Products Serving the Liquefied Natural Gas Industry
LNG is natural gas in a liquid state and is used by millions of homeowners and businesses everyday. It is shipped to our shores, where it is used to fuel homes, generate electricity and power various industries. Demand is high for natural gas because it is a clean-burning alternative to coal. LNG can help us meet our growing need for clean and affordable natural gas as we move toward a greener energy future.

Whether you're looking to upgrade an existing operation or specifying equipment for a new facility - SPX has a solution for you.

SPX brands design and manufacture different types of mechanical equipment used in various stages of LNG production, refrigeration, transportation, conversion and storage. When you spec our equipment, you get more than a product – you get a partner. Our dedicated team of experienced engineers utilize their process and mechanical design skills to provide quality solutions to meet your specific requirements.

We listen to your goals and design the best solution - based on our decades of experience in the LNG industry - to help you achieve them.

Your partnership with us doesn't end at the sale. Our supportive aftermarket services include training, consulting, remote diagnostics, repairs and much more. Our experienced engineers are available to fit OEM replacement parts to ensure that your process will continue to run smoothly.

Explore the endless solutions that SPX has to offer. You're sure to find answers that will reduce costs and improve plant performance.

**SPX Brands Serving the LNG Markets:**

- APV
- Bran+Luebbe
- ClydeUnion Pumps
- Copes-Vulcan
- Delair
- Dollinger
- GD Engineering
- Johnson Pump
- Lightnin
- Plenty
- Pneumatic Products

[www.spx.com](http://www.spx.com)
SPX Products Serving the Liquefied Natural Gas Industry

**LNG Export Terminal**

- Inlet Separation
- Feed Gas

**Gas Treatment**

- Dehydration
- Liquefaction

**Cooling**

- NGL

**LNG to Ship**

**LNG Storage**

**PUMPS**

- **Bran+Buebbe**
  - Process Pumps
  - Systems Packages

- **ClydeUnion Pumps**
  - Pumps Solutions

- **Plenty Pumps**
  - Screw Pumps
  - Rotary Vane Pumps

- **Johnson Pump**
  - Centrifugal Pumps
  - Sump Pumps
  - Self-Priming Pumps
  - Multistage Pumps
  - Gear Pumps

**GAS & LIQUID FILTRATION**

- **Dollinger**
  - Filtration

**PLATE HEAT EXCHANGERS**

- **APV**
  - Plate Heat Exchangers

**AIR TREATMENT**

- **Delair**
  - Dryers
LNG Sea Transport

LNG from Ship

LNG Storage

BOG Compression

Re-Condensing

Heat Source

Gas Sendout

LNG Vaporization

HP Pumps

LNG Import Terminal

MIXERS
- Lightnin
  - Mixers
  - Agitators

CONTROL VALVES
- Copes-Vulcan
  - Severe-Duty Control Valves

CLOSURES & PIG ALERTS
- GD Engineering
  - Closures
  - Pig Signallers

AIR FILTERS
- Plenty Process Filtration
  - Filtration

DRYERS
- Delair
  - Pneumatic Products
  - Dryers

STRAINERS & FILTERS
- Plenty Filters
  - Filters
KNOWLEDGE

SPX provides heat transfer solutions for oil and gas production - both onshore and offshore. They are designed to meet demanding requirements and to optimize the utilization of energy. Saving energy through more efficient processes and high heat recovery can help reduce operational costs significantly. The range of SPX plate heat exchangers is designed with the mission to do both. Our heat transfer solutions have proven reliable and highly efficient helping customers worldwide to run their processes safely and economically.

Applications:

SPX plate heat exchangers are typically used in low to medium pressure heat transfer applications, ranging from cooling and heating to condensing and evaporating process fluids and play an important role in LNG processing, including:

- Dehydration
- Gas sweetening
- Refrigeration
- (Re-)Liquifaction
- Re-gasification

TECHNOLOGY

SPX heat transfer solutions consist of a comprehensive range of plate-type heat exchanger technologies including gasketed, semi-welded and welded plate heat exchangers - from standard heat exchangers to specially designed units, from high-capacity, heavy-duty heat exchangers to small, compact designs. Designed for high thermal efficiency, reliable operation and minimum space requirements our plate heat exchanger solutions can reduce your capital investment cost and energy consumption.

Gasketed Plate Heat Exchangers

A wide range of gasketed plate heat exchangers are available for crude stabilization, dehydration, gas sweetening, and refrigeration duties, gaseous as well as liquid, and high-capacity utility cooling solutions. The optimized plate design maximizes energy use and cost effectiveness thanks to high heat recovery effect.

- Design pressure: 0-25 bar gauge (0-363 psi)
- Operating temperature: -35°C - 200°C (-13°F - 392°F)
- Heat transfer area: Up to 3,800 m² (40,903 sq. ft.)
- Flow rate: Up to 4,500 m³/h (19,800 US GPM)
- Optimized plate designs for maximum thermal efficiency
- Flexibility to reconfigure heat exchanger to changing needs
- Easy operation and maintenance – easy gasket mounting and plate alignment systems reduce service downtime
Semi-welded Plate Heat Exchangers and Paramine™ Gasketed System

SPX semi-welded plate heat exchangers with the APV Paramine™ gasket system offer a unique and superior plate/gasket combination for rich/lean amine interchanger duties. The APV Paramine™ system has been specially developed to resolve heat exchanger lifetime and reliability issues in Amine and Sulfinol interchanger applications and can withstand the impact of high concentrations of H₂S and CO₂.

- Design pressure: 0-30 bar gauge (435 psig) on welded side
- Operating temperature: Up to 160°C (320°F)
- Heat transfer area: Up to 1,800 m² (19,375 sq. ft.)
- Proven in gas sweetening in rich/lean amine interchanger duties - withstanding the impact of high concentrations of H₂S and CO₂
- Gasket life time: Up to 10 years, depending on process conditions
- Flexibility to reconfigure heat exchanger to changing needs

Hybrid Welded Plate Heat Exchangers

The APV Hybrid series is a range of welded plate heat exchangers combining highly efficient, gasket-free plate-pack and a strong vessel construction. It is designed to operate under challenging conditions where other heat exchangers may be restricted due to temperature and pressure limitations - enabling extremely low pressure drop if required. The flexible design makes it very compact, keeping weight and installed space to a minimum.

- Standard and custom solutions available
- Design pressure: Full vacuum up to 40 bar gauge (580 psi)
- Operating temperature: -200°C – 400°C (-328°F – 752°F)
- Heat transfer area: Up to 1,800 m² per unit (19,375 sq.ft)
- Full utilization of pressure drop to maximize thermal efficiency
- Close temperature approach – down to 1°C (1.8°F) possible
- Flexible and compact design
- Maintenance friendly design for easy inspection and cleaning (tube-side)

Service & Original Spare Parts

The global network of SPX Heat Exchanger Service Centers combined with local service capabilities provides rapid service and maintenance assistance by experienced technicians. Our service offerings include:

- Maintenance contracts to help you avoid unscheduled stoppages
- On-site audits to help further reduce your operating and maintenance expenses
- Field service technicians available 24/7 to assist at your plant when needed
- Heat exchanger and plate pack refurbishment or replacement
- Recommended on-site spare parts inventory, balancing risk against capital outlay
- Original spare parts and rapid delivery all over the world
Severe Duty Control Valves

**KNOWLEDGE**
SPX, with its Copes-Vulcan brand, is recognized worldwide as a leader in valves for severe and critical service applications. Our strength lies in our ability to provide innovative valve solutions for our customers’ application needs.

**TECHNOLOGY**
The SD-Severe Duty valve is Copes-Vulcan’s premium severe duty and critical service control valve design. It is the next generation of improved control valves designed specifically for severe duty applications. The SD-Severe Duty line incorporates a number of improvements such as:
- Quick disconnect between valve stem and actuator yoke on most models that simplify service and inspection
- Standard trims are available including previously offered custom designs
- Shorter lead times/quicker delivery of both entire valve assemblies and replacement parts

**Applications:**
- Potentially high noise applications
- Vibration prone service

The most important sub-assembly of a control valve is the trim. It must control the fluid process, often under extremely high pressure drop conditions, without undue damage due to flashing, cavitation, wire drawing, noise vibration or instability. SD Series valves can be fitted with an extensive array of standard and high performance trims to meet most severe duty/critical service requirements. All trims are of quick change design to assure ease of maintenance. Most are fully interchangeable between like sizes to ensure maximum flexibility and reduced inventory requirements.

A complete range of extremely rugged pneumatic diaphragm actuators will meet practically any severe duty service. In addition to the actuators manufactured by SPX, we can provide electric and hydraulic actuation that will meet the needs of each application.

**SERVICE**
Copes-Vulcan customer assistance is available on a 24-hour basis with field service dispatched from our principal manufacturing centers in Houston, Texas; McKean, Pennsylvania; Winsford, England; and Shanghai, China.

Valve services include:
- Startup and commissioning consultation.
- Pre outage inspection.
- Maintenance and repair training/education programs.
- Outage support - supervision, labor.
Special Application Globe Style Control Valves

The Severe Duty Valve is the SPX premium severe duty and critical service control valve design.

- High Turndown
- 0.75-24" Sizes
- 150-4500 ANSI Ratings
- Special ANSI Ratings
- Meets ASTM/ASME Standards
- Threaded -- Butt/Socket Weld -- Flanged Ends

Trim Types

SPX offers the widest variety of general service and severe duty trim designs in the industry. Our wide variety of Copes-Vulcan trim configurations allows us to customize our valve designs to meet our customers’ requirements and conditions, while optimizing performance.

- Minimum 13 Types
- One Stage Hush©
- Noise Control, Cavitation Elimination, Velocity & Erosion Control
- RAVEN™
- HUSH™
- CAV B9°

Steam Conditioning Equipment (Desuperheaters)

Desuperheaters can easily meet the most demanding needs in both power and process industries. They offer extremely fine control and exceptional turndown that is limited only by the rangeability of the coolant control valve. They are adaptable where custom fitting to new or existing piping is a problem. Provides alternatives where limited space or changes in header diameter are factors.

- 7 Styles
- Mechanical Atomizing
- Variable Orifice
- Integral Cooling Water Function Available
- 150-2500 ANSI Ratings
- Special ANSI Ratings
- Meets ASTM/ASME Standards

Actuators

Designed specifically for severe duty service, our actuators can be used in any application where shock and/or vibration may be encountered. Our actuators have undergone extensive testing and analysis for seismic and environmental considerations and are suitable for nuclear applications.

- Diaphragm Style:
  - Models 700 & 1000
  - Model 1000 Field Reversible
- Electric Available
- Electro/Hydraulic Available
- Piston, Reverse or Direct Acting (Model 1000 Field Reversible)
Mixers and Agitators

KNOWLEDGE

NGL Treatment - Natural gas processing is a complex process designed to clean raw natural gases to meet pipeline quality standards. In particular the process to sweeten Acid gasses to remove Carbon Dioxide (CO2) and Hydrogen sulphide (H2S) in the treatment of LNG & LPG typically involve the use of regenerable Amine solvents such as MEA, DEA, DGA, MDEA and MDEA based speciality solvents which need to be mixed with raw liquid gas streams. Controlled dispersion and intimate contacting of the Amine solvent within the aqueous gas phase is essential, as this is a significant contributor to the overall process efficiency and economic use of additive solvents. SPX mixing knowledge and know how with respect to blending, dispersion, and contacting coupled with its extensive range of dynamic mixers and mixing impellers, for open tank and draft tube agitated systems ensure even the most arduous mixing and dispersion requirements can be achieved.

Applications:
- NGL Treatment
- Mud Mixing
- Effluent Treatment
- Dosing
- Chemical Balance

TECHNOLOGY

SPX's extensive knowledge base, allows predictable process outcomes to be achieved with confidence. SPX's ability to scale up process requirements to any practical scale with assured process results allows plant design to be optimized. Its state of the art analysis tools which include CFD, and Laser anemometry can be used to support process understanding and development. Outside of the immediate Gas Treatment process, SPX's know-how extends to:
- Liquid-liquid blending
- Liquid-liquid dispersion
- Liquid-gas dispersions
- Liquid-liquid, liquid-gas, and liquid-solid chemical reaction and mass transfer
- Liquid-solid suspension

Related Technology

SPX has extensive knowledge and involvement with downstream hydrocarbon processing, petrochemical processing operations, coupled with its know-how with water and waste water treatment make it the ideal solution provider.
for mixing problems in the processing industries. SPX also has extensive know-how in make-down of hard to wet products and tote tank mixing for blending prior to chemical injection and dosing.

**R-135 (Low Torque Gas Handling) Impeller**

Parabolic radial flow impeller recommended for high shear mixing and gas dispersion applications:

- Optimized parabolic blade shape improves gas handling ability by 20% and reduces torque requirements by 40% over an R-130
- Radial design provides shear to achieve good contacting for liquid-liquid and gas-liquid dispersions and emulsions

**ECL (Enhanced Classic Line) Portable Mixers**

The ECL is an evolution of the original Lightnin brand Classic Mixer. These upgrades have provided enhanced mixer performance and process results.

- Maintenance free operation. All shaft bearings are sealed for life. Gears are synthetic grease lubricated for continuous lifetime service
- Aluminum housing designed for high strength and low weight using Finite Element Analysis
- Two interchangeable planetary gear ratios provide more output speeds and increased process flexibility. Direct drive also available.

**Series 45 Inline Mixer**

LIGHTNIN Series 45 Inline Mixers are easy to install into pipelines and are virtually maintenance free and has low operational costs.

- Permits rapid response time in continuous dosing and sampling systems to optimize chemical usage and maintain consistent product quality
- Is excellent for most fast reaction and difficult blending applications, including widely differing viscosities, densities and fluids with unusual properties such as polymers

**Mud Mixers**

Lightnin brand Mud Mixers are designed and engineered to provide complete suspension of the mud and cuttings.

- Provides a uniform feed to the mud cleaning equipment regardless of the mud weight
- Results in sending less sand and silt back into the mud pumps and into the hole, reducing wear and increasing the life span of pump liners, drill string, bearings and other moving parts
- Efficient mixing also minimizes the solids build-up on tank bottoms and helps keep mud weights uniform
KNOWLEDGE

With over 40 years of experience in the supply, installation and maintenance of these systems, Bran+Luebbe can offer a level of expertise unrivalled within today’s worldwide industry. SPX strives to obtain industry approvals for its products and services, which is why it is proud to highlight its registration in the First Point Assessment database.

First Point Assessment Limited (FPAL) was established by the international oil and gas industry with the prime objective of identifying opportunities for cost reduction and performance improvement throughout the supply chain. Bran+Luebbe’s oil and gas department has an established system that has provided FPAL with performance feedback for several years.

Applications:

- Biocides
- Chemical Dilutants
- Corrosion Inhibitors
- Demulsifiers
- Glycol
- Hypochlorite
- Methanol
- Oxygen Scavenging
- Polyelectrolytes
- Pour Point Depressants
- Scale Inhibitors

TECHNOLOGY

Standard Plunger Pumps

- Leak Free Double Diaphragm Pumps
- Fixed or Variable Speed Drive
- Manual, Electric or Pneumatic Flowrate Control Options
- Horizontal and Vertical Combinations
- Simplex and Multiplex Range
- Modular Design Concept Permits Future Expansion

SERVICE

- Remote monitoring- Enable one to know the pump’s conditions if the person is not at the original site to monitor the pump’s status
- Education & Training- Training operators in operation and maintenance of the equipment supplied
- Installation & Commissioning- SPX brand engineers ensure that your process solution is 100% operational from day one
• Optimizing production time- Enabling simple ordering of original spare parts and consumables for rapid delivery all over the world and recommending an optimum on-site spare parts inventory balancing risk against capital outlay
• Avoiding unscheduled stoppages- Offering maintenance contracts that meet the individual needs of each customer
• Rapid assistance when you need it- Providing rapid service and maintenance by experienced engineers and technicians
• Optimizing your competitive strength - Providing application knowledge in connection with process optimization and development of new applications

**Novaplex Process Pumps (API 674)**

• Flexible high performance double diaphragm fixed stroke length process pumps
• Technology offers leak-free operation while providing benefits of high reliability, operational integrity and easy maintenance
• Modular construction allows for a combination of up to seven pump heads on a single unit
• Ideal for toxic or chemically aggressive liquids and slurries
• Exclusive use of anti-friction bearings reduces energy consumption to almost theoretical levels, giving minimized life cycle costs
• Low to high pressure capability up to 8,700 psig
• Capacities up to 26,500 US gph

**NOVALINK CSM**

Continuous Status Monitoring, Remote Diagnostic - Permanent, fully automatic performance monitoring is available. Bran+Luebbe’s NOVALINK-CSM Online Diagnostics system continuously analyzes, documents and reports the current status of the pump’s key performance parameters without interrupting its operation, and transmits the data to a local or remote control computer. The test data can help to plan the optimum maintenance schedule and be used to reduce the time and cost of repairs.

**Multi-Pump Systems (API 675)**

Similar to multi-pump head skids, with capacities of one or more additional pumps. With unmatched experience and expertise, SPX is capable of designing, manufacturing, testing and certifying chemical injection systems to meet growing customer and industry needs.

**Multi-Ingredient Chemical Storing and Pumping Package**

Requirements for Chemical Injection Packages in the Oil and Gas Industry are very diverse - depending on the application, location, number of chemicals, multi-point injection, increases in production output and changes in production conditions.
SERVICE
Our trained and experienced staff are able to offer technical pre- and post-sales advice on all pumps and systems, training throughout all stages of pump assembly, and support through to on-site installation and commissioning.

Our network of technicians provide planned and comprehensive on-site service, repair and refurbishment programs for most types of pumps. Whether servicing takes place in the field or at our service center, the same standards of excellence apply, ensuring that our customers’ pumps are back in the field quickly and operating at maximum efficiency.

Our Service Center maintains a stock inventory of the most common wearing components. Parts required for emergency breakdown situations can be manufactured upon request quickly and accurately at our manufacturing facilities.

KNOWLEDGE
With decades of experience in designing and manufacturing rotary positive displacement pumps, SPX has built an excellent reputation for reliable pumping equipment for the marine, oil processing, petrochemical processing, power generation, defense, sugar and general industries. With its Plenty Mirreles Pumps, SPX has a solution for most pumping applications with a range that includes two screw (TWINRO), three screw (TRIRO) and our 2000 series vane pumps incorporating the unique variable flow feature.

Applications:
- Ship bunkering
- Forced lubrication
- Seal oil circulation
- Lube oil transfer
- Fuel oil firing (boilers etc.)
- Low sulphur diesel oil (LSDO)
- Heavy fuel oil pumping
- Fuel oil booster and transfer
- Ship engine rooms

TECHNOLOGY
TWINRO screw pumps provide an axial flow and are used in all bulk transfer duties where large volumes of liquid are required to be moved. They have features designed for emptying tanks, good suction conditions, excellent cargo stripping capabilities and are available in both horizontal and space saving, vertical configurations. Screw pumps provide a smooth, pulse-free flow and are designed to pump oils. The pump has an axial, pulse-free flow and silent operation for sensitive forced lubrication, seal oil circulation and oil firing systems.

Vane pumps are rotary pumps with a unique construction of eight blades with flat tips sliding in a precision machined rotor which provides low-shear, low-pulse flow with high volumetric and mechanical efficiency. The design enables low or highly viscous liquids to be pumped. The robust construction ensures very low vibration, quiet running and a long service life. They are designed to operate at low speeds, offering high resistance to wear.
**Twinro Pumps (API 676)**

The Twinro utilizes two contra rotating screws providing a smooth, pulse free flow. Each screw is accurately located between bearings providing a physical gap between each screw and between the screwset and casing, eliminating the need for internal lubrication from the pumped liquid.

- Flow range: 10 to 500 m³/hr. (higher flow rates up to 800 m³/hr on application)
- Temperature range: -40 to +200°C
- Operating pressure: Up to 14 bar (higher pressures on application)
- Viscosity range: 1 to 7000 cSt

**TRIRO Pumps (API 676) (API 614)**

The TRIRO positive displacement axial flow screw type pump is designed with only three moving parts - a power rotor and two idler rotors. These three rotors have accurately machined, precisely intermeshing threads which enclose the liquid being pumped and act as seals in relation to each other and to the pump body or sleeve in which they rotate. Designed to pump oils, the pump has an axial, pulse free flow and silent operation for sensitive forced lubrication, seal oil circulation and oil firing systems.

- Flow range: 0.1 to 750 m³/hr.
- Temperature range: -20 to +200°C
- Operating pressure: Up to 138 bar
- Viscosity range: 2 to 5000 cSt

**Vane Pumps (API 676)**

The "U" (Universal) 2000 offers infinitely variable flow from zero to 100% by varying the eccentricity of the shaft-to-rotor mechanism within the pump. The eccentricity can be varied in three ways: manually at the pump by a handwheel situated on top of the pump; remotely from a control center with a pneumatic or electric stroke actuator on top of the pump or automatically by C.P.C. (Constant Pressure Control) where pump flow is automatically adjusted.

- Flow range: up to 250 m³/hr (higher flow rates up to 500 m³/hr on application)
- Temperature range: -30 to +260°C
- Operating pressure: 14 bar (standard) up to 25 bar (special construction)
- Viscosity range: 2 to 75,000 cSt (standard)

**Large Flow Terminal Transfer Twinro Pump (API 676)**

- Specifically developed for the bulk transfer of liquids
- For ship-to-shore, shore-to-ship transfer
- For fuel oils – both heavy and light, chemicals, additives etc.
KNOWLEDGE
The two main companies that formed ClydeUnion Pumps both have a rich heritage and impressive track record. Clyde Pumps was formed in May 2007 when the Weir Pumps (Glasgow) business was acquired from the Weir Group plc, but its roots go back to 1871 when two brothers, George and James Weir, founded the engineering firm of G. & J. Weir. Union Pump has an equally impressive pedigree and had been producing advanced pumps since its inception in 1885 in Michigan, USA.

Today ClydeUnion Pumps is part of SPX and is structured in customer focused business units. Our business units are at the heart of everything we do and provide expertise across the upstream oil, downstream oil, power generation, water and industrial, minerals and mining sectors and offshore and marine. In addition our truly global aftermarket capability ensures our customers optimize their processes at all times.

Applications:
- HP Vaporiser Feed
- Storage
- Transfer
- Process

TECHNOLOGY
SPX is a leading manufacturer of centrifugal, power and steam driven reciprocating pumps for both onshore and offshore applications in the Hydrocarbon Processing market. Our pumps are designed to API 610 and 674 standards and are utilized in refineries, gas plants, offshore oil platforms, FPSOs and pipelines around the world. Pump packages are commonly supplied as complete engineered solutions inclusive of advanced API seals and sealing systems, lubrication systems, instrumentation and various drive train options. A wide choice of materials are available for all product lines.

SERVICE
ClydeUnion Pumps provides world class aftermarket support for all types of pump brands via our worldwide network of manufacturing facilities, service centers and approved service providers. Our experienced aftermarket personnel provide round the clock support to all industry sectors and focus on ensuring availability and life extension of pumping technologies.
**Overhung (OH) Pumps**

Single stage overhung type pumps are the workhorse of any process stream and the ClydeUnion Pumps radially split CUP-OH2 through to CUP-OH5 products are designed with versatility in mind. Their rigid construction makes them suitable for the full range of process applications as well as the transfer of product during LNG processing. All units comply with API 610.

**Between Bearing (BB) Pumps**

Our extensive range of between bearings pumps have been developed specifically to address high pressure and high speed applications, and can be found operating in worldwide LNG locations. These heavy duty, API compliant pumps include single or double stage CUP-BB1s & CUP-BB2s through to multi-stage CUP-BB3 and CUP-BB5 configurations, having impeller(s) mounted on a shaft between bearings at both ends. The CUP-BB ranges boast optimized rotodynamic stability, increasing reliability and mean time between overhaul.

**Vertically Suspended (VS) Pumps**

ClydeUnion Pumps VS products are ideally suited to key applications such as sump drainage, cryogenic processes, seawater lift and firewater pumps. These centrifugal pumps may be single or multi-stage configurations with impeller(s) situated vertically on the shaft and supported by robust bearing arrangements as required for the product and application. A comprehensive product portfolio, all of which comply to API 610, is inclusive of lineshaft type CUP-VS1s and CUP-VS4s through to canister type CUP-VS6s and submersible motor pump sets. Volute/diffuser style hydraulic variants further enhance our capability offering.

**Auxiliary and Specialist Sealing Systems**

Included in our range of auxiliary systems is the E~Z Lift automated reel system which is designed to meet the raw sea water supply requirements of typical jack-up rigs, production platforms, semi-submersibles, self-elevating heavy lift crane barge and wind turbine installation vessels. The patented CP System improves safety, reliability and eliminates fugitive emissions, ensuring zero leakage to the atmosphere, achieving this without the need for external power or a nitrogen gas source. Our CP Systems are operating worldwide in cryogenic and non-cryogenic applications, providing a simple means of pressurizing double, back-to-back & dual pressurised mechanical seals. The unit maintains constant differential pressure across the inboard seal, regardless of fluctuations in suction or discharge pressure.
KNOWLEDGE

SPX’s Johnson Pumps have been moving liquids for more than 75 years. We’re found everywhere from ocean-going ships and tanker trucks to liquefaction facilities, tank farms and distribution terminals. Pumps are the life of a ship. When the pumps stop working, everything on board shuts down. That’s why we make the best pumps to precisely meet the specifications demanded at a competitive price with the fastest possible deliveries. Johnson Pumps provide a full range of centrifugal and positive displacement pumps to suit your needs on-board. We focus on quality and low life-cycle costs (LCC) for our products. Our pumps are serviceable without having to remove the pump from the pipework. In addition, our authorized service partners use genuine OEM parts to ensure continuation of optimum performance.

Applications:
- Acid gas, water and heavy hydrocarbon removal
- Cooling water circulation
- Fire suppression systems
- Hot and lube oil
- Water for regasification
- Glycol

FreFlow Centrifugal Pump
Self priming centrifugal pump. Corrosive and slightly contaminated liquids containing gas or air such as sea, fresh, bilge and fire-fighting water.
- Excellent suction ability up to 7 meters lift
- Heavy-duty, dust tight, grease-lubricated bearing
- Inspection hatch for easy maintenance (bigger types)

CombiFlex Vertical Pump
Vertical pump with variable position suction bend. Hydraulics according to EN733.
- Many mounting options (floor-, bulkhead-, wallmounting)
- 8 positions possible between suction and delivery connections
- Top-pull-out construction in combination with spacer coupling for easy maintenance

TopGear
Heavy duty self-priming internal gear pump range. Cargo transfer, fuel and oil transfer.
- Front and Back-Pull-Out
- High and low viscous products
- Simple design
- Easy maintenance

Email: johnson-pump@spx.com
INSTRUMENT AIR DRYERS

SPX provides compressed-air dryers and filters that remove water, oil, dirt, rust and pipe scale. Contaminants found in compressed air can adversely affect all components of an air-distribution system, and can cause a malfunction of pneumatic control in the instrument air system. Properly treated compressed air can improve work efficiency and reduce maintenance.

SPX desiccant dryers incorporate these quality features:

- Superior quality desiccants are selected for their spherical uniformity, abrasion resistance and superior crush strength to deliver stable dew point performance and low dust creation
- Precision timing circuits control process valve sequencing protocols to deliver optimum dew point stability and energy efficiency
- Calculated desiccant bed construction ensures ideal tower velocities to absorb moisture, stabilize dew points and prevent bed movement
- Spare mufflers included on all models and sizes

Heated Desiccant Air Dryers

Heat reactivated desiccant dryers use an internal or external heat source to regenerate the off-line desiccant tower. Heat reactivation allows SPX to increase the volume of usable compressed air and reduce the energy consumption of the overall package. Pressure dew points from -4°F to -100°F are available.

- DEA Series internally heated
- CAB/IP Series blower regenerated
- PHD Series externally heated
- NRG-Les Series waste heat
- Low purge energy savings
- No process gas lost to purge
- All weather dew point control
- Compressor outlet heat regeneration

Heat-Les™ Desiccant Air Dryers

Heat-Les™ desiccant dryers are the most common design in use today to deliver stable pressure dew points to -100°F. Desiccant bed regeneration is accomplished using a side-stream percentage of clean, dry, internally supplied compressed air. This allows them to excel in areas where the ambient air may be compromised.

- LHA Series low flow desiccant dryer
- DHA/CDA Series standard and custom
- DSE/DSS/DHD Series industrial grade
- CHA Series large flow heatless dryers
- Consistent outlet dew points
- Durable economic industrial applications
- Corrosive, toxic or explosive environments
- Critical applications and hostile environments
KNOWLEDGE

Natural gas contains contaminants like water vapor. When this vapor condenses into liquid water it will form corrosive compounds in combination with other components in the natural gas. These corrosive compounds will have a detrimental effect on the equipment in which this condensation occurs. Moreover, water in combination with natural gas can form gas hydrates which are crystalline complexes of water and certain hydrocarbons contained in the natural gas. Hydrates can travel through the system but eventually will clog the equipment or the pipeline. It is therefore essential that the natural gas is dehydrated to a sufficient low dewpoint.

SPX, through its Delair brand, has more than 70 years of experience in engineered and standard products for the LNG industry and can provide a suitable solution for the removal of H2O from Natural gas. Additionally, SPX can supply a wide range of N2 generators for use in blanketing applications as well as Instrument Air Dryers suited for operation in Hazardous environments found in the Oil & Gas, LNG storage facilities, LNG carriers and industry. Pressure retaining parts can be provided according to ASME, PED, etc.

Applications:

- N2 generation for blanketing of LNG storage tanks and carrier hulls
- Removal of water from N2 used in storage tanks, carrier hulls and LNG loading facilities
- Purging of process-lines and flare stacks with N2
- Inert gas-dryer for Treatment & Loading facilities of LNG carriers
- Removal of H2O from CNG
- Compressed Air drying for LNG plant. (Utilities & Instruments)

TECHNOLOGY

The proven technology of Delair brand dryers and N2 generators available through our worldwide distribution network provides reliable, cost effective and care free operation for LNG operators worldwide in: LNG Drying, Gas Drying, Instrument Air Drying, N2 Generators (Membrane).

SERVICE

Your plant and equipment solutions from SPX are designed to meet your specific demands for quality, productivity and cost control as well as sustainability in terms of emissions, waste, process and energy management. The Delair commitment to
helping you to maximize your Return on Investment by improving performance and profitability does not stop at delivery. Our commitment covers every operational aspect of your Delair plant and equipment throughout its service life:

- **Education & Training** - Training operators in operation and maintenance of the equipment supplied.
- **Installation & Commissioning** - SPX engineers ensure that your process solution is 100% operational from day one.
- **Optimizing production time** - Enabling simple ordering of original spare parts and consumables for rapid delivery all over the world and recommending an optimum on-site spare parts inventory balancing risk against capital outlay.
- **Avoiding unscheduled stoppages** - Offering maintenance contracts that meet the individual needs of each customer.
- **Rapid assistance when you need it** - Providing rapid service and maintenance by experienced engineers and technicians.
- **Optimizing your competitive strength** - Providing application knowledge in connection with process optimization and development of new applications.

**Gas Drying**

Inert gas, e.g. produced by a N2 generator is used as a means to prevent explosions and reduce corrosion in cargo tanks. Untreated inert gas is saturated with water vapor. Water vapor in inert gas causes corrosion in the cargo tanks and might even result in product spoilage.

- **Typical capacity** 150 Nm³/Hr – 25,000 Nm³/Hr.
- **Achievable pressure dewpoints up to** -70°C.

**Instrument Air Drying**

Delair brand instrument air dryers use porous materials (desiccants) to adsorb water molecules from the compressed air. The desiccant is regenerated for re-use. To allow continuous operation, two desiccant towers are used, one adsorbing while the other is being regenerated.

- **Typical capacity** 150 Nm³/Hr – 25,000 Nm³/Hr.
- **Achievable pressure dewpoints up to** -70°C.

**N2 Generators**

The Delair membrane type nitrogen generator enables you to produce your own nitrogen from compressed air on site according to your own specifications. Moreover, you can produce an unlimited amount of nitrogen with the required purity.

**Custom Engineered Dryers**

SPX has more than 70 years of experience in custom engineered dryers to suit your specific process and ambient conditions. Among our experience are Loop-Gas, LNG and Flash-Gas dryers.
Filtration

**KNOWLEDGE**

LNG producers use filtration to increase production for mass transport and distribution of natural gas around the world. The challenge for LNG producers is to maximize their output and expand their facilities to meet the increasing demand for natural gas. Filtration plays an important role in this effort. LNG producers can optimize their yields through the strategic placement of filtration products developed with advanced filtration and separation technologies.

SPX knowledge in filtration and purification equipment combined with our worldwide experience on both Onshore and Offshore contracts enables us to offer the complete filtration package for gas treatment systems. Typical gas cleaning processes will also have a requirement for the removal of solid contaminants from the closed system. If left untreated, the contaminant would reduce the efficiency and operational life of the carbon filter and consequently lead to a decrease in purity and dehydration efficiency. Our range of liquid filters are ideal for oil and gas treatment applications. A vast selection from over 200 different types of media ensures compatibility with the fluids being filtered, the contaminants being removed and the process operating conditions.

**Applications:**
- Total LNG system protection - Remove liquid droplets and particulates from the gas
- LNG heat exchanger protection - Remove carryover lube oil downstream of a compressor
- Remove foulants from amine solvents
- Provide condensate water free of hydrocarbons
- Prefiltration for liquid/liquid coalescers
- Protect carbon bed upstream
- Remove carbon fines
- Protect MRU (Mercury Recovery Unit) bed from fouling with removal of fine particulate

**TECHNOLOGY**

SPX maintains mission-critical operations all around the world with innovative technology engineered to handle the most aggressive contaminants. SPX will work with you to find the right solutions for the challenges presented by your LNG system.

- Gas Coalescing Filters
- Liquid/Liquid Coalescers
- Gas Particulate Filters
- Liquid Particulate Filters
- Activated Carbon Filters
- Fabricated Strainers
**Gas Coalescing Filter (GPTS-198)**
Dollinger brand Gas/Liquid Coalescers prevent amine, hydrocarbon, and particulates from contaminating the amine and glycol systems. The reliability of the system compressor is improved while the refrigerant condenser and main LNG heat exchanger are protected from fouling. Each system has been designed to use a single-stage coalescing process. The unique fiber based media that contains increasing pore sizes separate difficult liquid aerosols from the natural gas. The fluoropolymer coating improves the drainage of liquids through the coalescer enabling increased cycle time while operating at a lower liquid saturation pressure drop.

**Liquid/Liquid Coalescer**
SPX offers a host of Dollinger brand Liquid/Liquid Coalescers in varying designs based on customer specifications. Our Liquid/Liquid Coalescers improve the reliability of the amine regenerator by removing foulants and provides condensate water free of hydrocarbons for your application. The liquid/liquid systems are engineered to efficiently separate liquid/liquid emulsions. Constructed using a variety of polymers and fluoropolymers ensure a wide range of compatibility across multiple applications. The vertical stack design is used with a coalescer/separator configuration to allow for even flow distribution, promoting a higher flow rate in a smaller assembly.

*A horizontal design is available for use in oil from anime separations and for very low emulsions.*

**Liquid Filter (LL-142)**
Dollinger brand Liquid Particulate Filters are used to remove solid contaminants from a liquid stream. The presence of this type of particulate in a system can lead to excessive pump wear, heat exchanger fouling, contactor foaming, regenerator fouling and shorter carbon bed life. Therefore, the removal of solid particulate is essential to maintain optimal operating conditions of your critical components.

**Gas Particulate Filter (GP-146)**
Small, solid aerosols from gas streams, including desiccant fines, iron oxides and sulfides can foul critical system components, such as valves, heat exchangers and instrumentation. Dollinger brand Gas Aerosol Filters protect the MRU bed and main LNG heat exchanger from fouling and eliminate the primary source of contamination that causes costly system failures.

**Activated Carbon Filter (LLAC)**
The Dollinger range of process filters includes the “LLAC Activated Carbon Filter”, this is primarily used in the Dehydration/Regeneration of Gas Treatment Systems. Whether Amine or Glycol (MEG, TEG or DEG) is the selected contacting medium for the gas cleaning process there is a requirement for the removal of hydrocarbon impurities from the absorption system. Activated carbon is very efficient in removing these contaminants. For either full flow or slipstream treatment of the adsorption system Dollinger is able to offer a specifically designed unit meeting all process requirements with respect to contact time and medium velocity.
Through its Plenty brand, SPX offers possibly the world’s largest range of liquid & gas filters, strainers, fully automatic backflush filters, filter separators, coalescers, cyclones, carbon bed filters & cartridge filters. With references worldwide its dedicated team of experienced engineers utilize their process and mechanical skills to custom design and build specialist filtration equipment to meet client specific application requirements. Filtration solutions are provided in the gas, oil, petrochemical, water & power markets, however applications exist wherever there is a liquid or gas. Plenty Process Filters have extensive reference lists for our range of both Liquid & Gas equipment which is successfully operating on many LNG projects worldwide.

Applications:
- Main seawater intakes
- Plate heat exchanger protection
- Filter Separators to remove solids & liquids from main gas feeds
- Driers after filters
- Amine filters
- Solvent recovery filters
- 1st & 2nd stage mercury removal
- TEG & MEG
- Hot Oil Filters
- Glycol Filters
- Cooling Medium Filters

Plenty brand process filters are able to work with you to custom design equipment, to meet all of your liquid & gas filtration requirements. All Plenty brand process filtration equipment is designed from 1st principles enabling us to fully meet with your exacting applications in terms of pressure loss, change-out periods & material suitability. SPX is your ‘one stop’ for all liquid & gas filtration & separation requirements.

We are able to offer back-up & service by our fully qualified engineers many of whom have extensive service knowledge gained within the filtration industry worldwide from oil / gas / petrochemical & are able to offer many years of experience & solutions to problems. Please contact us to discuss your specific filtration / separation requirements.
Liquid Filters
SPX has designed a range of filters in a variety of materials in accordance with international pressure vessel codes.
- Single basket and Dual basket (Duplex) filters
- Fully automatic backflush filters
- Hi-Flow Filters
- Designed to incorporate either quick release or bolted closures
- Elements are either cleanable or disposable

Filter Separators
Filter Separators are designed to remove both solids and liquids from gas streams.
- Constructed using Plenty coalescing cartridges, vane units and/or cyclones to achieve required solid and liquid removal efficiency
- Unit available from pipe sizes 2" and above to suit any pressure class
- Available in a range of materials suitable for most operating conditions

Skid Mounted Packages
- Custom designed to application requirements
- Skid mounted packages
- Modular
- Can include mechanical, electrical, instrumentation, ladders, platforms to be compatible with site requirements

Carbon Bed Filters
- Custom design Filters to meet specific application details
- Designed and manufactured in accordance with international pressure vessel code
- Range of materials of construction to meet specific customer operating parameters

Coalescers
- Coalescers are designed to coalesce fine liquid mist in gas streams into droplets considerably larger than their original size, such that they can be drained by gravity from the vessel
- Units are available in both horizontal and vertical orientation with single or two stage construction
High Pressure H-Type Gas Filters

The H Type is a fabricated horizontal filter designed for larger capacities and pipe connection sizes that may be custom designed to suit site connections. It is also available in standard configurations.

- Quick release covers eliminate the need for maintenance tools
- Designed for pressure ratings up to 100 barg (1440 psig)
- Supplied with two or three triple length elements for minimum service time
- Welded construction enables radially positioned inlet and outlet connections to suit site requirements

Filters

KNOWLEDGE

Plenty filters from SPX supplies a wide range of standard cast filters to numerous industries worldwide. With the emphasis on product quality, customer service, on time delivery and cost performance, the Plenty filters brand has built its reputation on extensive knowledge and resources in fluid handling equipment.

SPX has developed a range of filter products specifically designed for the LNG industry that offer a compact and lightweight solution to the many filtration requirements of the gas distribution system, the gas receiving stations, as well as the high medium and low pressure regional distribution networks. SPX continues to maintain and develop the quality standards traditionally demanded by the Gas Industry with all filters designed and manufactured to meet PD 5500, E13 and PV3 requirements under an ISO 9001:2008 Quality Management system.

Applications:
- Natural gas filtration
- Transmission pipelines
- Power stations
- Town gas
- Methane gas systems
- Gas processing plants
- LNG plants

TECHNOLOGY

SPX can offer a comprehensive range of proven dry and wet gas filtration solutions specifically designed for gas applications. Filters from SPX are used in any piping systems which carry liquids. They protect the piping infrastructure from harmful foreign particles and extend the efficient operating life of valuable process equipment. In addition to the standard cast range, special cast products and fabricated filters are also available.

Features include quick release covers and unique basket construction. As the filter collects debris in the basket, it is necessary to empty it on a regular basis. The quick release cover opens in seconds without the use of tools, simplifying the basket emptying step. Basket filter construction causes head loss on the product flow. When the basket is clean, head loss is recommended to be no more than 0.1 barg. If the fluid is highly viscous, the filter size will increase, reducing head loss. The basket is the heart of the strainer since it traps unwanted material. Strainer baskets are made of perforated sheet metal and a wide range of opening sizes are available.

SERVICE

Our filters are supported by extensive Aftermarket Services. We supply a full range of high quality spare parts designed specifically for our filters. Our experienced engineers are available to fit your parts to ensure your process will continue to run smoothly.
The size of the basket perforation should be slightly smaller than the minimum particle size to be removed. Using a smaller perforation opening than necessary will cause the basket to fill and clog more quickly, requiring frequent cleaning. The SPX gas filtration range from Plenty Filters is based on proven element designs developed and tested specifically for the Gas Industry, including “Pafic” resin bonded glass fibre and “Adept” woven polypropylene fibre cartridges that give a high dirt loading capacity. Filter elements are available in various sizes enabling selection of the optimum size of vessel to meet the requirements for performance, space availability and capital cost. SPX has successfully overcome specific problems including those associated with removal of pyrophoric dust from gas systems and supply a range of liquid removal separators, including; knock out pots, demister pads, vane separators, vertical separators, horizontal separators and cyclones.

**Simplex S-Type Single Basket Strainers**

Simplex basket type filters are of simple and robust cast construction with inline connections, designed for general applications where the process flow is intermittent and can be stopped for element cleaning.

- Quick release covers eliminate the need for maintenance tools
- Designed for pressure ratings up to ASME class 300 (51 BARG)
- Flow is from inside to outside the basket to trap and retain debris
- High basket area to pipeline C.S.A. ratio of over 10:1
- With coarse perforated baskets (2mm as standard) or fine ss mesh inserts to give particle removal down to 50 microns
- Disposable depth type cartridges are available for filtration to 5-10 microns

**Simplex T-Type Single Basket Strainers**

The Simplex T-Type extends the range of S-Type filters to higher pressures. It is a cast steel vertical filter, suitable for both liquid and gas applications and available with bolted or quick release type covers.

- Quick release covers eliminate the need for maintenance tools
- Designed for pressure ratings up to 149 barg (2160 psig)
- Flow is from inside to outside the basket to trap and retain debris
- High basket area to pipeline C.S.A. ratio of over 10:1
- With coarse perforated baskets (2mm as standard) or fine ss mesh inserts to give particle removal down to 50 microns
- Disposable depth type cartridges are available for filtration to 5-10 microns for liquid and 1–2 micron on gases

**Simplex High Pressure J-Type Gas Filters**

The Simplex Type J is a cast steel vertical filter which has been developed and designed for high pressure applications.

- Designed for pressure ratings up to 102 barg (1480 psig)
- Safe removal of filter basket
- Quick basket clean and return to service
- Quick release covers include safety interlocks designed for high pressure applications
KNOWLEDGE

GD Engineering is one of SPX’s leading brands and is known worldwide for providing engineered pipeline solutions for the oil, gas and process industries worldwide. SPX manufactures a range of innovative and proven pipeline products including the industry leading Bandlock™ 2 Quick Opening Closure, Hi-T Pigalert™ Scraper Passage Indicator and associated equipment. As a leader in this market, we draw on our experience to provide our LNG customers with a solution to their pipeline pigging problems.

• Innovation – Proven state-of-the-art engineering solutions.
• Know-how – Unsurpassed experience and process knowledge.
• Quality – Trusted genuine OEM parts competitively priced, and an after-sales commitment to excellent service support.
• Synergies – Our cooperative interaction strengthens our commitment to more than design, manufacturing and selling equipment. It is to provide effective solutions to problems encountered by today’s industries.

BandLock 2

SPX is a world leader in the design and manufacture of quick opening closures. Our GD Bandlock™ 2 is the original and benchmark design for global high pressure applications with over 25,000 units in operation worldwide. GD Bandlock™ 2 Closures provide horizontal or vertical access to any pressure vessel in seconds. Compared with other quick-opening closures they can be operated safely at remarkable speed — any size of unit can be opened or closed in less than a minute, with no special tools required. Computer-aided technology has played a large part in the design of Bandlock™ 2. The main pressure loaded sections have been designed to save weight by employing finite element analytical techniques and proof testing by strain gauges, whilst still adhering to primary pressure vessel code requirements.

The tried and tested locking band mechanism which gives the range its name is a duplex stainless steel conical thrust ring fitted between the door and hub, transmitting the pressure load uniformly around the full 360° circumference of the hub.

Typical applications include:

• Pipeline pig launcher & receiver traps
• Filters
• Coalescers
• Strainers
• Separators
• Meter skid systems
• Hydrocyclones
A hand-operated pressure warning screw integrated into the mechanism prevents the door being unlocked until it is confirmed that the vessel’s internal pressure has been relieved. Additional secondary safety features, such as mechanical key interlocks, can be fitted and integrated with control valve operations.

**Hi-T MAGAlert**

The Hi-T MAGAlert is a robust non-intrusive magnetic pig signaller used to detect, signal and log the passage of magnetic pigs at critical points along a pipeline. The Hi-T MAGAlert can be used for both offshore and onshore installations. The Hi-T MAGAlert is ATEX compliant and housed within a fully certified aluminum or 316 stainless steel explosion proof housing suitable for use in Zone 1, Zone 2 group IIA, IIB and H2 Areas. The Hi-T MAGAlert can log up to 100 events with time and date._logged events can be viewed on a 70mm (2.7”) high visibility display incorporated into the unit. Pig passages can also be signaled as they occur with ultra-bright LEDs which are incorporated into the unit and are visible from up to 100m. Prior to clearing the history of events it is possible to connect the Hi-T MAGAlert signaller to a PC and download all stored data. The Hi-T MAGAlert is very quickly and easily attached to a pipeline using ratchet straps or stainless steel bands.

- Detection Principle
- User-Friendly Display Menu/Operator Interface
- Unique Modular Design
- Interface Options
- Optional GSM Alarm Interface

**Rotalock™**

GD Rotalock™ has been developed to provide an inherently safe, low cost solution for small diameter, low pressure applications. It is designed and priced to offer a superior alternative to screwed closures and blind flanges. Typical applications include:

- Filters
- Separators
- Meter Provers
- Pig/Scraper Traps

- Blowdowns
- Strainers
- Coalescers
- Waste Disposal Vessel

**Hi-T Pigalert**

Simple to install and operate, the Hi-T Pigalert™ is an economically priced unit providing adjustable on-site penetration and giving the operator simple visual indication with a single action reset. The proven pivotless tumbler mechanism and laminated trigger blade provide the necessary depth of penetration into the pipeline to give a reliable and visible signal with negligible effect on the flow. All models are bi-directional and available with either mechanically operated signal flags, electrical auto resetting switches or mechanical and electrical signals in combination.
AFTER-SALES, SERVICE AND PARTS SOLUTIONS
FROM SPX

SPX brands offer a full range of after-sales products to ensure that the original equipment continues to operate at its maximum performance. SPX brands offer a full range of after-sales products to ensure that the original equipment continues to operate at its maximum performance.

- Repair and exchange services
- Equipment upgrade services
- Installation and start-up support
- Predictive and preventive maintenance
- Remote Diagnostics
- Process and mechanical consulting
- Asset management
- On-site field support
- Training

SPX provides innovative ways to improve your productivity and profitability. We’ll help you minimize your asset investments, while ensuring that you continue to meet your production requirements. Multiple service facilities are strategically located throughout the world, providing a wide range of support 24 hours a day.

Service locations are the hub for our parts distribution. We can analyze your spare parts inventory to identify critical, damaged and obsolete spare parts, and help you create an inventory reduction program.

- High quality OEM spare parts and consumables
- Quick-ship delivery services available

Our oil field valve service, provides a full range of valve and wellhead service, repair, remanufacturing and inventory management of customer assets for the pipeline, petrochemical, hydrocarbon storage well and geothermal industries. SPX specializes in reconditioning of valves from all manufacturers, and turnkey valve field services. SPX continues to manufacture the complete underground storage wellhead hook-up in accordance to our API 6A and 6D license.

To learn more email: ofm@spx.com