

# New Mobile Gas Processing Solutions for the Industrial Gas & Power Industries

At Cryoquip, we see the opportunity in every challenge. We take pride in applying innovation to developments in our industry as they arise. As more industrial gas consumers have expanded farther away from the traditional liquid source of the cryogen, new solutions were needed to meet their specific needs. One efficient solution was the development of specialized mobile equipment. We worked to address customers' need for options for conducting essential processes without fixed equipment. We also factored in different environments and settings for the operation of these tools. In the past few years, Cryoquip has seen a marked rise in the number of customers benefiting from mobile solutions. Some of the various types of equipment we have engineered and delivered to customers in response to their needs are discussed below.

Mobile vaporization or regasification of either liquid nitrogen or liquefied natural gas has been experiencing rapid growth. Historically, most industrial gas applications have involved a dedicated air separation unit (ASU) supply of liquid cryogen, a liquid pipeline or a delivery via trailer. All three of these methods have a common fixed point in that they rely on a permanent, stationary vaporization installation. This configuration becomes impractical when purging of process equipment (such as chemical reactors, pipelines and other chemical plant processing equipment) is required for maintenance services. In addition, a permanent purge line cannot be justified due to high cost and limited plot space. In situations such as these, a liquid cryogen trailer and a separate vaporization trailer are brought onsite for the temporary purging process. A vaporizer can also be utilized to provide gas to downstream customers, when a portion of an upstream pipeline must be taken "offline" for inspection or repair. This can be either a regional, low pressure supply line or a mid-to-high pressure natural gas transmission line.

Other areas of growth and usage are for mobile asphalt plants.

Figures 1-4 show a recent mobile nitrogen vaporization system custom designed for a large industrial gas company. The unit features a nominal vaporization capacity of 2,300 Nm<sup>3</sup>/h of liquid nitrogen per vaporizer. It includes dual liquid inlets and gas outlets on both the rear and center side portions of the trailer. This configuration allows for ease of access for operation, regardless of the orientation of the trailer to the job site. The system also features a fully-automated control panel and a three-way valve that provides automated switching between units, as well as offering manual override capabilities. Other noteworthy features include custom fabricated large hose storage racks on each side of the trailer, a drop-down ladder, gas regulation and flow measurement capabilities.



Figure 1- Trailer mounted natural draft ambient system



Figure 2 - Controls, ladder and hose racks



Figure 3 - Horizontal fan ambient vaporizer



Figure 4 – Ambient with three circuits in one frame



Figure 5 – Horizontal fan ambient in operation



Figure 6 – Range of mobile natural gas fired vaporizers & trim heaters

Other scenarios need different solutions. In remote areas where higher flow rates are required, a forced convection solution can be proposed to meet customer requirements. Figure 5 shows a horizontal fan ambient system. This unit is unique in that it offers the capability to house four circuits, or zones, within one ambient vaporizer frame. Each zone has its own dedicated fan as well as internal geometry to properly distribute the air for optimum heat transfer efficiency. The advantage of four zones is that it allows the end user to switch between zones on a 3 ON /1 OFF method of operation. This allows for near continuous runtimes at flowrates up to 5,000 Nm<sup>3</sup>/h, all within a single frame.

In colder climates, where ambient vaporizers are not the most efficient solutions due to limited trailer space or when higher discharge temperatures are required, miniature gas-fired vaporizers can be offered. (Figures 6 and 7) These units have a dedicated natural gas burner, process bundle, and glycol-water tank for low ambient conditions, as well as a circulation pump and gas discharge monitoring capabilities. With this technology, we incorporate two decades of knowledge from our large plant backup fuel-fired vaporizers and repackage it into a smaller, modular solutions. In addition to the small gas-fired vaporizers, Cryoquip has developed an even smaller burner system for trim heat capabilities, such as after an ambient vaporizer. These units have found particular success when used in remote oil well production activities to supplement temporary, large-scale vaporization events.

Cryoquip serves customers throughout the world with custom designed mobile vaporization systems. The above are just some examples of how our units can be scaled for flowrate, operating pressure, etc., to meet the end user's unique requirements.

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Figure 7 – Trailer mount natural gas fired water bath vaporizers