CHOOSING THE RIGHT LOADING ARM SYSTEM

A lot of time, thought and effort is needed when identifying a solution that optimises terminal operations, says OPW's David Morrow

IMAGINE seeing a notice asking for symphony orchestra musicians to be at a concert hall on a certain day and time, prepared to play Beethoven's Fifth Symphony, without rehearsal. The individual musicians who responded would likely have the talent and some past experience, but the performance as a whole would be disjointed.

Now try outfitting a storage terminal in the same manner, selecting loading-arm system equipment that probably should work well together, but with no past experience. The operation of that equipment would probably be about the same as the sound of that thrown-together orchestra – out of tune and disjointed. However, the orchestra can practice to get better, whereas an incompatible loading arm system has no chance of improving without major (and costly) design modifications.

Achieving a system in which all components work seamlessly in a system that is efficient, easy to operate and safe for the user – takes a great deal of time, due diligence and native knowledge.

KNOW THE BASICS

While all facilities that load and unload railcars and tank trucks (storage terminals, chemical plants, refineries, etc.) serve the same basic function, each one is unique in its operational design and setup. This means that the ones that are truly able to achieve and maintain elevated levels of efficiency, reliability, safety and ergonomic operation are those that have managers who put in the hard hours in order to determine the best loading-arm system to deploy.

In general, there are three variables that must be considered before selecting the loading arm system.

- **The site:** It's a cliché, but it's tried-and-true: The 'location, location, location' of the loading racks will be the main determining factor in which type of loading arms will be able to be used, along with where all ancillary equipment and structures will be positioned. After determining the number of loading positions, the system designer must choose the best spot for the risers, which are the foundation of the system. If several arms are to be used, all risers must be located so that they do not interfere with the operation of the other arms. The arms must be positioned so that they can move up, over and around any possible obstructions, from light poles, support columns and power lines to meters, gangways and safety cages, as well as fit under a roof if it is a covered application. Loading arms can be heavy, so proper structural support must also be built into the system design.
- **The product:** The specific facility can feature a range of products, all of which have different handling characteristics. Liquids with water-like viscosities will need to be handled differently than those with the consistency of molasses, while hazardous or corrosive liquids need compatible equipment. Some liquids will thicken, crystallise or even freeze as ambient temperatures change, so may need a heat-tracing system or steam jackets. The loading arm system must also be able to reliably produce desired flow rates, which goes hand-in-hand in determining the actual size of the piping that will be needed.
- **Transport:** The setup of the facility will pre-determine the method of loading and unloading, either bottom or top. Bottom loading is the preferred method for petroleum products because trucks are standardised, while top loading is more common in chemical-handling applications. In either case, it is good practice to walk through the entire loading/unloading process to determine what an ideal process looks like. Bottom loading connections are also easier to perform, and if the transport has several compartments, overall loading/unloading time will be reduced. Bottom loading bays also require less equipment and poured concrete, which makes them more economical. In the instances where top loading is used, the loading system must have enough horizontal range so that the arms can reach the farthest compartment without needing to respot the vehicle; the system must make mis-spotting a rare occurrence as any need to relocate the railcar or transport truck is lost loading/unloading time. The facility operator must also consider how the product will be top-loaded, either splash-filled through an open manway or through a hard connection. If hard connections will be used, the operator has many options available: hard or soft connection, quick- or dry-disconnect technology and whether any valving will be needed. Finally, a level detection system is normally recommended as a secondary shutoff that reliably indicates when the loading process is completed. Overfills lead to spills and unsafe working conditions, with the potential to do harm to the environment and surrounding communities.

Some final general considerations include whether special non-destructive testing of the loading arm equipment is required; are any special welding procedures

needed; is insulation designed to protect the operator from handling hot piping required; will any additional weight be added to the loading arms after installation; and will there be any need for connections to aid in venting or blowing down product from the arm at the end of the loading/unloading process.

A PETROLEUM PRODUCTS CASE STUDY

A high-volume bottom loading terminal in Kentucky, US, originally built in the 1970s, had undergone a number of upgrades, expansions and reconfigurations to its truck loading lanes. These modifications had ultimately resulted in an unorganised loading system layout with poorly spaced and incompatible arms. This led to loading inefficiencies while putting increased strain on the drivers via the non-ergonomic system design.

The terminal operator and the loading arm system provider determined that the biggest issue was the fact the loading arms did not effectively cross over one another. This meant that it had become difficult for the drivers to access the required arm without needing to move other arms out of the way first, or to load more than one compartment at a time.

A new layout design was created featuring short-range hose loaders that allow simultaneous connecting to and filling of three product lines. Dry-break API couplers (see sidebar) to ensure reliable and easy connection to a tank truck or railcar were added. New mounting risers for the truck lanes were designed that enabled the loading arms to be installed in the optimal mounting configuration.

Today, the redesigned loading system has arms that are able to cross over and clear one another, which allows easy access to the desired arm and the ability to quickly and efficiently load multiple compartments at the same time. The arms store and balance at roughly the same height as the truck adaptors, meaning that little effort or strain is required from the drivers in order to connect and disconnect the arms. With all of the new system's components sourced from the same supplier, it is easier to order, stock and track spare and replacement parts. And all of this took just six weeks from purchase order to installation.

CONCLUSION

A storage terminal must be designed with the needs and layout of the site, as well as those of the individual components, in mind. It's much easier to find that harmonious balance if all loading-arm system components are sourced from the same supplier, one that has many years of experience designed and engineering systems that meet the needs of every unique installation.

For more information:

David Morrow is director of sales for OPW Engineered Systems, Lebanon, OH, part of Dover Corporation's OPW division. He can be reached at (800) 547-9393 or David.Morrow@opwglobal.com.

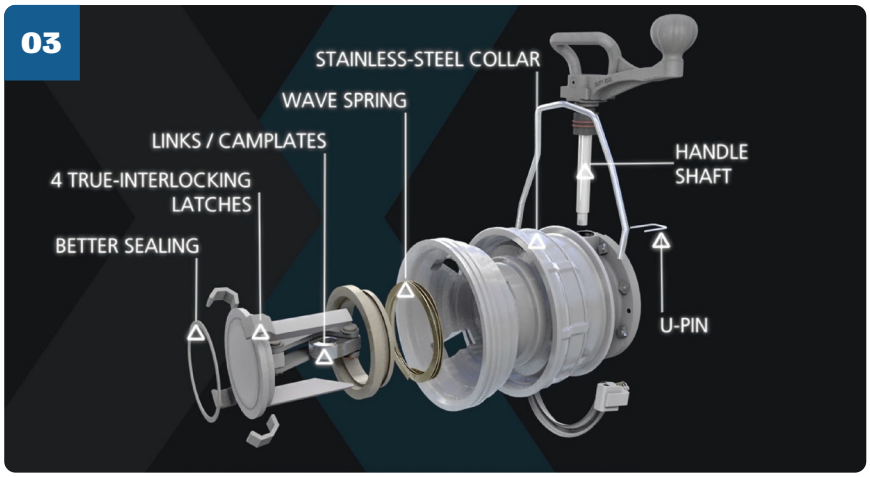
OPW is the global leader in fully integrated fluid-handling, management, monitoring and control solutions for the safe and efficient handling of critical petroleum-derived fluids from the refinery to the commercial and retail points of consumption.

www.opw-es.com

01 The site of loading arms is critical in optimising their functionality. Every site will have a unique operational design and setup

02 When using several loading arms, all risers must be positioned so the arms do not interfere with each other

03 An API coupler, with a unique U-pin for quick coupler assembly and disassembly, as well as a wave-spring design for improved durability



COUPLERS: UNSUNG TERMINAL HEROES

Bottom loading API couplers serve as the conduit between the loading arms and the tank truck or railcar. It is not unusual in busy terminals for the couplers to be attached and disconnected more than 50 times a day. Terminal operators are encouraged to make every effort to ensure that the couplers and their components are cared for so operations run smoothly. Terminals that experience excessive interruptions in their liquid transfer service due to malfunctioning couplers can't meet the demanding delivery schedules of their customers, with lost revenue for both and a loss of reputation.

Today's next-generation of advanced API coupler models combine all of the best features of legacy models into one device that is capable of consistently producing a superior and effortless bottom loading experience. Key features of these advanced designs include:

- A unique U-pin that allows coupler assembly and disassembly is as little as 30 seconds
- In-field replacement of the main seals, on or off the arm
- Wave-spring design that will last three times longer than competitive models
- Durable stainless-steel collar and anodised aluminum body for increased durability and life
- 'True interlocking' stainless-steel latches that ensure leak-free coupling and product containment
- A wide variety of seal materials, including fluorocarbon, Buna-N (nitrile) and FKM
- Ergonomic operating handle that puts less physical strain on users

The million of gallons of liquids of all types that pass through a storage terminal every year would have nowhere to go without API couplers. That means their design and reliability must be unquestioned if the terminal is to feature a truly efficient loading rack operation. Next-generation API couplers that can improve loading rack efficiency, cost-effectiveness and safety are now being recognised as true heroes in the terminal universe.