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Designing for Safety:

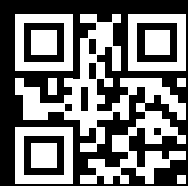
Best Practices

to Minimize

Explosions and

Fires in Hazardous

Environments



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A large, complex industrial facility, likely a refinery or chemical plant, with numerous tall distillation columns, storage tanks, and a dense network of pipes and structural steel. The scene is set against a clear blue sky.

Designing for Safe Practices to Minimize Explosions and Fires in Hazardous Environments

In industries where flammable substances and high-energy processes are commonplace—such as oil and gas, petrochemicals, or chemical manufacturing—designing facilities to minimize the risk of explosions and fires is both a regulatory necessity and an engineering imperative. Engineers working in these hazardous environments must consider a wide array of interdependent factors from the very beginning of the design phase, through commissioning, operation, and eventual decommissioning. A robust, systematic approach built on well-established design principles is key to preventing catastrophic incidents and ensuring the long-term safety of personnel, assets, and the environment.

The first and most foundational step is comprehensive hazard identification and analysis. This is not merely a checkbox exercise but a cornerstone of all subsequent design decisions. Tools such as HAZOP (Hazard and Operability Study), HAZID (Hazard Identification), Fire and Explosion Risk Assessments (FERA), and Quantitative Risk Assessments (QRA) allow engineers to understand the specific threats posed by flammable gases, combustible dusts, and other ignition-sensitive materials. QRA, in particular, provides data-driven insight into the probability and consequences of a given scenario, helping to in-

form design choices like equipment separation distances and the need for blast-resistant structures. Effective hazard analysis builds the risk profile of the facility, guiding decisions on layout, material selection, and protective measures with a strong empirical foundation. Once hazards are well understood, attention shifts to layout and spacing.

The spatial arrangement of equipment, process units, storage vessels, and occupied buildings significantly influences how fires or explosions develop and propagate. Proper layout ensures that ignition sources are kept well away from combustible materials and that any incident that does occur is less likely to escalate into a chain reaction. Adherence to standards such as API RP 752 and NFPA 30 helps engineers define appropriate separation distances, while also ensuring that access and egress routes for personnel and emergency services remain unobstructed. These layouts must be tested through fire and explosion modeling simulations to validate assumptions and optimize for both safety and operability. In parallel, the layout must also accommodate maintenance needs and the realities of construction, without compromising protection.

Equally vital to safety is the design and implementation of effective fire and gas detection and protection systems. These systems act as both early warning mechanisms and as active response tools. Gas detectors, flame detectors, heat sensors, and smoke detectors

Safety: Best Practices to Minimize Fires in Hazardous Environments

should be deployed in all high-risk areas, configured for continuous monitoring. When hazardous concentrations or conditions are detected, the system must trigger alarms and initiate predefined actions—such as shutting down equipment, activating fire suppression systems, or initiating building evacuation. The choice of suppression systems—whether sprinklers, foam systems, inert gas flooding, or portable extinguishers—must be based on the specific risks identified during hazard analysis. All of this must be integrated with emergency shutdown and blowdown systems designed to safely depressurize and isolate critical sections of the facility during an incident.

The electrical and instrumentation design must also meet strict criteria to avoid inadvertently becoming sources of ignition. This begins with proper classification of hazardous zones in accordance with IEC or NEC standards and continues with the selection of appropriately rated equipment—whether intrinsically safe devices, flameproof enclosures, or explosion-proof fixtures. Grounding and bonding must be meticulously designed to prevent static discharge, and surge protection should be included to shield sensitive systems from transient voltages. Instrumented safety systems must offer high reliability, with redundancy and diagnostics built into critical loops. Control systems must also be engineered for fault tolerance and integrated into emergency systems for rapid and safe shutdowns when required.

Human factors and safety management practices are another essential layer in the defense against explosions and fires. Even the most technically advanced facility can be compromised by operator error, poor decision-making, or insufficient training. For this reason, the interface between humans and machines must be carefully designed to be intuitive and fail-safe. Procedures should be standardized and reviewed regularly, and staff must undergo rigorous training and competency assessment. Integrating human reliability analysis into the design process helps uncover where missteps might occur and how they can be mitigated. A well-established safety management system—complete with incident tracking, audits, drills, and safety leadership—ensures that vigilance is maintained across the operational lifecycle of the facility.

Additional considerations can significantly enhance facility safety. Adequate ventilation is essential to disperse flammable gases and reduce the chance of dangerous concentrations forming. Material selection—especially for piping, containment systems, and structural components—should consider flammability, corrosion resistance, and thermal stability. Storage practices must separate incompatible chemicals and include bunding or secondary containment. Electrical isolation procedures, permit-to-work systems, and lockout-tagout programs all serve to enforce safe working practices during maintenance and shutdown operations.

Ultimately, minimizing the risk of explosions and fires in hazardous facilities is a multidimensional challenge that requires close coordination between process engineers, safety professionals, designers, and operators. There is no single solution, but rather a layered approach where technical design, procedural safeguards, and human factors combine to form a resilient safety architecture. Through meticulous planning, adherence to standards, and continuous learning from incidents and near misses, engineers can create facilities that not only comply with regulations but truly protect the people who work in them.

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People Told To Ask Questions About Forever Chemicals In Their Workwear

As the textile and laundry industries come under increased scrutiny to better manage 'forever chemical' contamination, phs Besafe is calling for more commercial laundries to ban retreating garments with PFAS.

PFAS (Poly and perfluoroalkyl substances), known as 'forever chemicals', are a group of man-made chemicals that never break down and accumulate in the environment and in our bodies, causing serious health conditions and damage to the planet.

Although PFAS are still used in everything from frying pans to beauty products, textiles account for around 35% of the total demand for PFAS, according to the European Environment Agency.

PFAS chemicals are low-cost and offer excellent stain and water repellent properties, making them popular choices for PPE and specialist workwear garments.

The European Environment Agency estimates that up to 143,000 tonnes of PFAS is used by the textile industry in the EU alone. It is often manufactured into the fabric of garments and added to finished items as an impregnation, finish or membrane to repel stains, water and even chemicals

phs Besafe, one of the UK's leading PPE and workwear providers and commercial laundries, has already made the commitment to ban or restrict PFAS from its services wherever alternatives are available.

They have a long-term partnership with industry-leading manufacturer Tranemo Advanced Workwear to ensure they can supply customers with the highest quality, PFAS-free workwear garments wherever a PFAS-free alternative is available.

The team has also been working with Ecolab, a global sustainability leader that offers environmental solutions to businesses, to ensure phs Besafe has PFAS-free laundry treatments for all the specialist workwear it washes at its commercial laundries.

"Customers need to think about how their garments are being laundered, as well as what their garments are made of," said Rob Piazza from phs Besafe.

"Garments with stain, water or chemical repellent finishes need to be retreated during the laundry process in order to maintain those vital properties. They are

often retreated with PFAS because they are cheap and easy to come by but it's just adding to our contamination problem.

"There are ways to retreat these garments without using PFAS. We know because we will only use PFAS-free retreatments in our laundries to reduce garment and water contamination. There is a lot of innovation happening around PFAS-free alternatives and we stay at the forefront of those because we understand the damage PFAS are doing – and it's only getting worse.

"The UK needs to change its current attitude to textiles. They want them fast and cheap, and quality and sustainability are further down the list. We need a culture shift, where value is placed on doing the right thing and health, safety and well-being are the drivers of the market.

"End users must look at the whole supply chain and find out how garments are being made and retreated and then ask whether that kind of manufacturing and treatment is acceptable."

PFAS chemicals are proven to accumulate in the environment, water systems and inside our bodies and are known to cause damage to the planet and serious health problems, including cancer, infertility, immune problems and high cholesterol.

In February 2025, France banned PFAS in clothing and a ban on all textiles is already set for 2030.

The European Environment Agency says that The European Chemicals Agency is considering a universal restriction on all PFAS including in textiles to mitigate the environmental and health risks. PFAS are not currently subject to many UK restrictions.

phs Besafe is one of the UK's leading suppliers of specialist PPE workwear and laundry solutions, ensuring the safety and comfort of thousands of people across the UK.

Its in-house laundry and drying processes are unique to the industry, offering a low energy, high quality service using the very latest eco-friendly technologies and products.



Speedor Storm outwits another UK storm

A

nother Speedor Storm has been installed at the height of one more summer storm to hit the UK. The storm was a challenge given the size of the door and the power of the wind at the time of the installation of the Speedor Storm.

The successful installation underlines the professionalism of the Hart team which performed superbly given the strength of the wind at the time.

Hart Door System's wind-resistant, high-speed Speedor Storm, is ready for business be it a factory, warehouse, storage facility or any kind of plant operation that has one or more large external openings which must be opened frequently for people and traffic.

With wind resistance available up to 'wind class 5', as defined by DIN EN 12424, in the closed position this high-speed door is ready for openings to a maximum 8 metres width or height subject to 48 square metres. The ability to withstand substantial wind pressure means major entrances open/close automatically so avoiding a less than optimal working environment and the escape of heated air.

Speedor Storm is designed specifically to help with several areas of business notably productivity – because entering and leaving a building can be done rapidly which creates a better environment in which to work. The high-speed operation means there are no unnecessary open periods. By delivering maintenance of temperature and environment and by door preventing penetration by wind born debris there can also be a saving on the substantial cost of heating – important as the cost of energy shows little sign of improving.

Made in the UK at Hart's Newcastle factory, from where its teams of engineers are available throughout the UK, not just for the installation of Speedor Storms but for reliable servicing and maintenance thereafter.

Speedor Storm's strength and wind resistance comes from its multi-layer PVC and textile, both long-lasting and tear-resistant and its inbuilt horizontal curtain braces and no external cumbersome and noisy external wind bars. There is a colour choice as well as 'a with or without vision panel' which combine to deliver a good appearance, operational effectiveness and a performance product.

Speedor Storm is in particular demand from waste processing plants and renewable energy facilities such as Anaerobic Digestion (AD) plants that produce energy from waste. The ability to limit the escape of odour and noise and prevent pests entering is highly valued by such companies. Speedor Storm's have also proved to be a great asset for ports, notably for grain tipping bays.

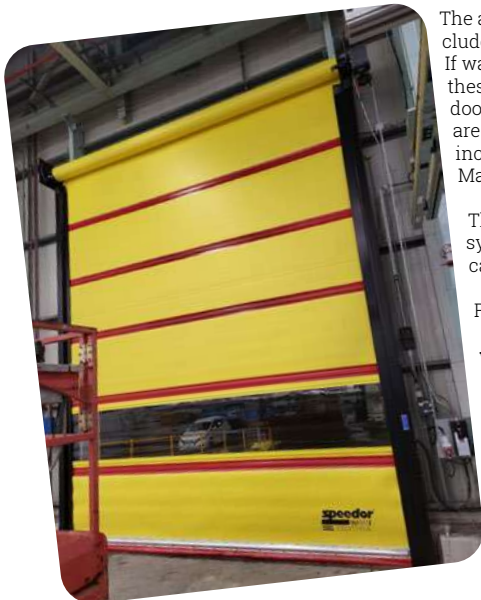
Safety features are of course paramount, and here they include a state of the art safety light curtain, anti-fall protection and sensors to activate the door. There is a range of operating methods that include hands free, floor loops, radar, photo beam, radio operation, movement sensors, handheld or vehicle-mounted radio transmitters, or simple push button and pull cords.

The automatic operation can be set to include or exclude pedestrians as desired. If warning lights or klaxons are required, these can be incorporated in a complete door system and control panel which are designed for any conceivable need including integration into a Building Management System if necessary.

This is delivered via its unique guide system in combination with other carefully designed features.

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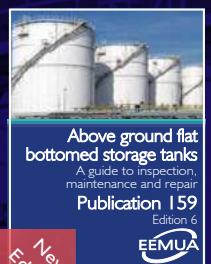
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13-15 October 2025 – in English – classroom – Manchester, UK

27-29 October 2025 – in Dutch – classroom – Rotterdam, NL



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Confined Space Entry: What It Is and How to Train for It Safely

Confined space entry is one of the most critical and potentially hazardous tasks in industrial, utility, and construction environments. These are areas not designed for continuous occupancy, often with limited access and egress, and they may contain serious physical or atmospheric hazards. Examples include tanks, silos, pipelines, sewers, tunnels, and enclosed ductwork. Despite being integral to operations in many industries, these spaces carry significant risks if not managed correctly. To ensure safety and compliance with regulations, employers must provide robust confined space entry training tailored to their specific work environment. This training equips employees with the knowledge, procedures, and hands-on skills needed to work safely in such spaces.

Confined space entry training involves educating workers on how to identify confined spaces, assess and control associated risks, and properly use safety equipment. The training focuses on how to enter and exit these areas safely, what to do in emergencies, and how to use monitoring tools to detect dangerous atmospheric conditions. Workers also learn about the legal definitions of confined spaces, relevant national standards such as OSHA's 29 CFR 1910.146 for permit-required confined spaces, and the roles and responsibilities of various personnel involved in the entry process, including authorized entrants, attendants, entry supervisors, and rescue teams.

The importance of confined space entry training cannot be overstated. Entering these spaces without adequate preparation has led to countless injuries and fatalities worldwide. Hazards may include low oxygen levels, the presence of toxic gases, flammable vapors, engulfment, or physical entrapment. Proper training allows workers to recognize these dangers early, avoid unsafe conditions, and respond effectively in emergencies. Furthermore, it instills a safety-first mindset that reduces the likelihood of incidents while improving the overall safety culture of the organization. From a compliance standpoint, training ensures adherence to local and international regulations,

helping organizations avoid legal liabilities and costly fines.



To train employees effectively in confined space entry, organizations must adopt a structured and comprehensive approach. This starts with a training needs assessment to define the program's objectives and understand the specific hazards present in the company's workspaces. Once the scope and content are established, employers should develop a curriculum that aligns with current safety standards and the specific environments in which employees operate. This curriculum should cover risk identification, permit systems, the selection and use of personal protective equipment (PPE), gas detection methods, ventilation techniques, and rescue procedures.

Equally important is the method of delivery. Classroom instruction alone is insufficient. Training programs should incorporate interactive elements such as hands-on practice, live demonstrations, and simulated rescue drills to reinforce theoretical knowledge. Instructors must be qualified and experienced in confined space operations and able to convey complex safety procedures in a practical and engaging manner. Ideally, learners should have access to real or replica confined space setups to simulate real-life scenarios. Such immersive experiences enable them to practice donning and using PPE, operating gas detectors, and communicating under pressure, which is essential for building confidence and muscle memory.

Evaluation is a key part of the training process. Assessments should be used to test participants' knowledge before, during, and after training to ensure the objectives are being met. Feedback should be gathered to continuously improve the program's relevance and effectiveness. Certification should be issued upon successful completion of training, with records maintained for compliance purposes. Regular refresher courses are also recommended, especially for employees who do not frequently perform confined space entry, to ensure that their skills remain sharp and that they stay informed about any changes to procedures or regulations.

The benefits of confined space entry training are both practical and strategic. On a day-to-day level, it increases the safety of work-



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ers who are directly exposed to confined space hazards. It reduces the risk of accidents, injuries, and fatalities, which in turn helps to lower insurance costs, workers' compensation claims, and operational downtime. From a business perspective, it supports regulatory compliance, improves productivity, and enhances the reputation of the organization as a responsible and safety-conscious employer. Additionally, training contributes to employee engagement and retention, as workers who feel competent and protected are more likely to remain loyal and perform their duties effectively.

When choosing a confined space entry training provider, it is crucial to consider several key factors. The provider should be accredited by recognized industry bodies and have a proven track record of delivering high-quality training programs in the relevant sector. Their instructors should possess real-world experience and certifications in occupational health and safety. The content should be up-to-date with current legislation and customizable to reflect your organization's specific work environments and hazards. It is also important to evaluate the training formats available—whether on-site, in dedicated training centers, or through online modules—and whether they meet the logistical needs of your workforce.

Testimonials and case studies from previous clients can offer valuable insights into the provider's reliability and effectiveness. Equally, consider the value of the training in relation to its cost. While low-cost training may seem appealing, inadequate instruction could result in higher long-term costs due to safety violations, operational disruptions, or worse—

loss of life. Also, check whether the provider includes follow-up support or refresher sessions to maintain workforce competency over time.

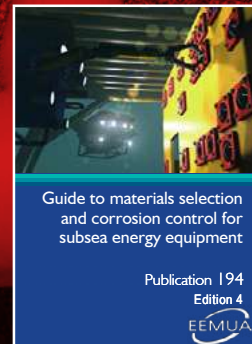
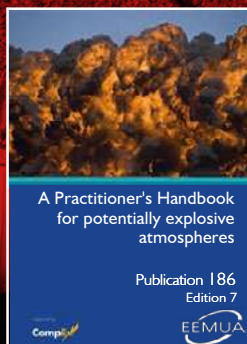
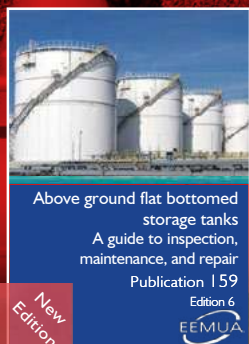
In addition to formal training, organizations should consider supplementary initiatives to embed safe confined space practices into the daily routine. These could include safety briefings, toolbox talks, visual aids at entry points, and leadership engagement in safety culture. Fire drills and rescue simulations should be integrated into the annual safety calendar to test emergency preparedness. Workers must understand not just how to prevent incidents, but how to react when things go wrong. This life-saving knowledge is essential in confined space scenarios where time is critical, and conditions can deteriorate rapidly.

Ultimately, confined space entry is not an isolated task—it is a system of people, processes, and equipment working together to ensure that a high-risk activity is performed as safely as possible. Comprehensive training is the foundation upon which this system is built. By investing in high-quality instruction, organizations not only comply with legal requirements but also foster a proactive safety culture that protects workers, improves operational efficiency, and strengthens long-term resilience.

In an industry where safety is non-negotiable, confined space entry training is both a regulatory requirement and a moral obligation. The hazards are real, but with proper knowledge, preparation, and ongoing education, they can be effectively managed. Treat confined spaces with the seriousness they demand, and empower your workforce to approach them with confidence, competence, and caution.



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AirBench Launches PFOS Tramp Oil Skimmer

AirBench Ltd are pleased to announce the release of their new tramp oil skimmer system; PFOS.

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- Reduce oil smoke inside workshop

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The unit runs from a compressed air supply so is easily set up for use; it can also be installed centrally, with coolant pipes to each machine. On site demonstrations are available – contact AirBench Ltd for more details or visit www.airbench.com/pfos.

PFOS

Profluid Tramp Oil Separator

AirBench PFOS is a mobile oil separator designed to remove oil contamination from coolant.

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Identifying the Best Subsea Engineering Service Providers for Well Intervention Operations

Well intervention in subsea environments is among the most complex and high-stakes operations in the oil and gas sector. These projects require not only precision and skill but also an acute understanding of the risks posed by deepwater pressures, low temperatures, and unpredictable subsea conditions. For engineers working in hazardous offshore environments, choosing the right subsea engineering service provider can make the difference between operational success and costly downtime—or worse, safety incidents.

The process of identifying a truly capable provider begins with evaluating the depth of their expertise. Subsea engineering is a highly specialized field that demands far more than academic qualifications. The most reliable service providers employ engineers with not just theoretical knowledge but substantial field experience in challenging subsea conditions. These engineers should be well-versed in handling high-pressure, high-temperature (HPHT) scenarios, and in operating within regulatory frameworks that differ across international jurisdictions. An established track record of successful interventions under comparable well conditions is a strong indicator of a provider's reliability and competency.

Beyond expertise, technological capability is a defining trait of top-tier service providers. The rapid evolution of subsea technologies—ranging from remotely operated vehicles (ROVs) and autonomous subsea systems to advanced coiled tubing and hydraulic workover units—means that yesterday's tools may not meet today's intervention challenges. A provider that consistently invests in modernizing its fleet and upgrading its systems is more likely to offer greater operational efficiency, enhanced safety performance, and quicker turnaround times. Engineers should consider whether a provider is using industry-standard tools or pushing the edge with proprietary innovations, and whether those technologies are proven in real-world scenarios.

Equally important is the provider's approach to safety. In hazardous subsea environments, safety is not an optional add-on—it is foundational. A strong safety culture must permeate the provider's entire operation. This includes rigorous training programs, methodical



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planning procedures, strict adherence to HSE regulations, and transparent incident reporting protocols. Providers should be able to demonstrate a clean or well-managed safety record, underpinned by verifiable statistics and independent audits. Their risk mitigation strategies should not just comply with minimum standards but should reflect a proactive commitment to protecting personnel, assets, and the environment from harm. This commitment must be evident in both routine operations and in how they prepare for unforeseen emergencies.

Operational flexibility is another critical factor that separates the best from the rest. Every subsea well is different, and standardised approaches rarely accommodate the complexities found in unique field conditions. A capable service provider must offer tailored solutions based on specific well architecture, reservoir behavior, and external conditions like ocean currents or seabed terrain. The ability to rapidly adapt plans, reconfigure equipment on-site, or mobilize additional resources in response to real-time changes is a hallmark of operational maturity. Engineers should look for signs of such adaptability in the provider's project history and client feedback.

Client feedback itself provides invaluable insights into the true performance and reputation of a service provider. While technical specifications and corporate brochures often paint a polished picture, testimonials from clients—particularly those managing similar types of assets or working under similar constraints—offer a more authentic view. Key themes to watch for include punctuality, budget adherence, responsiveness, and professionalism under pressure. Testimonials that reflect long-term partnerships also signal trustworthiness, suggesting that the provider delivers consistent value over time.

In addition to operational execution, comprehensive support throughout the project lifecycle is an essential marker of a high-quality service provider. From initial concept discussions to post-operation evaluation, the provider should be engaged, communicative, and collaborative. Engineers should expect detailed technical proposals, transparent risk assessments, and project plans that include contingencies for likely complications. During the intervention itself, communication must be continuous, with regular updates and shared decision-making. After the job is completed, debriefs and performance reviews should be conducted to capture learnings and optimize future operations. Providers who only show up for the execution phase miss opportunities to add value, reduce risk, and build deeper technical understanding.

Support services should also extend to logistics and asset integration. Well intervention often involves coordinating multiple contractors, tools, vessels, and schedules. The best service providers act as integrators, helping clients manage these complexities with robust project management frameworks. They should have a solid understanding of equipment compatibility, control systems interface requirements, and the impact of marine and weather conditions on deployment. Their logistical acumen can reduce costly delays and ensure that interventions are completed within narrow operational windows.

Another vital consideration is the provider's capacity for innovation and collaboration. In a sector where reservoir conditions are becoming more complex and conventional solutions are sometimes insufficient, the ability to co-develop bespoke technologies or workflows becomes a powerful differentiator. Providers who actively participate in joint industry projects, maintain in-house R&D teams, or work closely with OEMs (original equipment manufacturers) often bring added value to well intervention campaigns. Their ability to collaborate across organizational boundaries and solve problems creatively is particularly useful when conventional toolkits fall short.

It's also worth assessing the provider's global reach and regulatory awareness. Subsea interventions often involve multinational coordination, local content requirements, and adherence to national safety regulations. A provider with a broad geographic footprint, multi-lingual teams, and experience working in different legal

environments is better positioned to handle the red tape and cross-border logistics that these projects often involve. Their familiarity with permitting, customs procedures, and compliance documentation can accelerate timelines and reduce administrative friction for engineers and operators alike.

Lastly, a provider's financial health and commitment to sustainability should not be overlooked. Well interventions are often high-cost endeavors, and a financially unstable provider may struggle to deliver quality or honor commitments under budgetary pressure. Sustainability also matters more than ever, as environmental impact assessments, ESG (Environmental, Social, and Governance) ratings, and carbon emissions monitoring become integral to oil and gas operations. Providers who integrate sustainability into their engineering processes—whether through energy-efficient systems, waste reduction, or biodiversity protection—are increasingly favored by forward-thinking operators and regulators.

In summary, identifying the best subsea engineering service provider for well intervention operations requires a holistic evaluation of multiple factors. Technical expertise, access to cutting-edge technology, a robust safety culture, operational flexibility, and strong client relationships are all essential attributes. However, truly exceptional providers go further—they offer comprehensive lifecycle support, adapt quickly to field realities, innovate proactively, and maintain high standards of professionalism, safety, and environmental stewardship. For engineers working in hazardous environments, partnering with such providers is essential to ensuring the long-term integrity, performance, and safety of subsea well infrastructure.



Enerpac Split-Flow Pump Kits Expand Heavy Lifting Capabilities

Enerpac announces split-flow pump upgrade kits that provide the ability to network multiple pumps and coordinated lift points for higher accuracy synchronisation. The split-flow kits allow operators to combine units to accommodate up to 32 individual lifting points, greatly expanding the capabilities of heavy lifting and rental fleets with minimum investment.

Split-flow pump kits allow multiple pumps to be networked together under one consolidated control unit to make a system as small or as large as needed for a specific lifting application. The upgrade kits are an inexpensive means of increasing the number of lift points for contractors that already have split-flow pumps. With existing smaller split-flow pumps, a user does not need to purchase a larger stand-alone unit as one can simply connect the existing pumps with a network kit. No permanent modifications to the pumps are necessary.

1mm Lifting Accuracy

In critical applications, accuracy to within 1mm can be achieved with synchronisation upgrade kits. Split-flow pump kits can upgrade an existing system to provide a feedback loop via stroke sensors that results in a much more accurate lift. Pressure differential in systems with a large, centralised pump and different, longer hose lengths results in loss of accuracy and difficulty synchronising movement between lift points. Split-flow pump kits allow pumps to be connected closer to the lifting points and synchronised resulting in shorter hose lengths and greater stroke accuracy, increasing safety in heavy multi-point lifts.

Network and Synchro Upgrade Kits

Three upgrade kits are available from Enerpac: SFP Network Kit: Connects several split-flow pumps together to control them from a single control station, allowing the operator to increase the number of lifting points, Single SFP Synchro Kit: Synchronises the lifting points of a single split-flow pump through use of feedback from stroke and pres-

sure sensors and Multiple SFP Synchro Kit: Connects several split-flow pumps together and synchronise all the lifting points using stroke and pressure transducers.

For more information on the Enerpac Split-Flow Pump Upgrade Kits, visit www.enerpac.com



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Parker Introduces SCP10 and SCP11 ATEX-Certified Pressure Sensors for Critical Environments



High Pressure Connectors Europe, a division of Parker Hannifin, the global leader in motion and control technologies, today announces the launch of two new intrinsically safe pressure sensors, the SCP10 and SCP11. These sensors are specifically designed for use in hazardous environments, particularly in applications involving hydrogen. Both sensors meet rigorous ATEX certification requirements, ensuring safety and reliability in critical settings.

The SCP10 pressure sensor is engineered for use with liquid and gaseous media in hazardous areas, while the SCP11 is specifically designed for hydrogen applications. Both sensors comply with ATEX certification standards for Zone 0 (II 1G Ex ia IIC T4 Ga) and Zone 1 (II 2G Ex ia IIC T4 Gb). The SCP10 additionally meets requirements for Zone 0 (II 1G Ex ia IIB T4 Ga).

Utilizing a digitally calibrated piezoresistive stainless steel measuring cell, the SCP10 sensor can detect pressures ranging from 1 bar to 1000 bar. The SCP11 handles pressures from 4 bar to 1000 bar.

A notable feature of the SCP10 and the SCP11 sensors is their monolithic design, which eliminates the need for internal seals, material mixes, and weld seams. This design reduces the risk of leaks, associated with material fatigue at internal seals, and enhances the durability of the sensors. Additionally, the sensors are vacuum-tight and elastomer-free, contributing to longevity and reliability.

The materials used in their construction ensure broad media compatibility, making them suitable for diverse industrial applications. Importantly, the SCP11 sensor's construction is designed to prevent embrittlement of the metal surface due to exposure to ionized hydrogen.

Both sensors have a compact stainless steel housing that allows for space-saving installation, even in challenging environmental conditions. They offer a range of pressure options, output signals, and connectors, making them suitable for various industrial and mobile applications.

The introduction of the SCP10 and SCP11 pressure sensors aims to enhance measurement technology for hazardous environments. By combining safety, durability, and precision, these sensors provide users with reliable solutions for operating in demanding conditions.

This launch aligns with Parker's commitment to advancing hydrogen technology, a key focus area, which is dedicated to developing innovative solutions that support the growth of clean energy.

For more information about the SCP10 and SCP11 pressure sensors, please visit:

<https://ph.parker.com/gb/en/pressure-sensor-scp10-sensocontrol>

<https://ph.parker.com/gb/en/pressure-sensor-scp11-sensocontrol>



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Hoist & Winch Helps Bridge The Lifting Expertise Gap

Reinforcing the piers that support a major UK rail viaduct spanning a river estuary is no easy task, which is exactly why the specialist marine subcontractor appointed to undertake this project approached Hoist & Winch Ltd for the optimal lifting solution.

The brief provided to Hoist & Winch was for the supply of a turnkey lifting solution comprising two sets of four hoist units suitable for a marine environment.

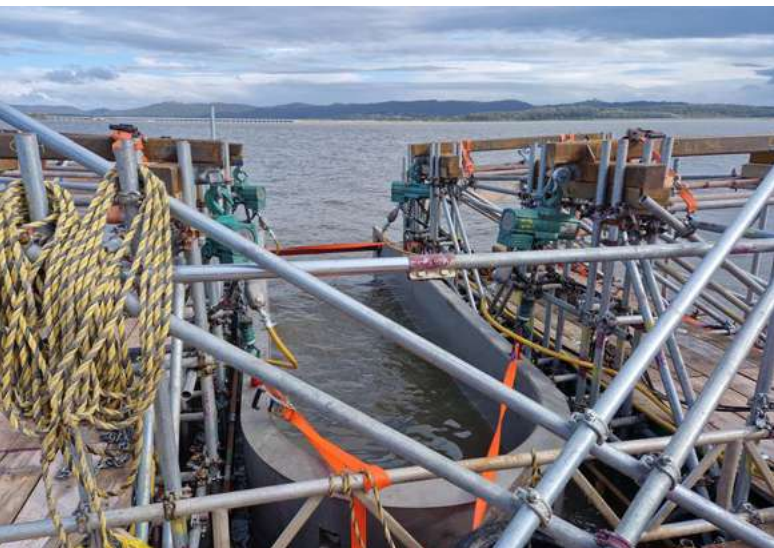
These hoists were to be suspended from temporary scaffold structures fixed to two separate motorised floating pontoons. As part of an innovative approach to a complex challenge, the hoist-mounted pontoons would serve to locate special horseshoe-shaped reinforcing concrete collars either side of one of the bridge piers at high tide, prior to joining

the collar halves together above the water with connection pins. Finally, the collar halves would require lowering to the river estuary bed for permanent fixing to the piers with concrete at low tide, thus providing the necessary reinforcement.

To establish the optimal package of hire equipment, as well as site installation, load testing and additional technical support services, Hoist & Winch consulted extensively with both the motorised pontoon designers and installation personnel responsible for lowering the special concrete collars into position.

After reviewing all the information from project stakeholders, Hoist & Winch subsequently proposed eight JDN top-hook suspension air-powered hoist. Each of these 3t swl (safe working load) hoists featured its own heavy-duty steel lubricator coupled with appropriately sized air supply hoses. The two sets of four hoists units would be operated from their own individually connected, heavy-duty (brass) two-button pendant control.

In order to monitor the load applied to each hoist unit and assist with delivering a balanced collar lowering procedure, Hoist & Winch also provided eight telemetry load cells of bow-shackle design. These load cells served to connect each hoist unit to its local scaffold anchor support position, transmitting individual hoist load data via radio signal to a central laptop display. Armed with this data, the appointed person directing lifting operations could instruct each hoist operator accordingly to ensure the load was evenly distributed between each set of four hoists and that each collar was lowered into position while remaining level.



Prior to commencing the process of installing and lowering the concrete collars, Hoist & Winch carried out the installation of the eight air-powered hoist units. This work included pre-use inspection, static load/deflection testing, and LOLER (Lifting Operations and Lifting Equipment Regulations) certification of the temporary scaffold structure and complete hoisting system.

Hoist & Winch also provided technical consultancy as part of the overall package, delivering guidance on important project areas such as lifting equipment legislation, lifting operation planning and management, and specification and procurement of the portable diesel-powered air compressors to power the hoist units. In addition, the company delivered full handover training for operators.

Both the specialist marine subcontractor and end client were extremely pleased with the final outcome, which saw the successful installation of two sets of trial pier-reinforcing concrete collars to the viaduct as part of a safe and controlled process.

"This specialist project demanded the application of our expertise and experience to ensure a successful conclusion in line with the appropriate safety standards and high performance levels demanded by our client," says Andy Allen, Director of Hoist & Winch Ltd. "We worked closely with project stakeholders to ensure the delivery of a robustly engineered lifting solution with precision control. Quality solutions and

service from Hoist & Winch once again led to a project that concluded with the highest levels of customer satisfaction."

Visit www.hoistandwinch.co.uk for further information and to view recent case studies.

Hoist and Winch Ltd

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Tel: 08450 171126

e-mail: sales@hoistandwinch.co.uk

web: www.hoistandwinch.co.uk



Why Galvanised Pipework Is No Longer Suitable for Safety Showers

In many industrial and commercial environments, emergency safety showers and eye wash stations play a critical role in protecting personnel from chemical exposure, burns, and other hazardous incidents. These systems must be capable of delivering clean, pressurised water instantly—regardless of how frequently they are used. Traditionally, galvanised steel pipework was widely adopted in these installations, valued for its affordability and mechanical strength. However, changing safety standards and growing awareness of hygiene risks have revealed its limitations. As a result, galvanised pipework is no longer considered a suitable solution for safety shower systems.

One of the primary concerns with galvanised steel is its tendency to corrode internally over time. While the zinc coating that lines these pipes is designed to prevent rust, it gradually deteriorates—especially in systems that remain dormant for long periods, as is often the case with emergency equipment. As this protective layer breaks down, it can release rust particles and debris into the water supply. This not

only discolours the water, often giving it a brown or metallic hue, but also introduces potential contaminants. In the context of emergency use, such contamination can exacerbate injuries, particularly when the water comes into contact with open wounds or the eyes.

In addition to physical corrosion, galvanised systems pose a heightened risk of bacterial growth. The stagnant water frequently found inside unused emergency showers creates ideal conditions for microbial proliferation, especially when paired with internal rusting. Among the most serious concerns is *Legionella* bacteria, the cause of Legionnaires' disease, which thrives in warm, stagnant water within corroded piping. Given the health implications, the presence of such bacteria in emergency equipment fundamentally undermines the system's role as a protective asset. Modern safety standards, such as ANSI Z358.1 in the United States and BS EN 15154 in Europe, are explicit in their requirements for water hygiene, temperature control, and immediate delivery—conditions that galvanised pipework struggles to maintain consistently.

Another significant drawback of galvanised piping is the gradual loss of hydraulic performance. As corrosion builds up inside the pipe, it reduces the internal diameter, impeding the flow of water. Over time, this constriction results in reduced pressure, longer delivery times, and inconsistent water flow. All of these factors compromise the core function of a safety shower, which is to provide a fast, forceful rinse to quickly decontaminate the user. Even minor delays or reductions in pressure can have serious consequences when treating chemical exposure.

Furthermore, galvanised steel has increasingly fallen out of step with modern safety and performance standards. These regulations now emphasise not only structural reliability but also hygienic performance and compatibility with temperature regulation systems. Galvanised pipework often fails to meet these newer criteria. In contrast, materials such as stainless steel and advanced plastics like CPVC or polypropylene offer superior corrosion resistance, better integration with heating elements, and minimal maintenance requirements. These materials are also better suited for environments where temperature control is essential, such as outdoor installations subject to freezing or extreme heat.

From a maintenance perspective, galvanised systems present ongoing challenges. The likelihood of corrosion-induced blockage



es, leaks, and mechanical failures increases as the system ages. Regular inspection becomes more critical—and more costly—over time. This not only raises operational expenses but also increases the risk of the equipment failing when it is needed most. In emergency scenarios, any delay caused by a malfunctioning safety shower can have severe health and legal implications.

The industry has responded to these limitations by embracing more reliable alternatives. Stainless steel has become a preferred option for its strength, durability, and hygienic properties. It resists corrosion and requires less frequent maintenance, ensuring dependable operation over a longer lifespan. Chemically resistant plastic systems, such as those made from CPVC or polypropylene, offer another viable solution. These materials are inherently non-corrosive, lightweight, and compatible with a range of industrial environments. Additionally, pre-insulated pipework systems are increasingly used in outdoor or climate-sensitive settings, where maintaining water temperature is essential to meet compliance standards and ensure user comfort and safety.

Ultimately, the choice of pipework in safety shower installations is no longer just a matter of budget or convenience. It is a matter of compliance, reliability, and most importantly, user protection. Galvanised pipework may have served its purpose in the past, but its limitations are no longer acceptable in the context of modern safety requirements. Transitioning to materials that support water hygiene, structural integrity, and regulatory compli-

ance is a critical step in any new installation or system upgrade.

For organisations committed to safeguarding their workforce, investing in the right pipework ensures that emergency equipment performs exactly as intended—without compromise. If you are planning a new installation or reviewing an existing setup, we encourage you to consider these factors carefully and reach out for further guidance on selecting the most appropriate system for your environment.







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Optimising Ex-Zone Operations: The Power Of Integrated Hardware And Software Solutions

In hazardous industrial environments, the convergence of certified mobile devices with specialised software applications represents a paradigm shift in operational efficiency and safety protocols. i.safe MOBILE introduces a white paper series that demonstrates how intrinsically safe devices can be transformed into powerful, industry-specific solutions through strategic software partnerships.

The Integration Advantage

The traditional approach of deploying separate devices for different functions in Ex-zones creates unnecessary complexity and potential safety risks.

By integrating proven software solutions with ATEX/IECEx certified mobile devices, organisations can achieve unprecedented operational streamlining whilst maintaining the highest safety standards.

The newly launched white paper collection of i.safe MOBILE addresses a fundamental question: "What is the best way to optimise processes in Ex-zones by combining the right software and hardware?" The answer lies in understanding how certified intrinsically safe devices can serve as comprehensive platforms for multiple industrial applications.

Two inaugural white papers demonstrate this integration approach in practice:

Push-to-Talk Communication: Mobile Tornado's PTX technology

Integration with the i.safe MOBILE 5G radio IS440.1 and the 5G smartphone IS540.1 via the i.safe MOBILE App World delivers sophisticated communication capabilities across hazardous environments. The solution provides instant group communication, emergency alert systems, lone worker protection, and real-time location tracking - all through a single, certified device. With 99.999% system availability and ultra-low latency, this integration serves critical communication needs in chemical manufacturing, offshore operations, and emergency response scenarios.

Barcode Scanning Excellence: The integration of mobXscan software with the i.safe MOBILE tablet IS940.1 eliminates the need for separate scanning devices in explosive atmospheres. This

solution transforms a single device into a comprehensive barcode scanning and processing station, offering immediate data visualisation on the large 10.1-inch display with 5G connectivity. Industries from oil and gas to pharmaceutical production benefit from streamlined inventory management, quality control documentation, and real-time batch tracking.

Technical Excellence Meets Practical Implementation

Both solutions exemplify the principle that effective Ex-zone technology must balance sophisticated functionality with user-friendly operation. The mobXscan integration requires no coding expertise for implementation, whilst the PTX solution offers intuitive interfaces that minimise training requirements. These characteristics are essential for maintaining operational continuity in demanding industrial environments.

Strategic Partnership Approach

These white papers are more than technical documentation – they demonstrate i.safe MOBILE's commitment to collaborative innovation. By working with leading software developers, the company ensures that its intrinsically safe devices serve as the basis for industry-specific solutions and not just as communication tools.

As a specialist in explosion-proof mobile technology, i.safe MOBILE combines in-depth technical expertise with a comprehensive understanding of industrial requirements. The approach involves analysing specific operational challenges and recommending optimal combinations of certified devices and partner software solutions.

The white paper series is continuously being expanded, with further industry-specific integrations planned for publication. Each document contains detailed technical specifications, implementation notes and real-world case studies to support informed decisions.

For companies looking to optimise their Ex-zone operations, these white papers offer valuable insights into achieving greater safety, improved efficiency and reduced operational complexity through strategic technology integration.

<https://www.isafe-mobile.com/de/loesungen/success-stories/white-papers>



EPIT Drives International Growth With Strategic Training Delivery Across Key Global Markets

Aberdeen-based EPIT Group, a leading provider of specialist training for hazardous area industries, has further expanded its international footprint following the successful delivery of technical and safety training programmes across Nigeria, Oman, Angola, and Trinidad in the second quarter of 2025. These projects form part of the company's long-term strategy to support global clients with in-country, high-quality training that meets local and international standards.

In Nigeria, EPIT is working with long-standing partner True Blue Energy Services to support the installation of additional hazardous area training bays at their facility in Port Harcourt. Designed to enhance the delivery of CompEx courses, the expanded setup will significantly increase the number of delegates trained throughout the year, responding to growing demand in the region and supporting local workforce development with internationally recognised qualifications.

In Oman, EPIT recently delivered a CompEx course for BP technicians, supporting the client's operational and safety standards for hazardous area compliance. Delivered with in-country partner RAY International Skills Development, the course took place at their Muscat facility and forms part of EPIT's wider capability in providing high-spec training to energy operators.

with practical components and tailored to meet both Shell's corporate safety framework and local operational standards. This marks over a decade of collaboration since EPIT first began delivering training for BG Group prior to its acquisition by Shell.

All international programmes are quality-assured from EPIT's headquarters in Aberdeen, where training content, delivery, and compliance are benchmarked to some of the highest standards in the industry. This ensures consistent delivery across regions, regardless of local infrastructure or regulatory frameworks.

"We're proud to deliver the same level of quality and technical excellence internationally as we do in Aberdeen," said Martin Constable, Operations Director at EPIT. "Our trainers work closely with clients on the ground, and every course is backed by our quality assurance systems here in the UK. Whether we're working in Trinidad or Port Harcourt, our priority is to ensure that every delegate receives effective, relevant training aligned with local and global standards."

As EPIT continues to build strategic partnerships and expand international delivery, further programmes are already in planning, including growth into new markets across Asia. These latest projects reflect the company's broader commitment to providing technically robust, adaptable training solutions wherever clients operate.

About EPIT:

EPIT Group is a leader in hazardous area training and certification, offering specialised courses like IECEx, CompEx, and ATEX to ensure safety and compliance in explosive environments. Based in Aberdeen, EPIT supports global clients across oil and gas, pharmaceuticals, and manufacturing with expert, practical training solutions.

contact: Victoria Vyalikova at victoria@brandhouzz.com or 07960471441



Further west, EPIT delivered a tailored NEC500/505 training course in Angola. The three-day course, designed for technicians installing Ex equipment, was delivered at a global client's facility in Portuguese with the assistance of a translator, ensuring compliance with US NEC standards in a non-English speaking environment. The ability to adapt content and delivery format to meet both regulatory and linguistic requirements highlights EPIT's operational agility and international capability.

In the Caribbean, EPIT continued its long-standing relationship with Shell by delivering a bespoke High Voltage (HV) training course and conducting competency assessments of Shell's electrical technicians and engineers in Trinidad. The four-day programme forms part of Shell's internal competency management system, blending theory



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Condition Based Maintenance In Hazardous Locations - What You Need To Know

Condition based maintenance of rotating equipment (pumps and motors) in potentially hazardous locations can be fraught with difficulty. Firstly, there is the problem of deciding what instrumentation can be used. This can be tricky, particularly if the exact hazard is difficult to assess. For example, instruments used in hazardous locations such as flour mills, coal mines, petrochemical plants and fuel transfer facilities, need to be "intrinsically safe" and incapable of igniting an explosive atmosphere. However, some not so obvious hazardous locations include water treatment plants, tunnels and underground passageways or any location where a build-up of naturally occurring flammable material (such as methane or dust) could occur.

Secondly, a shut down in a hazardous location can be costly, particularly if a whole process must be stopped. Consequently, before stripping down a pump, you need to be sure you really do have a worn bearing and you are not picking up some other source of pump noise, such as cavitation.

This is where smart trend meters like the TPI 9085Ex come to our aid. The "go anywhere" 9085Ex is certified for Zone 0 IECEx/ATEX with North American approval. This means you simply don't have to think what potentially explosive atmospheres you might encounter, as the 9085Ex is certified to be intrinsically safe for ANY atmosphere, anywhere in the world.

The 9085Ex measures "bearing noise" and displays it in bearing damage units (BDU), which is roughly equivalent to "percentage wear". In other words, 100 BDU is indicative of a worn bearing. In addition, the 9085Ex uniquely incorporates a directly contacting temperature sensor within its vibration probe. This gives a highly accurate, virtually instantaneous, surface temperature reading for the bearing simultaneously as the vibration reading is being taken. With a high BDU reading and high temperature you can be reassured that what you are seeing really is a worn bearing!

Another difficulty is that a lot of machinery is remotely located (e.g. pumping stations), often in the "middle of nowhere", requiring highly mobile teams of operatives to access them. The compact handheld TPI 9085Ex is extremely affordable and simple to use. It can, and indeed should, be included in every operative's basic tool kit. Additionally, by

using the FREE TPI Bridge App, "routes" and readings can be transferred to and from the 9085Ex anywhere in the world.

"Routes" are simply lists of machines showing exactly what readings need to be taken and where to take them. The readings are then automatically time and date stamped and saved in the route for transfer back to the included computer-based trending software.

Trending is the key to condition based maintenance (CBM). By looking at trends of bearing noise and temperature readings, you can determine well in advance when a bearing will likely need replacing. The TPI 9085Ex comes with powerful, yet simple to use, subscription free trending software, which includes automatic email notification of alarms and report generation, giving you everything you need for a full CBM strategy.

For more information please contact TPI Europe's head office on +44 1293 530196 or take a look on the website at www.tpieurope.com or email sales@tpieurope.com





PRODUCT CERTIFICATION

ExVeritas offer highly accredited and internationally accepted product certification including UKCA Ex, ATEX, IECEx and North American Listing with award winning 'customer service' levels. Our unique 'CMS' system gives customer 24/7/365 access to their quotes, certification project status, and issued certificates. Whilst we specialise in explosion safety, we also have in house EMC and Electrical Safety testing to offer turnkey global approvals.



TRAINING AND COMPEX CERTIFICATION

ExVeritas are the leading CompEx provider with international practical training centres around the world. We have more experienced lecturers and more benefits than any other Ex training provider, including free software tools and pre-and post e-learning. Our unique speciality courses include 'advance' level Ex Inspector and 'Advanced Intrinsic Safety Circuit Design'. Only a company with ExVeritas depth of experience can deliver courses at this level.



The Explosive Atmosphere Safety Specialist

The ExVeritas Group provides Product Certification, Management System Certification, CompEx Certification and Site Safety Services. We are a UK Government Appointed Body for UKCA 'Ex', an ATEX Notified Body and an IECEx Certification Body and Test Laboratory

Our Product and System Certification is internationally recognised for global markets, and we can parallel issue UKCA, ATEX, IECEx and UKAS ISO9001 Certifications to save our clients time and money. For sites we offer safety consultancy on explosion safety including equipment risk assessments and Ex inspection. We also qualify people with CompEx certification as well as specialist and bespoke training.

ExVeritas is a multi-award-winning company including the 'Queen's Award', the highest honour that can be bestowed on a UK company. We have a proven track record of delivering world class certification, consultancy and training.

With Certification Bodies in the UK, Mainland Europe and North America and training facilities in the UK, Malta, Italy, Denmark and Ireland, we can offer a global service and a cost effective and efficient service.

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ExVeritas conduct electrical and non-electrical 'Ex' Inspections. We also offer explosion risk assessments, fitness for purpose assessments and even 'on site' UKCA, Notified Body or IECEx Certification. All of this makes us uniquely positioned to deliver full compliant explosion safety solutions, including our unique online and tablet based 'iEx Inspection & Management' solution.



www.exveritas.com
info@exveritas.com

Gas Detection Cameras for a Safer, Cleaner Future

The pressure is on. With the EU Methane Regulation (2024/1787) now in effect, energy producers across Europe are under increased scrutiny to detect and repair methane leaks across their operations. The goal? To ensure the prevention of the avoidable release of methane into the atmosphere and drive down emissions across the entire fossil fuel supply chain, both within the EU and globally.

At FLIR, we're here to help you meet these evolving standards safely, efficiently, and with confidence through our advanced G-Series Optical Gas Imaging (OGI) cameras: the FLIR Gx320, G620, and Gx620. Next-Generation Gas Detection, Built for Compliance the FLIR G-Series is engineered to make gas leak detection faster, safer, and more accurate than ever before.

Whether you're monitoring a refinery, offshore platform, or gas processing plant, these cooled OGI cameras deliver pinpoint precision when detecting methane, hydrocarbons, and over 400 volatile organic compounds (VOCs). Key Advantages of the G-Series:

- Type 1 Leak Sensitivity: Detect leaks as small as 17 g/hr • In-Camera Quantification: Instantly measure leak size and type; no additional tools required. • Scan Smarter, Not Harder: Survey areas up to 9x faster than traditional gas sniffers

- High-Resolution Thermal Imaging: Up to 640 × 480 IR resolution for clearer, more accurate visuals

- Enhanced Thermal Contrast: Improve gas cloud visibility with precise temperature differentiation Engineered for Real-World Challenges Gas detection doesn't happen in perfect lab conditions; it takes place in rugged, potentially hazardous environments. That's why the G-Series is designed with durability and flexibility in mind:

- Certified for Hazardous Locations: Approved for Class 1, Division 2 or Zone 2 • ATEX-Compliant: Gx320 and Gx620 meet European standards for explosive atmospheres • Ergonomic Design: Lightweight body and rotating 4-inch LCD touchscreen for easy inspections in tight or high-up areas 1/2 Compliance Made Easy The new methane regulation mandates more than detection; it demands proof. FLIR G-Series cameras are built to streamline documentation and simplify compliance workflows. G-Series Compliance Features:

- Multi-REC Mode: Record both infrared and visible spectrum video at the same time

- On-Camera Annotation: Highlight leak sources, record voice notes, and tag important data on the fly

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FLIR G-Series OGI cameras aren't just tools; they're a complete solution for tackling methane emissions while supporting your compliance goals, improving operational safety, and avoiding regulatory penalties.

See how the FLIR Gx320, G620 or Gx620 can transform your gas detection programme. Book a Demonstration Today ABOUT FLIR, A TELEDYNE TECHNOLOGIES COMPANY FLIR, a Teledyne Technologies company, is a world leader in intelligent sensing solutions for industrial applications with thousands of employees worldwide. Founded in 1978, the company creates advanced technologies to help professionals make better, faster decisions that save lives and livelihoods.

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Safety Guidelines for Electrical Equipment in Hazardous Areas: A Detailed Guide for Engineers

Electrical safety in hazardous areas is a matter of utmost importance for engineers working in environments where explosive gases, vapors, or combustible dusts may be present. The combination of electrical energy and flammable atmospheres creates a high-risk scenario, where even minor oversights can lead to catastrophic outcomes. Ensuring the safe selection, installation, operation, inspection, and maintenance of electrical equipment in such locations requires strict adherence to internationally recognized standards and engineering best practices. This article explores the seven essential pillars of hazardous area safety, offering detailed guidance for each.



The first step in safeguarding any hazardous area is correct classification. Without accurately identifying where explosive atmospheres are likely to occur, even the most rigorously certified equipment can fail to prevent ignition. Two primary classification systems are commonly used worldwide. The International Electrotechnical Commission (IEC) employs a zonal system that categorizes areas into Zones 0, 1, and 2 for gas hazards and Zones 20, 21, and 22 for dust hazards. In contrast, the National Electrical Code (NEC) in the United States utilizes a divisional system, breaking areas down into Division 1 and Division 2

for both gas and dust risks. Zone 0 or Division 1 indicates a high probability of a hazardous atmosphere being present continuously or frequently, while Zone 2 or Division 2 denotes areas where such atmospheres are only likely during abnormal conditions. Determining the type of flammable material, the duration and frequency of its presence, and the effectiveness of ventilation systems are all critical elements of this classification process.

Following proper classification, engineers must ensure that electrical equipment is matched appropriately to the zone or division. This involves choosing equipment designed to limit or eliminate the possibility of ignition, either by containing internal explosions, preventing the occurrence of sparks or excessive heat, or by physically isolating electrical components from the external hazardous atmosphere. Protection methods include designs such as explosion-proof or flameproof enclosures, intrinsic safety circuitry, increased safety enclosures, non-sparking designs, encapsulated components, and pressurized enclosures. Each of these methods serves a specific purpose and comes with unique benefits and limitations. Equipment must be tested and certified under appropriate standards, such as ATEX, IECEx, or UL, and should be clearly marked with compliance labels indicating the zone suitability, gas group, and temperature class. Selecting inappropriate protection for a specific zone can invalidate certification and introduce significant risks to personnel and equipment.

Installation of electrical equipment in hazardous areas must be performed with meticulous attention to detail. It is not sufficient for the equipment to be properly rated; it must also be installed in a way that preserves its safety characteristics. Only qualified personnel with specialist training in hazardous area work should undertake these installations. Installers must ensure correct grounding and bonding, the use of certified glands and cable seals, and compatibility between all interconnected components. Enclosures, conduits, junction boxes, and terminal compartments must be appropriately rated and sealed to prevent the ingress of flammable substances. Installations should also account for environmental challenges such as mechanical stress, corrosion, UV exposure, or thermal expansion. Even minor lapses, such as using the wrong cable gland or leaving an ingress point unsealed, can compromise the entire protection concept and increase the likelihood of ignition.

Once equipment is installed, it must be operated within the constraints of its certification. Unauthorized or improper operation is a major contributor to hazardous incidents. Only trained and authorized personnel should interact with electrical systems in these environments, and they must understand the specific hazards and protective mechanisms associated with each piece of equipment. Operations must ensure that devices are not overloaded, overheated, or subjected to conditions outside their design parameters. Alarm systems and fault indicators should be actively monitored, and any anomalies must be addressed immediately. Unauthorized modifications or makeshift repairs—however well-intentioned—can have severe consequences by voiding certifications and undermining the safety features designed into the equipment.

Regular inspection is essential to verify the continued suitability and integrity of electrical equipment. Over time, wear, corrosion, environmental contamination, or mechanical damage can degrade the performance of even the most robust systems. Inspections should be carried out according to a documented plan that defines the frequency and scope of inspections, depending on the area classification and environmental conditions. Qualified inspectors should assess the condition of enclosures, seals, cable entries, terminals, and bonding connections. They should also ensure that all markings remain legible and that there are no signs of unauthorized alterations. Any issues identified during inspection must be recorded and addressed promptly, with clear documentation of remedial actions taken.

Maintenance activities follow a similar principle. While inspection checks for existing or potential faults, maintenance is concerned with preserving and restoring functionality. Maintenance must be performed in strict accordance with manufacturers' guidelines and relevant standards. Tasks may include cleaning, lubrication, calibration, testing, or replacement of parts. All components used in maintenance must be certified for use in hazardous areas and must not compromise the equipment's protective properties. It is essential that a formal maintenance plan is established, detailing intervals, methods, and record-keeping procedures. Personnel must be equipped with the correct tools and training to perform these activities safely and competently. Inadequate or incorrect maintenance can be just as dangerous as improper installation or operation.

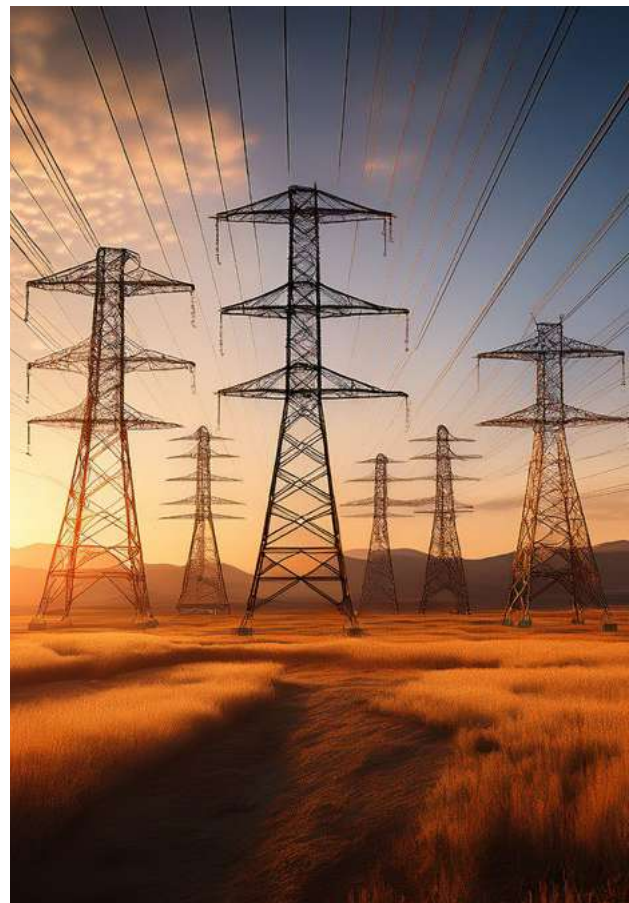
Beyond these technical pillars, several broader considerations also influence safety outcomes. One of the most important is the implementation of a formal management of change (MoC) process. Any modification to the layout, function, or configuration of equipment in a hazardous area should trigger a thorough risk assessment to ensure that existing safety measures remain valid. This includes changes in process parameters, new materials, or adjustments to zoning classifications. Another critical consideration is emergency preparedness. Facilities must have clearly defined procedures for

isolating electrical systems during incidents, and staff must be trained to execute these procedures safely and efficiently. Coordination with fire suppression systems and external emergency responders is also essential to minimize escalation in the event of a failure.

Finally, lifecycle thinking should be applied to all hazardous area equipment. From selection and procurement through to maintenance, upgrade, and eventual decommissioning, engineers must consider the long-term availability of certified spares, the impact of evolving standards, and the ongoing training needs of maintenance and operational staff. By embedding lifecycle planning into hazardous area strategies, organizations can reduce risk, lower costs, and extend the safe service life of their critical systems.

In conclusion, managing electrical equipment in hazardous areas is a highly specialized task that requires more than just technical compliance. It demands a culture of continuous vigilance, rigorous procedural control, and disciplined engineering execution. From the initial hazard assessment through to final decommissioning, each phase of the equipment's life must be managed with precision and care. For engineers, the goal is clear: maintain the integrity of the protection concept at all times and under all conditions. In doing so, we protect not only our assets and production processes but also the lives of those working in some of the most demanding industrial environments.

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Troubleshooting EIE Systems in Hazardous Environments: A Technical Guide for Engineers

Electrical and Instrumentation Equipment (EIE) systems are the backbone of control and safety in industrial operations, especially within hazardous environments such as petrochemical plants, offshore platforms, or facilities handling flammable, toxic, or corrosive substances. Troubleshooting these systems requires a careful, structured approach that not only restores functionality but ensures compliance with rigorous safety standards.

Understanding the Nature of the Hazard

Before initiating any diagnostic activity, engineers must assess the specific hazards present in the operating area. These environments are typically defined by their hazardous area classification (HAC), which categorizes zones based on the likelihood and duration of explosive atmospheres. Each classification dictates what types of equipment can be safely used and under what conditions. Engineers must review documentation such as the HAC drawings, Material Safety Data Sheets (MSDS), and site-specific risk assessments.

Hazards can arise from various sources: flammable gases and vapors (Zone 0, 1, 2), combustible dusts (Zone 20, 21, 22), high-pressure leaks, or inadequate ventilation. Understanding the chemical and physical properties of the substances involved—such as autoignition temperature, flash point, or explosive limits—is critical. Compliance with local and international standards such as ATEX (EU), IECEx (global), and NEC (US) is mandatory. No troubleshooting should proceed without full awareness of these classifications, coupled with adherence to site protocols, including the use of personal protective equipment (PPE), lock-out/tag-out (LOTO) procedures, and valid work permits.

Selecting the Right Tools for Safe Intervention

Troubleshooting in explosive atmospheres mandates the exclusive use of intrinsically safe (IS) tools and testing devices. These tools are engineered to limit electrical and thermal energy below the ignition thresholds of gases and dusts that may be present. Engineers should verify the certification markings on all tools—such as Ex ia IIC T4 Ga—to confirm they are appropriate for the hazardous zone and gas group.

Standard metal tools that might cause sparking, or plastics that can accumulate static charge, must be strictly avoided. Instead, IS multimeters, loop calibrators, and communication interfaces specifically designed for use in classified areas should be employed. Care must also be taken to ground test equipment correctly, to avoid introducing unintended energy into the system. Each instrument used should be within calibration and inspected prior to use, with proper documentation to confirm its readiness.

Assessing and Validating System Wiring

One of the most frequent root causes of EIE failure in hazardous areas is compromised wiring. Over time, cables can degrade due to temperature extremes, chemical exposure, mechanical vibration, moisture ingress, or simple aging. Even minor cable sheath damage or connector corrosion can create intermittent faults, lead to signal attenuation, or, in the worst case, trigger unsafe system behavior.

A comprehensive wiring inspection begins with a visual check for

signs of physical damage, discoloration, or improper cable routing. Following this, continuity testing using an IS-rated multimeter can confirm the integrity of circuits. Voltage and current measurements at key nodes in the loop will help identify open circuits, shorts, or incorrect load conditions. Ground loop problems—often overlooked—should also be investigated, especially in systems using shielded cabling for signal integrity. Any damaged cables, terminals, or glands must be repaired using certified components and methods compliant with the site's hazardous area installation standards.

Evaluating EIE Components for Faults or Degradation

Beyond wiring, individual system components such as transmitters, sensors, relays, and interface modules must be scrutinized for failure. Environmental stresses, including vibration, humidity, dust, or corrosive vapors, can cause premature aging of sensitive components. Incorrect installation or incompatibility within the system architecture can also lead to failures that are difficult to detect at a glance.

Field devices should be tested using manufacturer-specific simulators or portable calibration instruments. These tools allow engineers to inject known signals (e.g., 4–20 mA loops, resistance values, or pulse trains) to verify that input and output responses fall within expected tolerances. When discrepancies arise, recalibration may be necessary. For devices with digital interfaces (HART, Foundation Fieldbus, or Profibus), communication diagnostics can identify protocol errors, configuration mismatches, or address conflicts. Physical inspection should not be neglected: damaged enclosures, evidence of condensation, or signs of electrical arcing all warrant immediate replacement.

Software Diagnostics and Control Logic Troubleshooting

In many EIE systems, hardware operates under the governance of embedded software, programmable logic controllers (PLCs), or distributed control systems (DCS). Software errors can stem from corrupted logic, outdated firmware, or unintended changes during maintenance. These faults may manifest as incorrect readings, missed alarms, or system crashes.

Troubleshooting software-related issues begins with accessing system logs, fault codes, and event histories. Most modern control systems include diagnostic tools that allow engineers to trace logic flow, monitor real-time data points, and compare current system states to expected behaviors. Configuration backups should always be stored securely and updated after any modification. If a problem cannot be resolved by debugging the live program, reverting to the last known-good configuration may be necessary.

Engineers must also be vigilant about cybersecurity. In networked environments, malicious software or unauthorized access can cause system instability. Ensuring the latest patches and anti-malware protocols are in place is a key part of preventive maintenance in EIE systems.

Recording and Communicating Diagnostic Outcomes

Documenting the troubleshooting process is not only good engineering practice—it is essential for compliance and future reliability. Every step taken, from initial fault detection to final resolution, must be recorded clearly. This includes details such as fault codes, test values, tools used, components replaced or recalibrated, software changes

made, and any deviations from standard procedures.

Sites may require entries in digital maintenance systems, hard-copy logbooks, or formal incident reports, depending on the scale and criticality of the fault. Clear documentation ensures traceability and enables other engineers to learn from past incidents, contributing to continuous improvement. It also helps validate that the system remains within the certified safety parameters for the hazardous area.

Communication should not end with paperwork. Engineers must brief their supervisors and, if necessary, other operational teams about the nature of the issue and any recommended changes to procedures, training, or system design. Sharing this information improves the collective understanding of how to respond effectively to faults in high-risk settings.

Additional Considerations for Sustained Reliability

Beyond these core troubleshooting steps, engineers must also consider the broader operational context. Are similar faults occurring across multiple assets, suggesting systemic design issues? Have environmental conditions changed over time, requiring a reassessment of area classification or mitigation strategies? Is there sufficient training in place to ensure that all personnel can respond to EIE issues without compromising safety?

Engaging in periodic reviews of incident data, condition monitoring trends, and maintenance records can help detect patterns that individual fault responses might miss. Engineers working in hazardous environments must not only react to problems but anticipate them—through predictive maintenance, design optimization, and cross-functional collaboration.

In these demanding environments, effective troubleshooting is as much about discipline and foresight as it is about technical skill. A methodical, safety-first approach ensures that when EIE systems fail—as they inevitably will—engineers can restore them swiftly, safely, and in full compliance with the strict regulatory frameworks that protect lives and infrastructure.






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Filtermist Introduces Revolutionary New Absolent Technology In Boost For Uk Dust And Fume Extraction

One of the UK's leading filtration experts has announced the launch of innovative new dust and fume extraction technology from sister company Absolent AB.

Filtermist Limited, which specialises in ensuring the air in workshops is clean and safe to breathe, is now offering the brand-new AD range that maximises 'True Downflow' technology to provide dust extraction units which are compact and easy to maintain, yet deliver optimised filtration density.

Designed utilising input from hundreds of real customer use cases, the new offer provides a truly modular, fully 'customer centric' product line that is now available to UK man-

ufacturers that undertake abrasive metal processes including welding, laser cutting, grinding and many more, exclusively from Filtermist Limited.

"Several pain points were identified and addressed during the 3-year project," explained Robert Wiktorén, Absolent Air Care Group's Chief Product Officer.

"As an existing manufacturer of dust collectors under our Absolent, Dustcheck and Diversitech brands, we knew there was a need in the market for a



brand-new way of thinking about dust and fume extraction.

"Traditionally, dust collectors have been sized using generic data to select suitable filter type, filter area and air speeds between filter elements, and resultant footprints have been comparatively large. Noise levels are frequently high due to external compressed air cleaning systems and integral fans, and the units can be difficult to maintain."

He continued: "When filters need to be changed, even the best current designs require the filter retaining mechanism and moving parts to be in the 'dirty side' of the unit, exposed to contamination. This is not a great environment for moving parts and requires a tool to reach the filter elements furthest away."

"Our True Downflow combines the verticality of the filter elements with a top to bottom air flow. This unique combination optimises the effect of gravity and ensures that the dust coming out of the filter elements during pulse jet cleaning is forced down to the disposal solution in the hopper."

The roll-out of the first AD phase includes three models: the 0.5 (which holds two deep pleat cartridges) 1.0 (four filters) and the 1.5 (six deep pleat filter elements). Airflows currently range from 1,200-10,800m³/hr, but can be increased thanks to the modular construction.

The new range is being introduced in stages to customers throughout Europe and the UK, with phase one suitable for use in metal applications such as welding, laser cutting, plasma cutting and non-ATEX abrasive metals (grinding and finishing).

Additional models for use in a wide range of other applications, including explosive dusts requiring ATEX certified equipment and higher air volumes (>65,000m³/hr), will follow later, along with alternative dust disposal options.

Dust collectors suitable for pharmaceutical dust (requiring safe change features) will be added to the range during 2026.

Senior Group Product Manager and former Filtermist employee Andy Darby, who played a pivotal role in developing the new range, went on to add: "A baffle at the inlet evens out the air flow across the volume of the filter and makes sure we use each square metre to its maximum potential. True Downflow is the only solution that guarantees to eliminate any upflow or cross-flow with the filter elements - traditionally leading to higher dust retainment and having to oversize the filtration surface."

"This enables us to offer 'high filtration power density', mean-

ing we can increase the filter speed and reduce the filter media surface area. Because of this, the solution comes in a far smaller footprint than other filter units on the market.

"Another unique aspect of the new range is the 'CleanChange™' filter change clamping mechanism. The filter elements are linked together and, as the operator pulls the first element out, the next one is pulled to the front. No tool is needed, and engineers do not have to enter the dust filled unit."

"Locating the fan and cleaning unit inside the body of the extraction unit decreases noise and we can reduce this even further if required by using additional noise attenuating measures. Finally, the standard units will be constructed from pre-treated Galfan steel, which offers a high level of corrosion protection."

The AD range uses modular construction ensuring extremely competitive lead times, even for customised products.

Robert Wiktorén concluded: "We are confident that the AD range will revolutionise the way end-users, OEMs and systems integrators think about dust and fume extraction."

Find out more by visiting www.filtermist.co.uk or call Filtermist's dedicated dust and fume team on 01952 290500.

Dust & fume extraction just got smarter

**Brand
NEW**



High filtration performance in a small footprint

The modular AD range from Absolent is specifically designed for metal fabrication applications including welding, plasma cutting, laser cutting, grinding, finishing and polishing.

- ✓ Easy to maintain
- ✓ High corrosion resistance
- ✓ Low running costs

Visit www.filtermist.co.uk to find out more.



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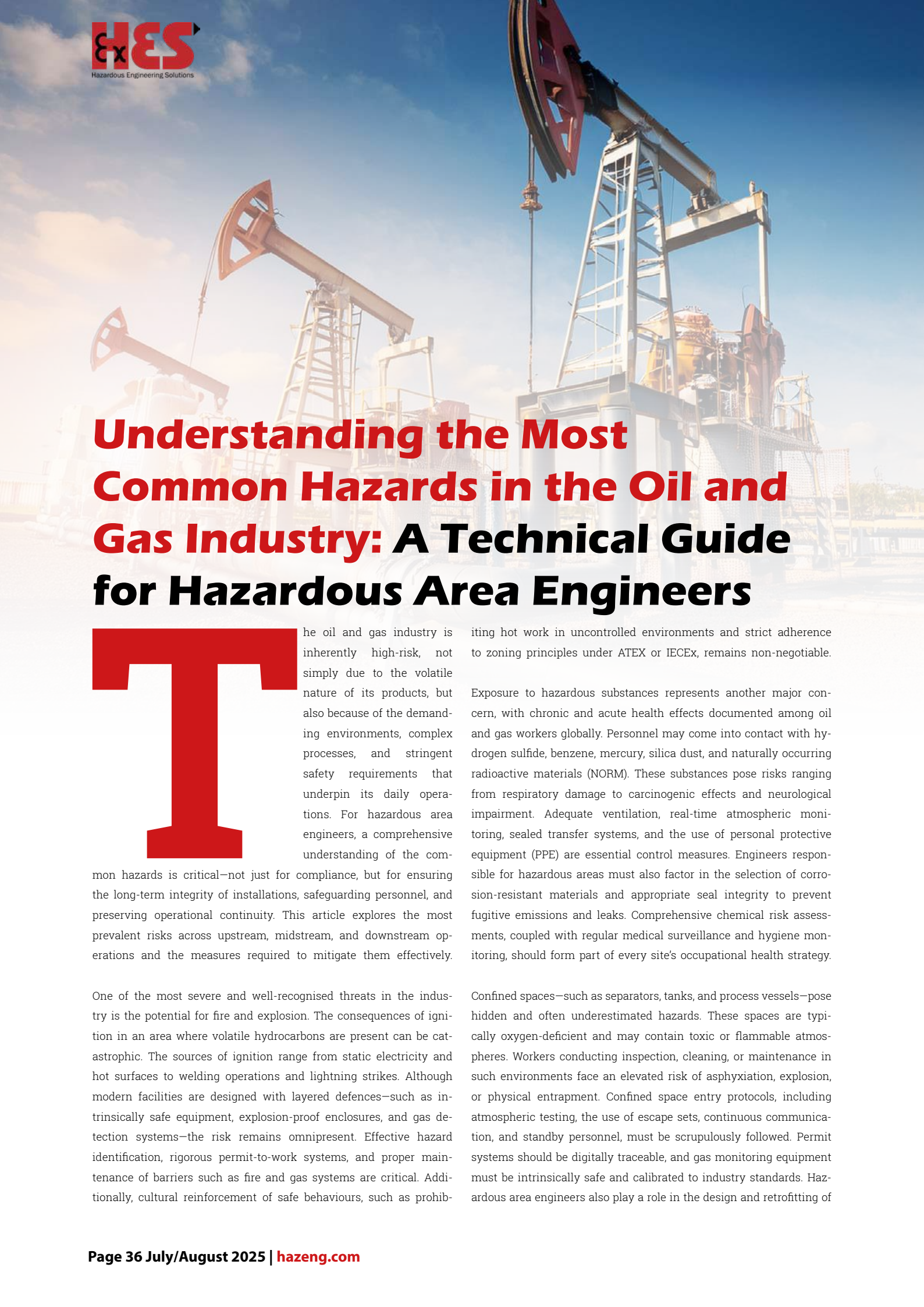
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Understanding the Most Common Hazards in the Oil and Gas Industry: A Technical Guide for Hazardous Area Engineers

The oil and gas industry is inherently high-risk, not simply due to the volatile nature of its products, but also because of the demanding environments, complex processes, and stringent safety requirements that underpin its daily operations. For hazardous area engineers, a comprehensive understanding of the common hazards is critical—not just for compliance, but for ensuring the long-term integrity of installations, safeguarding personnel, and preserving operational continuity. This article explores the most prevalent risks across upstream, midstream, and downstream operations and the measures required to mitigate them effectively.

One of the most severe and well-recognised threats in the industry is the potential for fire and explosion. The consequences of ignition in an area where volatile hydrocarbons are present can be catastrophic. The sources of ignition range from static electricity and hot surfaces to welding operations and lightning strikes. Although modern facilities are designed with layered defences—such as intrinsically safe equipment, explosion-proof enclosures, and gas detection systems—the risk remains omnipresent. Effective hazard identification, rigorous permit-to-work systems, and proper maintenance of barriers such as fire and gas systems are critical. Additionally, cultural reinforcement of safe behaviours, such as prohib-

iting hot work in uncontrolled environments and strict adherence to zoning principles under ATEX or IECEx, remains non-negotiable.

Exposure to hazardous substances represents another major concern, with chronic and acute health effects documented among oil and gas workers globally. Personnel may come into contact with hydrogen sulfide, benzene, mercury, silica dust, and naturally occurring radioactive materials (NORM). These substances pose risks ranging from respiratory damage to carcinogenic effects and neurological impairment. Adequate ventilation, real-time atmospheric monitoring, sealed transfer systems, and the use of personal protective equipment (PPE) are essential control measures. Engineers responsible for hazardous areas must also factor in the selection of corrosion-resistant materials and appropriate seal integrity to prevent fugitive emissions and leaks. Comprehensive chemical risk assessments, coupled with regular medical surveillance and hygiene monitoring, should form part of every site's occupational health strategy.

Confined spaces—such as separators, tanks, and process vessels—pose hidden and often underestimated hazards. These spaces are typically oxygen-deficient and may contain toxic or flammable atmospheres. Workers conducting inspection, cleaning, or maintenance in such environments face an elevated risk of asphyxiation, explosion, or physical entrapment. Confined space entry protocols, including atmospheric testing, the use of escape sets, continuous communication, and standby personnel, must be scrupulously followed. Permit systems should be digitally traceable, and gas monitoring equipment must be intrinsically safe and calibrated to industry standards. Hazardous area engineers also play a role in the design and retrofitting of

access points and egress pathways, ensuring that engineering controls support safe intervention when confined space entry is unavoidable.

Falls and slips, though sometimes perceived as mundane compared to process safety hazards, remain a significant source of lost-time injuries—especially in offshore platforms and elevated structures. Oil residues, water ingress, and uneven surfaces create slip hazards, while vertical access routes such as ladders and scaffoldings amplify fall risk. Engineers must ensure that anti-slip coatings, safety gratings, and handrails meet certification standards and are maintained adequately. Load-bearing structures must be verified against design tolerances, especially in dynamic offshore environments where corrosion and saltwater exposure degrade integrity over time. Moreover, personal fall arrest systems should be integrated with anchor points that are verified through load testing and inspection regimes.

Ergonomic hazards, although often less visible, are a growing concern—particularly as workforce demographics evolve and tasks become more repetitive or require the handling of heavy tools and equipment. Manual handling of valves, torqueing in awkward postures, and extended periods working on metallic gratings can lead to musculoskeletal disorders. Engineers need to incorporate ergonomic principles into layout design, including reducing lift heights, optimising tool access, and using mechanical aids wherever feasible. Fatigue due to prolonged shift cycles also exacerbates ergonomic injuries and should be addressed through appropriate rostering, work-rest cycles, and fatigue management systems integrated with wearable technologies or biometric monitoring.

Psychological hazards are increasingly recognised within the sector, particularly in remote or offshore deployments. Extended isolation, high-pressure decision-making, and limited social interaction contribute to mental strain, potentially impairing performance and increasing the likelihood of safety incidents. Mental health is now rightly acknowledged as a component of process safety, and engineers must support organisational efforts to address it. This includes

integrating rest areas into facility designs, ensuring connectivity for communication with loved ones, and supporting the implementation of mental health programmes. Training in psychosocial risk recognition should be extended to supervisors and control room operators who are often the first to observe behavioural changes in colleagues.

It is also essential to recognise transportation as a critical hazard in the industry. Travel between sites—by helicopter, light aircraft, road, or sea—poses significant risks, especially in adverse weather conditions or in countries with underdeveloped infrastructure. Transportation-related incidents remain a leading cause of fatality in oil and gas operations. Mitigating this risk involves rigorous journey management planning, the use of certified aviation and maritime service providers, and real-time tracking systems for personnel. Moreover, engineers involved in site logistics and infrastructure must factor transportation safety into broader risk models.

Lastly, while each of these hazards can be addressed through technical, procedural, and behavioural controls, it is their interdependence that creates true systemic risk. A fire risk may be triggered by a psychological lapse; a confined space incident may be worsened by poor ergonomic design; chemical exposure may go undetected due to fall-related access limitations. As such, hazard mitigation in the oil and gas industry requires a holistic, integrated approach—rooted in rigorous engineering standards, supported by continuous training, and enforced through a culture of accountability and vigilance.

For hazardous area engineers, this demands not only technical competence but also a commitment to multidisciplinary collaboration. Safety is not merely about checking boxes or adhering to standards—it is about anticipating failure, designing for resilience, and never underestimating the power of human factors in complex, high-stakes environments.

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Securing Smart Metering Systems Over Time: A Technical Perspective for Hazardous Area Engineers

In an era where the industrial Internet of Things (IIoT) is redefining energy management, smart metering systems are at the heart of digital transformation across utilities. These devices enable real-time monitoring, remote diagnostics, and precision billing across oil and gas plants, chemical refineries, and other hazardous environments. But the very connectivity that makes smart meters valuable also renders them vulnerable to increasingly sophisticated cybersecurity threats. For hazardous area engineers—tasked with managing safety, compliance, and operational continuity—securing these metering infrastructures is no longer optional; it is essential for the resilience of both digital and physical systems.

Securing smart metering systems begins with the implementation of robust encryption and authentication protocols. Data transmitted between meters, data concentrators, head-end systems, and utility control centers must be encrypted to prevent eavesdropping, tampering, or replay attacks. Modern standards such as TLS 1.3 for IP-based traffic and DLMS/COSEM over HDLC for serial links are critical components of secure communication architectures. However, encryption alone is not enough. Effective authentication schemes must be layered into the communication stack to ensure that each node in the system—be it a field device or backend server—is verified through cryptographically secure digital certificates or multifactor authentication tokens. In hazardous areas where access must be tightly controlled, authentication must extend to physical access to hardware, ensuring that only authorised personnel can modify meter configurations or firmware on-site.

The security of these systems is not static. Firmware and software that underpin metering platforms must be routinely updated to defend against emerging threats. Many vulnerabilities are discovered only after deployment, making patch management an ongoing obligation. Smart meters must support secure boot processes and digitally signed firmware updates to ensure that no malicious code is introduced during the update cycle. Given the distributed nature of metering infrastructure, over-the-air (OTA) updates are often preferred, but they must be managed through tightly controlled, encrypted channels. To further reduce risk, update mechanisms should incorporate rollback protection, audit trails, and checksum validation. For hazardous environments, where site visits are limited due to safety protocols, remote diagnostics and patch deployment systems must be engineered to be as resilient and secure as the physical devices themselves.

Continuous monitoring and audit logging are foundational to long-term cybersecurity in smart metering networks. Monitoring allows operators to detect anomalies in real time—whether due to cyber intrusion, system misconfiguration, or operational failure. Audit logs must capture both machine and human interactions with the system, including command issuance, login attempts, and data flow irregularities. These logs should be secured using write-once-read-many (WORM) storage and protected from unauthorised modification. In hazardous areas, where consequences of failure can be catastrophic, log data can also be critical for forensic investigations following any incident involving control system interference. Advanced security information and event management (SIEM) platforms can correlate log data across systems,



enabling real-time threat detection and alert generation that feed into plant-level emergency protocols.

Beyond the technical controls, the implementation of privacy policies is a strategic imperative. Smart meters collect granular usage data that can be linked to operational schedules, plant throughput, and even shift patterns—information which, if breached, could present industrial espionage or sabotage risks. Privacy policies must define what data is collected, how long it is retained, how it is anonymised, and who has access. These policies must be harmonised with regulations such as the General Data Protection Regulation (GDPR) in Europe, Brazil's LGPD, or the California Consumer Privacy Act (CCPA), depending on the jurisdiction. From a plant engineering perspective, aligning operational data flows with legal privacy frameworks means working closely with legal teams to ensure that sensor telemetry does not expose strategic vulnerabilities or personal data of site personnel.

Educating both staff and consumers of smart metering systems is one of the most underestimated yet impactful security measures. Engineering personnel must be trained not only in technical configurations but in recognising phishing attempts, understanding the implications of default credentials, and applying incident response playbooks effectively. Staff education must extend from the control room to maintenance personnel, all of whom may have access to components of the system. In high-risk environments, human error—such as connecting unauthorised USB devices to field equipment or ignoring abnormal device behaviour—remains one of the most common causes of compromise. Consumers of smart meter data, whether internal process engineers or external regulators, must also understand the basics of data integrity, verification, and how to identify inconsistencies that could indicate system compromise.

Maintaining long-term system security demands a structured process of periodic evaluation and continuous improvement. Security measures must be tested through regular vulnerability assessments, penetration testing, and scenario-based red team exercises. Evaluations should cover not just digital systems but physical protections, including tamper seals, explosion-proof housings, and electromagnetic shielding. Based on evaluation outcomes, control measures must be refined to address any gaps. This process of iterative improvement aligns with industry frameworks such as ISO/IEC 27001 for information security and IEC 62443 for industrial automation and control system cybersecurity. Importantly, hazardous area engineers must ensure that any change to the system—be it software, network architecture, or physical installation—undergoes thorough hazard and operability (HAZOP) reviews and cyber risk assessments as part of a broader safety lifecycle management program.

There are also domain-specific considerations to address. In offshore oil platforms, for instance, the networking hardware for smart meters must be marine-grade, while also conforming to ATEX or IECEx zoning

requirements for explosive atmospheres. Communication infrastructure such as wireless mesh networks or power line communication (PLC) must be designed to withstand electrical noise, vibration, and environmental ingress without compromising signal integrity or exposing the system to interception. Similarly, integration with SCADA systems introduces another layer of vulnerability, particularly when legacy systems are retrofitted with modern smart metering functionality. Ensuring secure protocol conversion, sandboxing of untrusted devices, and enforcing strict segmentation between IT and OT networks becomes vital.

Ultimately, securing smart metering systems is not a one-off engineering task but a continuous lifecycle management commitment. It involves foresight during design, vigilance during operation, and adaptability in the face of emerging threats. For hazardous area engineers, the challenge lies in balancing rigorous safety requirements with the need for digital openness and flexibility. This balance must be struck not just at the device level, but across the architecture—encompassing policy, process, people, and platform. When done correctly, it transforms smart meters from mere data loggers into secure, intelligent sentinels that support safety, efficiency, and resilience in the world's most demanding industrial environments.



The background of the page is a faded, high-resolution image of various industrial electrical and instrumentation components. It includes a digital multimeter with a blue screen showing a waveform, a pressure gauge with a white face and black markings, and various cables and connectors. The overall tone is technical and industrial.

The Most Common Challenges in Electrical, Instrumentation, and Control Engineering: A Technical Insight for Hazardous Area Engineers

Electrical, Instrumentation, and Control (EIC) engineering forms the backbone of process automation and safety in hazardous industrial environments, where accuracy, reliability, and real-time control are paramount. Yet, even the most advanced EIC systems face persistent challenges that engineers must overcome to maintain compliance, performance, and plant integrity. For hazardous area engineers, who work in classified zones with strict ATEX or IECEx requirements, these challenges are amplified due to the complex interplay between environmental conditions, safety-critical systems, and regulatory constraints.

Calibration and accuracy are perhaps the most fundamental concerns in EIC engineering. The instruments used to measure pressure, temperature, flow, and level are only as effective as their calibration permits. Drift in sensor output, mechanical wear, or electronic degradation can lead to miscalculation and process deviation. In safety-instrumented systems, such inaccuracies can compromise the safety integrity level (SIL) of a loop, leading to false trips or failure to act. Traceable calibration against national or international standards is essential, but so too is maintaining calibration intervals that reflect not just the manufacturer's recommendations but the actual duty cycles and environmental stressors on the device. Moreover, ac-

curacy is not a static attribute—it must be verified regularly through zero checks, span validations, and loop testing, particularly in critical loops interfacing with control systems or emergency shutdown logic.

Noise and interference present another pervasive challenge. Electromagnetic interference (EMI), ground loops, and signal crosstalk can distort process variable readings, destabilise control loops, or create nuisance alarms. In hazardous areas, where devices often operate in close proximity to high-voltage motors, variable frequency drives, or power distribution panels, shielding and grounding practices must be rigorously applied. Engineers must pay close attention to cable routing, separation of power and signal conductors, and the use of shielded twisted pairs with correct termination. Profibus, Modbus, or 4–20 mA analog signals are all susceptible to degradation from poorly implemented earthing schemes or physical damage to cable insulation. Advanced diagnostic tools such as portable oscilloscopes, spectrum analysers, or signal quality testers become essential for tracing noise sources and validating signal integrity.

Compatibility and integration pose a significant challenge, particularly in brownfield sites or multi-vendor installations. New instrumentation is rarely deployed in isolation; it must be integrated into existing control architectures, which may include legacy PLCs, distributed control systems (DCS), or supervisory SCADA platforms. Differences in communication protocols—such as Foundation Fieldbus, HART, OPC UA,

or Modbus TCP—can create bottlenecks or misinterpretations in data transmission. Device Description (DD) files, integration host software, and middleware gateways often become critical to translating and mapping data correctly. Moreover, engineers must be mindful of timing, update rates, and response behaviour when integrating fast-acting devices into slower process loops. Functional testing is not sufficient—interoperability testing under dynamic process conditions is essential to prevent downstream logic or alarm management issues.

Maintenance and troubleshooting are made even more complex in hazardous environments where access is restricted, systems are energised, and equipment may be installed at height or in confined spaces. Instruments and control systems are subject to environmental degradation from dust, moisture, corrosive gases, or thermal cycling. Predictive maintenance strategies—using historical trend analysis, diagnostic status signals, or device self-checks—are replacing traditional reactive models, but these too require reliable data capture and operator interpretation. Fault-finding in EIC systems must go beyond simple device replacement. Engineers must investigate failure modes such as loss of loop power, shorted sensor inputs, or configuration mismatches between devices and controllers. Diagnostic tools, remote monitoring systems, and digital twin environments are increasingly used to simulate failures and plan interventions. Still, the real-world skill of systematic fault isolation remains irreplaceable, particularly during unplanned outages where time is limited and safety margins are narrow.

Safety and compliance underwrite every aspect of EIC engineering in hazardous zones. Systems must conform not only to performance specifications but also to local and international standards such as IEC 61508/61511 for functional safety, IEC 60079 for explosive atmospheres, or ISO 13849 for machine safety. This includes ensuring proper intrinsic safety barriers, maintaining zoning integrity, and validating fail-safe behaviour in the event of power loss or sensor failure. Compliance does not end at commissioning—it is a lifecycle obligation requiring documentation, proof testing, change management, and revalidation. Engineers must be well-versed in safety lifecycle documentation, including safety requirement specifications (SRS), verification plans, and proof test intervals. In some cases, the pursuit of compliance can create conflicting pressures between operational flexibility and safety conservatism, and engineers must navigate these tensions with professional judgement and stakeholder engagement.

Innovation and adaptation represent a more strategic, yet no less pressing challenge. The rapid evolution of field devices—from traditional analog transmitters to smart sensors with built-in diagnostics and wireless connectivity—means that EIC engineers must constantly update their skill sets and reconsider architectural assumptions. Technologies such as Industrial IoT, cloud-based SCADA, and artificial

intelligence-based fault prediction offer powerful tools for process improvement, but their deployment in hazardous areas requires rigorous evaluation of cybersecurity, availability, and certification compliance. Engineers must balance the promise of digital transformation with the practical constraints of safety zones, data ownership, and change management. Vendor support, workforce training, and phased implementation plans are essential to avoid technological obsolescence and ensure that new tools enhance rather than complicate plant operations.



Beyond these technical dimensions lies the enduring influence of human factors. Misinterpretation of sensor readings, misconfiguration of controllers, or failure to act on diagnostic alerts often stem not from equipment faults, but from communication gaps or skill deficiencies. Instrumentation may function perfectly on a technical level, but still fail operationally due to unclear alarm rationalisation or a lack of training among plant operators. Bridging the gap between field-level detail and control room understanding requires cross-functional collaboration, effective documentation, and a culture of shared responsibility.

In conclusion, the most common challenges in electrical, instrumentation, and control engineering are interconnected and multidimensional. Calibration, noise, compatibility, maintenance, compliance, and innovation each demand a specific set of skills, but they must be addressed within a unified engineering framework that prioritises safety, reliability, and adaptability. For hazardous area engineers, the stakes are especially high—missteps can result in not just downtime, but catastrophic consequences. Excellence in EIC engineering, therefore, is not defined by the absence of problems, but by the ability to anticipate, detect, and respond to them with technical rigour and operational foresight.



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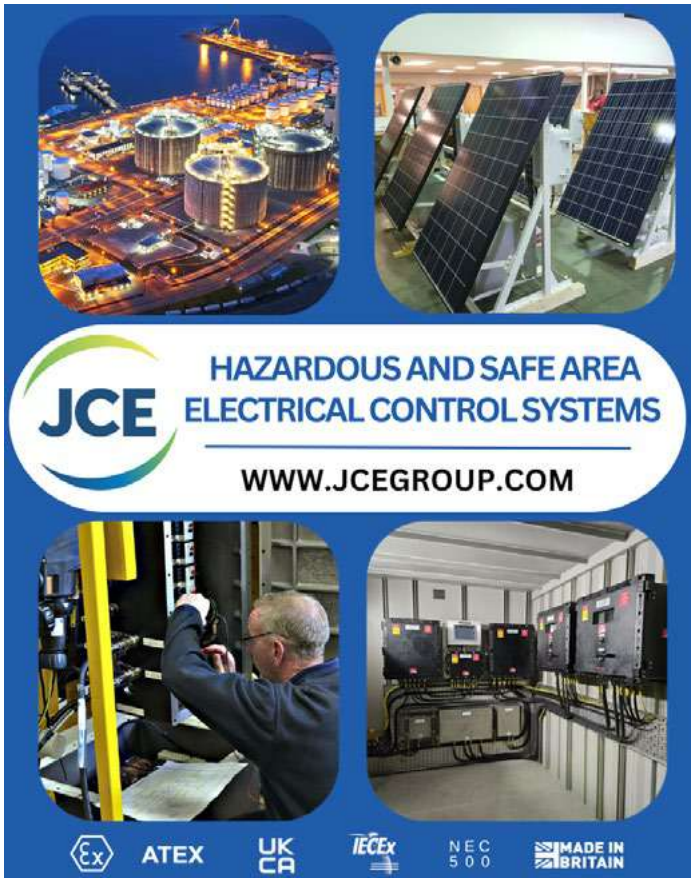
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