CRYOGENIC INDUSTRIES

FROSTBYTE

Newsletter from Cryogenic Industries | Fall 2015

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This case began during an informal discussion of the various pumping methods available for unloading containerized cryogenic tanks placed on top of a semi-trailer. We discussed the advantages and weaknesses of the most commonly used, hydraulically driven centrifugal pumps with a mechanical shaft seal. This pump drive system is often preferred, particularly for handling LNG, since no electric power is involved. Since there is no guarantee that a mechanical seal won't leak, the use of a gastight, sealless pump offers more security in the hazardous environment when handling LNG. In our opinion, the best choice of submerged motor pump is an ACD TC-34. Then there is the issue of where to install this pump with its sump, on a standardized containerized tank.

Our clientõs perspective was there is not sufþcient space within the restrictions of a standard 40 foot container tank frame, which was designed to provide the maximum possible liquid volume. Locating the pump at either end of the tank would reduce the payload of the container and require costly re-designing. However, the ACD TC-34 can be installed inside the transport tank. In fact, a customer in the USA had already done so. That meant there would have to be some kind of manhole through the double-walled cryogenic tank in order to reach the pump for installation and for maintenance.

ACD CRYO suggested they place the TC-34 in a horizontal position and in a horizontal sump somewhere outside, but at the end of, or underneath, the container. Although the TC-34 is designed for operation in a vertical position, the American customer had already established that the TC-34 can be used in a horizontal position, albeit with a reduced number of operating hours (due to an accelerated wear of the bearings).

Coincidentally, ACD CRYO was approached some months later by a representative of a German company, who was also a specialist in the transportation and distribution of LNG in Europe. They were looking for a better solution for transport of LNG with a containerized tank on a chassis, complete with a pump system that could be used both for re-fuelling and bunkering purposes in a mobile installation. They too were interested in the idea of using a horizontal submerged motor pump.

The main challenge here was to design and construct a suitable horizontal sump with an adapted vacuum-insulated closing plate and the necessary devices to support the horizontal pump both inside the vessel and against vertical loads and shocks from the road. This also had to be done in such a way that the pump could be removed relatively easily for regular maintenance, without causing signiþcant downtime, and still create an overall pumping system with a minimum amount of gas loss during operation and standby. All lines and valves between tank and pump sump are vacuum insulated, and the installation incorporates a ÿow meter and a calibrated and approved LNG dispenser.

Another objective was to develop and build compact electric control equipment to be mounted in the container which would incorporate the variable frequency converter required to drive the pump's special VFD motor. This electric control system had to fulþll various European standards and regulations, including ATEX, and be þtted in the limited space alongside the tank inside the container frame. As the client had already gained experience with this kind of installation, they decided to carry-out this task themselves.

As usual with these kinds of new developments, it took longer to realize all this than anticipated but in approximately a year the two semitrailers were handed over to the client for þnal adjustments and testing. The entire installation was approved by TÜV. This mobile LNG fuelling station was built and operated in accordance with the ADR Dangerous Goods regulations (òGefahrgutrechtó), and fulþlls the requirements of PED directive 97/23/EG.

After the successful completion, the semitrailers were driven to Poland, where they are now in service as a mobile LNG re-fuelling station for a Polish city bus company in Warsaw.

For further information go to www.acdcryo.com