

# THE EVOLUTION OF FUEL-HANDLING SAFETY

Improving safety levels in critical fuel-handling applications will never end, but there have been some recent notable enhancements for terminals, transporters, and retailers, writes Keith Moye

**I**t's a natural reaction for humans when they've completed a task or project to allow themselves a few moments to sit back, take a deep breath, reflect on their efforts and even apply a self-congratulatory pat on the back for a job well done.

But for some endeavours, while significant advancements may have been made, the job is never completely done; the concept of clothing 'fashion' is one of these, along with (the cynical among us might say), road construction.

'Safety' is another one; specifically for our purposes, the level of safety that must be built into the handling, storage, transport, and sale of hazardous fluids in the terminal, delivery and retail-fuelling industries. Many thousands of gallons of hazardous motor fuels are handled

every day in these industries and unsafe fuel-handling operations can put lives, communities, and the environment at risk.

The companies that design and develop equipment and systems for fuel-handling operations recognise the importance of creating a safe fuel-handling atmosphere, which has helped make these processes as safe as they've ever been. But, those companies also recognise that the pursuit of optimised safety is a never-ending one, with no time to sit back and rest on their laurels.

That's why these companies continue to work diligently to develop the next generation of equipment and systems that will further advance the cause of fuel-handling safety. In recent years, there has been a flurry of activity in this area, with

a number of game-changing innovations entering the market that have taken fuel-handling safety to an elevated level from the storage terminal to the tank truck and railcar to the fuelling site. Let's take a closer look at five of the most significant ones:

## 1. 'Smart' tank-truck monitoring systems

Historically, fuelling systems have relied on drivers to take action necessary to prevent the wrong fuel from being dropped into the wrong storage tank at the terminal or retail-fuelling site. For example, older systems instructed the driver always to drop diesel first. The development of manual product grade indicators (PGIs) let the driver know which storage tank held

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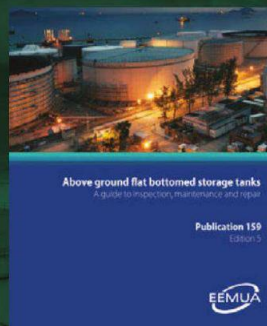
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which grade of fuel. Experience, however, has shown that hurried or distracted drivers might forget to unload diesel first, and PGIs can be imperfect with respect to indicating the correct grade of fuel.

The industry has recently begun to adopt the 'smart' tank-monitoring system. This highly engineered, digital solution consolidates driver access to the different control systems on the tank trailer – including cross-drop prevention, on-board overfill-prevention monitoring, pneumatic (air pressure) control, security, electronic PGIs, troubleshooting and usage history – operated by an easy-to-use digital touchscreen display.

The touchscreen can be securely activated by the driver – even while wearing gloves – through the entry of a unique user ID and PIN. The system becomes active during loading when the driver attaches the grounding cord to the receiving socket on the trailer at the loading terminal. Once the grounding cord is connected, the system will send a 'permit' signal to the load rack that allows loading to commence. The system is designed to alert the driver if the trailer fails to 'permit' and communicates the reason(s) why to the driver through on-screen dialogue. The trailer will only be allowed to load safely once active 'non-permit' issues have been resolved.

The system enables actual unloading once a match is made between its delivery elbow and the RFID tag that is attached to the storage tank via a wireless signal that automatically unlocks matching product unload heads and internal valves. At the conclusion of the unloading process, the touchscreen lets the driver know that each compartment is empty, which indicates that hoses, elbows, and adaptors can be safely disconnected. 'Empty' status is also stored in the system memory in case the fuel delivery is questioned by the customer.

### 2. Total terminal fluid-handling solutions

A storage terminal is more than a collection of disparate parts performing in a vacuum with no regard for what the other fuel-handling components are doing. On the contrary, a storage terminal features a series of critical fuel-handling operations and pressure points, all of which must work harmoniously in order to maximise operating safety.

With this in mind, in engineering fuelling solutions, manufacturers of the components used in a terminal must remain mindful that every link in the fluid-handling chain be capable of performing its specific duties each and every time lest the entire system fail. The following components have advanced in recent years, all with the end goal of an optimised fuel-handling experience:

- **Loading arms:** A variety of loading-arm styles – short-range hose, balanced mechanism, counterweighted hose, A-frame hose and compact torsion spring (CTS), among others – have been developed to meet the unique design and operational needs of different loading terminals. From pre-engineered standard models to the most highly customised system, all are designed to deliver a safer loading experience in which strain on the operator and threats of product leaks are minimised or even eliminated.

- **API bottom-loading couplers:** These have been designed to combine ease of loading with installation and maintenance that can be performed in a matter of seconds, not minutes or hours, with no special tools required. They are also the cleanest, safest couplers ever developed, with a goal of making product leaks and spills at disconnection or





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worker safety considerations, the high value of the fluid, or where cleanliness is a concern.

The flow shut-off mechanism within dry disconnect couplings also allows for very low flow restrictions. This design enhances flow while simultaneously reducing the risk of internal blockages, which can lead to connection malfunctions. This type of coupler also includes a safety interlock to prevent accidental opening, and a sealing arrangement that results in a drip-free

through accidental incident a thing of the past.

• **Electronic equipment:** Thanks to the advances in everything from digital ground-verification and optic rack monitors to overfill-prevention devices, it has never been safer to load or unload a tank truck at a storage terminal. These devices are designed to prevent delivery commencement until it is safe to do so and allow the disconnection of all hoses and equipment only when fluid flow has ceased.

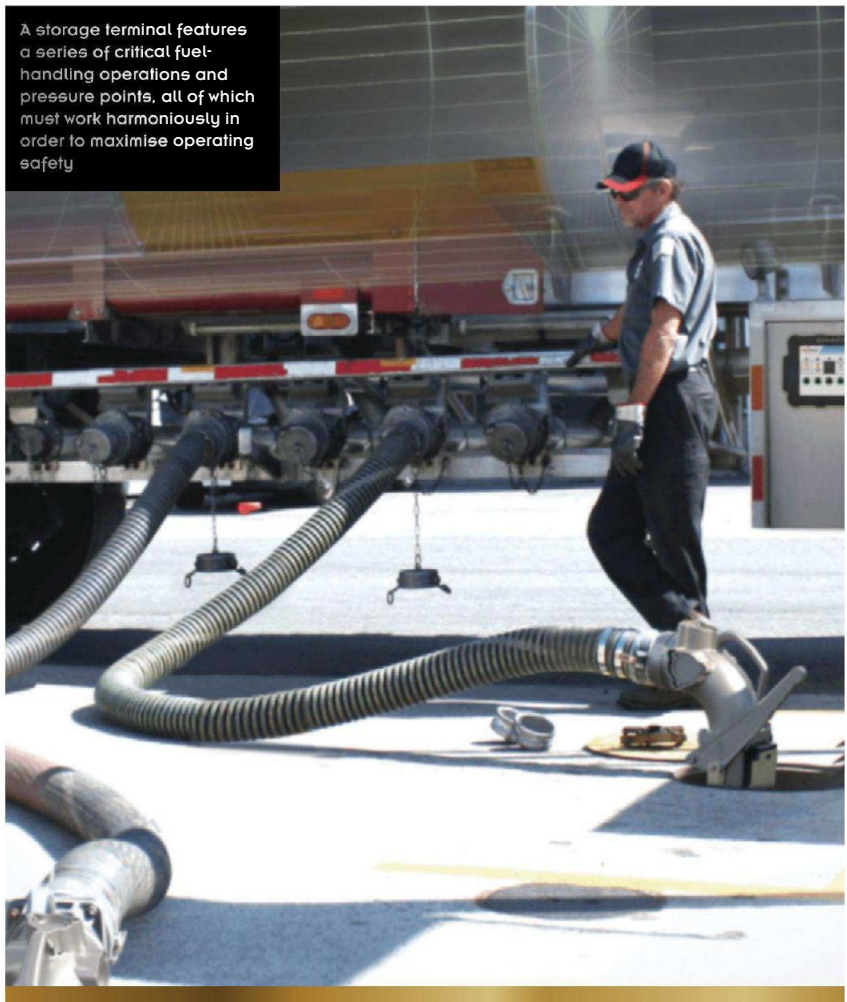
• **Swivel joints:** Manufactured for use in a broad range of fluid-handling applications in chemical, petroleum, petrochemical and refinery industries, swivel joints are used with flexible piping systems, loading arms, and hose reels, where they provide durable, reliable and safe operation in critical connection points along the fluid-handling chain.

• **Safety breakaways:** Available in direct-pull and cable-release iterations, safety breakaways provide an added layer of protection for people, equipment, and the environment from unintended tank-truck pull-away incidents that can result in a catastrophic spill of hazardous materials. The breakaways shut at both ends during a pull-away incident, which enables them to simultaneously prevent a spill and protect the loading station from damage.

**3. Leak-free dry disconnects**

These hose-connection devices feature an automatic sealing mechanism at both the hose and fixed-pipe ends when a

delivery hose is disconnected. These couplings are ideal for use in any fluid-transfer application where loss of fluid on disconnection cannot be tolerated because of environmental regulations,



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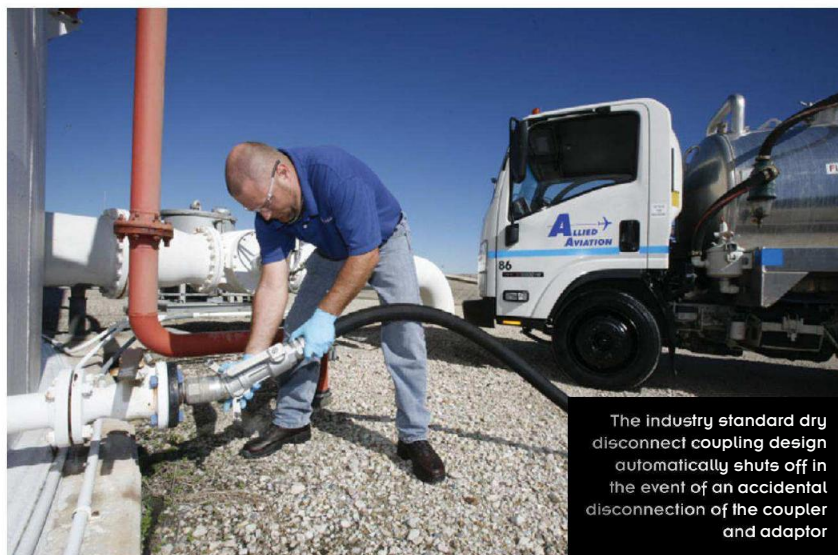


dry disconnect.

The industry standard dry disconnect coupling design automatically shuts off in the event of an accidental disconnection of the coupler and adaptor. Should this type of dry disconnect coupling be accidentally disconnected due to operator error or accident while the handle is in the open position and product flow is in progress, the poppet in the adaptor will automatically close and the seal cylinder will immediately stop flow through the coupler.

**4. Watertight fuel-storage systems**

Knowing the challenges associated with the monitoring and maintenance of underground fuelling equipment at retail- and commercial-fuelling sites, the designers and manufacturers of tank and dispenser sumps, manhole covers, spill containers, and multiports have worked



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diligently to create state-of-the-art solutions, especially where water intrusion is a constant concern.

The advanced abilities of the new age of 'watertight' fuel-storage systems and components lower the chance that they may fail, whether through water intrusion or any of a host of seismic events:

- **No-drill tank sumps:** These devices feature factory-installed conduit ports and electrical wiring junction boxes that require no drilling, which allows them to be installed as-is at the fuelling site. This

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mitigates the risk that unintended leak points are created while drilling holes for the placement of entry fittings or that leaking conduit lines may allow water migration into the sump.

• **Watertight tank sumps:** These sumps function as liquid-tight isolation containers that provide secondary containment for tank and pipe fittings, valves, and pumps. They are manufactured via a resin transfer moulding (RTM) process that creates consistent wall thickness, proper glass-to-resin ratios and ultra-smooth wall surfaces inside and out for ultra-tight waterproof sealing capability. They are outfitted with a stainless-steel ring and watertight sealing gasket for additional water-intrusion prevention capability.

• **Low-profile dispenser sumps:** These sumps offer a completely integrated, environmentally secure underground fuel-delivery system that employs pre-fabricated, factory-assembled sumps and components that support watertight operation while also eliminating many operator errors that can occur during installation. Factory-installed dual-sided,

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rigid entry fittings (REF) provide double protection by sealing the pipe inside and outside the sump. Construction featuring a rigid composite material eliminates entry-fitting degradation that can result in water intrusion.

• **Composite multiports:** Lightweight fibreglass construction resists corrosion and reduces handling strain while improving safety for the operator. They are installed over the top of tank sumps to provide spill containment for fill pipes and

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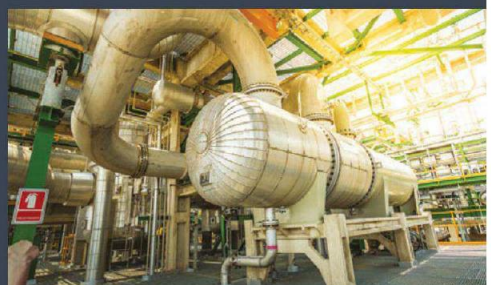
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vapour-recovery risers, while also allowing easy access to the tank top.

• **Double-wall sealable spill containers:**

These feature an integral 'plumber's plug' and double-wall sealable design aimed at preventing water and debris from penetrating the spill container at the surface. These also limit corrosion and damage to the fill and vapour-return riser connections and components, while an integrated vacuum test port allows for easy testing with no need for hydrostatic testing.

• **Composite manhole covers:** Designed to be lightweight, corrosion-resistant, and durable, the covers feature a non-bolted design with a flat gasket creating a watertight seal and ideal for use in tank-sump access, multiport, single-port fill sump and interstitial-sump applications.

**5. Cleaner fuel-nozzle technology**

The search for true 'dripless' fuelling

nozzle technology has proceeded for years, with a true breakthrough in this search recently realized via a new series of nozzles that feature a patented, free-draining spout that drains the residual fuel out of the spout and then into the vehicle when the dispensing process is halted. These next-generation nozzles have been tested and approved to meet the rigorous standards set by California Air Resources Board (CARB) for dripless conventional nozzles.

The nozzle series includes two dripless gasoline nozzle models, both of which have been engineered with patented free-draining spouts with no hidden dams or reservoirs where fugitive fuel can nest, precise fuel control, and rugged durability. These nozzles have been approved by Underwriters Laboratories (UL) and Underwriters Laboratories Canada (ULC).

For those fuelling sites that offer a diesel-fuel option, a third nozzle offers patented diesel-capture technology that allows any retained fuel in the spout to

migrate back to the diesel-capture device, which secures the fuel in a diesel-capture chamber until the next fuelling cycle begins.

### CONCLUSION

The pursuit of optimised fuel-handling safety for storage terminals, tank trucks and forecourts will never end, but the level of safety that is available to the operators in these industries has never been higher than it is today – with many more innovations promised to come.

*Keith Moyer is VP global marketing for OPW, based in Cincinnati, OH, US*

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