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### The New Generation of Self-Pressurized Delivery Systems for MicroBulk and Small Bulk Distribution

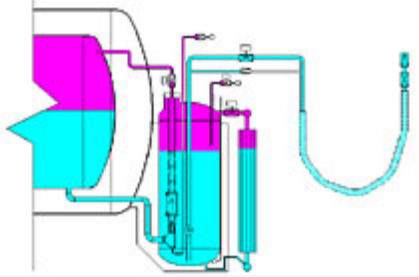
Timothy A. Neeser
Director, New Product Development and Marketing

Chart Industries
Distribution & Storage Division
407 7th Street N.W.
New Prague, Minnesota 56071
U.S.A.

As the MicroBulk market evolves into a globally accepted mode of gas delivery, there is a demand for an improved system over the external and submersed pump designs. The drivers are simple: the pump and its associated power distribution are too expensive and too costly to maintain where the economics just can't afford it. While the submerged pump is an order of magnitude better than an external pump in terms of cooldown losses and maintenance frequency, all pump systems are relatively high cost and limit the utility of MicroBulk over a full range of end user applications. The new pump-less alternatives developed by Chart expand the application in MicroBulk.


It all starts with the creative concept of adding a small vertical tank on the back end of the horizontal main tank. This additional smaller tank is known as the "pulse tank." It integrates

in a common vacuum. The main tank operates at the typical road-relief pressure of 25.3 psig (1.7 barg), while the pulse tank operates at a higher pressure, 325 psig (22.4 barg). When the pressure in the pulse tank is less than the pressure in the main tank, low pressure liquid flows past a check valve into the pulse tank, where it is held ready for dispense into a MicroBulk vessel.



When the pulse tank is full (300 liters), the operator initializes the external pressure-building circuit by opening a high flow automated valve. To expedite the pressure rise of the pulse tank, a large custom-engineered external vaporizer is utilized. Because the tank is vertical (creating high head pressure), the cryogen easily flows into this vaporizer, quickly pressurizing the pulse tank at rates of 100 psi/min (6.9 bar/min). Once at the preset delivery pressure of 100 psig (6.9 barg) over the receiving tank pressure is reached, the low saturated cryogen in the pulse tank can be dispensed to the MicroBulk tank in 300 liter "pulses" at 40 gpm (150 lpm). If more "pulses" are required, the pulse tank is depressurized, refilled, pressurized and dispensed, all within a seven-minute cycle. Losses during depressurization of three to five percent are expected depending on receiving tank pressure, gas service and other delivery variables.

This self-pressurized system allows low pressure, quality cryogenic liquid to be delivered to MicroBulk tanks

like Perma-Cyls® with a single hose and no loss transfer - all without the high costs and down times associated with pump systems. The ORCA PT1000 and its platform have defined the "next generation" in delivery systems for this market.

**XT2500**

A further enhancement of this system allows the liquid in the pulse tank to be directed to a larger capacity vaporizer for fast pressure rise of the main tank, which operates up to 225 psig (15.5 barg). This feature is designed into the ORCA XT2500, so liquid can be quickly dispensed from the larger horizontal vessel at rates of 60 gpm (227 lpm) into large Perma-Cyls and small bulk tanks, through a separate high-flow hose. The ORCA XT2500 also allows dispensing from the pulse tank for small Perma-Cyl deliveries. In addition to lower life-cycle costs, these new generations of self-pressurized ORCA delivery systems work in oxygen service as well as inert service for better asset utilization.

To learn more about this product, visit www.microbulk.com.