



CLEAN ENERGY SOLUTIONS

a **DOVER** company



Hydrogen Solutions

A Leading Provider of Precision Engineered Cryogenic
Solutions for The Hydrogen Economy and Other Dynamic,
High Growth End Markets



Acme Cryogenics Capabilities

Focusing on the Liquid Hydrogen & Helium Economies, Bio-Cryo, Space Launch Services, Satellite Constellation Expansion, Niche Food Beverage, Specialty Manufacturing, and Electronics industries.

- **Highly Customizable**
- **Expert Service**
- **Top Quality Value**
- **Parts For Every Need**

Providing comprehensive gas solutions for all your gas and liquid handling needs, including LIN/LOX/LAR/LCO2/LNG/LH2/LHe.

We specialize in unique solutions that can be developed without putting pressure on engineering resources.

Products

Mission critical products and services that facilitate the production, storage, and distribution of Cryogenic liquids and gases.

 **Vacuum Jacketed Pipe**

 **Cryogenic Valves**

 **Cryogenic Manifolds**

 **Vaporizers**



Vacuum Jacketed Piping Systems (VJP)

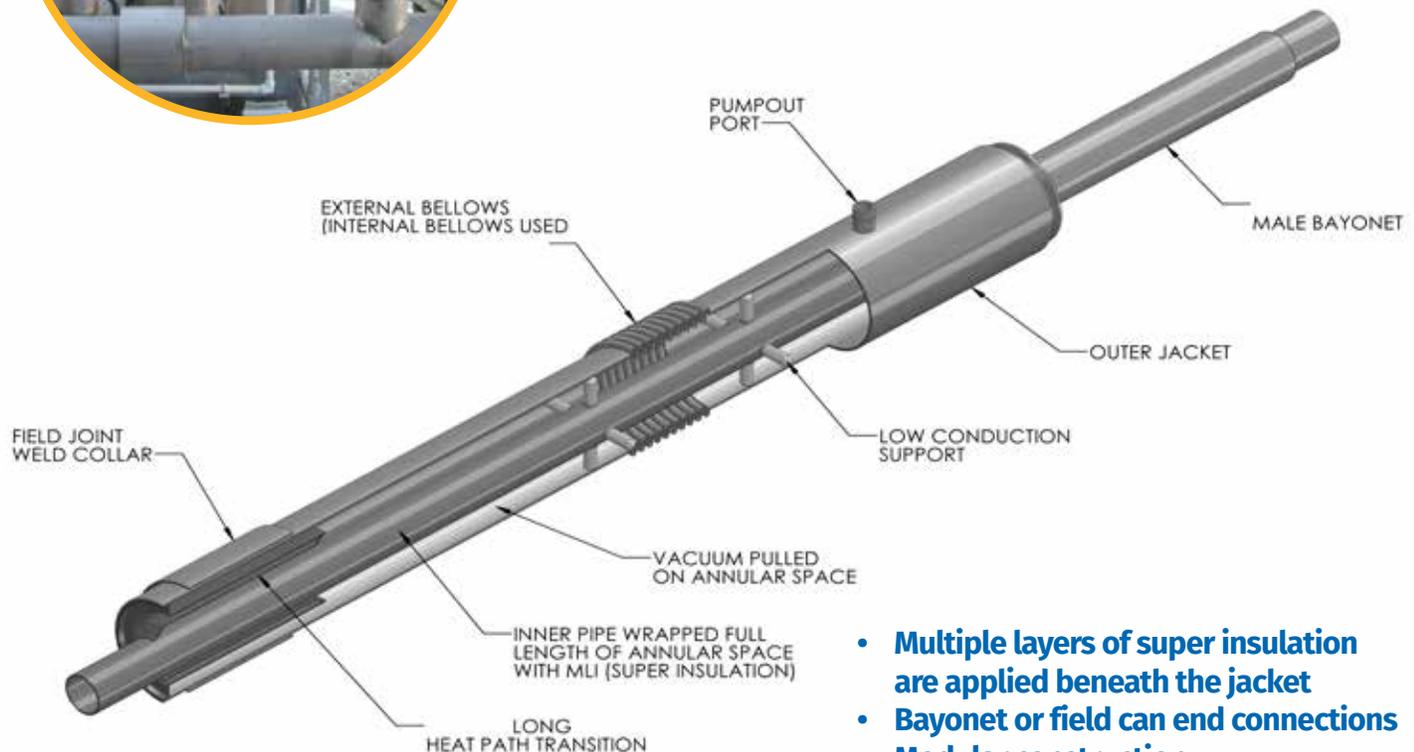
The most cost-effective way to transfer cryogenic liquids, Vacuum Jacketed Pipe (VJP) also known as Vacuum Insulated Piping (VIP) is the preferred piping solution for the safe, reliable, cost-effective transfer of cryogenic liquids. We make vacuum jacketed pipe for the following cryogenic liquids: Nitrogen, Oxygen, Argon, Helium, Natural Gas, Carbon Dioxide, Hydrogen.

- **Standard size VJP (1/2" - 6")**
- **Large-bore VJP (> 6")**
- **VJP Bayonets & Components**
- **VJ Filters**
- **Phase separators**
- **Subcoolers**



Capabilities

The VJP system consists of two 300 series stainless steel pipes: an inner pipe through which the cryogenic liquid flows, and an outer pipe that seals the annular space and forms a "vacuum jacket." Multiple layer insulation (MLI) between the pipes coupled with a vacuum ensures optimal thermal efficiency. Vacuum Jacketed Pipe efficiently transfers liquids at high pressures. These systems minimize heat leak to maximize efficiency and savings over time.



- **Multiple layers of super insulation are applied beneath the jacket**
- **Bayonet or field can end connections**
- **Modular construction**

Cryogenic Valves - Acme Model Cv

Our patented vacuum jacket technology, which is incorporated into our specially designed cryogenic valve lines, helps to minimize product loss due to conductive heat transfer.

- **Designed for all cryogenic services, including hydrogen and helium, our valves exceeds the industry's highest standards for reliability and performance.**
- **With the shortest lead times in the industry, our cryogenic valve lines are available in both jacketed and non-jacketed models to meet your specific needs.**
- **Industry standard for hydrogen applications.**

All our cryogenic valves are designed for the lowest heat leak and quickest cool-down times. The top entry design allows maintenance without disturbing the vacuum space.

Rigorously tested to ensure long life. We've developed over 800 different distinct valves for our customers.



Cryogenic Gas Manifold

We offer a complete line of cryogenic gas manifolds and associated accessory equipment, to fit the needs of your gas handling system. Our reliable, cost-effective manifolds are customizable for every application and will fit the needs of your specific job. Pair our manifolds with accessory equipment and our outstanding support for quick integration into your gas handling system.

- **Cryogenic Gas Manifolds**
- **Gas Blenders**
- **Ultra High Purity Gas Systems**



Vaporizers

Vaporizers are an important part of the cryogenic system when the end use application is gas service. Vaporizers can add the energy necessary to change the state or phase of the cryogenic liquid to a gas. This added energy can be introduced either from heat exchange with air using our ambient or forced convection vaporizer product lines. This added energy can also be introduced with external power utilizing our direct to process electric vaporizer product lines.

Product Lines

- **Ambient**
- **Forced Air Ambient**
- **Electric Direct to Process**

Capabilities

We are a leading provider of engineering, designing and configuring vaporization systems for your specific project application.



CGA Fittings

Acme offers a wide array of Cryogenic Liquid Transfer Connections for LIN/LOX/LAR, CO₂, Nitrous Oxide and LNG which are designed for safe and reliable cryogenic liquid transfer, fully compliant with CGA V6. Acme carries the world's largest inventory of Liquid Transfer Fittings.

Product Lines

- **Brazed & Threaded Hose End**
- **Fixed End Integral Flange Head Plug Assemblies**
- **Pressure Cap Assemblies**
- **Copper Clad Gaskets**
- **Head Pieces**
- **Dust Cap Assemblies**
- **Tail Plug Assemblies**
- **Fixed End Clamps**
- **Fixed End Assemblies - Rail Car**
- **Forged Brass Flanges**
- **And more...**



Markets



Hydrogen Economy



Specialty Electronics



Space Launch Services



Niche Food & Beverage



Cryogenic Gas Production



Alternative Fuels & Energy



Cryobiology & Healthcare

Complete Value Chain Flow Control Leader In Clean Energy, Compliance, And Safety Applications

Clean Energy Applications

Hydrogen

Supply, transport and storage infrastructure
Hydrogen-powered mobility applications

LNG

LNG-powered trucks
CNG-powered transport
Fueling stations
LNG supply chain

Cryogenic

Air separation units
Plant infrastructure
Distributed piping systems

Space Launch

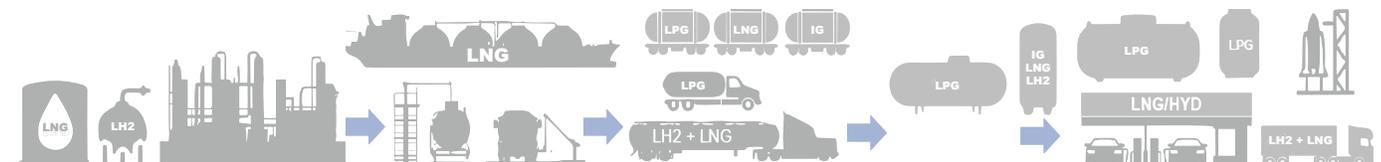
Fuel supply
Launch pad infrastructure
Component testing

Food & Beverage

Carbonated beverages
Flash freezing / preservation
Food processing

Specialty Electronics

Semicon manufacturing
Server farms
High performance and quantum computing



Space Technology

Cryogenic engineered systems are critical to launch pad infrastructure, vehicle development and testing, and oxygen life support systems.

Product Applications

- **Launch Pad Fuel Supply**
- **Launch Pad Infrastructure**
- **Component Testing**
- **Rocket Launch Vehicle Development**

Capabilities

Furnishing vacuum jacketed pipe in sizes up to 12"x16" and pressures up to 5,000 psig. Our VJP systems serve liquid hydrogen, liquid helium, liquid oxygen, liquid nitrogen, and liquid methane.

Space Launch Services

For over 30 years, Acme Cryogenics has delivered the high-quality, safe, precise equipment and services. Space Launch Services consists of a series of activities related to the manufacture, preparation, and launch of space vehicles and satellites. Acme Cryogenics is capable of furnishing vacuum jacketed pipe in sizes up to 12"x16" and pressures up to 5,000 psig. Our VJP systems serve liquid hydrogen, liquid helium, liquid oxygen, liquid nitrogen, and liquid methane.

Product Applications

Cryogenic liquids, such as hydrogen and oxygen, are often used as rocket propellants because they have a high energy density and can be stored and transported at very low temperatures.

In a launch pad fuel supply system, cryogenic fluids are typically stored in insulated tanks or tank trailers and are piped to the launch vehicle through a series of cryogenic distribution piping systems referred to as VJP. These systems are designed to insulate and maintain the low temperature of the liquids to prevent evaporation during the fueling process. Acme Cryogenics designs manufactures and installs the entire vacuum jacketed piping systems needed to deliver cryogenic liquids as rocket fuel in the safest and most efficient manner possible.

Capabilities

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"The increasing adoption of space launch services for satellites and testing probe application is one of the most significant factors driving the growth of the market. Furthermore, the introduction of space tourism is expected to provide lucrative growth opportunities."



Component Testing

Testing components is critical to ensure performance is maintained when facing the harsh environmental conditions that are experienced in space. Acme Cryogenics has the experience and expertise in a diverse range of component testing applications that utilize cryogenic liquids including the use of HALT and HASS chambers (Highly Accelerated Life Test (HALT) and Highly Accelerated Stress Screening (HASS))

When working with cryogenic liquids, safety is paramount. Acme Cryogenics provides emergency shut-off valves, control panels, and oxygen sensors to ensure the safety of workers in the presence of cryogenic liquids that are potentially dangerous.



Hydrogen Economy

Cryogenic solutions are mission-critical to help accelerate the expansion of liquid hydrogen as a clean and sustainable energy source for transportation, industrial, and Residential/ commercial fueling applications.

Product Applications

- **Hydrogen Supply Infrastructure**
- **Hydrogen Mobility**
- **Ecologically-Friendly Industrial Production**

Capabilities

Custom-engineered systems and components to deliver liquid hydrogen with minimum product loss.





Alternative Fuels & Energy

Cryogenic solutions easily and safely facilitate the non-pressurized storage and transportation of LNG and CNG, vital energy sources utilized extensively in both industrial and residential applications.

Product Applications

- **LNG Production and Transportation**
- **CNG Production and Transportation**
- **Natural Gas Pipeline Supply for Peak Shaving**
- **Hydrogen transportation and distribution include mobile high-pressure supply equipment, manifold systems for hydrogen fuel cell technology, and complete fueling stations.**

Capabilities

Acme Cryogenics is a technical leader with over 40 years of experience engineering and fabricating VJP systems which serve as critical technologies for LNG facilities. As uses of liquefied natural gas and Hydrogen increase and change, Acme Cryogenics has stayed ahead of the curve. The global use of LNG as an alternate fuel to diesel and other refined petroleum fuel products continues to increase as an alternative transportation fuel.

Cryobiology & Healthcare

Acme Cryogenics is the leading provider of equipment, installation services, and maintenance to the Cryobiology/Cryopreservation markets. Our specially-designed Vacuum Insulated Pipe, Automatic Fill Systems, and Freezer Installation offer the precise and high-quality systems required by this market. Dewars and Control-Rate Freezers provide effective and accurate cooling of biological specimens or samples at the optimum temperature for preservation. With Liquid Nitrogen temperatures, specimens like blood cells can be preserved almost indefinitely.

Product Applications

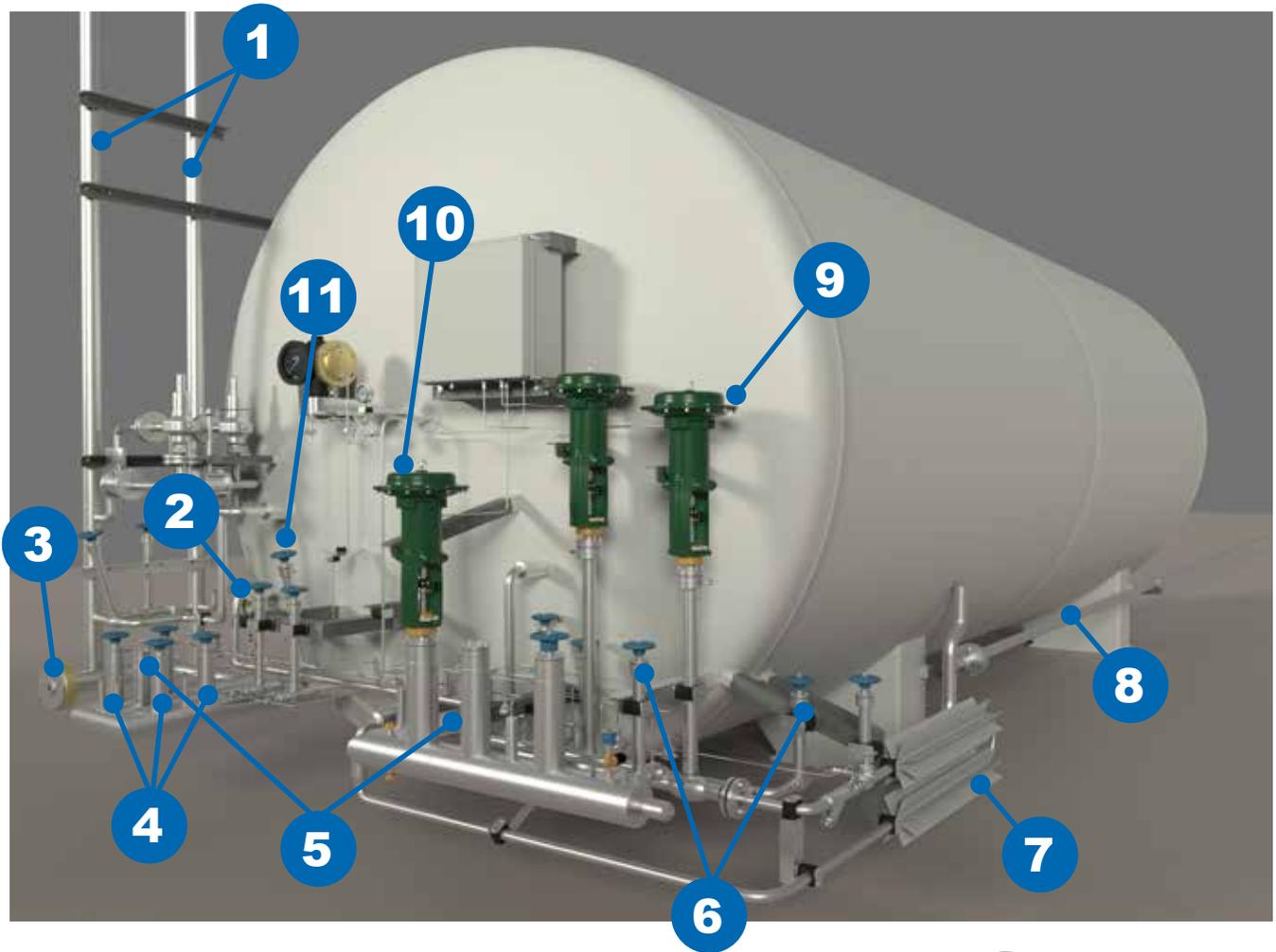
- **Blood / Cancer Therapies**
- **In Vitro Fertilization**
- **Medical Oxygen**
- **Pharmaceutical Freeze Drying**
- **Tissue Transplant / Preservation**
- **Biotech Research**
- **Cryopreservation of Cells and Tissues**
- **Cryosurgery**

Capabilities

Providing reliable, safe, high-purity cryogenic equipment that fulfills standards and requirements for pharmaceutical companies and modern laboratories, especially for Active Pharmaceutical Ingredient (API) manufacturing. Acme Cryogenics' sanitary-grade equipment and service provide the highest level of quality and reliability.



Hydrogen Tank



1. H2 Vent Stack Assembly
2. Full Determination Gauge
3. LH2 Fill Bayonet
4. Manual Vacuum Jacketed Bellows Sealed H2 Valve
5. Jacketed Check Valve
6. Manual Non Vacuum Jacketed Bellows Sealed H2 Valve
7. H2 Pressure Builder Ambient Vaporizer
8. Vent Stack Topworks
9. Actuated Non Vacuum Jacketed Bellows Sealed Fire Control Valve
10. Actuated Vacuum Jacketed Bellows Sealed H2 Valve
11. Manual Vacuum Jacketed Bellows Sealed H2 Valve

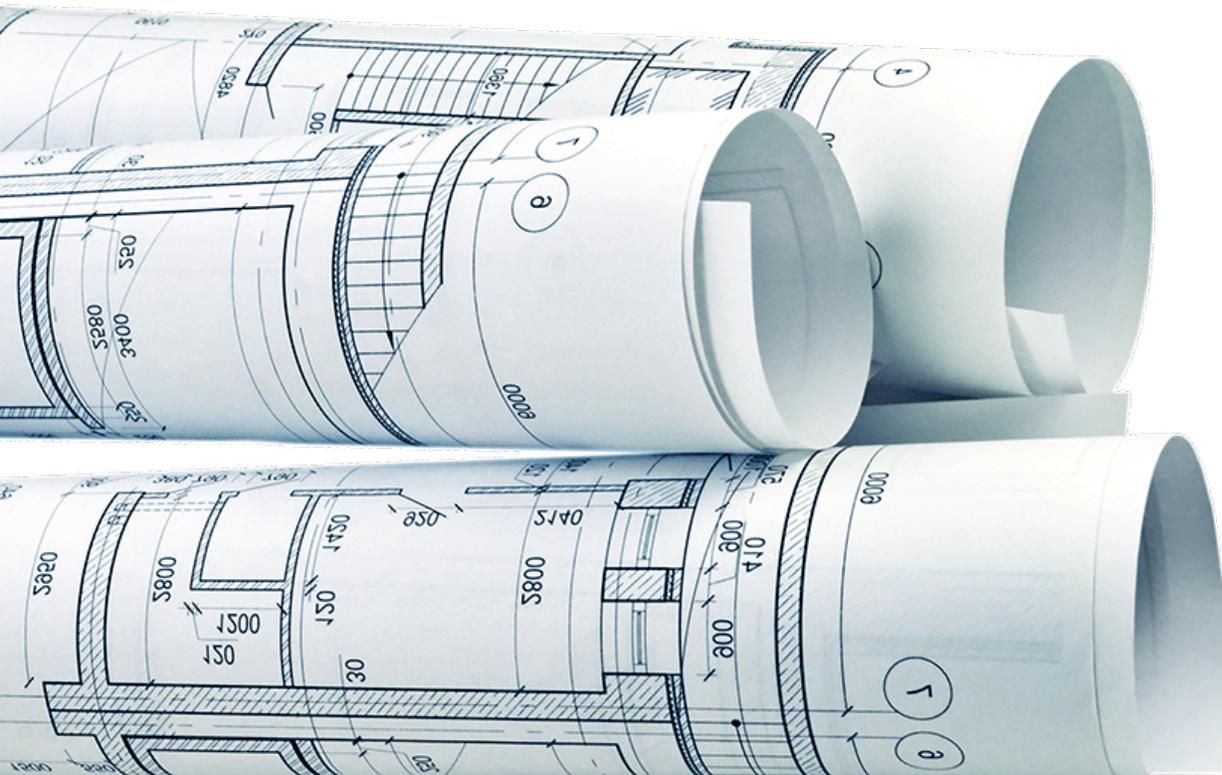


Design & Engineering

The Acme Cryogenics design and engineering team has reliable expertise across a wide variety of industries. Whether your project is large or small, or if your requirements are industry standard or custom, we'll provide you with leading technical capabilities and response times.

Overview

Acme Cryogenics brings industry-leading safety, quality, and reliability to all customers and projects. Our decades of experience provide our customers with the specific expertise needed for effective cryogenic system design and engineering. Our team can provide system level solutions with leading technical capabilities.



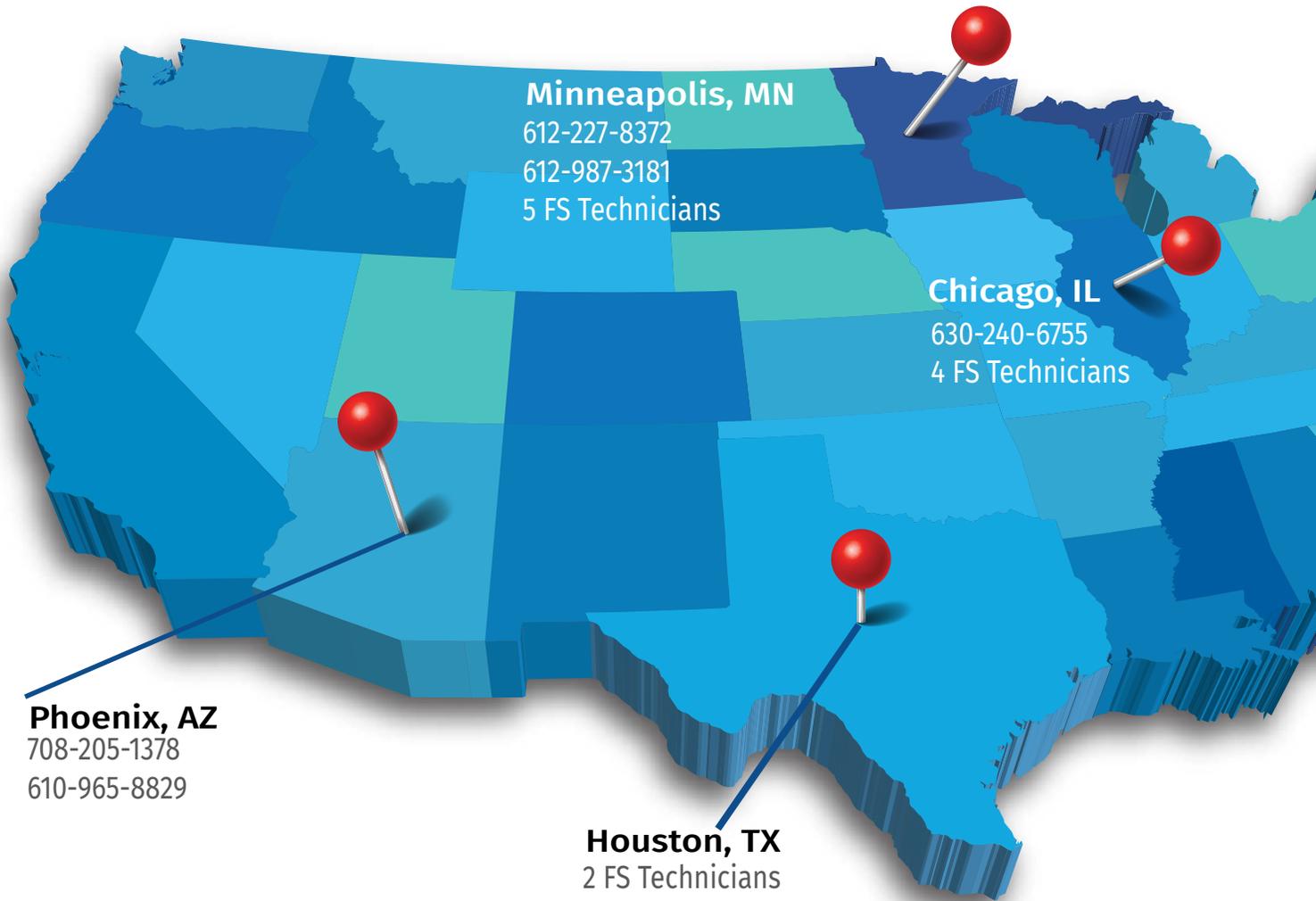
Certifications



- **ASME “U” certificate of authorization**
- **Class 10 & class 100 clean rooms**
- **DOT registration under section 107.503 Title 49**
- **DOT registration as manufacturer of cylinder 49cfr 178.50**
- **National board “r” certificate of authorization**
- **Quality system audited to csa b-51-03 appendix h**
- **Transport canada-certificate of registration**
- **UL & CSA certification for manufacture of control panels**
- **All welding & brazing procedures developed & qualified in accordance to asme section ix**
- **PED Certified**
- **KGSC Certified**
- **TPED in process**



Service & Equipment Distribution Hubs



Techs & Managers are certified to health & safety procedures and are welding, brazing (medical gas) certified.
Trained to work with hazardous materials, are vacuum experts and can troubleshoot and solve complex design issues.

Allentown, PA

708-205-1378
484-223-8254
6 FS Technicians

- Allentown, PA
- Lonsdale, MD
- Oxnard, CA
- Ball Ground, GA
- South Plainfield, NJ

South Plainfield, NJ

908-482-6195
6 FS Technicians

Count On The Acme Team

- At Acme Cryogenics, we pride ourselves on our in-house designs, which are created and manufactured by our highly trained personnel.
- We also have a fully staffed customer service center to provide faster responses to your needs.
- Additionally, we offer unique solutions that are tailored to fit your specific requirements.
- Above all, we strive to deliver the highest quality products and services.

Atlanta, GA

484 -538-6202
2 FS Technicians



SITE SURVEY | EQUIPMENT SIZING | LOGISTIC SERVICES

Acme Field Service Solutions

Acme Cryogenics' Field Service Team leads the industry in supporting all industrial gas applications and facilities. Committed to design, engineer and manufacture high quality systems, equipment and components for the industrial gas, medical gas and chemical industries. Safety is our highest priority, both for our employees and our products.



REGO®



PART OF OPW | a **DOVER** company

HYDROGEN FLOW CONTROL

STORAGE • TRANSPORT • VEHICLE TANKS • FUELING SOLUTIONS



REGO
100% TESTED
★

CLEANED FOR
OXYGEN SERVICE
O₂
CGA G-4.1

REGO
10
YEAR
WARRANTY*



www.regoproducts.com

*RegO products carry an industry leading 10 year warranty unless otherwise noted.

Long Lasting Product

With the largest installed base in the industry, RegO has over 110 years of field proven track record of long lasting service.

Supply Chain Management

RegO utilizes the Production Part Approval Process (PPAP) in our supply chain. Critical measurements are taken of all components parts to ensure quality and reliability.

World-class quality—but don't just take our word for it.

RegO builds products that last. Our durable materials, proven designs, and rigorous testing, all add up to products designed for years of operations under harsh conditions. With internal standards like these, it's no wonder that RegO quality is recognized the world over.

100% Testing

All our products are 100% tested at multiple steps in the process from incoming component quality to final assembly testing for leakage, lock up and set pressure.

Manufacturing Excellence

RegO uses top quality materials and precise robot-assisted manufacturing in our factories. That means every product has consistent quality.

We Stand Behind Our Products

RegO values the relationships we have with our customers, and we stand behind our products. In addition to an industry leading 10 year warranty on our products, we support our channel partners with ongoing training and technical assistance.

RegO® brings decades of cryogenic experience to liquid and gas hydrogen applications.

RegO is a pioneer in the development of valves and regulators for industrial gases and cryogenic liquids. For more than 60 years we've been at the forefront of innovation in cryogenic flow control applications such as bulk/micro bulk storage, transport, piping, and cylinders. We have combined our extensive small molecule gas experience in medical-grade oxygen, LNG transportation fueling, and cryogenics to develop our growing portfolio of liquid and gas hydrogen products.

Quality materials, quality manufacturing—and 100% cleaned per CGA G-4.1.

Backed by our industry-leading 10-year warranty, RegO hydrogen products are designed, built, and 100% tested in the USA. We use superior materials and innovative designs to develop products that withstand the rigors of cryogenic environments, gas exposure and over torquing. Stainless Steel 361L cast components, heavy-duty ACME threads, proprietary seal and packing technologies assembled by an experienced manufacturing team are just some of the reasons our products are long-lasting, high-performing and easily serviced.

LIQUID HYDROGEN PRODUCTS



Swing Check Valve for Liquid Hydrogen Service
886MGF Series Metal-Metal Seal



Swing Check Valve for Liquid Hydrogen Service
886GF Series Soft Seal



Liquid Hydrogen Globe Valve
231 Series

HYDROGEN GAS PRODUCTS



Stainless Steel Relief Device Diverter
DV4108 Series



Brass or Stainless Steel ASME Relief Valves
9400 Series



Brass Globe Valve Short Stem
VB-206GF



Stainless Steel Gate Valve for Cryogenic Service
110WHZ Series



Stainless Steel Globe Valve for Cryogenic Service
210WHZ Series



Angle Relief Valves
AR Series



Heavy Duty Gas Line Regulators
1780 & BR-1780 Series



High Pressure Gas Master Valves
HP9560 Series

RegO Products Sets New Standard in Hydrogen Handling With HydROMac® LH2 Fueling Nozzle



While the global growth of the “Hydrogen Economy” is gaining much-warranted attention, the fact is that energy-dense hydrogen has been used as an energy source for many decades, driven by its carbon-neutral status that outputs low-emission water and air that makes it more environmentally friendly than other petroleum-derived fuels.

What hydrogen does have in common with those other fuels is that its volatile nature can make it perilous to harvest, refine, handle and consume, which means that it must be handled in the most reliably safe manner possible. Specifically, hydrogen is combustible in a wide range of concentrations in its gaseous form while in its liquid form it has a temperature of -423F. This means the equipment used to dispense it requires massive amounts of thermal insulation in order to prevent huge ambient losses in volume due to evaporation.

Speaking particularly of liquid hydrogen (LH2), the fuel is gaining growth within the overall Hydrogen Economy because it has proven to be a reliable and efficient fuel for the powering of larger long-haul vehicles such as trucks, planes and ships, whereas compressed gaseous hydrogen has proven to be an effective fuel for powering smaller commuter vehicles. The problem is that, while LH2 has huge potential for the energy section, getting it safely and efficiently from Point A to Point B can be a massive challenge.



With the need to ensure that the fuel is always handled safely combining with a growing reliance on tricky-to-handle LH2 – with a need to focus on its extremely cold characteristics – for long-haul vehicles, the search was on to develop a robust LH2 transfer and dispensing solution that can replicate the existing compressed gaseous hydrogen delivery system with a minimal number of friction points. In other words, the search became one of identifying and developing an LH2-coupling technology that possesses the capability to produce a diesel-like handling and refueling experience.





Coupling Safety With Efficiency

The biggest safety concern when handling LH2 is its combustibility, making optimized material selection, leak detection and automated fueling control imperative in creating an effective LH2 nozzle and coupling. Since very few materials are compatible with LH2 because of its combustibility, low temperature and tendency to result in a phenomenon known as “hydrogen embrittlement” (a reduction in the ductility of a metal due to the presence of absorbed hydrogen), great care must be taken to ensure that the coupling’s seals and components are compatible with the fuel.

At the same time, the coupling must be constructed in a way that there is no chance that leakage will occur and if a leak does happen, the coupling’s operation must be able to be instantly halted in order to prevent a potentially dangerous scenario from developing. On top of that, the coupling must possess automated flow control capabilities that enable the operator to be physically at a safe distance as the refueling process takes place.

One final safety concern is the potential for the buildup of condensed liquid air on the coupling during a refueling activity. This liquid air can lead to high concentrations of liquid oxygen, which can then cause common materials to become highly combustible. Therefore, the LHS-handling system must be jacketed and have an extremely high vacuum in order to keep the outer surfaces at ambient temperature so there can be no buildup of liquid air.

Fueling The Hydrogen Economy

Building on its more than 100 years of developing, manufacturing and supplying gas-flow and control systems and solutions dedicated to the safe and efficient handling of industrial gases, RegO Products has created the industry’s first-ever quick-coupling nozzle for use in refueling activities in LH2 applications.

Officially christened the RegO HydrOMac® LH2 Fueling Nozzle, it is designed for use in low-force quick-coupling applications that can attain the hoped-for replication of a common diesel-like refueling experience.



The following Features & Benefits are what makes the HydrOMac LH2 Refueling Nozzle unique in the industry:

- **Robust design that can diminish the complexity in LH2 handling**
- **Built-in leak detection capabilities for improved peace of mind**
- **Automated fuel control that enables the operator to remain in a remote location during the refueling process**
- **Three-stage thermal isolated design optimizes efficiency and performance**
- **Jacketing that meets the extreme low-temperature handling requirements of LH2**

The HydrOMac LH2 Refueling Nozzle joins the RegO Products family of hydrogen-handling components, including gate and globe valves, relief valves, regulators, HP master valves, check valves and angle relief valves.

See the complete line at regoproducts.com/h2 Or call us at: 1.336.226.3244

WHEN YOU'RE BUILDING
THE HYDROGEN FUEL
INFRASTRUCTURE

LOOK TO THE
CRYOGENIC FLOW
CONTROL EXPERTS



RegO® brings decades of cryogenic experience to liquid and gas hydrogen applications.

When you partner with RegO, you get 100% tested products backed by our global support network and our industry-leading 10-year warranty. From regulators to valves, our products are easy to use, and designed for maximum performance and long life.



GLOBE VALVES



GATE VALVES

REGO
10
YEAR
WARRANTY

REGO
100% TESTED
★

CLEANED FOR
OXYGEN SERVICE
O₂
CGA G-4.1



CHECK VALVES



RELIEF VALVES



ANGLED RELIEF VALVES



REGULATORS



HP MASTER VALVES

See the complete line at regoproducts.com/h2

Or call us at: 1.336.226.3244

Vacuum Jacketed Pipe (VJP) & Acme Cryogenic Valve

The most cost-effective way to transfer cryogenic liquids

Evacuation & Safety Device

The comprehensive component design to complete the system design, manufacture, and installation capability.



Stainless Steel Inner Pipe

Maximum service life thanks to these advanced features to produce exceptional efficiencies across the entire system.

Cryogenic insulation for Nitrogen, Oxygen, Argon, Helium, Natural Gas, Carbon Dioxide, Hydrogen

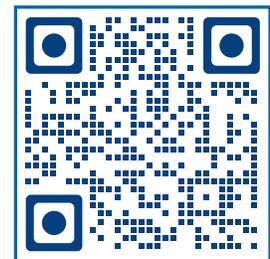
Super-Insulation

The inner and outer pipe is constructed of 300 series stainless steel. Insulation is a low vacuum with multiple layer insulation (MLI).



Cryogenic Valve

The patented design builds on a conventional globe configuration by incorporating numerous unique features that decrease heat leak and increase the service life of the valve. Rated Working Temperature -425° F to 150° F. Vacuum jacketed available. Compatible with liquid nitrogen, argon, oxygen, hydrogen, helium and LNG.



For more information visit acmecryo.com

PED Certified 

HYDROGEN FUEL TECHNOLOGY
IS ACCELERATING.

**BE READY
TO ROLL
WITH REGO.**



**LIQUID & GAS
HYDROGEN
FLOW CONTROL :**

STORAGE
TRANSPORT
FUEL TANKS
FUELING NOZZLES

**RegO® brings decades of cryogenic flow control experience
to liquid and gas hydrogen applications.**

When you partner with RegO, you get 100% tested products backed by our global support network and our industry-leading 10-year warranty. From regulators to valves, our products are easy to use, and designed for maximum performance and long life.



See the complete line at regoproducts.com/h2

Or call us at: 1.336.226.3244



*RegO products carry an industry leading 10 year warranty unless otherwise noted.