Finding the right balance

How NuStar optimised its railcar loading operations at its US terminal in California

NuStar has terminal operations across the country and its Stockton facility in California is one of its largest. It features 33 storage tanks, with a total storage capacity of nearly 900,000 barrels, for a mix of petrol, diesel/ULSD, ethanol and aviation fuel. It sports a three truck loading rack with nine loading lanes, as well as two rail spurs with 16 loading/unloading positions. The facility also offers automated additive and dye-injection services, truck scales and dry warehouse storage.

'We had a customer ask us if we could move red-dye diesel fuel by rail to a mining site in Nevada,' explains Dan Thomas, terminal manager at NuStar's Stockton facility. 'We could and we began by transloading the red-dye diesel via a fleet of trucks that would fill up at our truck rack and then drive to the rail siding, where they would be pumped off with a portable pump into the railcar. We would need to use three trucks running a continuous loop from the truck rack to load one railcar.'

This was not only a repetitious process, but also a time-consuming one. As only one truck could be unloaded at a time, it would take more than 10 hours to load five railcars. Since the railcars were being bottom-loaded from the trucks, there were also ergonomic and safety concerns for the technicians who were facilitating the loading process.

'Once the contract was finalised for the red-dye diesel, and we saw how long it was taking to get those railcars loaded, we knew we would build a new rail siding,' adds Jude Singleton, NuStar's engineering manager.

The plans called for the new rail siding to feature six loading platforms that would be fed via a pipeline which would run directly from the storage tanks. After that was in place, the next question was: 'What type of loading equipment would be used to outfit the platforms?'

The Stockton terminal's new rail siding features six loading platforms

A trio of challenges

For assistance, NuStar turned to US-based flow-measurement and control equipment provider PFT-Alexander.

'NuStar contacted us for the complete fabrication of the platforms that would provide top access to the railcars, and also for the loading arms,' says Kathy West, sales for PFT-Alexander.

There were three main considerations that had to be satisfied when selecting the loading arms:

1. They had to be long enough to easily extend out to each of the railcars positioned on the siding.

'The arms had to be able to accommodate different railcars because no two are the same,' says Thomas.

2. The drop tubes on the loading arms had to be long enough to reach the floor of the railcar when loading operations were taking place.

'The drop tube had to go to the very bottom of the railcar's interior to ensure safety from static,' says West. 'When the drop tube goes that far and the fuel is discharged there, there is a better flood of the compartment to eliminate static. If a railcar

has petrol vapours and you drop in diesel, it could explode. By telescoping the arm all the way to the bottom of the railcar, you help eliminate or negate any vapours that may remain.

3. The loading arms had to have torsion-spring operation, rather than pneumatic.

'When we were looking at the selection of the loading arms, with the length, reach and travel that we needed, there was a limited number of solutions, many of which needed an air-operated actuator,' says Singleton. 'However, there is a lot of additional cost when you have air-actuated assist because you have to pay for air, so we were looking to go with a torsion-spring design.'

Finding a balance

As fate would have it, at the time NuStar was planning its new railcar-loading platforms, US-based OPW Engineered Systems, manufacturer of systems for the safe and efficient loading of hazardous materials, was releasing its new 890 Series Hi-Load Counterbalance to the market.

OPW-ES designed the 890 Series Counterbalance for loading arms that are required to handle extremely heavy loads and travel a long distance. The 890 Series has a high-load spring that means it does not require the pneumatic system that is typical for loading arms that have a longer reach or additional weight.

The high-load spring technology allows the 890 Series to handle roughly 50% higher load capacities without worrying about the dangerous drift that can compromise load stability. Maintenance is also simplified as any spring-tension adjustments can be completed by one technician, armed with just a socket wrench.

'When we suggested the 890 Series, NuStar liked the idea of not needing to have additional support structures on the platforms, which can make them harder to operate and also saves money,' says West. 'This is also a long-reaching boom arm with 15ft of total extension. They also liked the ability of the swivels to enter into the top of the railcar. The loading arm is also easier to move around, stow and handle, is lighter and more maneuverable. The drop tube also has large D-style handles. One of the operators told me that he feels confident handling it, that it doesn't feel like he has to yank on it to move it.'

'This is our first attempt using this kind of spring and it's working well,' adds Singleton. 'We were really nervous we would go over budget if we had to use pneumatic counterbalances with air actuators.'

Looking at the bigger picture, the new loading system is not only operating at a high level, but its design is also enabling NuStar to optimise its railcar-loading operations.

'The operators are ecstatic, the customers are impressed – they call it first-rate,' says Thomas. 'This new loading system has dropped the loading time from five cars in 10 hours to six cars in under four hours. The system is also ergonomic for the operators so they're no longer getting under the railcar since we're now top-loading through the boom arms.'

Singleton believes once the terminal technicians become completely familiar with the loading system they will be able to load two railcars simultaneously at a maximum of 750 gallons (2,840 litres) a minute in less than an hour, including the time spent on hookup and disassembly. That means that six railcars will be able to be loaded in less than three hours, less than one-third of the time that was previously needed to transload five railcars off of tanker trucks.

Dan Thomas, terminal manager at NuStar's Stockton facility, says he can't be more pleased with the new loading system

The 890 Series has been designed for loading arm systems that need to handle heavy loads and travel long distances

For more information:
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