Advanced couplers and hazchem handling

Closed-loop systems are the safest way to prevent the leakage and spillage of hazardous chemicals and a complete portfolio of dry-disconnect coupler technologies is available to aid in that task, writes David Morrow

Without the chemical butadiene, people wouldn't be able to drive their cars, cover their floors with carpet or go scuba diving.

In other words, butadiene is one of those substances that most people haven't heard of, but without it, we would not have the synthetic rubbers and elastomers that are integral components in the manufacture of vehicle tyres, shag carpeting and wetsuits, to name just a few of many consumer goods that list butadiene as one of their ingredients.

At the same time, butadiene is also a chemical that must be handled with care at all times. Butadiene is a colourless, non-corrosive gas with a mild, gasoline-like aromatic odour. As such, it is listed as a potential occupational carcinogen by the National Institute for Occupational Safety and Health (NIOSH), and both short- and long-term exposure to it can cause a host of health issues. It is also extremely flammable in both its liquid and vapour forms.

Butadiene is one of many chemicals that must be produced, transported and stored in the safest manner possible, with no risk of physical exposure to technicians or release to the environment. This article illustrates how advanced dry-disconnect coupler technology can help reduce, or even eliminate, the risk that a chemical-release incident might occur during or at the conclusion of the loading and unloading of transport vehicles – most often railcars and tank trucks – into a storage vessel.

The chemical transport challenge

As noted, the main challenge in transporting chemicals is keeping them adequately contained. This is especially true if the chemical is transported as a liquefied compressed gas in a pressurised railcar. If any of these substances exceed their boiling point and revert to a gaseous state, they will expand, thereby putting the ability of the transport vehicle to contain the chemical at risk. This could lead to a product release and/or explosion.

Therefore, the overriding challenge for the transporters of chemical substances is to prevent them from 1) escaping the transport vehicle, whether in liquid or gaseous form, and 2) reverting to a gaseous state, if applicable, during transport.

Even so, many chemical transporters continue to rely on outdated coupler technology and 'open-loop' systems to connect transfer hoses from the transport vehicle to the storage vessel. Often, this technology is simply a technician inserting a 'stabber' pipe at the transfer point with a pipe wrench. These connections have operational shortcomings that prohibit them from being the best dry-disconnect choice, mainly that they cannot ensure that a leak-free connection has been made or that any residual product will be prevented from remaining in the coupling when disconnected.

A better alternative to an open-loop system is the 'closed-loop' system. In the closed-loop system, there is significantly less risk that product will remain in the coupler as it is disconnected, which lowers the exposure risk to almost zero, resulting in a safer chemical-transfer process.

Butadiene is an indispensable component in many common products, but its hazardous nature means it must be handled with care at all times and advanced dry-disconnect technology can aid in that task

There are two main obstacles to getting chemical manufacturers and transporters to convert from an open to a closed system of product transfer. The first one involves the "this is the way we've always done it" mindset that hampers efforts to convince people to adopt a better way.

The second is physical: most of the railcars that transport chemicals are owned and operated by third-party carriers, not the manufacturer. This means that the storage terminal must adapt its operations to meet the needs of each individual railcar. Since the product-transfer

connections 'live' on the railcars, the challenge is to get users to buy into the benefits of closed-loop systems, thereby making advanced dry-disconnect equipment standard on their fleets.

The dry-disconnect solution

Aiding the cause in convincing chemical manufacturers and transporters to upgrade to a closed-loop system is a comprehensive portfolio of advanced dry-disconnect couplers. The foundation of this portfolio is innovative flat-face poppet and double-ball-valve designs. These methods of construction help reduce the risk that residual fluid will be trapped within the coupler, lowering the chance that spills will occur and giving the liquid virtually no place to collect, which eases cleaning. Typically, there will be less than 0.5 ml (0.02 ounces) of fluid left on the face seal of the coupler on disconnection.

These couplers feature multiple safety interlocks that allow the valve to open and close only through deliberate user action, helping prevent accidental opening. And for extremely sensitive applications, an optional keyed interface locks out and isolates transfer lines so that only a specific coupler can be used with a corresponding hose or loading arm, preventing cross-contamination.

Finally, the couplers are quick and easy to maintain because they have fewer parts, which allows them to be repaired on-site with no time-consuming and costly returns to the manufacturer needed or interpretation of complicated maintenance instructions.

Here's a look at three specific advanced dry-disconnect technologies, along with the benefits that each can offer to chemical transporters:

- Flat-Face Poppet Dry Disconnects: These couplers are the most commonly used advanced coupler technology because they feature a rugged design, excellent flow characteristics and heightened product control. The flat-face poppet ensures minimal product loss at disconnection, while the fully interlocked double-safety connection system prevents opening if the coupler is not mated properly. Some models allow closure from both the coupler and adaptor side, which further reduces the risk of retention and spillage of any residual product at disconnection. Many models have been approved for use by the Association of American Railroads (AAR) and Canadian Registration Number (CRN) regulating authorities.
- Double-Ball-Valve Dry Disconnects: This design gives the coupler double-shutoff reliability, which allows them to deliver the industry's lowest product-loss rates. Integrated interlocks help eliminate unintentional disconnects that can threaten worker safety and damage the environment. The coupler's unrestricted flow path creates no turbulence during product transfer for full-flow optimisation.
- Quick-Connect Dry Disconnects: These couplers are extremely user-friendly due to quick, easy connection capabilities while also delivering minimal product loss at disconnection. They have also been designed to be interchangeable with other dry-disconnect models. Optional keyed couplings minimize the risk of product cross-contamination occurring when the same transport vessels are used to ship different chemicals.

Conclusion

Hazardous chemicals are indispensable ingredients in many products that are ever-present in our daily lives. At the same time, these chemicals must be handled with extreme care, lest the user or environment become harmed as a result of a leak, spill or catastrophic release.

Integral components in the handling of industrial chemicals are the couplers that facilitate connection points between transport vehicles and storage vessels. In this case, the use of advanced dry-disconnect technologies can greatly reduce the risk that hazardous chemicals will leak, drip or nest within the coupler during a transfer operation, resulting in a safer handling process for some of the world's most significant raw materials.

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Flat-face poppet dry disconnects help reduce the risk that hazardous chemicals will leak from or nest in the coupler on disconnection

Today's advanced dry disconnects have been designed to reduce connection time from 30-40 minutes to just 30-40 seconds