WITH ENVIRONMENTAL REGULATIONS FOR PRESSURE RELIEF EVENTS

- Malfunctioning Pressure Relief Valves (PRVs) can be a safety hazard if they don’t open and seat when needed.
  — When we analyzed PRV pre-test service records, we found that 20% of PRVs were leaking below 50% test pressure. On 8%, leaks were so extreme the PRV did not pop, so there was no visual indication of the leaks.
  (Source: Emerson study of 10,000 PRV pre-test service records from a large North America customer)

MITIGATE RISK – FOCUS ON HIGH-INCIDENT AREAS

- Top Causes of Process Safety Events
  — 49%: corrosion of internal and external pipes
  — 11%: tanks
  — 8%: pumps
  — 6%: heat exchangers
  — 4%: fired-heaters
  — 4%: pressure vessels
  (Source: American Fuel & Petrochemical Manufacturers Annual Learnings Report)

- 42% of SIS dangerous failure modes come from sensors
  — Most of the sensors used in SIS installations are traditional instruments
  (Source: Offshore Reliability Database)

RESPOND FASTER TO INCIDENTS

- For an operator in distress, every second counts.
  — Pinpointing the exact location where a safety shower has been activated is challenging. Emergency medical services must be available within 3 to 4 minutes.
  (Source: OSHA Best Practices)

- Location technologies can help you respond faster to over 70% of Personal Recordable Accidents.
  — Emerson’s digital transformation offerings can help you reduce barriers to the adoption of personnel location technologies.

Improve Safety While Preserving Financial Health

Safety and protecting the environment are top priorities in chemical plants.

Emerson has a comprehensive set of technologies and services to help you cost-effectively achieve your Health, Safety and Environment (HSE) goals while preserving your financial health objectives.

You can keep your people safe by leveraging technology that keeps them out of the plant, provides early detection of any hazards and leaks, and reduces response time to emergencies. Environmental protection can be achieved by avoiding leaks, spills, and releases with reliable tank management solutions, corrosion monitoring, and pressure-relief device monitoring. Incident prevention is key and by increasing visibility to process issues and data with wireless devices and advanced diagnostics, abnormal process conditions can be detected before they create an incident.

With a comprehensive portfolio of industry-leading devices which have low dangerous undetectable (DU) failure rates and remote partial proof-testing capability, you can ensure you are exceeding your safety integrity levels and extending proof test intervals.

APPLICATION CHALLENGES

Protecting your plant, your people and your community is your safety goal. We can specifically help you with these major challenges so you can achieve your safety goals.

- Restrict on-site access
- Operate safely despite reduced staff
- Extend turnaround schedule
- Lack of remote monitoring
- Production run rate changes
- Frequent shutdown and startups
Emerson has a comprehensive set of technologies and services to provide early detection and avoidance of potential safety incidents and mitigate the consequences.

With Emerson’s solutions you can:

- Manage and reduce the potential for fires, explosions, and other process incidents
- Ensure you can easily meet the safety integrity level (SIL) requirements of your plant with our portfolio of SIL-rated devices
- Proactively detect leaks, spills, and releases with reliable tank management solutions, corrosion monitoring, and pressure-relief device monitoring
- Achieve reduced emergency response time and a safer work environment

Please contact your Emerson sales representative to discuss solutions to meet your goals.
GOAL: KEEP PERSONNEL SAFE

**Issues**  
- Risk of extended response times during an emergency  
- Sending people into the plant for routine maintenance, manual rounds and sampling can increase the risk of injury

**Solutions**  
- Real-time location with emergency event alerts  
- Keep people out of the plant for manual rounds with real-time measurements and remote connectivity

**Featured Products**

- **Emerson™ Location Awareness**:  
  - enabled by Personnel/Asset Tags and WirelessHART® Location Anchors  
  - helps to reduce the industrial environment barriers of existing location technologies  
  - provides a solution for the main use cases of geofencing, safety mustering and safety alerts, and streamlines them into an easy-to-use interface

- **Emerson Wireless Pervasive Sensing™ Solutions**:  
  - cost effectively automate manual rounds  
  - improve insight to process measurement data on applications such as utility gas pressures, seal oil levels, filter differential pressures and bearing temperatures  
  - keeps operators out of process areas that may expose them to unnecessary risk

- **Micro Motion™ Fork Viscosity and Density Meters & Rosemount pH and Conductivity Sensors**:  
  - Emerson’s broad portfolio helps reduce personnel exposure to volatile organics and hazardous chemicals  
  - reduces personnel time in the field associated with manual sampling along with limiting lag times between lab sampling that can cause dangerous operating conditions

- **Emerson Wireless Gateway, Wi-Fi and Bluetooth®-enabled Transmitters**:  
  - use Emerson’s wireless gateways to remotely configure and troubleshoot devices  
  - Wi-Fi and Bluetooth allow the field technician to connect to the device to perform configuration, run diagnostics and download historical files without the need of a hot work permit or equipment to access the device if it was installed in a difficult-to-reach location

- **TopWorx™ Safety Shower & Eyewash Station Monitoring Kits**:  
  - provides instant notification and location when safety showers and eyewash stations have been activated, improving first responder response time
### GOAL: KEEP PERSONNEL SAFE - CONTINUED

<table>
<thead>
<tr>
<th>Issues</th>
<th>Solutions</th>
<th>Featured Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exposure to undetected leaks of flammable and toxic chemicals increases risk of injury</td>
<td>Leverage toxic and flammable gas detection technologies</td>
<td>Rosemount 935 and 936 Open Path Combustible Gas Detectors - detects large-scale toxic and combustible gas leaks that might occur anywhere along the line-of-sight of the detector</td>
</tr>
<tr>
<td></td>
<td>Net Safety® Millennium II BASIC Single Channel Transmitter - protects workers from toxic gases and detects presence of combustible gases to identify leaks and prevent fires</td>
<td></td>
</tr>
<tr>
<td>Quickly respond to fires including fires invisible to the naked eye</td>
<td>Install optical flame detecting technologies</td>
<td>Rosemount 975MR Multi-Spectrum Infrared Flame Detector - optical flame-sensing technologies utilizing UV, UVIR and multi-spectrum infrared to detect flames of differing fuel sources that use line-of-sight detection of the radiation emitted in the spectral bands to determine if a flame is real</td>
</tr>
</tbody>
</table>

### GOAL: PROTECT THE ENVIRONMENT & COMMUNITY

<table>
<thead>
<tr>
<th>Issues</th>
<th>Solutions</th>
<th>Featured Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tank overfills damage the environment, risk injury and are costly to clean up</td>
<td>Improve tank level and automated overfill prevention systems</td>
<td>Rosemount 3408 Level Transmitter - Non-Contacting Radar and Rosemount 5300 Level Transmitter - Guided Wave Radar - Rosemount 3408 delivers ideal level measurement for corrosive fluids - Rosemount 5300 provides both level and interface measurement to prevent tank overfills</td>
</tr>
<tr>
<td>Limited insight into pipe, tank, vessel integrity increases risk of containment breaches and hazardous leaks caused by corrosion or erosion</td>
<td>Real-time corrosion and erosion monitoring to reduce risk of system integrity failures</td>
<td>Rosemount 2160 Wireless Level Detector - Vibrating Fork - fully integrated, wireless level detector provides a more cost-effective, easier and safer way to detect a high level for the safety shutdown system</td>
</tr>
<tr>
<td>Undetected gas leaks and pressure relief events risk personnel exposure and costly environmental fines</td>
<td>Implement PRV monitoring and gas leak detection</td>
<td>Rosemount Wireless Permasense ET310C Corrosion and Erosion Transmitter - wireless battery powered non-intrusive ultrasonic measurement with magnetic mounting is easy to install and monitors wall thickness that early detection is critical to avoiding a loss of containment and helps ensure process safety</td>
</tr>
<tr>
<td></td>
<td>Roxar™ Retrievable Electrical Resistance (ER) Probes - intrusive corrosion and erosion monitoring technology ideally suited for high-sensitivity (nanometer range) applications and fast response when used with Roxar CorrLog range of instruments</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rosemount 708 Wireless Acoustic Transmitter, Rosemount 4390 Series Corrosion and Erosion Wireless Transmitter, and Plantweb® Insight Software - enables the immediate identification and response to release events that documents the release duration and volume for regulatory purposes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Incus Ultrasonic Gas Leak Detector - detects pressurized gas leaks with the industry’s fastest response time, for any chemical composition, that can be leaking from a small hole or rupture</td>
<td></td>
</tr>
</tbody>
</table>
GOAL: INCREASE VISIBILITY TO PROCESS ISSUES & DATA

<table>
<thead>
<tr>
<th>Issues</th>
<th>Solutions</th>
<th>Featured Products</th>
</tr>
</thead>
</table>
| Undetected abnormal process conditions risk safety incidents           | Utilize measurement device diagnostics capable of detecting unusual process conditions | Micro Motion Coriolis Flow Meters -
  - detect abnormal situations or process upsets such as entrained air or gas with Coriolis’ density measurement and drive gain
  - entrained gas could be an indication of a seal failure and process leak
  - reduce safety risk of process upsets due to mis-measurement with Smart Meter Verification and coating detection |
|                                                                        |                                                                           | Rosemount 3051S Pressure Transmitter -
  - proactively monitor and detect abnormal conditions with Statistical Process Monitoring
  - get insight to dynamic and critical process issues including furnace flame out, pump cavitation, column flooding and entrained air |
|                                                                        |                                                                           | Rosemount 3144P Temperature Transmitter -
  Hot Backup® capability, sensor drift alert and T/C degradation diagnostics reduce the risk of measurement loss resulting in dangerous temperature excursions |
| Unable to determine if a potentially dangerous process measurement is valid or the instrument is faulty | Use instrument health diagnostics to ensure measurement integrity | Micro Motion Coriolis, Rosemount Magnetic Flow Meters, and Rosemount 3408 Level Transmitters - Non-Contacting Radar -
  - Smart Meter Verification continuously monitors transmitter and sensor health ensuring measurement integrity without removing the instrument from the process |
|                                                                        |                                                                           | Rosemount 3144P Temperature Transmitter -
  Hot Backup® capability, sensor drift alert and T/C degradation diagnostics reduce the risk of measurement loss resulting in dangerous temperature excursions |
| High cost of adding devices for timely process data limits insight increases safety risks | Use simple to install devices and wireless technology to lower installation cost | Emerson Pervasive Sensing Solutions -
  - cost effectively add more measurement points to improve insight to process measurement data on unmonitored applications to reduce safety risks |

GOAL: ENSURE SAFETY INSTRUMENTED SYSTEM INTEGRITY

<table>
<thead>
<tr>
<th>Issues</th>
<th>Solutions</th>
<th>Featured Products</th>
</tr>
</thead>
</table>
| Lack of access to required instrument FMEDA (Failure Modes, Effects and Diagnostic Analysis) data makes it difficult to calculate probability of failure on demand (PFD) to ensure adequate safety integrity level (SIL) is met | Select instruments with publicly verified third-party FMEDA data | Emerson’s portfolio includes solutions for measurement of pressure, temperature, level, flow, tank gauging and flame & gas detection
  Emerson has millions of field-proven devices installed worldwide with billions of safe operational hours supported by products certified to IEC 61508
  - includes extensive documentation to support Probability of Failure on Demand (PFD) calculations and Prior Use justification to IEC 61511
  - Emerson’s diverse range of measurement instrumentation is designed for safety, with specific consideration to ensure very low numbers of dangerous undetected (DU) failures and advanced diagnostics coverage to extend proof test intervals for increased safety and reliability |
|                                                                        |                                                                           | Micro Motion Coriolis, Rosemount Magnetic Flow Meters, Rosemount 2160 Wireless Level Detector -
  Vibrating Fork and Rosemount 3408 Level Transmitter - Non-Contacting Radar -
  - Smart Meter Verification continuously monitors transmitter and sensor health and advanced diagnostics enable partial remote proof testing ensuring safety while reducing proving cost |
|                                                                        |                                                                           | Rosemount 8800 Dual and Quad Vortex Flow Meters -
  - reduce maintenance and false trips of safety systems with online replaceable sensors and measurement redundancy in a single meter body
  - up to SIL2 for 1oo1 or 1oo2 voting for Standard and Dual Meters and up to SIL3 for Quad meters with 2oo3 voting per IEC 61508 |
|                                                                        |                                                                           | Rosemount 9295 Process Flow Meter -
  - simplify SIL compliance with multiple independent transmitters on the same spool section with conditioning orifice technology greatly simplifies the installation
  - all-welded design reduces potential leak points
  - ruggedized isolation valves improve process safety |
|                                                                        |                                                                           | Rosemount 5900S Radar Level Gauge, Rosemount 2410 Tank Hub and Rosemount Level Switches -
  - Emerson’s 2-in-1 system (two radar gauges in one housing) is an SIL-certified solution and provides independent level measurement and overfill prevention |
Measurement Instrumentation

The broadest range of measurement and analytical technologies for the chemical industry.

To learn more about Emerson’s solutions for the chemical industry