

**Freeze out obstacles to a plentiful  
source of clean energy**



**Proven Automation for LNG Liquefaction, Carriers, and Regasification**

Leverage Emerson's comprehensive portfolio of valves, actuators, regulators, and services.





With global demand for LNG soaring, speed and reliability are more critical than ever.

## There are inherent operational risks and uncertainties with LNG.

LNG is a highly efficient, reliable, clean alternative to most other fossil fuels. But there are challenges to LNG too. Namely, natural gas must be taken to a crisp, consistent  $-162^{\circ}\text{C}$  ( $-260^{\circ}\text{F}$ ) for transport in liquid state, and many reserves are in areas where super freezing isn't easy or convenient to maintain. As global demand increases, complexity and risks are rising as well.

The long-term demand for LNG will grow between 4 to 7 percent each year.  
–Bloomberg New Energy Finance



Inferior or poorly specified valves in critical applications can leak and put your operations at risk, potentially causing harm to personnel, environmental contamination, and product loss.



The LNG industry will continue to adopt, implement, and update safety measures that protect the health and well-being of all parties.  
–Center for Liquefied Natural Gas



# Leverage the latest technology to excel in a dynamic, global market

LNG is complex and requires innovative thinking and creative solutions to overcome the extreme temperature and pressures. Emerson experts work with operators of liquefaction facilities, carriers, and regasification terminals to implement advanced products necessary to keep up with evolving nature of this industry. Currently, Emerson leads the market with the broadest portfolio of valves, actuators, and regulators with critical isolation and control technologies.



## Protect process equipment and maintain uptime

- Utilize proven technologies for full cryogenic temperature performance, advanced corrosion resistance, and noise and cavitation control
- Get 24/7 access to diagnostics that help keep assets running smoothly

Fisher valves have been supplied to the LNG industry since the first liquefaction trains were built in the 1960s. Over 70% of global LNG production flows through Fisher valves.



## Produce and store LNG in necessary quantities and in time for tanker shipments

- Improve awareness of and response to imminent asset failures

Emerson is trusted with the largest, most complex projects in the world, including Qatargas and Shell Prelude FLNG.



## Safeguard against leakage, fugitive emissions, and product loss

- Achieve tight shutoff in cryogenic applications with leakage rates as low as 1/10th those allowable by industry standards
- Address ultra low emission requirements with butt-weld top-entry valves that offer access for in-line maintenance

“We are entirely satisfied with the performance of the Vanessa valves in cryogenic service, including those used as control valves.”  
– Facility Engineering Leader

# LNG Solutions

## Inlet Feed and Separation

- Reduce pressure swings that can cause cycling of the whole plant, impacting throughput and reliability. ▶ p5

## Acid Gas Removal and Dehydration

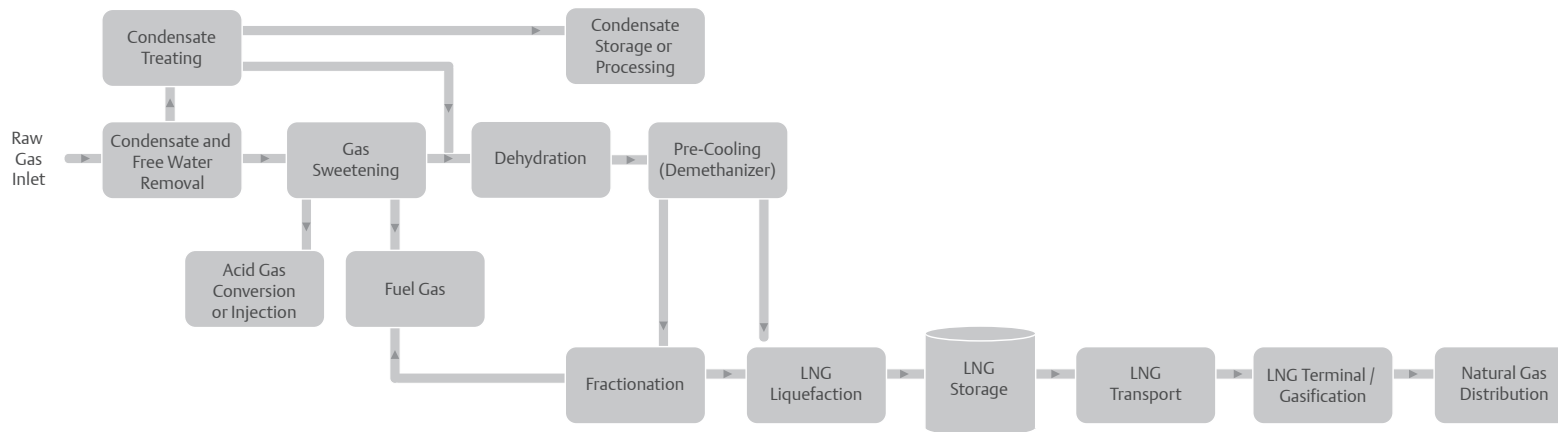
- Eliminate hydrate formation from H<sub>2</sub>S and CO<sub>2</sub> in cold sections of the process. ▶ p7

## Sulfur Recovery

- Heat the acid gas to prevent sulfur condensation in the catalyst bed and maximize catalytic reaction. ▶ p9

## Fractionation

- Handle varying compositions of natural gas liquids (NGLs) and change the mix of hydrocarbon components in the exported products. ▶ p11



## Main Cryogenic Heat Exchanger

- Manage LNG production by maximizing the liquefaction compressor discharge pressure to the limit. ▶ p13

## Compression Train

- Maintain efficient operation and prevent surge. ▶ p15

## Storage, Jetty Loading, and Boil-Off Gas

- Provide safety measures, control the tank level, and automatically recover boil-off vapors. ▶ p17

## Unloading, Storage, and Regas Vaporization

- Convert the liquid natural gas to its gaseous form and manage tight schedules. ▶ p19



## Inlet Feed and Separation Solutions

Maximize production via throttling and remove water and natural gas liquids that could be destructive to the liquefaction process. ▶ p5

## Acid Gas Removal and Dehydration Solutions

Protect process equipment and maintain uptime by removing contaminants from the natural gas feedstock. ▶ p7

## Sulfur Recovery Solutions

Maintain reliable and safe combustion control and reduce the effects of corrosion. ▶ p9

## Fractionation Solutions

Maximize recovery of saleable hydrocarbons ethane, propane, and butane with accurate control. ▶ p11

## Main Cryogenic Heat Exchanger Solutions

Manage elevated pressure drops to induce cooling down to cryogenic temperatures. ▶ p13

## Compression Train Solutions

Minimize pollutants and the emission of volatile organic compounds when pressurizing the refrigerant gas mix. ▶ p15

## Storage, Jetty Loading, and Boil-Off Gas Solutions

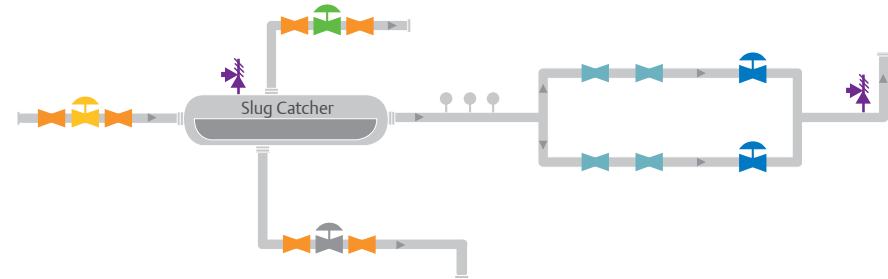
Effectively manage boil-off gas to avoid the environmental impact of flaring or disposal. ▶ p17

## Unloading, Storage, and Regas Vaporization Solutions

Safely meet market demands and operate efficiently. ▶ p19

# Inlet Feed / Separation Solutions

Inlet receiving facilities knock out any liquids present in the feed gas, reduce the pressure from the gas pipeline, and throttle the flow of gas into the downstream processing units. Stable and reliable operation lays the foundation for the profitable LNG operation. Unexpected maintenance or surprise failures have the potential to bring down LNG production, which can incur significant contractual penalties.



## What's your opportunity?

- Maximize condensate recovery to prevent the introduction of liquids in the downstream treatment process
- Improve energy use
- One hundred percent operational redundancy to ensure uptime
- Increase throughput



## Automate valves with your choice of actuators.

On/off valves typically represent 90 percent of the total valve population in a production facility, representing a significant portion of the plant's control architecture, protocol, and DCS I/O. Emerson offers complete automated on/off valve solutions with pneumatic, electric, or hydraulic actuation.



## Services offered...

- Shutdown, turnaround, and outage planning and execution support
- Startup optimization and performance testing
- Valve sizing and selection
- Technology upgrades and retrofit
- Online and offline diagnostics
- Leak detection
- Control, isolation, and pressure relief valve calibration and repair
- Regulator configuration and repair
- Product and system training

## Featured Inlet Feed and Separation Solutions

### ■ Fisher Gas-to-Flare Valve



Manage the flare of feed gas or refrigerant to the stack and safeguard against overpressure.

- Noise abatement trim and body reduce the effects of noise and vibration despite pressure differentials and high flow rates during flares
- Accurate and rapid response

[Control Valve Noise Reduction webpage](#) ▶

### ■ Fisher Pressure Letdown Valve



Provide the proper rate of flow into the facility.

- Precise, stable throttling control through a wide range of gas flows from startup and commissioning through full rated output of the plant

[Fisher Whisper Trim™ III product webpage](#) ▶  
[Control Valve Noise Reduction webpage](#) ▶

### ■ Fisher Slug Catcher Inlet Valve



Provide the final pressure cut before the fluid enters the slug catcher and jump starts the separation.

- Full-bore valve allows slugs to pass through the opening without restriction
- Combats vibration and the potential for water hammer

[Fisher V260 product webpage](#) ▶

### ■ Bettis™ | KTM™ Feed Gas Isolation Valves



Isolate feed gas reliably with fully engineered, automated valve solutions.

- Zero leakage shutoff
- Low fugitive emission designs
- Low running torques
- Compact, lightweight, efficient

[KTM Series EB1 product webpage](#) ▶  
[Bettis CBA300 product webpage](#) ▶

### ■ Anderson Greenwood Pressure Relief Valve



Ensure overpressure protection at the slug catcher without leakage or excess fluid loss.

- Modulating action minimizes fluid lost during relief events
- Bubble tight seating during normal operation
- Large full bore orifices available for large capacity requirements

[Anderson Greenwood 400 Series webpage](#) ▶

### ■ Fisher Overpressure Protection Valve



Shut off the flow of a hazardous gas upon detection of a dangerous event.

- Torque assisted elastic metal seal ensures continuous bi-directional, zero leakage performance

[Fisher Digital Isolation™ TOV product webpage](#) ▶

### AEV™ | Bettis | Vanessa™ Emergency Shutdown Valves



Ensure consistently tight shutoff in critical emergency shutdown applications.

- Zero leakage shutoff
- Rapid open or close in emergency event
- Advanced diagnostics and data logging

[AEV 2XC product webpage](#) ▶  
[Vanessa Series 30,000 product webpage](#) ▶  
[Bettis EHO product webpage](#) ▶  
[Bettis G Series product webpage](#) ▶

### AEV | Vanessa Isolation Valves



Isolate your critical assets with confidence for inspection and repair events.

[Isolation Valves webpage](#) ▶

### Additional products

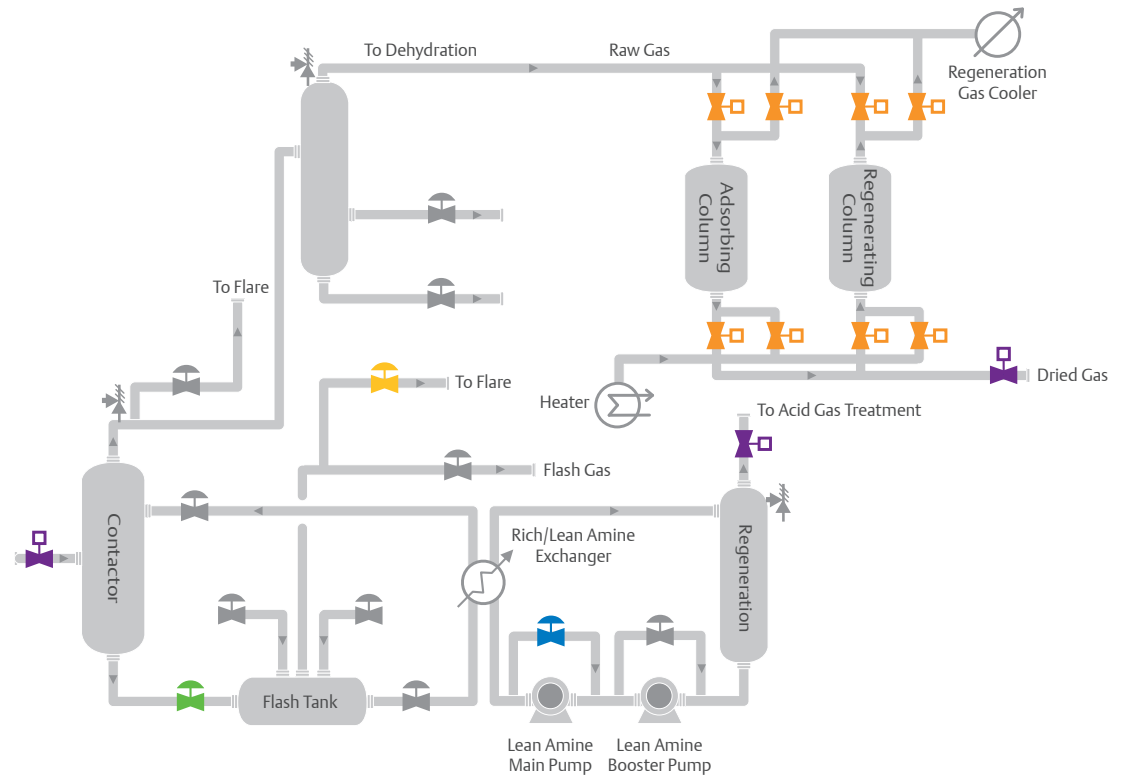
- Fisher FIELDVUE digital valve controller



Visit the [Gathering System webpage](#) to learn more.

# Acid Gas Removal and Dehydration Solutions

The acid gas removal unit reduces the concentration of hydrogen sulfide (H<sub>2</sub>S) and carbon dioxide (CO<sub>2</sub>) that are present in the feed gas through an amine treatment or sweetening process. The dehydration unit then removes moisture from the sweet gas to avoid dropout and hydrate formation under cryogenic conditions downstream.



## What's your opportunity?

- Remove all of the contaminants to contractually specified levels
- Eliminate hydrate formation from H<sub>2</sub>S, CO<sub>2</sub>, and H<sub>2</sub>O in cold sections of the process to avoid damaging cryogenic units
- Maintain emissions below permit limits
- Provide critical sequencing of dehydration beds to improve the ability of the unit to properly dry the natural gas feedstock

## Adopt modern valve technology to improve dehydration unit reliability and plant performance.

Your choice of switching valve is a critical technology decision in determining overall plant reliability. Traditionally used rising stem ball valve designs are ill-equipped to perform in this arduous service, resulting in more frequent downtime, increased fugitive emissions, and higher operating costs.

Emerson's AEV<sup>2</sup>XC severe service C-ball valve enables superior dehydration unit performance with a non-rubbing, cavity-free design for more reliable operation while also providing true bidirectional, zero leakage shutoff and ultra-low emissions.

Best practices for selecting switching valves ►



## Services offered...

- Shutdown, turnaround, and outage planning and execution support
- Startup optimization and performance testing
- Valve sizing and selection
- Technology upgrades and retrofit
- Online and offline diagnostics
- Leak detection
- Control, isolation, and pressure relief valve calibration and repair
- Regulator configuration and repair
- Product and system training





## Featured Acid Gas Removal and Dehydration Solutions

### ■ Fisher Rich Amine Letdown Valve



Regulate the level of rich amine solution that accumulates in the bottom of the contactor vessel.

- Valve and trim are proven to mitigate the potentially damaging effects of outgassing

[Fisher easy-e ET product webpage](#) ▶  
[Control Valve Outgassing webpage](#) ▶

### ■ Fisher Amine Pump Recycle Valve



Precisely control the pump discharge flow that routes to the suction side of the pump within the acid gas removal unit.

- Highly responsive throttling of recycle flow
- Proven anti-cavitation trim to eliminate damage to the control valve and pump

[Fisher easy-e ET product webpage](#) ▶  
[Anti-Cavitation Valve Trim webpage](#) ▶

### ■ Fisher Flash Gas-to-Flare Valve



Manage the flare of feed gas or refrigerant to the stack and safeguard against overpressure.

- Noise abatement trim and body reduce the effects of noise and vibration despite pressure differentials and high flow rates during flares
- Accurate and rapid response

[Control Valve Noise Reduction webpage](#) ▶

### Fisher Overpressure Protection Valve



Shut off the flow of a hazardous gas upon detection of a dangerous event.

- Torque assisted elastic metal seal ensures continuous bi-directional, zero leakage performance

[Fisher Digital Isolation TOV product webpage](#) ▶

### ■ AEV | Bettis | Fisher | Vanessa Dehydration or Molecular Sieve Switching Valves



Optimize one of the most challenging applications in the LNG value chain with advanced severe service valve technology to handle abrasive adsorbents, corrosive gases, thermal transients, and frequent cycling.

- Minimize product loss and contamination with unrivaled valve sealing tightness
- Increase unit uptime and reduce maintenance costs with non-rubbing sealing components
- Meet fugitive emissions compliance with quarter-turn designs and ultra-low emission packing

[AEV ²XC product webpage](#) ▶  
[Bettis Morin S Series product webpage](#) ▶  
[Vanessa Valves in Molecular Sieve Applications webpage](#) ▶  
[Bettis G Series product webpage](#) ▶  
[Fisher Control Valves for High-Cycle Applications brochure](#) ▶

### ■ AEV | Vanessa Isolation Valves



Isolate your critical assets with confidence for inspection and repair events.

- Zero leakage shutoff and ultra low emissions
- No routine maintenance
- Simple automation when required

[Isolation Valves webpage](#) ▶

### Additional products

- Fisher FIELDVUE digital valve controller



Visit the [Gas Processing and LNG webpage](#) to learn more.

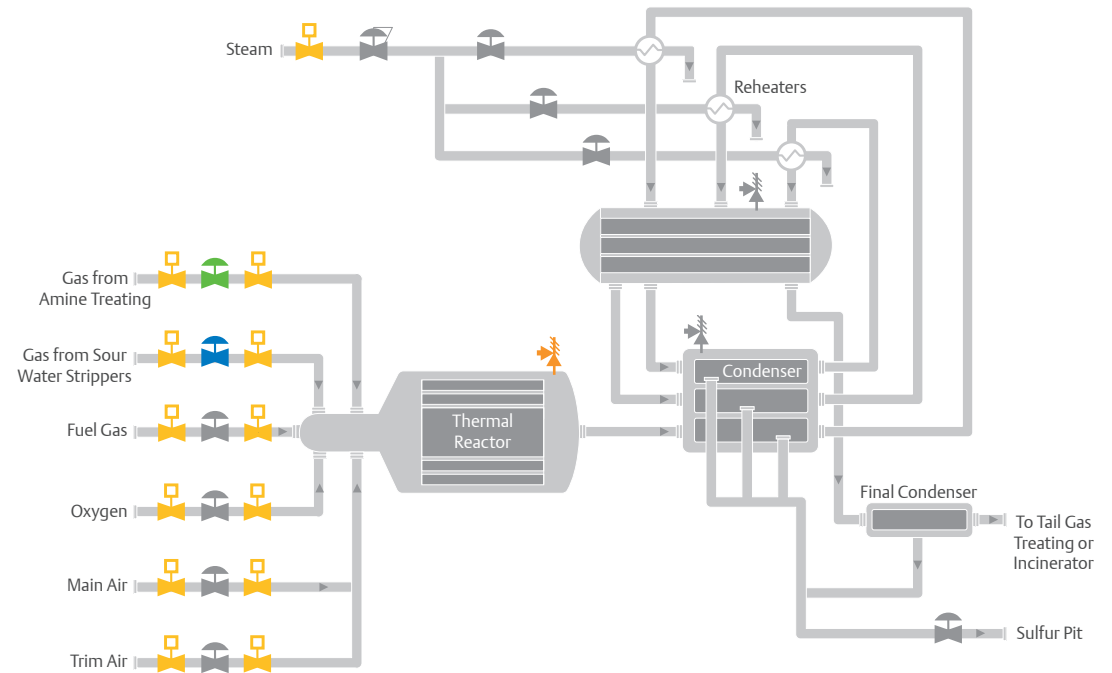
# Sulfur Recovery Solutions

An imbalance of combustion air in sulfur recovery units could result in too much hydrogen sulfide or sulfur dioxide in the tail gas and possibly cause a shutdown of the entire LNG facility—and corrosion is an ongoing challenge. Overall throughput can also be negatively impacted if the sulfur being removed is not able to be fully processed.



## What's your opportunity?

- Maintain reliable and safe combustion control and reduce the effects of corrosion
- Avoid limited throughput due to sulfur content



## Fulfill overpressure protection requirements.

Pressure relief valves are safety devices designed to open when the pressure in the tank gets too high and close again when the event has subsided. The most important aspect of a relief valve is its ability to open at its designed pressure and flow the required capacity to prevent a dangerous, uncontrolled overpressure event.



## Services offered...

- Shutdown, turnaround, and outage planning and execution support
- Startup optimization and performance testing
- Valve sizing and selection
- Technology upgrades and retrofit
- Online and offline diagnostics
- Leak detection
- Control, isolation, and pressure relief valve calibration and repair
- Regulator configuration and repair
- Product and system training

## Featured Sulfur Recovery Solutions

### ■ Fisher Acid Gas from Amine Valve



Effectively handle highly-sulfuric processes, like bringing acid gas to the thermal reactor, with durable, NACE-compliant materials.

- Increased wear resistance of the standard hardened stainless steel trim means long-lasting service
- Monitor valve performance online to evaluate performance and reliability

[Fisher easy-e EWT product webpage](#) ▶

[Fisher FIELDVUE DVC6200 product webpage](#) ▶

### ■ Fisher Sour Water System (SWS) Valve



Move sour gas from the sour water strippers efficiently and avoid the costly effects of valve sulfur damage.

- Engineered passages within the valve body provide optimal capacity and create a stable flow pattern for smooth operation

[Fisher easy-e ET product webpage](#) ▶

### ■ Vanessa Sulfur Recovery Isolation Valve



Protect against thermal loss, medium solidification, and corrosion with an on/off or bypass valve solution featuring a thermal jacket, bearing flushing, and suitable material selection.

- Ensures temperature of the valve seat/bearing areas will not fall below the sulfur crystallization point
- Asymmetric, frictionless triple offset design prevents jamming or sticking
- Camming action sweeps build-ups off the sealing surface
- Non-intrusive, intelligent automation with full internal datalogger records

[Vanessa 30,000 Series product webpage](#) ▶

[Bettis XTE3000 product webpage](#) ▶

### Yarway™ Boiler Trim and Level Solutions



Ensure optimized boiler performance and steam generation by removing sediment, controlling boiler level surge, and managing liquid level.

- Rugged construction to withstand high pressures and velocities
- Designed to meet increasing demand for reliable, cost-effective means of sensing water level in boilers and other refining applications

[Yarway Blow-Off Valves product webpage](#) ▶

[Yarway Water Columns and Probes product webpage](#) ▶

### Yarway Drip, Tracing, and Process Steam Traps



Minimize steam loss throughout the distillation column with thermodynamic, thermostatic, and mechanical steam traps.

- Energy-efficient design is suitable in low, medium- or high-pressure applications

[Yarway Repairable Drip and Tracer product webpage](#) ▶

### ■ Crosby Direct Spring Pressure Relief Valve



Protect against overpressure events to avoid process interruptions and reduce risks to personnel.

- Available as both a balanced and conventional style direct spring valve
- Full nozzle design reduces wetted components in corrosive service

[Crosby J Series product webpage](#) ▶

### Additional products

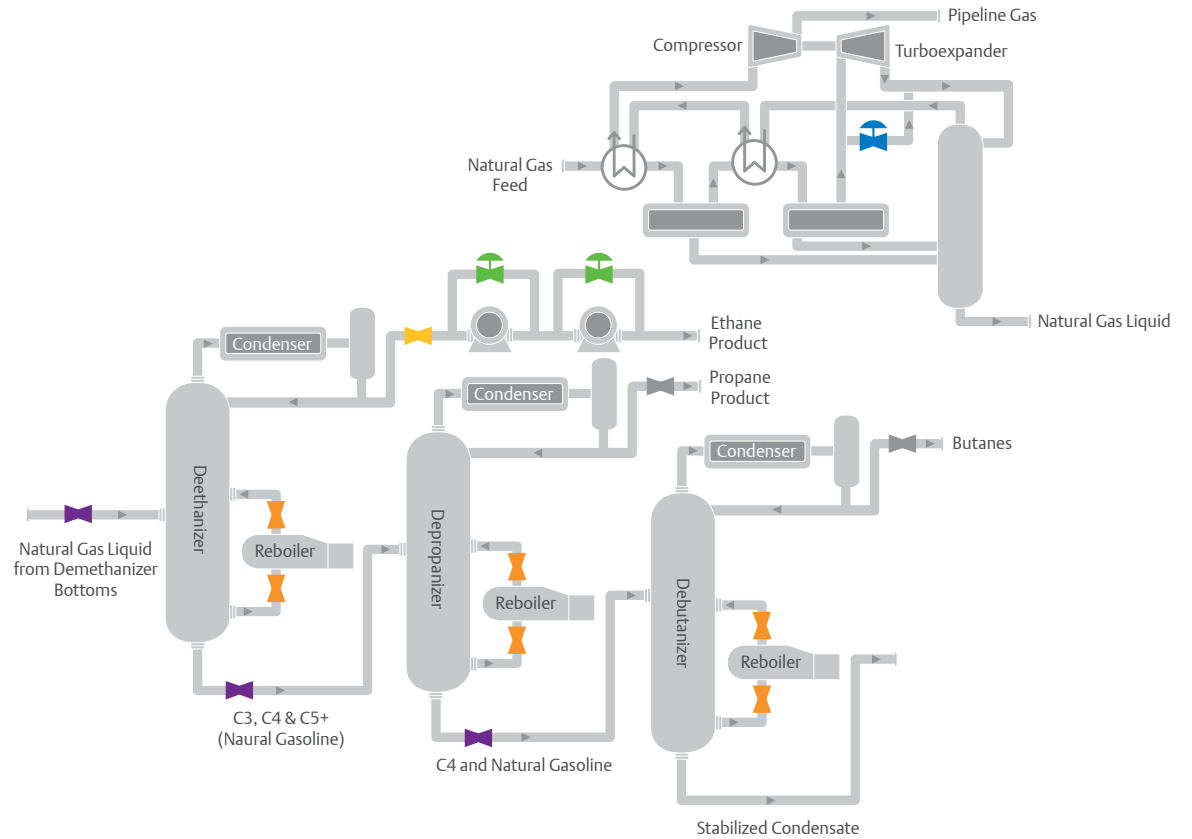
- Fisher FIELDVUE digital valve controller



Visit the [Sulfur Recovery Application Solutions webpage](#) to learn more.

# Fractionation Solutions

The fractionation process separates a raw stream of mixed natural gas liquids (NGLs) into its primary hydrocarbon components. It occurs in stages by boiling off hydrocarbons one by one from the mixed stream and then recovering the pure product stream via an overhead condenser. Regional demand and economics dictate which hydrocarbons are recovered at each particular fractionation plant. An NGL stream typically consists of Ethane, Propane, and Butane.



## What's your opportunity?

- Increase NGL recovery
- Meet product purity specifications and yields
- Minimize loss of valuable gas components



## Discover how triple offset valves are engineered for performance.

The Vanessa triple offset valve was the first to provide bidirectional zero leakage performance for positive isolation, creating a new industry category using a technology not previously available with other quarter turn valves.

What makes the Vanessa Series 30,000 manufacturing facility different from many others is the ability to produce thousands of cryogenic valves every year from full vacuum to 250 bar (over 3,600 psi) in sizes between NPS 3 and NPS 112.



## Services offered...

- Shutdown, turnaround, and outage planning and execution support
- Startup optimization and performance testing
- Valve sizing and selection
- Technology upgrades and retrofit
- Online and offline diagnostics
- Leak detection
- Control, isolation, and pressure relief valve calibration and repair
- Regulator configuration and repair
- Product and system training

## Featured Fractionation Solutions

### ■ Fisher Booster Pump Recycle Valve



Recycle flow through the ethane booster pump when needed to prevent cavitation damage.

- Anti-cavitation trim provides wear resistance for longer trim life at elevated pressure drops
- Valve trim utilized for ultra low flow control

[Anti-Cavitation Valve Trim webpage ▶](#)

### ■ Fisher Expander Bypass Valve



Enable an efficient startup and shutdown of the turboexpander and protect it in the event of a system upset.

- Valve trim offsets damaging noise and vibration
- Styles available with extension-style bonnet for cryogenic temperatures

[Cryogenic Control Valves product bulletin ▶](#)

### ■ Bettis | KTM | Vanessa Fractionation Unit Isolation Valves



Isolate inlet and outlet lines of the fractionation units with fully engineered, automated isolation solutions.

- Zero leakage shutoff
- Low fugitive emission designs
- Simplified commissioning and maintenance

[KTM Series EB1 product webpage ▶](#)

[Vanessa Series 30,000 product webpage ▶](#)

[Bettis RPE Series product webpage ▶](#)

### ■ AEV | Vanessa Reboiler Isolation Valves



Isolate the reboiler with confidence for scheduled inspection and repair events.

- Zero leakage shutoff
- Ultra low emissions
- No routine maintenance
- Simple automation when required

[Isolation Valves webpage ▶](#)

### AEV | Bettis | Vanessa Automated Isolation Valves



Ensure consistently tight shutoff in critical applications including emergency shutdown.

- Zero leakage shutoff
- Rapid open or close in emergency event
- Advanced diagnostics and data logging

[AEV ?XC product webpage ▶](#)

[Vanessa Series 30,000 product webpage ▶](#)

[Bettis EHO product webpage ▶](#)

[Bettis G Series product webpage ▶](#)

### ■ Fisher Overpressure Protection Valve



Shut off the flow of a hazardous gas upon detection of a dangerous event.

- Torque assisted elastic metal seal ensures continuous bi-directional, zero leakage performance

[Fisher Digital Isolation TOV product webpage ▶](#)

### Additional products

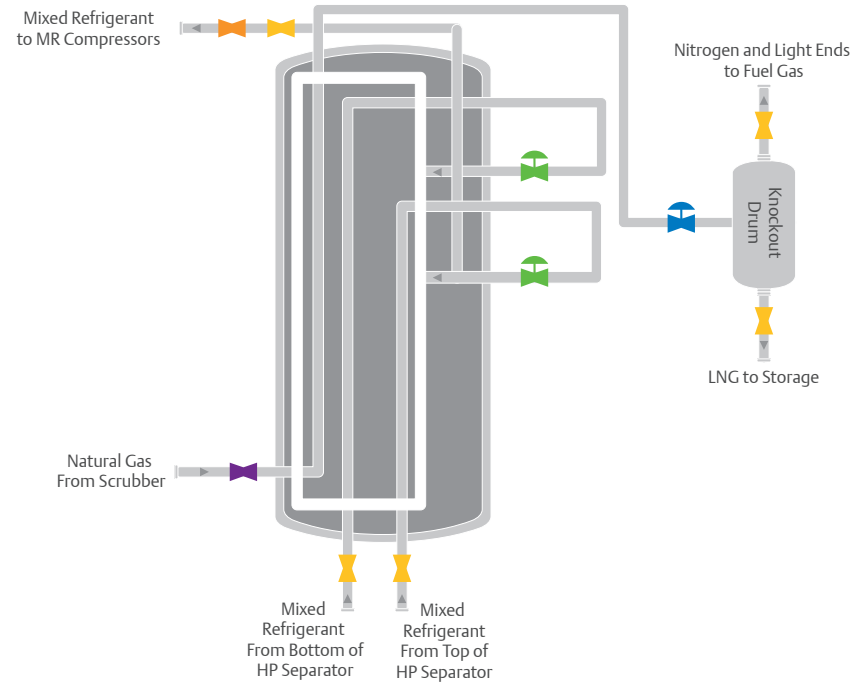
- Fisher FIELDVUE digital valve controller



Visit the [Natural Gas Liquids Fractionation webpage](#) to learn more.

# Main Cryogenic Heat Exchanger Solutions

The main cryogenic heat exchanger (MCHE) is the heart of the liquefaction facility. It liquefies natural gas then subcools it. The MCHE is composed of a large number of spiral wound tube bundles. When the feed gas exits the top of the MCHE, it has been turned into liquid as the temperature has been reduced to approximately -146°C (-231°F).



## What's your opportunity?

- Maintain optimum refrigerant flow circulation
- Reduce energy consumption when feed is restricted
- Product more LNG with high-precision controlling elements that enable optimal controller tuning



## Handle cryogenic applications with ease.

Control valves that handle highly flammable LNG require special cryogenic testing to verify that the sealing members provide the required shut off. Fisher control valves are seat leak tested according to FGS 4L7 or FGS 4L19, which are Emerson's standard offerings. Testing is performed using a liquid Nitrogen bath and Helium as the test medium. The requirements of the BS6364 standard can be applied if specified by a customer, however it's not preferred because it's an on-off or block valve standard.

- FGS 4L7 seat leak tests at low or cryogenic temperatures for sliding-stem control valves in accordance with SPE 77/306
- FGS 4L19 seat leak tests at low or cryogenic temperatures for Fisher brand rotary style valves



## Services offered...

- Shutdown, turnaround, and outage planning and execution support
- Startup optimization and performance testing
- Valve sizing and selection
- Technology upgrades and retrofit
- Online and offline diagnostics
- Leak detection
- Control, isolation, and pressure relief valve calibration and repair
- Regulator configuration and repair
- Product and system training

## Featured Main Cryogenic Heat Exchanger Solutions

### ■ Fisher Joule-Thomson Valve



Utilize pressure drop to achieve cooling of liquids, gases, or multi-phase fluids.

- Withstands full cryogenic temperatures
- Maintains stable flow of refrigerant to chillers and cold boxes under large differential pressures
- High precision assembly with  $\leq .25\%$  deadband

[Cryogenic Control Valves product bulletin](#) ▶

### ■ Fisher LNG Temperature Valve



Control the temperature of LNG coming out of the main heat exchanger.

- Drilled hole trim in flow up direction so flashing and/or outgassing is directed away from trim
- Expanded outlet valve body design allows for downstream expansion of lighter hydrocarbon constituents

[Cryogenic Control Valves product bulletin](#) ▶

### ■ AEV | Bettis | Vanessa Automated Cryogenic Isolation Valves



Ensure consistently tight shutoff despite temperature and pressure changes.

- Torque seated, zero leakage shutoff
- Trapped cavity risk eliminated
- Zero maintenance with non-rubbing design

[AEV 2XC product webpage](#) ▶

[Bettis RTS product webpage](#) ▶

[Vanessa Series 30,000 product webpage](#) ▶

[Bettis G Series product webpage](#) ▶

### ■ Fisher LNG Injector



Inject LNG into the gas to cool it.

- Wide range of Kv capacities
- Multiple atomizer technology
- Near uniform spray quality over the entire operating range

[Fisher Yarway AT-37/47 product webpage](#) ▶

### ■ Fisher Overpressure Protection Valve



Shut off the flow of a hazardous gas upon detection of a dangerous event.

- Torque assisted elastic metal seal ensures continuous bi-directional, zero leakage performance
- Cryogenic extension

[Fisher Digital Isolation TOV product webpage](#) ▶

### AEV | Vanessa Manual Cryogenic Isolation Valves



Isolate your critical liquefaction facility assets with confidence for inspection and repair events.

- Torque assisted elastic metal seal ensures continuous bi-directional, zero leakage performance

[Isolation Valves webpage](#) ▶

### Additional products

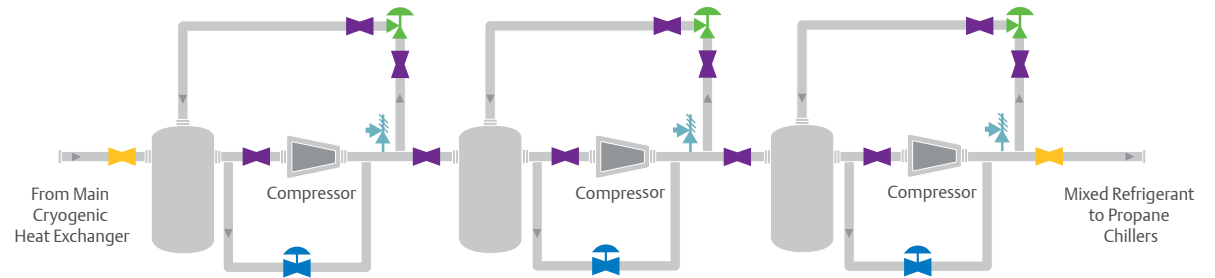
- Fisher FIELDVUE digital valve controller



Visit the [Liquefaction webpage](#) to learn more.

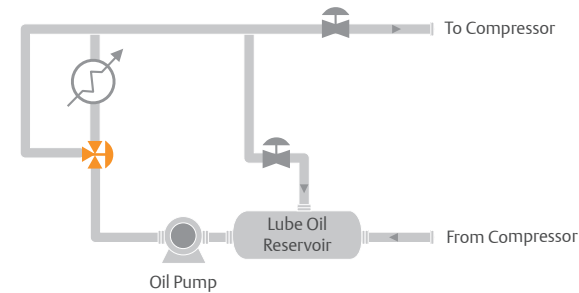
# Compression Train Solutions

Centrifugal compressors are the main components of the gas liquefaction train. They are typically a multi-stage compression of refrigerants necessary to ensure that natural gas reaches its liquid state for storage and transport. The entire refrigeration cycle relies on robust compressors to ensure uninterrupted LNG production.



## What's your opportunity?

- Achieve maximum compressor efficiency and high throughput
- Protect critical compressor from surge, failures, and shutdowns
- Avoid pollutant and dangerous emission of volatile organic compounds



## Watch an anti-surge valve demonstration.

Emerson designs ultra-high-speed Fisher valves specifically for surge control purposes. These precision valves allow the system to operate closer to the surge point.

Set up an appointment to see a demonstration of a Fisher anti-surge control valve either via webcast or in person. Shown right is an NPS 12x18 Fisher FBT control valve with 14 7/8-inch travel that has the ability to stroke in 1.1 seconds with a DVC6200 ODV-tier digital valve controller and 0.75 seconds under solenoid trip.

[Compressor Anti-Surge Valve Solutions Webpage](#) ▶



## Services offered...

- Anti-surge valve field testing
- Shutdown, turnaround, and outage planning and execution support
- Startup optimization and performance testing
- Valve sizing and selection
- Technology upgrades and retrofit
- Online and offline diagnostics
- Leak detection
- Control, isolation, and pressure relief valve calibration and repair
- Regulator configuration and repair
- Product and system training



## Featured Compression Train Solutions

### ■ Fisher Optimized Compressor Anti-Surge Valve and Accessories



Protect your critical and costly compressor from a damaging surge event with a complete optimized anti-surge valve package that provides higher gains, precise response, and remarkable stability.

- The Fisher control valve provides quick, accurate response during a surge to recycle the discharge flow back to the suction side of the compressor, avoiding expensive and disruptive damage
- The Fisher SS-263 volume boosters offer three times the capacity of traditional boosters, high vibration resistance, enhanced throttling control, and a desirable fail-safe mode
- The FIELDVUE ODV-tier digital valve controller is dual certified as intrinsically safe and explosion proof, and offers an anti-surge-specific tuning capability

[Fisher Anti-Surge Valve Solutions webpage](#) ▶

### ■ Fisher Hot Bypass Valve



Recycle gas around the entire set of compressors as a safety feature so they won't shut down.

- Very large size of up to NPS 36 to accommodate the capacity rates of the compressors
- Quick opening time

[Fisher EW product webpage](#) ▶

### ■ Fisher Overpressure Protection Valve



Shut off the flow of a hazardous gas upon detection of a dangerous event.

- Torque assisted elastic metal seal ensures continuous bi-directional, zero leakage performance

[Fisher Digital Isolation TOV product webpage](#) ▶

### ■ Fisher 3-Way Temperature Valve



Maintain the appropriate temperature of the oil lubricant.

- Throttling or flow switching service
- Cavity free
- Non-rubbing design completely eliminates wear on sealing surfaces

[Fisher YD and YS product webpage](#) ▶

### ■ AEV | Bettis | Vanessa Automated Cryogenic Isolation Valves



Ensure consistently tight shutoff despite temperature and pressure changes.

- Torque seated, zero leakage shutoff
- Trapped cavity risk eliminated
- Zero maintenance with non-rubbing design

[AEV 2XC product webpage](#) ▶

[Vanessa Series 30,000 product webpage](#) ▶

[Bettis RTS product webpage](#) ▶

[Bettis G Series product webpage](#) ▶

### ■ Anderson Greenwood™ Overpressure Protection Valve



Provide overpressure protection at the compressor outlets with a product designed to minimize nuisance reliefs.

- Robust bracketing and tubing minimize the impact of vibration of the pressure relief valve
- Spike snubbers smooth pressure waves at the valve inlet reducing accidental reliefs

[Anderson Greenwood 200 Series product webpage](#) ▶

### ■ AEV | Vanessa Manual Cryogenic Isolation Valves



Isolate your critical liquefaction facility assets with confidence for inspection and repair events.

[Isolation Valves product webpage](#) ▶

### Additional products

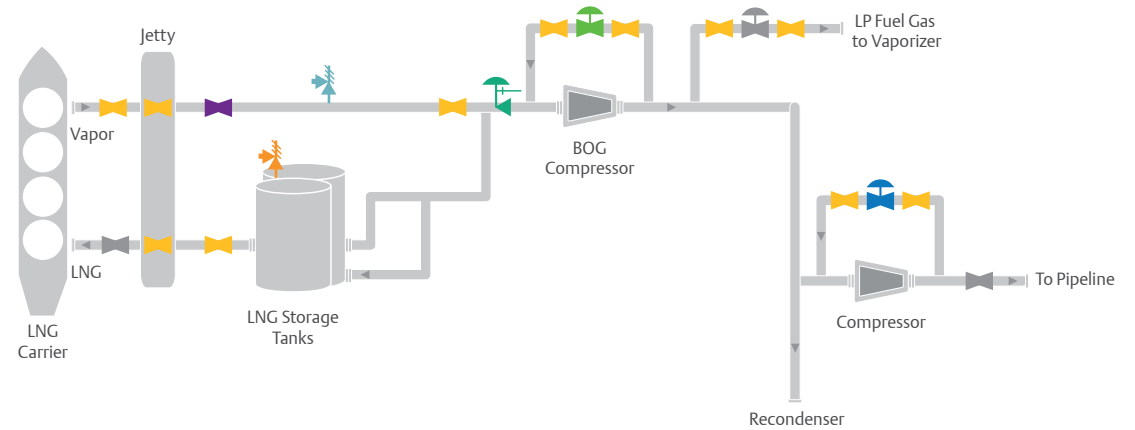
- Fisher FIELDVUE digital valve controller
- Fisher Yarway AT-38/48 propane injector



Visit the [Gas Processing and LNG webpage](#) to learn more.

# LNG Storage, Jetty Loading, and Boil-Off Gas Solutions

Usually two or more above ground tanks are installed for receiving and storing LNG. During normal operation, boil-off gas (BOG) is produced in the storage tanks and LNG lines by heat transfer from the surroundings. It is compressed and liquefied in a recondenser. This process helps to avoid flaring or venting and to minimize the environmental impact of the facility.



## What's your opportunity?

- Recover boil-off gas
- Detect gas leaks
- Reduce total installed cost of loading arms
- Minimize valuable product loss



## Minimize emissions with superior cryogenic valve technology.

Fugitive emissions can account for vast amounts of lost product. Facilities employing triple offset valves and double eccentric c-ball valves in butt-weld top entry configuration can proactively eliminate future emissions and potential issues with regulatory authorities. While zero leakage standards have become common on ambient service, cryogenic processes are much more demanding. Single fixed seat, torque seated, cavity-free valves offer long lasting, tight shutoff at cryogenic temperatures.



## Services offered...

- Shutdown, turnaround, and outage planning and execution support
- Startup optimization and performance testing
- Valve sizing and selection
- Technology upgrades and retrofit
- Online and offline diagnostics
- Leak detection
- Control, isolation, and pressure relief valve calibration and repair
- Regulator configuration and repair
- Product and system training

## Featured LNG Storage, Jetty Loading, and Boil-Off Gas Solutions

### ■ Fisher Boil-Off Gas Compressor Anti-Surge Valve



Protect the compressor from damaging surge events with quick and accurate valve response to immediately recycle the discharge flow.

- The proper valve, actuator, and accessories can help increase compressor throughput, reliability, and efficiency as well as plant uptime

[Fisher Anti-Surge Valve Solutions webpage ►](#)

### AEV Loading Arm Valves



Minimize the total installed cost of loading arms with zero leakage cryogenic valves optimized for space and weight.

- C-shaped ball reduces top flange diameter by 40%
- Up to 30% weight reduction versus traditional designs
- Compact, reliable, robust automation

[AEV ²XC product webpage ►](#)

[Bettis M Series product webpage ►](#)

### ■ Fisher Pipeline Compressor Anti-Surge Valve

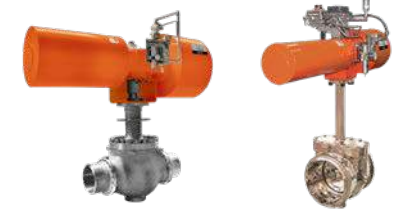


Protect the compressor from damaging surge events with quick and accurate valve response to immediately recycle the discharge flow.

- The proper valve, actuator, and accessories can help increase compressor throughput, reliability, and efficiency as well as plant uptime

[Fisher Anti-Surge Valve Solutions webpage ►](#)

### ■ AEV | Bettis | Vanessa Automated, Welded Cryogenic Valves



Ensure safe, zero leakage shutoff in challenging jetty operations including isolation, flow modulation, and emergency shutdown.

- Minimize product loss and emissions with welded, ultra low emission designs
- Trapped cavity risk eliminated
- Top entry design for in-line maintenance

[AEV ²XC product webpage ►](#)

[Vanessa Series 30,000 product webpage ►](#)

[Bettis G Series product webpage ►](#)

### ■ Anderson Greenwood Pressure Relief Valve



Protect the LNG storage tank from overpressure and vacuum scenarios while eliminating leakage during operation.

- Leading relief capacity per size
- Minimize the size or number of valves required for adequate protection

[Anderson Greenwood 9300H product webpage ►](#)

### ■ Enardo™ Detonation Arrestor



Protect against vapor ignition by reducing the temperature and momentum of a flame.

- Designed for unstable detonation
- Larger flame channels for lower pressure drop and less frequent maintenance
- Range covers both unconfined and confined applications and gas groups B, C, and D

[Enardo DFA Series product webpage ►](#)

### ■ Anderson Greenwood Pressure Relief Valve



Protect piping and equipment from thermal expansion due to the warming of the cryogenic LNG.

- Bubble tight seats and true pop action eliminate risk of freezing
- Sized for thermal relief to minimize product loss
- Withstands full cryogenic temperatures

[Anderson Greenwood 80s Series product webpage ►](#)

### ■ Fisher LNG Injector



Inject LNG into the boil-off gas to cool it.

- Wide range of Kv capacities
- Dimensions to meet gas line size requirements
- Fine atomization for fast evaporation to minimize liquid accumulation in the suction drum

[Fisher Yarway AT-37/47 product webpage ►](#)

### Additional products

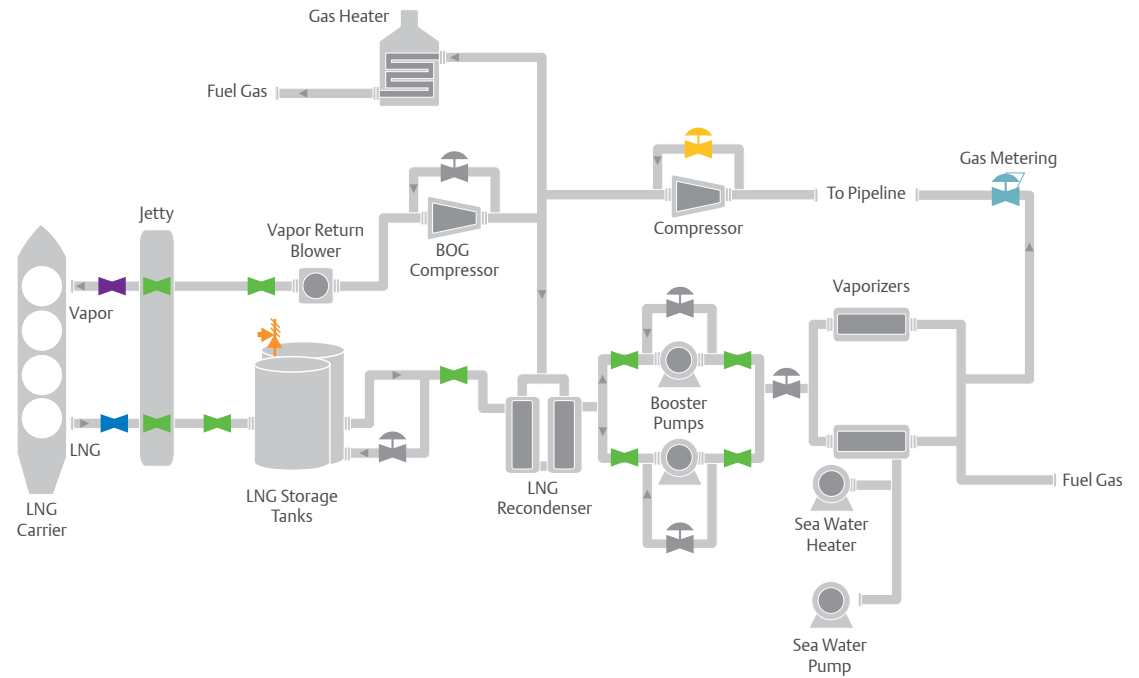
- Fisher FIELDVUE digital valve controller
- Yarway ARC valve
- Fasani bolted bonnet check valve



Visit the [Cryogenic and Refrigerated Storage webpage](#) to learn more.

# Unloading, Storage, and Regasification Solutions

An LNG receiving terminal accommodates the unloading of vessels and has large insulated holding tanks designed to keep the LNG at atmospheric temperature. A vaporization system is used to return the LNG to a gaseous state prior to distribution in a natural gas pipeline system.



## What's your opportunity?

- Maintain stable regasification operations under all conditions
- Efficiently minimize energy consumption and emissions
- Improve personnel and equipment safety
- Efficiently manage customer delivery expectations
- Reduce total cost of unloading arms



## Eliminate safety risk in volatile processes with superior valve technology.

Traditional ball valves, by design, have a cavity in the body that can trap process media. If that media is volatile as in the case of LNG, which can expand to 600 times its size when returning to a gaseous state, it can result in catastrophic failure.

AEV C-ball valves feature a revolutionary single fixed seat design that completely eliminates the cavity, and with it, any risk of media being trapped in the valve body.



## Services offered...

- Shutdown, turnaround, and outage planning and execution support
- Startup optimization and performance testing
- Valve sizing and selection
- Technology upgrades and retrofit
- Online and offline diagnostics
- Leak detection
- Control, isolation, and pressure relief valve calibration and repair
- Regulator configuration and repair
- Product and system training

## Featured Unloading, Storage, and Regasification Solutions

### ■ AEV | Bettis | Vanessa Automated, Welded Cryogenic Valves



Ensure safe, zero leakage shutoff in challenging jetty operations including isolation, flow modulation, and emergency shutdown.

- Minimize product loss and emissions with welded, ultra low emission designs
- Trapped cavity risk eliminated
- Top entry design for in-line maintenance

[AEV ²XC product webpage ▶](#)

[Vanessa Series 30,000 product webpage ▶](#)

[Bettis G Series product webpage ▶](#)

### ■ Fisher Overpressure Protection Valve



Shut off the flow of a hazardous gas upon detection of a dangerous event.

- Torque assisted elastic metal seal ensures continuous bi-directional, zero leakage performance

[Fisher Digital Isolation TOV product webpage ▶](#)

### ■ Fisher Compressor Anti-Surge Valve



Protect the compressor from damaging surge events with quick and accurate valve response to immediately recycle the discharge flow.

- Cryogenic construction due to the temperature of the boil-off gas
- Noise-attenuation trim

[Fisher Anti-Surge Valve Solutions webpage ▶](#)

### ■ Anderson Greenwood Pressure Relief Valve



Reduce vessel penetrations, product waste, and maintenance costs.

- Highest flow available on the market enables the use of smaller valves for the same required capacity
- Simple self-guiding seat design allows for repeatable seat tightness

[Anderson Greenwood Series 9300 product webpage ▶](#)

### ■ Enardo Detonation Arrestor



Protect against vapor ignition by reducing the temperature and momentum of a flame.

- Designed for unstable detonation
- Larger flame channels for lower pressure drop and less frequent maintenance
- Range covers both unconfined and confined applications and gas groups B, C, and D

[Enardo DFA Series product webpage ▶](#)

### ■ Injection Station



Inject regasified LNG into the natural gas network with pressure reducing and metering stations.

- Pressure regulators and overpressure protections for safe and accurate operations
- Reliable flow measurement to accurately identify the quantity of LNG injected in the pipeline

[Tartarini pressure regulator product webpage ▶](#)

### AEV Unloading Arm Valve



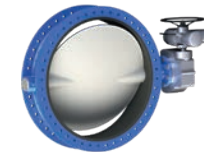
Minimize the total installed cost of unloading arms with zero leakage cryogenic valves optimized for space and weight.

- C-shaped ball reduces top flange diameter by 40%
- Up to 30% weight reduction versus traditional designs
- Compact, reliable, robust automation

[AEV ²XC product webpage ▶](#)

[Bettis M Series product webpage ▶](#)

### Keystone | Bettis Seawater Isolation Valves



Achieve long life, intelligent, automated isolation in corrosive seawater applications.

[Keystone Series GR product webpage ▶](#)

[Bettis XTE3000 product webpage ▶](#)

### Additional products

- Varec pressure and vacuum relief valve
- Fisher Yarway AT-37/47 LNG injector
- Yarway ARC valve
- Fasani bolted bonnet check valve
- Fisher FIELDVUE digital valve controller



Visit the [LNG Regasification webpage](#) to learn more.

# Continuous support in the face of changing market and operating conditions

Emerson leads the way with industry-defining end-to-end digital service experiences, enabling you achieve superior outcomes through our maintenance, reliability, and performance offerings. The tools we've developed support the digital transformation of the LNG industry, providing the confidence to extract the maximum value from your service and technology investments. Our teams partner with you across the globe to help you maintain safe operation, improve reliability, and optimize plant performance.

With over 200 regional service centers and 80+ mobile service centers worldwide, local experts are available to work with you to understand your unique challenges and enable you to find a solution. Our broad portfolio of service offerings allows us to tailor our support to align with your specific business goals.

[Webpage: Lifecycle Services for Valves, Actuators, and Regulators](#) ►



## Valve Condition Monitoring

Leverage smart valve technology and Emerson expertise to help your workforce make informed performance and reliability decisions.

[Webpage: Valve Condition Monitoring](#) ►



## Turnaround Services

Identify, prioritize, and plan long-term plant reliability improvements to reduce maintenance events and enhance LNG performance.

[Brochure: Shutdowns, Turnarounds, and Outages](#) ►



## Digital Walkdown and Installed Base Assessment

Acquire, analyze, and organize your process and equipment data with more efficiency and accuracy.

[Flyer: Digital Walkdown and Installed Base Assessment](#) ►



## Startup and Commissioning

Certified technicians meticulously work through approvals, calibration, testing, and certification to deliver a comprehensive handover, on time and on budget.

[Flyer: Startup and Commissioning](#) ►



With locations worldwide, Emerson local experts are never far away. Get in touch today to arrange a site walk and see the value Emerson can bring to your operations.

# Increase safety and reliability in your LNG value chain, reduce downtime, and protect the environment.



Emerson delivers time-tested and innovative LNG solutions designed to help you improve your operation's overall throughput, safety, and emissions. Contact us now for world-class technologies, and services that can maximize your speed and reliability. Getting started is easy. Visit [Emerson.com/FinalControl](https://www.emerson.com/FinalControl)

**Emerson Electric Co.**  
Global Headquarters  
8000 West Florissant Avenue  
St. Louis, Missouri, 63136  
United States  
T +1 314 679 8984  
ContactUs@Emerson.com  
Emerson.com/Final Control

**Emerson Automation Solutions**  
Latin America Headquarters  
1300 Concord Terrace Suite 400  
Sunrise, Florida 33323  
United States  
T +1 954 846 5030

**Emerson Automation Solutions**  
Europe Headquarters  
Neuhofstrasse 19a P.O. Box  
1046 CH 6340 Baar,  
Switzerland  
T +41 41 768 6111

**Emerson Automation Solutions**  
Middle East & Africa Headquarters  
Emerson FZE P.O. Box 17033,  
Jebel Ali Free Zone - South 2,  
Dubai, United Arab Emirates  
T +971 4 8118100

**Emerson Automation Solutions**  
Asia Pacific Headquarters  
1 Pandan Crescent  
Singapore 128461  
T +65 6777 8211

The Emerson logo is a trademark and service mark of Emerson Electric Co. ©2020 Emerson Electric Co. All other marks are the property of their respective owners. All rights reserved.  
D353109X012 / Sep20



## CONSIDER IT SOLVED™