

THE LOADING ARM: AN EVOLUTION IN SAFETY

he oil and gas industry is sometimes seen as something from the Jurassic age, much like the products it deals with, an industry where innovation and development lags behind the superfast digital age. Is this perception true? Alec Keeler, managing director of Loadtec Engineered Systems, begs to differ.

INNOVATION AND SAFETY IS ITS ROOTS

The modern loading arm was invented in 1938 when Bob Wheaton and John Savage built an articulated pipe system to replace a canvas hose and swivel joint arrangement for loading 1,000-gallon horse-drawn tanker barrels carrying hops in New Jersey, US.

Until this point, rubber hoses were the main method used for fluid loading and unloading on road tankers, rail tank cars and ships (marine loading arms were first made commercially available in the 1950s). By replacing hoses with loading arms, the safety and operational efficiency benefits were numerous:

- Hoses have limited bend radius, can be catastrophically damaged through poor handling; are an environmental spill waiting to happen and more likely to become a major manual handling incident
- Loading arms are balanced throughout their movement envelope; are designed not to hit the ground – protecting the valves and couplers; carry a (negotiable) five-year warranty; allow a one-man operation; can be moved into position with ease and left hanging in the air while the operator prepares the tanker connection; are parked neatly and can have various interlocks fitted to give

warnings of arm condition or position. The method of transferring fluids has changed surprisingly little since then. What has changed though is not only the security, reliability, durability and safety of the components used, but also the operation built around a loading arm to make the process of transferring fluid safer, faster and more efficient.

In the autumn of 2015, Loadtec was approached by an international pharmaceutical company in Ireland. They had no experience



Integrated meter skid atex control system & telescopic top loading arm

with liquid tanker loading, having previously only exported in bulk powder form. They required a turnkey solution.

All the client wanted to do was provide clean-dry instrument air, 110 volts and an inlet flange. They wanted Loadtec to manage everything else.

NEW CHALLENGES

In the early 2000s, Loadtec developed a design for waste solvent tanker loading using telescopic loading arms. These were provided extensively to the pharmaceutical industry and set new standards for safe, clean and efficient tanker loading of this volatile liquid.

However, the scope was limited to the loading arm with a telescopic drop pipe and the fall prevention systems which, by then, Loadtec had their credentials firmly established for having the widest portfolio on the market.

The most recent project set new challenges for the UK-based company that it believes has further evolved the concept and pushed the boundaries of 'plug and play' loading arm technology.

In this case, the client requested that the station should:

- be designed to be the most compact size
- all necessary components at easy working height for maintenance and cleaning
- ATEX-approved custom control system to interface with the client's DCS (distributed control system), provide pre-set batch volumes and totaliser along with permissives from a number of safety interlocks:
 - Interlock #1 Loading arm not parked
- Interlock #2 Loading arm cone pressed down on manhole rim

- Interlock #3 Telescopic drop pipe touching tanker bottom
- Interlock #4 Vapour return line pressure below pre-set limit
- Interlock #5 High level probe is dry
- Interlock #6 Tanker is correctly earthed and verified
- Interlock #7 Dry line detection upstream of the control valve
- Interlock #8 Heating system at optimal temperature

LISTEN, CREATE AND INNOVATE

Rather than supply a separate meter skid to control the flow of the product into the tank, Loadtec employed a technique developed on a previous multi-position rail loading project in Saudi Arabia.

The metering and control components are all mounted on the loading arm standpost. This provides the customer with a neat solution which is shipped in two boxes to site and can be assembled in a few hours.

It further eliminates the need for site run spool pieces between the two packages and allows installation to take place in less than one day.

Loadtec also supplied a control system with batch controller which connected to the site PLC (programmable logic controller) providing assurance to the operators in the control room that all the loading conditions had been met before loading commences. Because the loading process would take a number of hours, the panel was designed to be fully automated but also readable by a security camera watched by a remote operator.

The starting point was the platform, this included a large working area, double flight stairs to ground and a canopy over the working area.

This arrived at site from Loadtec's UK facility in a semi-pre-assembled state. Site time involved bolting the sub-assemblies together and mounting on the foundations.

Next the folding stair, meter skid and top loading arm delivered from the Zip-Load factory in Italy.

These all arrived and were installed by the site team following the IKEA-type instructions provided. The final visit by a Loadtec Service commissioning engineer was to set up the system and ensure everything was working in line with the operating philosophy.

INSPIRATIONAL TECHNOLOGY

Uniqueness in this market is uncommon. Virtually all designs are an adaptation of a previous solution. In this case the design has been very much an evolution, created by a customer need that was listened to, developed and well presented as a solution.

While this solution was developed for the pharmaceutical industry, waste solvent is a chemical and this technology is something that can and should be easily adapted into the oil and gas market today.



Detail view on control valve position indicator



Rear view of meter skid

Uniqueness in this market is uncommon. In this case the design has been very much an evolution The compactness of the design certainly had its own challenges and the Loadtec engineers utilised Solidworks systems to ensure that everything went together seamlessly. Once built, the system was fully tested in the client's presence for flow and interlock viability at our test facility in the factory.

This meant that the unit could be tested at full flow, physically disrupt all the interlocks, both in turn and in combination, to witness the behaviour of the control system and valves. It also allowed for the simulation of real world issues that can arise during normal tanker loading.

FOR MORE INFORMATION

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