Issue 25 Spring 2026

INSIGHT

Tank storage provides an essential interface between sea, road, rail and pipeline logistics.

Page 4

WHY TERMINALS, NOT SHIPS, WILL DECIDE THE PACE OF GREEN SHIPPING

The quarterly magazine from the Tank Storage Association

Also in this issue, we examine the latest sector insights and highlight the initiatives shaping the future of bulk storage and energy infrastructure.

Insight is published by the Tank Storage Association, the voice of the UK's bulk storage and energy infrastructure sector.

To contact the editorial team, please email info@tankstorage.org.uk

TSA Insight Team

Peter Davidson, Jamie Walker, Nunzia Florio

CONNECT WITH US

@UK_TSA

Tank Storage Association

TSA

@uk_tsa

CONTACT

Tank Storage Association
Devonshire Business Centre
Works Road
Letchworth Garden City
Herts. SG6 1GJ
United Kingdom

Telephone: 01462 488232

Peter Davidson
Chief Executive, TSA

Welcome to the spring issue of Insight. The Department for Energy Security and Net Zero has issued a call for evidence on the future of the UK downstream oil sector to inform its Future of Fuels strategy, due to be published later this year. The bulk storage and energy infrastructure sector plays a vital role in the in the UK's energy system, facilitating the flow of a diverse range of energy products from producers to end users, helping to balance supply and demand fluctuations and ensuring a stable market for these products. The sector will remain instrumental in connecting supply with demand for the products used in the energy transition, supporting the government's future energy missions and the delivery of a net-zero economy. This will require investment, research, development and sustained innovation in the field of logistics. I hope you find this new issue of the magazine both insightful and engaging.

Contents

Why terminals, not ships, will decide the pace of green shipping

The debate over green shipping has become fixated on fuels and vessels: methanol versus ammonia, dual-fuel engines, the timing of the International Maritime Organisation's (IMO) long-delayed net-zero framework.

Yet this focus risks missing one decisive factor in maritime decarbonisation - the transition will not be won at sea, but at terminals.

For those of us in the tank storage industry, it is obvious that without safe, dependable, and commercially viable infrastructure to store, handle and bunker green maritime fuels, decarbonisation remains theoretical. And Exolum's launch of the UK' first commercial biomethanol bunkering service at Immingham illustrates why terminals matter and why existing assets may prove more valuable than innovative technologies.

Our terminal at Immingham already manages conventional fuels at scale. And its significance in the decarbonisation of shipping lies precisely there. By repurposing existing tanks, pipelines and jetties with straightforward hardware changes, the project demonstrates that the fastest route to green shipping is adaptation, not reinvention. Biomethanol's compatibility with current terminal infrastructure allows low-risk, incremental investment rather than the binary bet implied by entirely new fuel systems.

This matters because shipping's regulatory environment is fragmenting. With the IMO delaying global rules and Europe moving ahead alone, demand for green fuels will emerge unevenly by corridor, by port, by region. Terminals must therefore be flexible, fuel-agnostic, and modular. Infrastructure that can pivot between biofuels, e-fuels and conventional products is far better suited to this uncertain landscape than bespoke assets tied to a single molecule.

Terminals also determine where early markets form. Green shipping corridors only work if both ends can supply compliant fuels. Ports that move early by converting tanks, upgrading safety systems, and building bunkering capability will attract first-mover volumes and anchor future demand.

There is a broader policy lesson here. Governments often frame maritime decarbonisation as a question of standards and targets. But terminals operate on balance sheets, not declarations. Recognising the value of existing infrastructure through supportive policy measures targeted at logistics could unlock faster emissions reductions than any single regulatory mandate.

The energy transition in shipping will be challenging, uneven, and contested. But one conclusion is already clear: a pragmatic approach that adapts existing terminals and prioritises flexibility will shape the market. The rest will simply service it.

Author

Gorka Penalva, Northwest Europe Commercial Director, Exolum

News

Scully Signal Company upgrades mobile truck tester for hazardous area compliance and expands app functionality

Scully Signal Company recently obtained approval for the Mobile Truck Tester (MTT) to be used in Hazardous Environments - a feature required when used in loading lanes of petroleum terminals, and in many global regions. The accompanying user-friendly app received upgrades as well, with new functionality including test report generation, backup and restore capability, and global real-time clock adjustments among several other enhancements.

The MTT provides an intuitive, single-operator solution for troubleshooting and validating tank truck overfill, earthing, and vehicle identification systems prior to loading. Some key capabilities of Scully's Mobile Truck Tester include:

- **Comprehensive testing** for overfill, earth verification, and truck identification systems.
- **Versatility** making it ideal for tank truck carriers, independent repair shops, and terminal managers.
- **Single person operation** allows users the ability to conduct wet tests solo with a phone or tablet.
- **Truck ID** is easily accessible available on the tester or the app.
- **Single sensor or sensor holder testing** through the socket adapter and wire harness.

When paired with the app, the MTT offers added automation to streamline troubleshooting, documentation, and maintenance. Key app capabilities include:

- **Test Report Results:** A simple table of single or aggregated test results that can be shared.
- **Archive Test Results:** Store test logs per truck ID, customer, or work order for historical reference.
- **Advance Fault Notifications:** Detailed failure modes are listed during wet test, allowing for quick repairs.
- **User-Friendly Digital Application:** The first-of-its-kind application in the industry is intuitive, easy to use, and supported on IOS and Android devices.

"The Mobile Truck Tester has been widely adopted by repair shops and fleet technicians because it is simple, ergonomic, and built for true single-person operation," says Dani Alkalay, Director of Product Marketing at Scully. "Achieving hazardous area approval opens new opportunities for use at petroleum terminals and other global facilities requiring these safety standards."

The MTT Kit expands Scully's portfolio of overfill prevention and safety technologies and continues the company's 90-year legacy of engineering innovation.

Learn more about the MTT and its unique benefits for safe and efficient tank truck operations: https://scully.com/mobile-truck-tester-1000/

LEVERAGING TECHNOLOGY TO SHAPE THE FUTURE OF COMPETENCE IN HIGH-HAZARD INDUSTRIES

As digitalisation accelerates, energy systems shift and the workforce transforms, John Reynolds of Reynolds Training Services asks: can technology strengthen the culture of competence or risk diluting it?

Reynolds Training Services

High-hazard industries are being reshaped before our eyes. Digitalisation is rewiring how we operate. The energy transition is pipelining new fuels, new standards and new hazards. And decades of expertise are walking out the door as the workforce changes.

Each of these forces carries risk. At the same time, a new generation is entering our workforce. They are digital natives. Technology is second nature. They were born into it. That makes them quick to embrace new tools, but with very different expectations of how they learn and engage. Traditional training methods alone won't hold their attention. Yet digital learning alone won't build the instincts that protect lives.

This is the crux of the challenge. As industry digitises, will competence keep pace or get left behind? And if technology is part of the answer, how do we make sure it strengthens, rather than dilutes, the culture of safety on which everything depends?

Losing the five senses

When I joined this industry, you learned with all five senses engaged. You could smell vapour before you saw it. You could hear a pump straining before it broke down. You could feel the temperature of a tank skin as you took a manual reading.

That kind of sensory experience is harder to replicate in a digital world. A screen doesn't smell or rattle. A dashboard won't teach you to trust your gut. And when you consider that 80–90% of major accidents involve human error - often linked to training gaps - the danger of losing these instincts becomes clear.

This erosion of embodied competence isn't happening in a silo. It's being accelerated by the tectonic shifts of digitalisation, energy transition and workforce change.

In my view, this is where the hazard lies. If we train people only through digital theory, we risk losing the instincts that protect lives and assets.

And this is the irony of automation...

I love technology. Anything that improves safety and protects plants, processes and people has to be welcomed. But it is a double-edged sword. I recall stumbling across Lisanne Bainbridge's famous "irony of automation" in the early 1980s, an era when films like The Terminator were feeding the cultural imagination. Bainbridge's point still resonates today: the more systems take over, the less practice humans have in managing them and, in turn, the harder it becomes when they need to intervene.

Time travel back to 2025, and that irony risks being played out in our own sector. An operator who spends years monitoring screens may never develop the instinctive awareness that once came from walking the plant, feeling the heat off a vessel or hearing the faint rattle of a pump before it failed.

The danger is that technology can quietly mask inexperience, right up until the moment it fails. And at that point, competence becomes the last line of defence. That's why it must evolve alongside technology, not erode beneath it.

So, what's the solution?

Should we throw technology out? Pretend dashboards, digital twins and VR don't exist? Ignore the reality that new entrants to our industry have grown up with smartphones in their hands and expect to learn differently? Of course not.

The question isn't technology or tradition. It's how we blend the two.

Because here's the reality: skills are leaving faster than they're being replaced. In the UK energy and utilities sector alone, over a quarter of the workforce is expected to retire within the next decade, taking decades of knowledge with them. At the same time, regulators are demanding proof of competence in domains that didn't even exist ten years ago - hydrogen handling, CCUS, digital safety systems. The future isn't waiting. Neither can we.

Technology, then, is not the enemy. It's inevitable. And more than that: it's essential. Used well, it is the key to unlocking safer operations today and preparing the workforce of tomorrow.

But only if we blend it with the embodied, experiential learning that turns theory into instinct. True competence isn't digital or manual. It's the integration of knowledge, skills and experience, expressed through the behaviours that keep plants, processes and people safe.

Virtual reality, real competence

For me, the answer isn't about choosing between digital or traditional methods - it's about bringing them together. That's exactly why we developed Virtual Reynolds: born from these very challenges and designed to put experiential learning back at the heart of competence.

With Virtual Reynolds, learners step into immersive environments that mirror real-world experiences. They can walk through layouts and learn to recognise potential hazards in context - all within a safe, controlled space. Crucially, this complements accredited online learning and forms part of a blended pathway. By the time trainees reach a live training facility, they already have familiarity with the environment, accelerating their progress and reducing risk.

The technological advantages are clear:

- **Realistic rehearsal:** complex scenarios can be repeated until they become second nature.
- **Safe exposure:** learners can experience critical incidents and near-misses without risk to people, plant or environment.

- **Familiarisation:** site-specific digital mapping means trainees can practise on a virtual replica of their own workplace before stepping through the gate.
- **Scalability:** multiple learners can train simultaneously, at any location, on demand.

Aviation and healthcare have long used VR to prepare professionals before they face pressure in the real world. Our industry shouldn't lag behind.

Digital tools are enablers, not replacements

Virtual Reynolds proves the point - digital tools can transform how people prepare for high-hazard environments. But let me be clear: no digital platform is the whole answer. Competence must still be proven in reality, observed in the field and tested under pressure. That's why our VR system, like others, is designed to complement, not replace, physical training and assessment at facilities such as our National Centre for Process Manufacturing. And VR is just one part of the wider shift. Across industry, organisations are adopting elearning platforms and simulators, for example, to expand training access and consistency. These tools make learning scalable and cost-effective. They provide safe environments to test knowledge and practise rare scenarios. And they allow companies to capture lessons learned and recycle them across their workforce.

The trend is clear: the global VR training market alone is projected to exceed $4.5 billion by 2032. Industry is moving fast to embrace immersive and digital methods. Regulators, though, have rightly drawn a firm line. Under COMAH and similar frameworks, competence cannot stop at theory. Training may start online, but it must always end in practice - validated and reinforced in the real world.

That's why I say digital training is an enabler, not a replacement. It accelerates knowledge. It broadens access. It builds familiarity. But true competence is forged when knowledge, skill, experience and behaviour come together in the field - because that's where safety lives or dies.

Shaping competence together

Digital tools can accelerate learning, but on their own they're not enough. True competence isn't built in a headset or on a dashboard, it's built across a career. It has to be structured, measured and reinforced, so knowledge turns into capability, and capability is forged through consistent behaviours.

That's why we work beyond technology, partnering with TSA, SIAS and awarding bodies to shape career pathways and proficiency matrices that reflect real operational needs. These frameworks link roles to responsibilities and training requirements. They make competence measurable, transferable and sustainable.

Blended learning is at the core: moving from theory, to simulation, to plant, to observed behaviours. It ensures that digital tools are integrated into the journey. Not as an endpoint, but as a step towards real-world capability.

No single organisation can solve this alone. Competence is a collective responsibility. That's why we're working together to shape a culture of competence that is future-proof and regulatory-compliant.

Keeping competence safe in a digital world

If technology is the enabler, people are the foundation. That's the message I want to leave you with.

We cannot let competence become disconnected in a digital world. We cannot afford to lose the instincts and behaviours that underpin safety. And we cannot leave the next generation without the tools - and the confidence - to succeed. Technology will continue to evolve. So must competence. By capturing knowledge before it's lost, embedding it into blended training and shaping it collectively across the sector, we can face the challenges of digitalisation, energy transition and workforce change head-on. Because in the end, competence isn't just a compliance exercise. It's the culture that keeps people safe, keeps businesses resilient and keeps the future within our control.

We can't shape it alone. It takes all of us... together.

About the author

John Reynolds is the Managing Director of Reynolds Training Services Ltd. He founded the company in 2009 with a vision to create a more interconnected approach to health, safety and technical training within the bulk storage sector. Since then, he has become a leading voice in high-hazard industry training, pioneering new models of blended learning and driving innovation in virtual education.

www.reynoldstraining.com

Non-Man Entry Tank Cleaning

As part of any busy tank cleaning and maintenance programme, bulk liquid storage facilities, especially those handling hazardous substances, should be continuously striving to reduce the risks to personnel and contractors engaged in tank cleaning operations.

Non-Man Entry (NME) tank cleaning methods should be considered as part of the hierarchy of control in eliminating risk from the process of tank cleaning.

NME cleaning advantages are as follows:

- Safety: eliminates the need for personnel to enter the tank, reducing the risk of accidents and exposure to hazardous environments.
- Efficiency: reduces the time required for cleaning, allowing for quick turnaround times and less downtime for operations
- Cost-Effectiveness: lower labour cost and reduced need for hazardous materials handling, leading to significant savings for business.
- Environmental Impact: minimises waste and pollution, contributing to better environmental practices and regulatory compliance.

These advantages make non-man entry tank cleaning the preferred choice for many industries looking to enhance safety, efficiency and cost effectiveness in their tank cleaning processes.

FSS has been delivering specialist non-man entry tank cleaning solutions for over 40 years having successfully adapted ISGOTT marine tank cleaning best practice to shoreside industrial tank cleaning. These solutions eliminate confined space entry during primary cleaning operations. Our approach enables the safe and effective cleaning of storage tanks, vessels, and confined spaces throughout industrial and marine industries.

The FSS NME solution

We install a high-pressure spirographic wash head through an existing penetration or man lid, allowing us to clean all internal tank surfaces remotely. The wash head delivers a controlled 360-degree cleaning pattern at 12 bar pressure, ensuring full surface coverage of all internal tank surfaces without the need for personnel entry.

The system is powered by:

- High-volume pumping units to drive consistent flow and maximise cleaning performance.
- A 4,500 lb containerised steam boiler, generating large volumes of hot water up to 90°C.
- Optional chemical / detergent injection for enhanced residue breakdown.
- Water management and recycling systems to reduce consumption and minimise waste disposal.

All operations are carried out externally by trained FSS technicians under strict safe systems of work, including full Lock Out Tag Out (LOTO) procedures.

Proven across multiple sectors

Our NME system has been successfully delivered across refineries, oil and fuel storage terminals, commercial vessels, defence vessels, and anaerobic digestion facilities.

We don´t just manage confined space risks, we remove them.

By combining advanced wash head technology, controlled 12 bar application, 90°C hot water capability, chemical injection, and sustainable water management, FSS delivers a modern, safety-led tank cleaning solution that reduces risk, downtime, and cost.

For more information, please visit www. fuelspecialistservices.co.uk

ADVANCED CFD MODELLING TO SUPPORT THE TRANSITION TO SAF

Sustainable Aviation Fuel (SAF) is becoming increasingly important for the bulk liquid storage sector, as the UK SAF mandate is steadily increasing, within the constraints of existing storage and logistics capacities, and to consistently meet aviation standards. Although terminals have decades of experience handling conventional hydrocarbons, mixing Sustainable Blending Components (SBCs) with Conventional Jet Fuel (CJF) to produce SAF introduces an additional process that requires certainty to support quality and operational requirements.

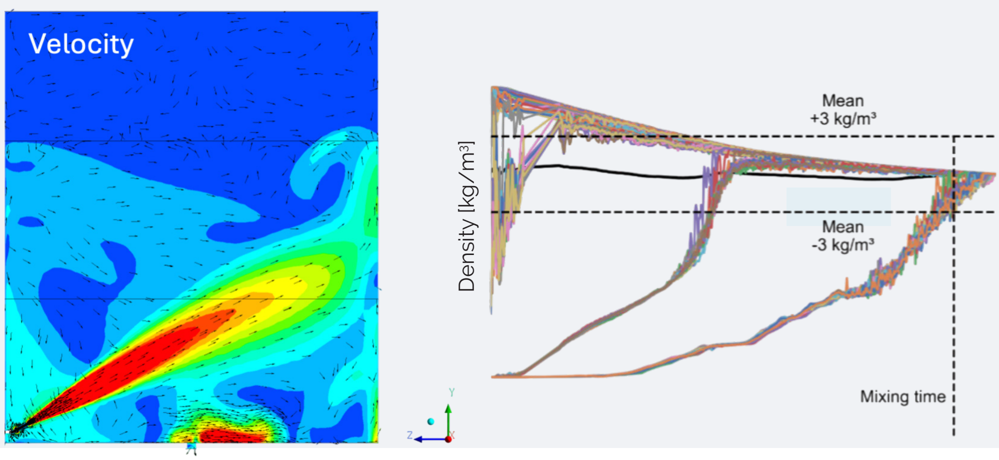
Computational Fluid Dynamics (CFD) modelling is robust, accurate, and provides certainty as part of the management of change process for the introduction of SAF to a storage terminal. To support the sector in this transition, InSite and PDL have combined their strengths to create a unified capability that brings advanced CFD modelling together with practical process engineering and operational experience. Working as one team, they provide clear technical evidence, grounded in real-world operational constraints, to ensure SAF can be introduced safely, efficiently and with confidence. For terminal operator clients, the team develops high quality models and applies advanced analysis techniques to understand and explore complex, nonlinear behaviour across the design space. This ensures that every project delivers maximum value and insight, whether the objective is assurance against mixing standards, improved understanding of flow behaviour and mixing time, or evaluating different mixing solutions when retrofitting to existing infrastructure. CFD modelling provides engineering certainty while saving time, cost and operational resource.

Recent SAF blending projects have shown how this integrated capability supports terminals preparing for emerging fuel demands. Although the work focused on understanding how Jet A-1 and HEFA behave during blending, it also illustrated the value of combining modelling insight with operational experience.

CASE STUDY 1

PDL's modelling focused on establishing a reliable time that ensured the product would be fully homogenised ahead of redistribution by the terminal operator. The tank consisted of a prop-mixer and inlet jet mixing nozzle. PDL created a conservative CFD model, starting at full volume with two stratified layers: the lighter HEFA on top of the Jet A-1. A transient, multispecies simulation was then run for over five hours of real-world mixing time (taking around three weeks of computation time) until the density variation throughout the tank fell below 3 kg/m3, as required by the Energy Institute EI/JIG 1530 standard. These results were validated against operational experience and gave confidence in the mixing system capability. Figure 1 shows the tank flow pattern and mixing history.

Figure 1: Flow contours on a plane through the jet nozzle (left) and mixture density at sample points through the tank as a function of time (right).



CASE STUDY 2

Another study of SAF blending, this time using multiple jet-mixing nozzles, identified a potential hazard of splashing at the liquid surface due to the inclination of the jet nozzles. Such conditions can lead to misting of the fuel, creating a potentially flammable environment in the tank headspace. A transient gas-liquid multiphase analysis was conducted to capture the liquid-surface disturbance caused by jet-nozzle flow. Figure 2 shows the predicted surface disturbance at a single point in time. The level of surface agitation was assessed for different tank fill levels, and a safe operating level for the jet-mixers was confirmed. CFD results were compared with published correlations with good agreement.

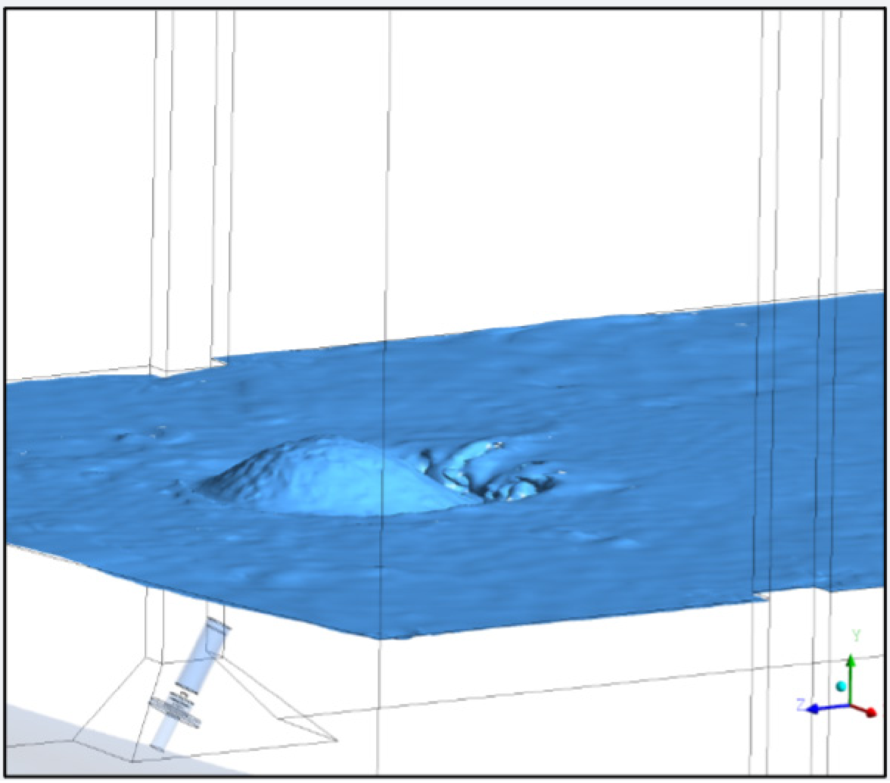
This integrated approach provides a clear and practical route forward. Terminals can rely on accurate simulation and process engineering expertise to validate their blending performance, demonstrate compliance, and make informed decisions about configuration or procedural changes. As SAF volumes increase and new fuel types emerge, the capability offered by the InSite and PDL team allows operators to anticipate challenges, avoid unnecessary investment and adopt new products with confidence. For organisations preparing to handle SAF for the first time, or those looking to validate their existing blending arrangements, the team offers support across every stage of the process. They provide independent engineering assurance, CFD driven analysis and practical operational guidance to help terminals understand the physical behaviour of SAF within their specific systems. Whether a project requires the review of existing configurations, modelling of blending performance or insight into how SAF can be integrated safely and compliantly into established infrastructure, the team can assist operators in making informed, confident decisions about their transition to SAF.

Author

Dr Wesley Appleton, Engineering Team Lead, CFD.
Wesley.Appleton@pdl-group.com

For more information, contact Jason O'Malley, UK Sales Director.
Jason.OMalley@insitetechnical.co.uk
www.insitetechnical.com

Figure 2: Surface disturbance profile.



UM TERMINALS HOLDS FIRST EVER SAFETY DAY, LAUNCHES UNITED INSPECTIONS AND SUPPORTS HEALTH AND WELLBEING

Key initiatives across the business highlight UM Terminals' focus on safety, innovation and wellbeing.

UM Terminals recently held its first ever Safety Day, bringing together all the members of its UK-wide Safety Committee. The day was organised by Group EHS Manager Rebecca Broughton-Lee and involved 16 colleagues in total from UM Terminals' sites in Liverpool, Hull and Portbury.

The day, which was held at the Malmaison Liverpool, began with opening remarks about safety culture from UM Terminals' Managing Director Vic Brodrick.

This was followed by a guest session with Peter Davison, Chief Executive of the Tank Storage Association (TSA). Peter gave a presentation about the Buncefield incident, which saw a huge explosion rip through the Hertfordshire Oil Storage Terminal, close to the M1 motorway, 20 years ago.

Peter talked about the ensuing investigation and the lessons still being learnt. He also discussed the work of the TSA and the training support and materials it makes available to members such as UM Terminals.

In the afternoon, Rebecca led two sessions, the first of which focussed on Work Wallet, the cloud-based reporting system that is being introduced and which will capture in one place various information including site checks, audits, risk assessments and any issues that arise. The session gave colleagues an opportunity to brainstorm other potential uses for the system. This was followed by a session talking about safety culture, what it means to colleagues and creating building blocks for what good looks like, associated values and how to effectively embed it across the business.

The final part of the afternoon gave colleagues the opportunity to discuss next steps and start to develop a six-month plan, with a key priority being the successful and effective roll out of Work Wallet.

Rebecca said: "I was delighted with how the day went, our first dedicated Safety Day involving all members of the Safety Committee. We meet on a quarterly basis, normally on a site-by-site basis, but bringing all the committee together on the same day was something I'd been championing for a while. Getting everyone together in-person for the day meant that we could bring a real strategic focus to safety culture, devising innovative and proactive ways in which we can continue to enhance and embed our approach across the business."

United Inspections launched

United Inspections is a new arm of UM Terminals offering a comprehensive range of high-quality Asset Inspection Services.

This exciting development follows the strong performance of its own internal asset inspections at UM Terminals' facilities and a successful proof of concept for third party inspections.

Liam Crowley, Inspections Manager of United Inspections, said the new operation provides customers with comprehensive asset integrity inspections and advanced Non-Destructive Testing (NDT) services, adhering to the highest industry standards including:

- **Flat Bottom Storage Tank Inspections**
  Full compliance with EEMUA 159 and API 653 for structural integrity.

- **Pipeline Inspections**
  Expert evaluations to API 570, ensuring pipeline safety and performance.

- **Pressure Vessel Inspections**
  Thorough assessments to API 510, prioritizing operational reliability.

- **Non-Destructive Testing (NDT)**
  Cutting-edge techniques, including:
  - Ultrasonic Thickness and Weld Inspection
  - Eddy Current Testing
  - Magnetic Particle Inspection
  - Dye Penetrant Inspection
  - Phased Array Ultrasonic Testing
  - Time of Flight Diffraction (TOFD)

Jake Ellis, UM Group Asset Integrity Manager, said: "We have already had repeat business from customers who have engaged United Inspections. Customers tell us they like the fact that we have vast experience operating terminal businesses worldwide, giving us unparalleled insight into asset integrity challenges and the ability to deliver solutions other inspection companies can't match."

For more information visit https://unitedinspections.co.uk or email: inspection.enquiries@umgroup.com

UM football team boosts health and wellbeing

A group of colleagues at UM Terminals' Liverpool sites are doing their bit to encourage health and wellbeing by running a regular football team.

For the past two years, they have got into the routine of getting together each Thursday to play 5-a-side games. The core group consists of Duncan Wilkinson, UM Terminals' Mersey Site Controller, along with Lewis Chambers, David Garvey, Jamie Clintworth, Maddy France, Tate France and Geoff Groom.

The inspiration for the football team emanated from last year's Great Molasses Challenge which saw UM colleagues across the Group raise over £33,000 for the charity Farm Africa.

Duncan said: "After we had played football as part of the Great Molasses Challenge, a few of us were chatting at work and thought it would be a nice idea to make it a more regular activity, something outside of work and good for fitness. Some of the guys had played for teams in the past, while others just liked the idea of doing something social away from the office. We've played most weeks now for the last 18 months with the opposition often being made up of friends and family. We play at the Soccer Dome in Wirral and UM has been very supportive, supplying kits. The games are competitive and we're talking about perhaps entering a league from next year. Some of the guys have also started playing golf outside of work and this is something we are also hoping to build on when the weather gets better."

Geraldine Carroll, UM Group HR, Training and Office Manager, said: "We were delighted to support Duncan and the rest of the team with this fantastic initiative. As a Group, we are passionate about the importance of colleague health and wellbeing, and the football team is a great example of this in action."

For more information, please visit www.umterminals.co.uk.

MOBILE DEGASSING AND EMISSION REDUCTION IN INTERMODAL TRANSPORT

Meeting safety and environmental challenges in freight logistics.

ETS Degassing
MOBILE EMISSION TREATMENT

David Wendel, Managing Director
ETS Degassing

A normal, busy day in a large tank terminal: tank trucks are lined up, rail cars are positioned on the rails and tank ships are moored at the quay. All vehicles are loaded with their cargo, getting ready to start their journeys to provide different regions with fuels and chemicals. Pumps are running, loading arms are connected, schedules are tight. But then the stationary Vapor Recovery Unit of the terminal has a malfunction and needs to be shut down, all operations are stopped and the entire facility stands still.

Intermodal transport connects road, rail and maritime freight in tightly coordinated supply chains. Liquid fuels, chemicals and petrochemicals, solvents and liquified gases are transferred daily between storage tanks, trucks, rail cars and ships. During loading and unloading or product changeover, vapors are displaced and must be captured and treated properly. If stationary emission control fails, operations cannot continue. However, mobile degassing and emission reduction technologies can prevent such worst-case scenarios and offer a flexible solution for sustainable operations in intermodal transport – whether it is on site, along the way or during stationary VRU downtimes.

The challenge of emission treatment in intermodal transport

Tank trucks, tank wagons, tank containers and ships move vast volumes of fuels, chemicals and liquified gases every day. The challenge of handling pollutants and emissions does not end when a tank is emptied as tanks often contain significant volumes of residual gases and vapors. These must be treated as well, preventing the direct release into the atmosphere. Before inspection maintenance, repair of product change, the residual emissions must be removed in a controlled manner – instead of harming environment and human health, they should be destroyed almost completely. Proper degassing and emission treatment ensures just that.

Safety is another key concern when it comes to emissions in the intermodal sector. Residual vapors can form explosive mixtures when they come in contact with other products or can expose staff to toxic conditions. Proper emission treatment reduces these hazards, protecting personnel and infrastructure while helping to comply with occupational safety and environmental standards.

Sustainable and safe processes in the intermodal sector

In a sector where assets constantly move between terminals, depots and ports, fixed emission control infrastructure is not always available in the required location. Even where stationary systems such as VRUs are installed, they may need to be shut down due to regular maintenance or malfunction.

Mobile emission treatment technologies provide a flexible solution for application in the intermodal sector. The mobile units are designed for rapid deployment and can be easily transported and installed at terminals, rail yards, logistics hubs or quaysides. Hazardous vapors are extracted from the containments via piping systems and are guided into a mobile vapor combustion unit (VCU), where they are thermally destroyed with an efficiency of over 99.99% - without open flame or odor. The units for degassing destroy gases, gas mixtures and vapors the explosion groups IIA, IIB and IIC, meeting strict environmental and safety standards.

Mobile VCUs can be applied for the degassing of tanks, pipelines, ships and other components, ensuring an almost complete removal of hazardous emissions. The units can also serve as temporary replacement for stationary units such as VRUs during maintenance or outages. Without alternative emission treatment, facilities may have to halt

Mobile emission treatment technologies provide a flexible solution for application in the intermodal sector. The mobile units are designed for rapid deployment and can be easily transported and installed at terminals, rail yards, logistics hubs or quaysides.

Mobile VCUs can be applied for the degassing of tanks, pipelines, ships and other components, ensuring an almost complete removal of hazardous emissions.

loading or unloading operations to avoid exceeding emission levels. Mobile vapor combustion units bridge these gaps, enabling continuous operations and reducing the risk of costly shutdowns.

Purging with nitrogen is another important part of emission reduction that can be critical for components containing liquefied gases under pressure such as LNG, ammonia, LPG or other cryogenic cargos. Inerting those containments with nitrogen creates a safe working environment for degassing and subsequent maintenance, adding further flexibility to intermodal logistics workflow.

Project insights: keeping freight traffic moving

With over 3,000 successful emission reduction services across Europe, we have of course supported several intermodal operations with our technologies.

Rail and road transport applications

In one project, we were commissioned to degas ten LPG tank trucks in preparation for regular maintenance. We provided a mobile vapor combustion unit and additional equipment such as pipes, flame arresters, valves, pressure reducers and T-pieces. In a refinery, we have provided temporary back-up for the VRU to uphold truck loading. Thus, an operational shutdown was avoided and the truck loading could continue, with approximately 340 trucks loaded per day. We deployed our mobile unit for a three month period, ensuring that a shutdown of the loading station and the entire refinery was prevented. In a tank wagon terminal, we replaced the stationary VRU for six months. By deploying our mobile vapor combustion unit, 22 tank wagons could continue to be loaded with ethanol every week without restrictions. Thus, a shutdown of the entire plant was avoided. In another facility, we degassed several rail cars loaded with different gases under pressure to enable inspection, maintenance and repair. The rail cars were previously loaded with propane, propylene, propene and isobutylene. Our mobile vapor combustion unit served as a replacement for the stationary equipment.

Maritime operations

In the Port of Amsterdam, we degassed a damaged LNG tanker with two mobile vapor combustion units in order to ensure that the tanks were gas-free so that maintenance and repair works could be carried out in the shipyard. After the repairs, we also carried out a cool-down using our mobile nitrogen vaporizer. In a terminal in Belgium, we replaced the stationary VRU – our unit took over the treatment of emissions generated during ship loading. Thus, ship loading processes could continue without interruption or restrictions. We also operate a permanently stationed ship degassing site in the Port of Duisburg, offering shipping companies an opportunity for ships to be degassed and removing residual gases to make them ready for maintenance, repair or product change.

Ensuring operational continuity and sustainability

Mobile degassing and emission reduction systems ensure that loading, maintenance and repair in the intermodal transport sector can continue – even when stationary emission control infrastructure is unavailable. By enabling compliant on-site treatment of hazardous vapors, downtimes are reduced, safety is maintained and operators can meet environmental requirements. Thus, mobile degassing and emission treatment is an essential component of reliable intermodal logistics.

Contact:
David Wendel, ETS Degassing GmbH | +49 162 243 34 86 | sales@ets-group.com

Teamwork Security and Training Services Ltd

Operating within the bulk storage and energy infrastructure sector demands robust security, regulatory compliance and a strong safety culture. Teamwork Security and Training Services Ltd supports terminals, ports and industrial operators across the UK with specialist consultancy, accredited training and safety-critical services designed for high-risk environments.

As a Department for Transport (DfT) Approved Training Provider, the company combines practical port and terminal experience with in-depth regulatory knowledge. This ensures solutions are not only compliant on paper, but effective in live operational settings.

Maritime and Facility Security Expertise
For terminals operating under the International Ship and Port Facility Security (ISPS) Code, maintaining compliance while managing complex commercial pressures can be challenging. Teamwork Security and Training Services provides:

- Port Facility Security Plan (PFSP) – production and maintenance
- Ship Security Plan (SSP) – production and maintenance
- Independent ISPS audits
- Competent Authority inspection preparation
- Tabletop and live security exercises
- Port Facility Security Assessments (PFSA) when required
- Ship Security Assessment (SSA)

Exercises are designed around realistic threat scenarios, helping terminal operators test procedures, decision-making and communication pathways in a controlled but demanding environment.

Training for Regulated and High-Risk Environments
The company delivers nationwide training tailored to bulk liquid terminals, energy infrastructure sites and industrial facilities. Courses include:

- Port Facility Security Officer (PFSO)
- ISPS Security Awareness
- Search and screening training
- X-Ray operations
- Dangerous Goods Safety Adviser (DGSA) training

Programmes are designed to strengthen competence, reinforce regulatory understanding and support audit readiness.

Dangerous Goods and Safety-Critical Compliance
Bulk storage and energy infrastructure operators face particular scrutiny when handling hazardous cargoes. Teamwork Security and Training Services provides Dangerous Goods advisory services, compliance monitoring and audit support to ensure facilities remain aligned with current legislation and industry expectations.

In addition, the company delivers professional Drug and Alcohol Testing Services across safety-critical environments. Services include random testing, for-cause screening, post-incident testing and pre-employment checks - supporting operators in maintaining safe systems of work and demonstrating due diligence.

Professional Security Personnel
Beyond consultancy and training, the company supplies experienced security personnel to regulated industrial sites, port facilities, commercial events and public sector organisations. Their operational understanding of high-risk environments ensures professionalism and regulatory awareness at every level.

For bulk storage and energy infrastructure operators seeking practical, sector-informed security and compliance support, Teamwork Security and Training Services offers a fully integrated solution.

Contact: 01752 425424 or email: enqs@teamwork-security.co.uk
www.teamwork-security.co.uk

PEOPLE ALWAYS FIRST – THE POWER OF MENTORING

Recruiting the right people is just the start of the journey, we need to empower people to continually improve, grow and hone their skills over their professional career.

Safe | Smart | Sustainable

It might sound obvious, but a company is only as good as its people. For us, as a Process Safety consultancy in the complex business of risk management, we rely on the knowledge and expertise of our team. Without them, we know that we wouldn't have a business. And so, we give a lot of attention to being a great place to work and the growth of our team.

We develop our people to become the best in the industry. Genuine collaboration is central to our approach. We foster an environment in which people are encouraged to grow, which fosters a friendly and supportive environment. This promotes the natural development of our team and in turn, our capabilities. A key feature of our internal development processes is a formal mentoring scheme which empowers our team and streamlines our growth. It provides a pathway for development, passing down the tangible experience of the senior members of our team to new starters, imparting key knowledge to the next generation.

Growth and Development

Our team are the experts in their field, providing specialist advice to our clients. This kind of competence is not built overnight. We invest time and effort in guiding our team to gain the experience and knowledge required to cover the scope of the services we provide.

The concept of placing a focus on the development of your workforce is nothing new, but for us this is more than just a case of ticking boxes. We enable our people to be the best that they can be. We have strengthened our Employee Value Proposition, to state our companies' commitment to the personal growth of our people, ensuring that they feel valued, autonomous, invested, cared for, understood and secure while at work. Continuous improvement is the name of the game in our industry, and we believe that mindset applies to our team as much as it does to the technical expertise we provide to our clients. If our people are our greatest asset, then investing in them and ensuring that they can continuously learn and improve is of great value for all of us.

The Power of Mentoring

Our mentoring scheme is intended to maintain consistent momentum and empower our team to facilitate their own progression.

The mentee has the power to determine their own development pathway, setting and working towards their own personal goals. Within the mentoring partnership the mentee has autonomy; each individual is led down a path of their choosing. Ultimately, as our people grow with us this leads to the selection of a branch to specialise in.

Throughout our history at RAS, we have encouraged open discussion and flexibility. We have developed a Competence Framework which outlines the minimum expectations for our teams' knowledge as they develop at RAS and guides their development, but we do not impose a one-size-fits-all approach. Each member of our team is treated as an individual and the expectations for their growth are founded in their personal experience, background and interests. This creates a culture in which our people feel seen and their whole self is valued at work. This has established a team with a breadth of capabilities and skills which enables us to provide the optimal support to our clients.

That being said, the age-old concept of 'you don't know what you don't know' can come to fruition if the right systems are not in place. To mitigate this we have developed a range of systems whereby our most experienced consultants can disseminate their insights across the team.

The high hazard industries are complex and building up the knowledge required can be a daunting prospect for new graduates. By signposting resources and collaborating with specialists within our team, mentoring can facilitate the evolution of our workforce.

As part of our onboarding process, we have a buddy system, to integrate new starters into the organisation and widen our network of support. We know that the working environment today can be fast-paced and stressful and therefore a helping hand, especially early on in a career, is an important aspect of looking after our team.

Benefits of Mentoring

Mentoring has benefits for both the individual being mentored and the mentor themselves, broadening our team's capacity and confidence. The feedback from our team is that both parties benefit from the time invested and the opportunity to share a challenge and look for solutions in collaboration. Don't just take our word for it though, according to MentorcliQ:

- Median profits are **over 2X higher** for companies with mentoring programmes
- **3% median employee growth** for companies with mentoring vs. **33% median decrease** for those without
- Between **56-71%** of all organisations now use mentoring to some degree

This demonstrates the power that mentoring can bring to an organisation, benefiting the individuals involved, the wider team and the business as a whole.

The RAS Way

The process safety industry is built upon the principle of continuous improvement, whether that be technological advancements or the evolving regulatory landscape to minimise risk to people. Why would we not apply the same principles to ourselves? Recruiting the right people is just the start of the journey, we need to empower people to continually improve, grow and hone their skills over their professional career. This helps to ensure that our people develop with us rather than leaving us for pastures new.

By investing in our people and empowering them to work flexibly and authentically, we retain talent for the long term and build trust across our organisation. We recognise our team as our greatest asset and create an environment where everyone can thrive and bring their whole selves to work.

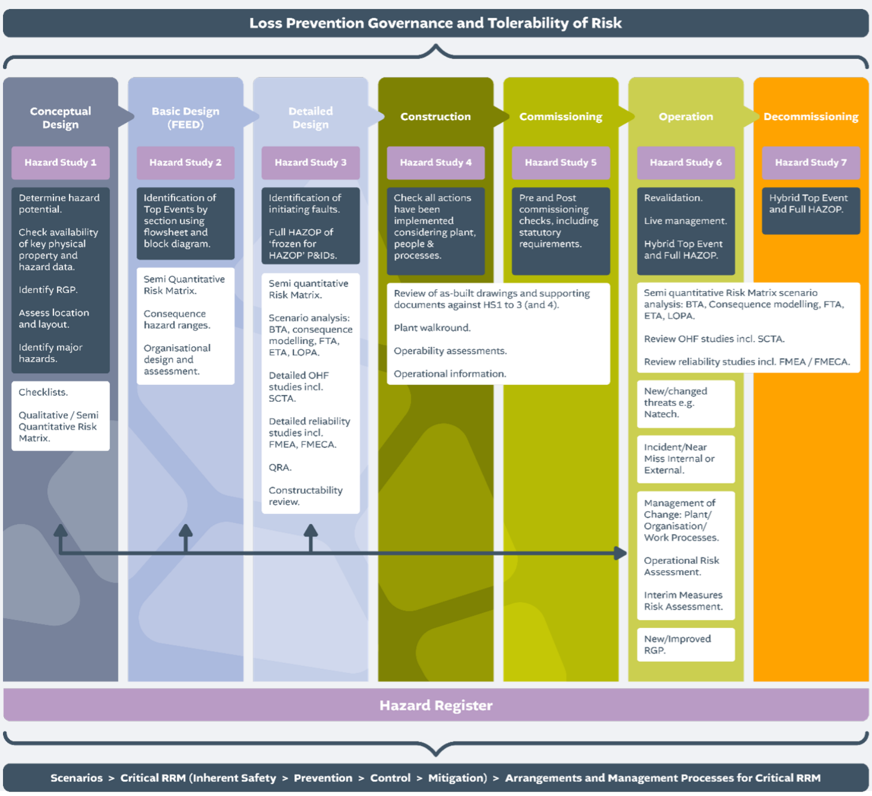
On top of our award-winning expertise in carrying out hazard identification and risk assessments, RAS can support you to build your safety management system to provide effective oversight of your major hazards.

Our services range from project support and implementation of inherently safe design through to good practice gap analysis, emergency response plan development. If you would like to get in touch, go to our website: https://ras/ltd.uk.

DEMONSTRATING ALARP FOR NON-COMAH ENERGY TRANSITION FACILITIES WITH MAJOR ACCIDENT HAZARDS

Cairn Risk Consulting (Cairn Risk) joined the TSA in July 2025 to further increase our cross organisation collaboration and sharing of good practice. Our article for the Autumn Insight magazine shared some key messages for leveraging good practice for the energy transition. In our article for the Winter Insight magazine we explored what application of process safety good practice looks like for energy transition hydrogen projects and in particular the importance and benefit of designing in inherent safety. In this article we share an approach for demonstrating that residual risk is As Low As Reasonably Practicable (ALARP) for energy transition facilities, which have major accident hazards but are not regulated under the Control of Major Accident Hazard (COMAH) regulations. Such facilities include grid scale Battery Energy Storage Systems (BESS) and hydrogen facilities with less than 5 tonnes of hydrogen inventory. The ALARP demonstration can draw on all relevant design and assurance

Figure 1: Risk Management Lifecycle Approach



BTA	Bow Tie Analysis
ETA	Event Tree Analysis
FEED	Front End Engineering Design
FMEA	Failure Mode and Effects Analysis
FMECA	Failure Mode and Effects Criticality Analysis
FTA	Fault Tree Analysis
HAZOP	Hazard and Operability Study
LOPA	Layers of Protection Analysis
OHF	Organisational and Human Factors
P&ID	Piping and Instrumentation Diagram
Natech	Technological incidents caused by natural events e.g. flooding, wildfires
QRA	Quantitative Risk Assessment
RGP	Relevant Good Practice
RRM	Risk Reduction Measure(s)
SCTA	Safety Critical Task Analysis

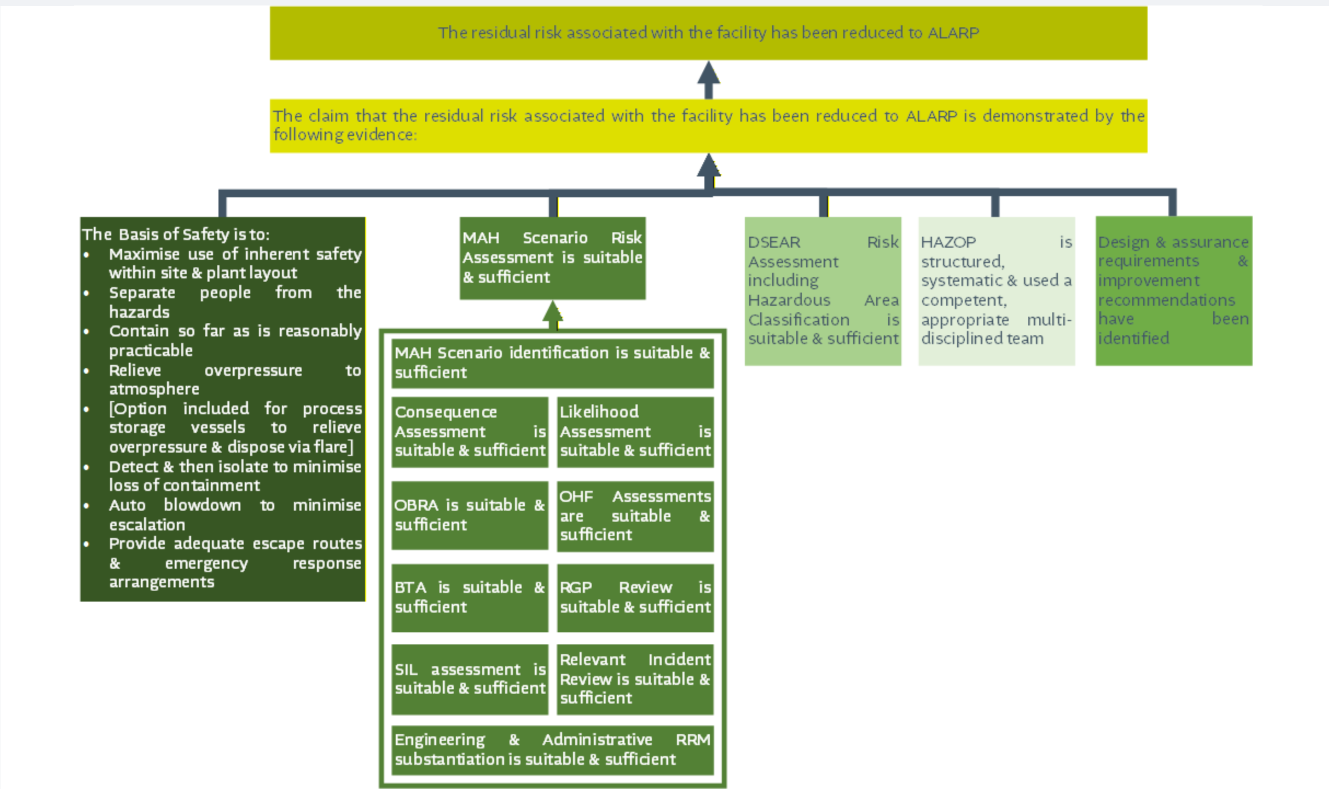
information in a Basis of Safety and ALARP Demonstration report. This report can be reviewed and updated as a facility progresses through its lifecycle from conceptual design through to construction, commissioning, operation and eventual decommissioning. It works well in combination with the multi hazard study approach to process safety and wider HSSE that was discussed in our Autumn Insight article and is summarised in Figure 1. This approach enables the management system to be developed and implemented alongside the facility design, construction and operation.

Claims Arguments Evidence Approach

The claims arguments evidence (CAE) approach is widely used to structure safety cases such as for the nuclear, defence and aviation sectors, to demonstrate that risks have been reduced to ALARP. It provides a visual, flexible, concise and scalable means to utilise a diverse range of qualitative, semi-quantitative and quantitative evidence sources to support ALARP demonstration. Additionally, it provides a means to explicitly define evidence linked and used to support claims and to ensure that there is sufficient evidence available or planned. CAE can potentially highlight any weaknesses, uncertainties or gaps in the overall safety demonstration (marked by missing or insufficient claims, arguments and /or evidence) **[Ref. 1]**. The use of argument for safety cases and reports has been discussed and applied in various forms for over 25 years **[Ref. 2, Ref. 3]**.

However, CAE structures can be very complex and obscure risk communication rather than support it, as highlighted by the Office for Nuclear Regulation **[Ref. 1]**, and the approach should be applied appropriately and proportionately. In the illustrative hydrogen facility example in Figure 2, the detail sits within the evidence used to support each argument leg and it is a much simpler CAE structure

Figure 2: Illustrative Hydrogen Facility Summary Claim Argument Evidence Structure for Residual Being Reduced to ALARP



than would be used for a nuclear safety case. If supporting evidence is inadequate then the argument and top level claim are undermined. Figure 2 shows that typical inputs to an ALARP demonstration (evidence lines /argument legs) for such a facility during the design phase are:

- Basis of Safety and the supporting design documents.
- Major Accident Hazard (MAH) Scenario Risk Assessment including:
  - MAH Scenario identification
  - Consequence assessment, including modelling of releases, dispersion, hazardous outcomes and assessment against harm criteria;
  - Bow Tie Analysis (BTA);
  - Occupied Building Risk Assessment (OBRA);
  - Likelihood assessment such as Fault Tree Analysis (FTA) and Event Tree Analysis (ETA);
  - Safety Integrity Level (SIL) assessment such as Layers of Protection Analysis (LOPA);
  - Organisational and Human Factors (OHF) assessments such as Safety Critical Task Analysis (SCTA), workload analysis, alarm rationalisation and Control Room layout and ergonomics;
  - Relevant Good Practice (RGP) review;
  - Relevant incidents review; and
  - Engineering and Administrative Risk Reduction Measure (RRM) substantiation.
- Dangerous Substances and Explosive Atmospheres Regulations (DSEAR) Risk Assessment and Hazardous Area Classification (HAC).
- HAZOP and supporting evidence of the output and the approach used.
- Identified further design and assurance requirements plus improvement recommendations to enable continued effective risk management to achieve a residual risk that is ALARP.
  - These requirements and recommendations require tracking to close out.

Basis of Safety

The Basis of Safety used within the CAE ALARP demonstration is based on the process safety hierarchy of control, which should be applied from inherent safety principles first through to administrative mitigation measures.

Additionally, reliability considerations such as redundancy and diversity as well as availability, maintainability and survivability, contribute to the adequacy of the Basis of Safety:

1. Inherent safety principles to minimise the hazard potential

Table 1: Illustrative Example Extract of ALARP Demonstration Evidence Summary

Document Reference	Document Title	High Level Summary of Evidence Provided
Basis of Safety (Extract)		
Ref. 1	Engineering Basis of Design	Design Basis assumptions and limits.
Ref. 2	Process Description	Unit operations and summary operational philosophy.
Ref. 3	Overall Site Layout	Separation of hazards from people and use of hazard potential gradient within site and plant layout.
Ref. 4	Site Sections	Separation of hazards from people and use of hazard potential gradient within site and plant layout. Use of hydrogen buoyancy for separation of people from hazards.
Ref. 5	Site Levels	Separation of hazards from people and use of hazard potential gradient within site and plant layout. Use of hydrogen buoyancy for separation of people from hazards.
Ref. 6	Venting and Blowdown Philosophy	Relieve overpressure to atmosphere. Auto blowdown to minimise escalation.
Ref. 7	Emergency Shutdown (ESD) Narrative	Detect and then isolate to minimise loss of containment. Auto blowdown to minimise escalation.

to harm people and /or environment;
2. Passive engineering prevention (of initiating faults) measures;
3. Active engineering prevention measures;
4. Administrative prevention measures;
5. Passive engineering control (of initiating faults developing into top events) measures;
6. Active engineering control measures;
7. Administrative control measures;
8. Passive engineering mitigation (of top events developing into harmful outcomes) measures;
9. Active engineering mitigation measures;
10. Administrative mitigation measures.

Basis of Safety and ALARP Demonstration

The Basis of Safety and ALARP Demonstration report then summarises the design and assessment documents which provide supporting evidence. This is typically summarised in a table, and an illustrative example extract is shown in Table 1.

The remainder of the report provides further information on the evidence used to support the ALARP demonstration, sourcing relevant summary content from the detailed analyses and reports referenced in the evidence summary table.

Conclusions

For energy transition facilities, which have major accident hazards but are not regulated under COMAH, such as grid scale BESS and hydrogen facilities with less than 5 tonnes of hydrogen inventory; we and our clients have found that it is highly beneficial to use a Basis of Safety and ALARP Demonstration report. Such a report draws on evidence provided by design and assurance activities to significantly improve the accessibility of the ALARP demonstration argument and how it relates to multiple design and assurance activities and deliverables. This enables clear and concise communication of the hazard and risk profile plus critical design aspects and Risk Reduction Measures to a wide range of users including:

- Designers;
- Managers;
- Directors;
- Investors;
- Customers;
- Community stakeholders;
- Insurers;
- Operators;
- Maintainers;
- Technical support staff;
- Regulators.

References

1. Office for Nuclear Regulation, The Purpose, Scope, and Content of Safety Cases, Nuclear Safety Technical Assessment Guide (NS-TAST-GC-051), Issue 1, December 2024. Appendix 4 Claims Arguments Evidence Structures within the Safety Case.
2. H. Conlin, P.G. Brabazon and K. Lee, Exploring the Role and Content of the Safety Case. Process Safety and Environmental Protection, Volume 82, Issue 4, July 2004, Pages 283 – 290.
3. Entec UK Ltd. A railway safety case regime. Class number EF14. Ladbroke Grove Rail Enquiry. Part 2. Rail safety core documents. 2000.

Author

Helen Conlin, Principal Consultant, Cairn Risk Consulting

For more information, please visit: www.cairnrisk.com

CAIRN RISK CONSULTING
Reducing risk for a sustainable future

The voice of the bulk storage and energy infrastructure sector

CONTACT US

Tank Storage Association
Devonshire Business Centre
Works Road
Letchworth Garden City
Herts. SG6 1GJ
United Kingdom

www.tankstorage.org.uk

T. +44 (0)1462 488232

info@tankstorage.org.uk

Follow us