

Fuel Fired Water Bath Vaporizers: “New tricks for an old dog”.

A review of the many diverse new features and applications for the Cryoquip VFTU Series

The VFTU Series is a fully-engineered, automatic vaporization system which has been an important part of Cryoquip's range of heat exchanger systems for many years. VFTU products are designed to provide reliable service in the full range of modern day process and back-up applications.

Each VFTU unit provides fuel fired vaporization capacities to 5,000,000+ standard cubic feet per hour (131,500 NM³ / HR) for liquid Nitrogen (LN₂), Oxygen (O₂) and Argon within a single system. The water bath tank, process bundle(s), burner system, and controls are all contained in one package with no external piping or boilers and are rated for full outdoor duty. The VFTU Series vaporizer can be designed for other cryogenic fluids such as LNG.

A recent project had some unique requirements, which included a stacked installation, low noise criteria, and a triple redundancy in control logic permissives. VFTU's are typically installed at ground level, however space limitations required this customer to install one unit on a platform above another unit at ground level. The customer wanted reduced noise, which was accomplished by installing noise abatement materials, blower silencers, and noise reducing blower jacketing which are optional features on the VFTU Series.

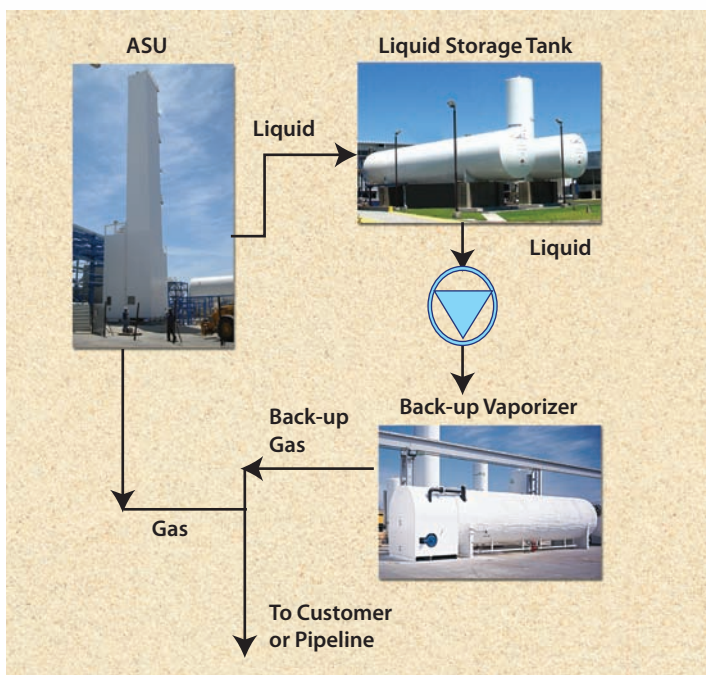


Figure 1

The VFTU Series can be used as a process or a back-up system vaporizer (see Figure 1), providing backup system for an ASU, to produce gaseous nitrogen, oxygen, and argon, as seen in the diagram. The gas is fed directly to the customer or to a pipeline and a back-up supply of liquid nitrogen, oxygen, and argon is stored in cryogenic storage tanks. When the ASU goes off line (either due to malfunction or maintenance), the liquid is pumped from the storage tanks through the VFTU backup vaporizer to maintain a seamless supply.

VFTU units are used in the manufacturing of steel, chemicals, and electronics, and other products.



Multiple exchanger bundles can be incorporated within the same system to accommodate multiple process streams, pressure builders, waste streams and specialty mixes. The VFTU Series is designed to accommodate any combination of these bundles running at any one time and at any flow turndown for maximum flexibility. The removable process bundles are made of stainless steel U-tube construction containing unique SPIRO-VANES, which promote highly efficient vaporization. U-tube construction results in low stress cryogenic design and long service life. Process bundles are provided to all world-wide pressure vessel code certifications. Standard is ASME Section VIII, Div. 1.

Emergency ballast water volume can also be included within the design such that up to 30 minutes or more of process runtime can be provided, even if the burner system is disabled due to fuel or electrical power interruption. Extended water ballast volumes provide emergency operation time without any utilities.

The VFTU includes the latest in automated burner flame safeguard controls and fuel trains to meet NFPA 85, FM (Factory Mutual) and IRI (Industrial Risk Insurer's) codes. The standard flame safeguard system, designed by Honeywell, has an Expanded Annunciator for pinpoint troubleshooting and burner status. The complete burner system is housed in the tank end-mounted burner shed with access doors for added protection from weather elements in harsh environments. A central NEMA 4 control panel is located on the outer burner shed wall. Whether used as a pipeline back-up supply or as the prime process vaporizer, the VFTU Series offers the reliability, package design and capacity range to meet most any need.

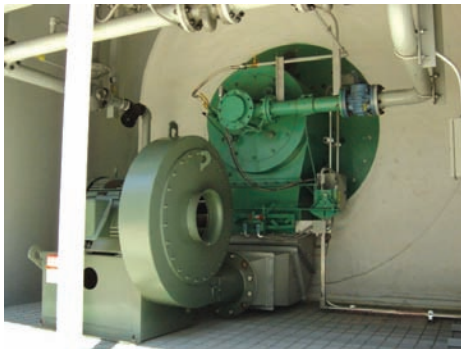


Figure 2

Some standard VFTU features include a completely pre-wired and assembled system in one integral package with integral burners, process bundles and controls. Burner choices include single 100%, dual 100% or dual 50% burner system packages (see Figure 2). There is also an efficient integral fire tube heat transfer design with nominal efficiencies of 80% for low fuel cost consumption.

All VFTU units undergo full-fire functional testing at Cryoquip factory prior to shipment. They also come with remote alarm status via dry-contact.

Optional VFTU features include -

- Low NOx emissions for the most stringent worldwide emissions locations
- Severe duty motors can also be used for the blowers and water circulation pump
- Dual 100% redundant and independent burners can be installed for maximum back-up reliability
- Expanded remote annunciation options of Data Highway RS-485 link (MODBUS)
- Blower silencer options are available for reduced noise level locations
- Hazardous area ratings are available for Class 1, Div 2, Grp D locations.
- Burner fuels are natural gas and propane gas.

Cryoquip also offers a very special VFTU design which is used for acoustic horn testing within the aerospace industry (see Figures 3, 4, and 5). Acoustic horns are strategically placed around a test room with the test specimen in the center. While table shakers are typically used for simple vibration testing, acoustic horns are able to create vibrations across extreme spectrums from various angles to simulate more complicated scenarios such as payloads on a rocket or shuttle launches. Gaseous nitrogen at a specific flow and temperature is passed through the horns to create intense noise for vibration testing. The discharge temperature tolerance of the nitrogen is extremely important for the horns to work properly. To achieve this tight tolerance of $\pm 5^\circ \text{F}$, a cold water bath temperature design is used, which requires an intricate internal icing design. Our specially designed VFTU vaporizers are ideal for this application because they offer large-scale vaporization and the required colder exit temperature control in a single package.

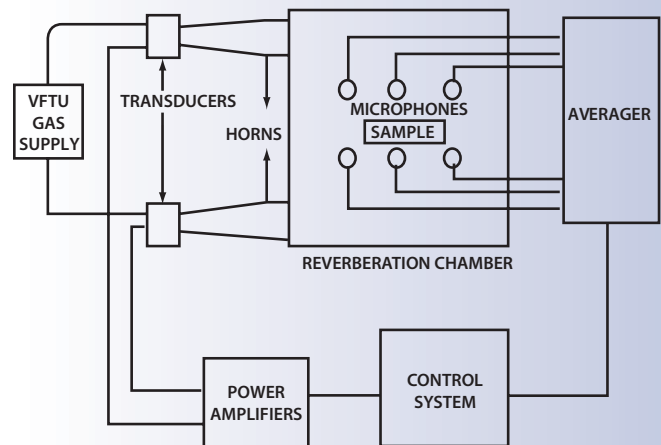


Figure 3 (Courtesy JPL)



Figure 4 (Courtesy JPL)

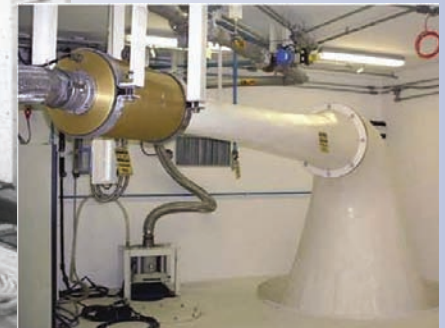


Figure 5 (Courtesy of Integration and Testing Laboratory, INPE, Brasil)

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