

**Industry:** Government

**Application:** Cryogenic Injection

**Product Descriptions:** Lance assembly with right-angle TFXW nozzle

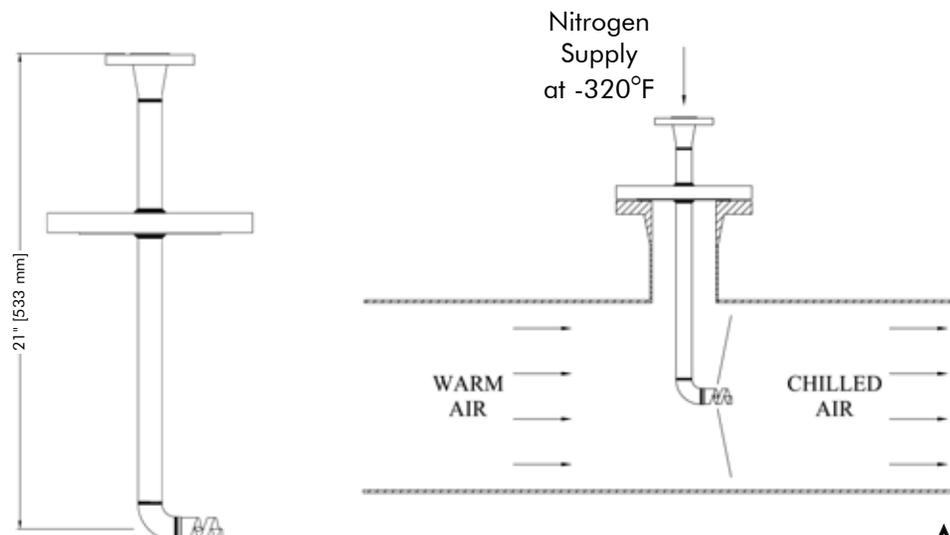
**Situation:** A BETE customer needed to inject liquid nitrogen into a pipe to maintain the airstream within the pipe at a constant, depressed temperature. The necessary range of flowrates was wide, with only a small pressure range, and the nitrogen needed to be dispersed throughout the airstream to cool it uniformly. Any solution provided was required to meet process piping code B31.3 and designed for an operating temperature of  $-320\text{ }^{\circ}\text{F}$  ( $-196\text{ }^{\circ}\text{C}$ ).

**BETE's solution:** Subsequent to initial contact and recommendation, a BETE customer submitted a sketch of the proposed injection system to the BETE Application Engineer. Upstream of the injection point, the nitrogen flow was controlled by a proportional valve based on feedback from a downstream temperature sensor. As the flowrate could get very low, the Application Engineer expressed concern about the liquid nitrogen flashing to vapor across the valve. The customer indicated that it may very well flash to vapor. The presence of vapor in the injection stream rather than pure liquid changed the capacity of the nozzle and the style. The construction of the spiral TFXW makes it suitable for liquid flow and/or vapor flow, providing a good distribution in the pipe regardless of the composition of the inlet stream.

After the nozzle capacity was recalculated to account for multiphase flow, the customer inquired if BETE could provide the entire lance or only the nozzle. BETE's long history of providing fabricated solutions enabled us to provide the entire lance. While the special low temperature requirements may have hindered other companies, BETE's familiarity with the relevant fabrication codes and our exceptional welding capability yielded a ready-to-install fabricated assembly qualified to B31.3 with a design temperature of  $-320\text{ }^{\circ}\text{F}$  ( $-196\text{ }^{\circ}\text{C}$ ).

### Technical Questions?

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