

Freeze Out Obstacles to a Plentiful Source of Clean Energy

Proven Automation for LNG Liquefaction, Carriers, and Regasification



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°C (-260°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



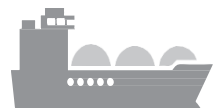
With global demand for LNG soaring, speed and reliability are more critical than ever.

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, Biffi leads the market with a wide portfolio of actuators solution in combination with valves and regulators with critical isolation and control technologies.



- Protect process equipment and maintain uptime
 - Actuators, utilize proven technologies for full cryogenic temperature performance, advanced corrosion resistance, and to be combined with a wide range of valve used to reduce the noise and cavitation control
 - Actuators allow the possibility to integrate the diagnostics devices that help keep assets running smoothly



- Produce and store LNG in necessary quantities and in time for tanker shipments
 - Actuators and valve combination, improve awareness of and response to imminent asset failures



- Safeguard against leakage, fugitive emissions, and product loss
 - Actuators and valve combination, can achieve tight shutoff in cryogenic applications with leakage rates as low as 1/10th those allowable by industry standards
 - Actuators and valve combination, can address ultra low emission requirements with butt-weld top-entry valves that offer access for in-line maintenance

Biffi actuators have been supplied to the LNG industry since the beginning of liquefaction trains in Europe and then in the rest of the world.

Biffi is trusted with the largest, most complex projects in the world, including Qatargas and NFE mega project is the last success

LNG Solutions

Inlet Feed and Separation

Reduce pressure swings that can cause cycling of the whole plant, impacting throughput and reliability → p.7

Acid Gas Removal and Dehydration

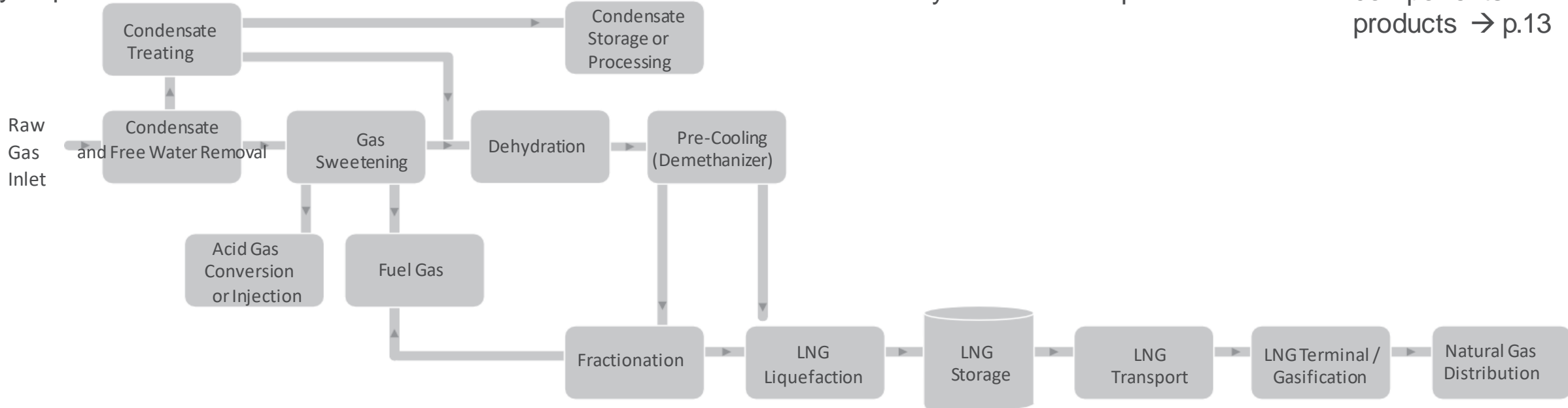
Eliminate hydrate formation from H₂S and CO₂ in cold sections of the process → p.9

Sulfur Recovery

Heat the acid gas to prevent sulfur condensation in the catalyst bed and maximize catalytic reaction → p.11

Fractionation

Handle varying compositions of natural gas liquids (NGLs) and change the mix of hydrocarbon components in the exported products → p.13



Main Cryogenic Heat Exchanger

Manage LNG production by maximizing the liquefaction compressor discharge pressure to the limit → p.15

Compression Train

Maintain efficient operation and prevent surge → p.17

Storage, Jetty Loading, and Boil-Off Gas

Provide safety measures, control the tank level, and automatically recover boil-off vapors → p.19

Unloading, Storage, and Regas Vaporization

Convert the liquid natural gas to its gaseous form and manage tight schedules. → p.21



LNG Solutions



Inlet Feed and Separation Solutions

Maximize production via throttling and remove water and natural gas liquids that could be destructive to the liquefaction process → p7

Acid Gas Removal and Dehydration Solutions

Protect process equipment and maintain uptime by removing contaminants from the natural gas feedstock → p9

Sulfur Recovery Solutions

Maintain reliable and safe combustion control and reduce the effects of corrosion → p11

Fractionation Solutions

Maximize recovery of saleable hydrocarbons ethane, propane, and butane with accurate control → p13

Main Cryogenic Heat Exchanger Solutions

Manage elevated pressure drops to induce cooling down to cryogenic temperatures → p15

Compression Train Solutions

Minimize pollutants and the emission of volatile organic compounds when pressurizing the refrigerant gas mix → p17

Storage, Jetty Loading, and Boil-Off Gas Solutions

Effectively manage boil-off gas to avoid the environmental impact of flaring or disposal → p19

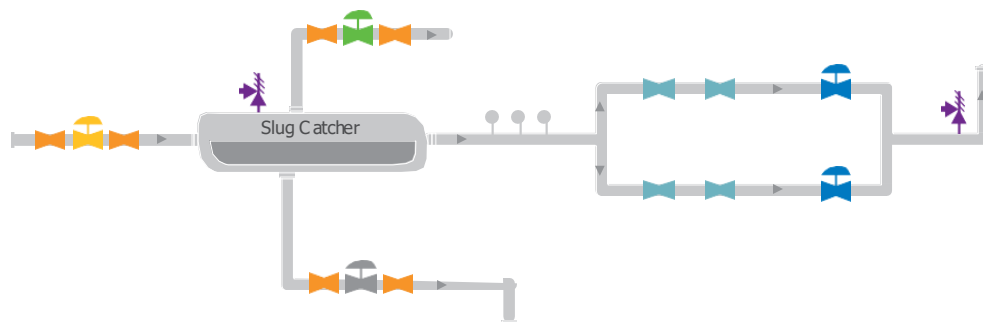
Unloading, Storage, and Regas Vaporization Solutions

Safely meet market demands and operate efficiently → p21



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 the 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. When an actuator is requested Biffi can offers a wide range of on/off solutions with pneumatic, electric, or hydraulic actuation.

Services offered

- Shutdown, turnaround, and outage planning and execution support;
- Startup optimization and performance testing;
- Actuator sizing and selection;
- Technology upgrades and retrofit;
- Online and offline diagnostics;
- Product and system training;



Featured Inlet Feed and Separation Solutions

Biffi PLA – PLAS
Linear actuators for
Gas-to-Flare Valve



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

[PLA PLAS webpage](#) ▶

Biffi PLA – PLAS
Linear actuators for
Pressure Letdown Valve



Valve function - Provide the proper rate of flow into the facility.

[PLA PLAS webpage](#) ▶

Biffi FCBA/FCBB
Quarter turn actuators for
Feed Gas Isolation Valves



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

[Biffi Sales product webpage](#) ▶

Biffi RPD/RPS
Quarter turn actuators for
Feed Gas Isolation Valves



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

[RPD/RPS product webpage](#) ▶

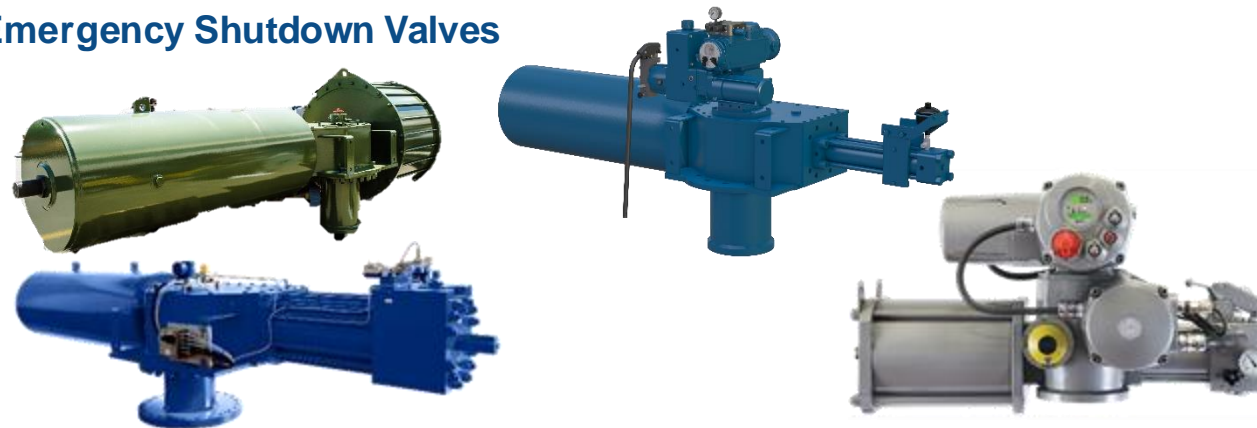
Biffi ALGA – ALGAS
Quarter turn actuators for
Overpressure Protection Valve



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

[Biffi ALGA_ALGAS product webpage](#) ▶

Biffi actuators for
Emergency Shutdown Valves



Valve function - Ensure consistently tight shutoff in critical emergency shutdown applications.

[Biffi ALGA_ALGAS product webpage](#) ▶

[Biffi EFS product webpage](#) ▶

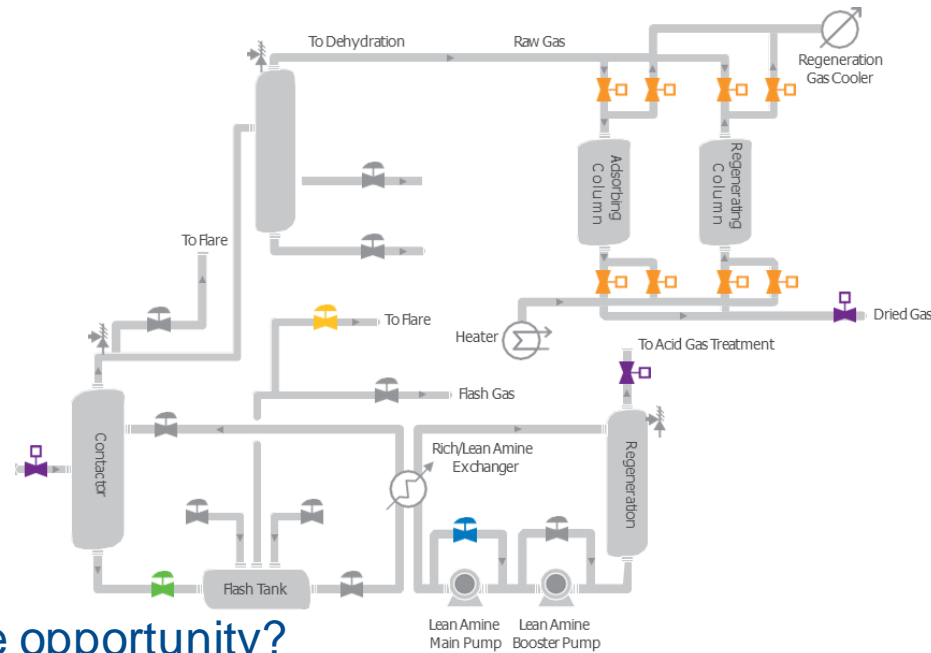
[Biffi OLGAS product webpage](#) ▶

[Biffi EHO product webpage](#) ▶

Additional products
[Biffi product webpage](#) ▶

Acid Gas Removal and Dehydration Solutions

The acid gas removal unit reduces the concentration of hydrogen sulfide (H₂S) and carbon dioxide (CO₂) 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.



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

The 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.

Biffi actuators can grant an automated valve operability according to the plant needs

Services offered

- Shutdown, turnaround, and outage planning and execution support;
- Startup optimization and performance testing;
- Actuator sizing and selection;
- Technology upgrades and retrofit;
- Online and offline diagnostics;
- Product and system training;



What's the opportunity?

- Remove all of the contaminants to contractually specified levels;
- Eliminate hydrate formation from H₂S, CO₂, and H₂O 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.



Featured Acid Gas Removal and Dehydration Solutions

Biffi PLA – PLAS Linear actuators for

Rich Amine Letdown Valve



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

[PLA PLAS webpage](#) ▶

Biffi PLA – PLAS Linear actuators for

Flash Gas-to-Flare Valve



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

[PLA PLAS webpage](#) ▶

Biffi ALGA – ALGAS Quarter turn actuators for

Overpressure Protection Valve



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

[Biffi ALGA_ALGAS product webpage](#) ▶

Biffi ALGA – ALGAS and Morin S series Dehydration or Molecular Sieve Switching Valves



Valve function - 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.

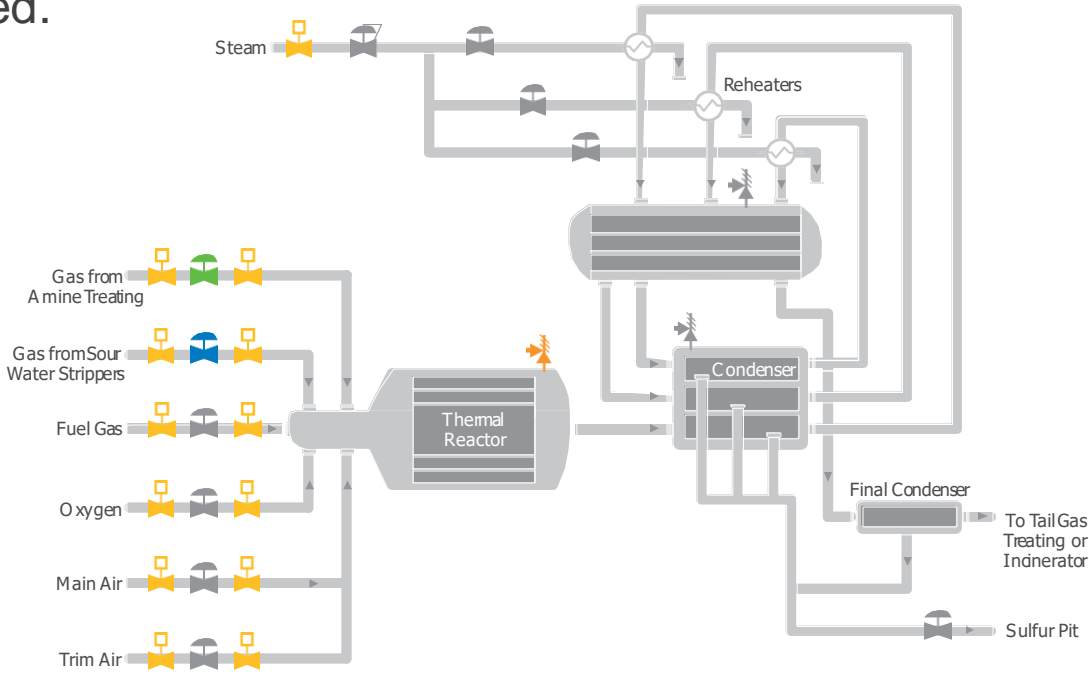
[Biffi ALGA_ALGAS product webpage](#) ▶

[Biffi Morin S series product webpage](#) ▶

Additional products [Biffi product webpage](#) ▶

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 the 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;
- Actuator sizing and selection;
- Technology upgrades and retrofit;
- Online and offline diagnostics;
- Product and system training;



Featured Sulfur Recovery Solutions

Biffi ICON3000
Electric actuators for

Sulfur Recovery Isolation Valves



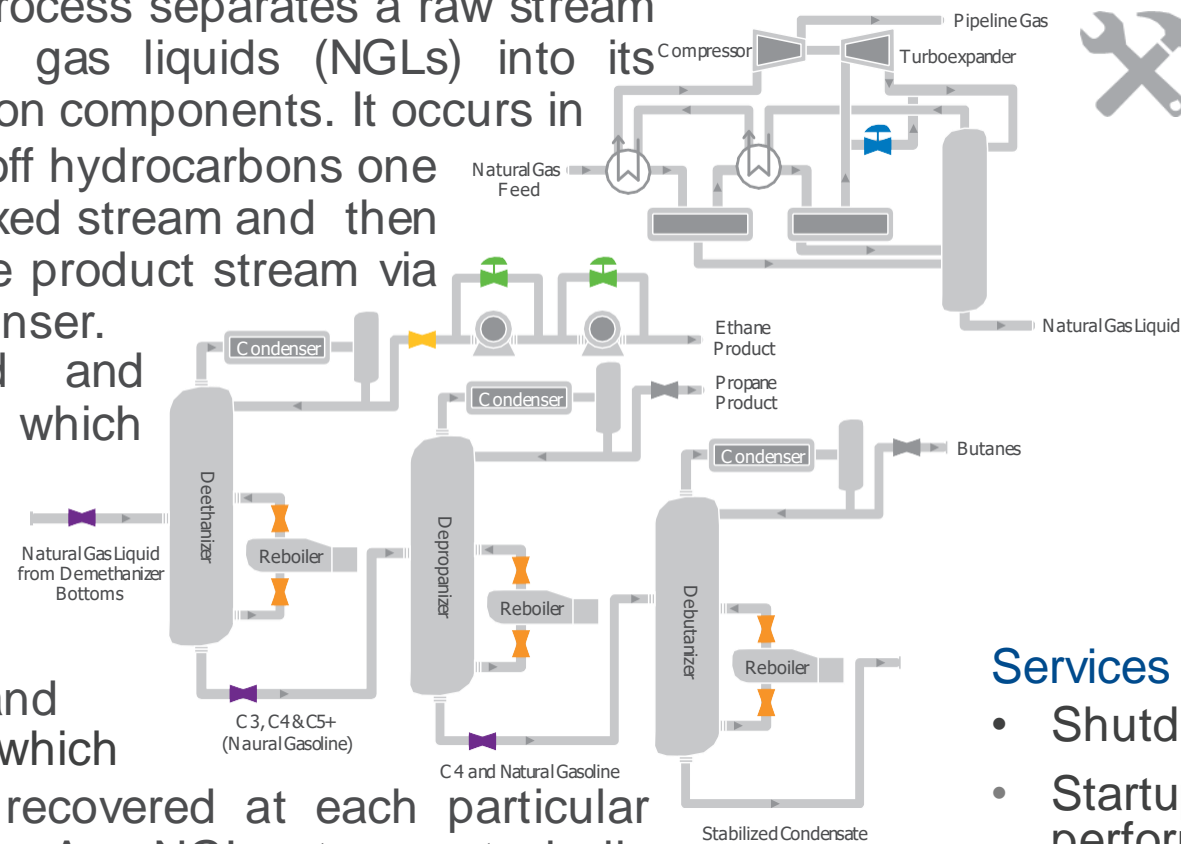
Valve function - Protect against thermal loss, medium solidification, and corrosion with an on/off or bypass valve solution featuring a thermal jacket, bearing flushing, and suitable material selection.

[Biffi ICON product webpage](#) ▶

Additional products
[Biffi product webpage](#) ▶

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. Regional demand and economics dictate which hydrocarbons are recovered at each particular fractionation plant. An NGL stream typically consists of Ethane, Propane, and Butane.



Discover how triple offset valves are engineered for performance

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

Biffi actuators can be installed on the above valve to complete an automated solution to simplify the onsite activities without impact on the valve performances.

Services offered

- Shutdown, turnaround, and outage planning and execution support;
- Startup optimization and performance testing;
- Actuator sizing and selection;
- Technology upgrades and retrofit;
- Online and offline diagnostics;
- Product and system training;



What's the opportunity?

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



Featured Fractionation Solutions

Biffi Quarter turn actuators for

Overpressure Protection Valve



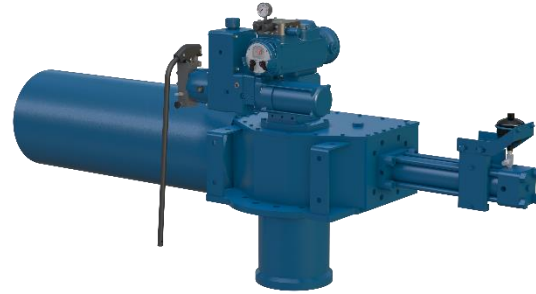
Valve function - Shut off the flow of a hazardous gas upon detection of a dangerous event.

[Biffi ALGA_ALGAS product webpage](#) ▶

[Biffi OLGA_OLGAS product webpage](#) ▶

Biffi Quarter turn actuators for

Emergency Shutdown Valves



Valve function - Ensure consistently tight shutoff in critical applications including emergency shutdown.

[Biffi EHO product webpage](#) ▶

[Biffi EFS product webpage](#) ▶

[Biffi ALGA_ALGAS product webpage](#) ▶

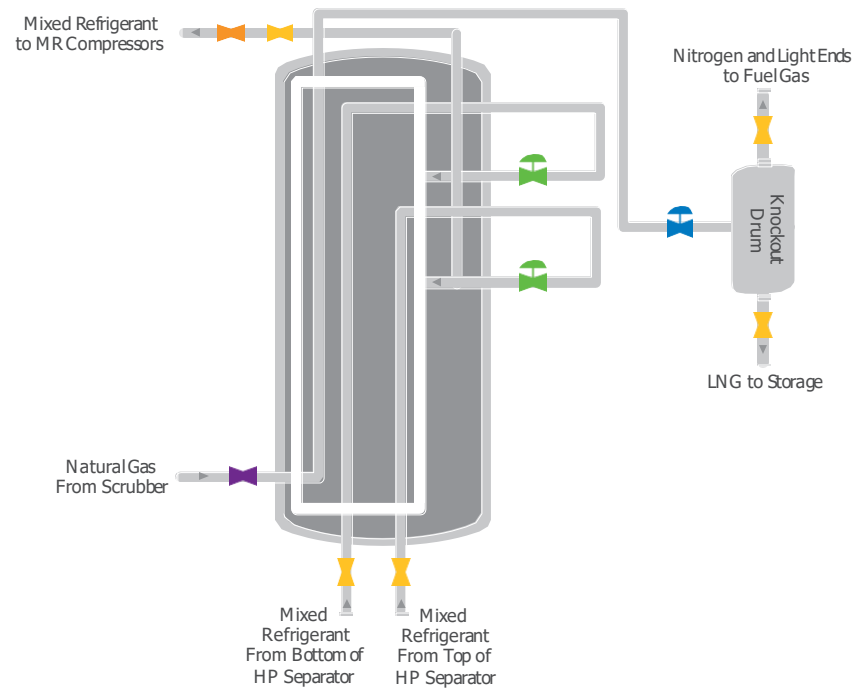
[Biffi OLGA_OLGAS product webpage](#) ▶

Additional products

[Biffi product webpage](#) ▶

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).



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.

Biffi actuators can be installed on the above valve to complete an automated solution to simplify the onsite activities without impact on the valve performances.

Services offered

- Shutdown, turnaround, and outage planning and execution support;
- Startup optimization and performance testing;
- Actuator sizing and selection;
- Technology upgrades and retrofit;
- Online and offline diagnostics;
- Product and system training;



What's the 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.

Featured Main Cryogenic Heat Exchanger Solutions

Biffi Quarter turn actuators for Automated Cryogenic Isolation Valves



Valve function - Ensure consistently tight shutoff despite temperature and pressure changes.

[Biffi ALGA_ALGAS product webpage](#) ▶
[Biffi OLGA_OLGAS product webpage](#) ▶

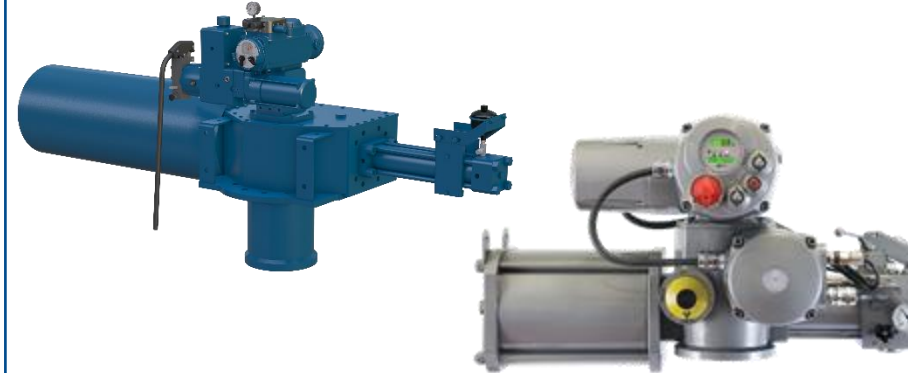
Biffi PLA – PLAS Linear actuators for LNG Temperature Valve



Valve function - Control the temperature of LNG coming out of the main heat exchanger.

[PLA PLAS webpage](#) ▶

Biffi Electric fail-safe actuators for Automated Cryogenic Isolation Valves



Valve function - Ensure consistently tight shutoff despite temperature and pressure changes.

[Biffi EHO product webpage](#) ▶
[Biffi EFS product webpage](#) ▶

Biffi Quarter turn actuators for Overpressure Protection Valve



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

[Biffi ALGA_ALGAS product webpage](#) ▶
[Biffi OLGA_OLGAS product webpage](#) ▶

Biffi PLA – PLAS Linear actuators for Joule-Thomson Valve



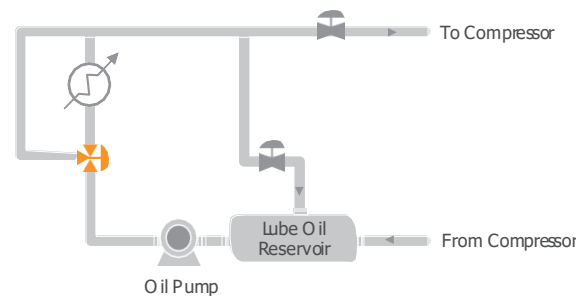
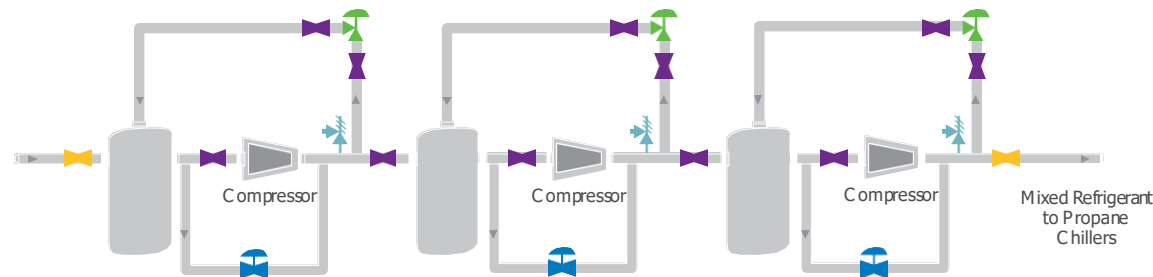
Valve function - Utilize pressure drop to achieve cooling of liquids, gases, or multi-phase fluids.

[PLA PLAS webpage](#) ▶

Additional products [Biffi product webpage](#) ▶

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.



Anti-surge valve.

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

Biffi actuators can be installed on the above valve to complete an automated solution to simplify the onsite activities without impact on the valve performances.

Services offered

- Shutdown, turnaround, and outage planning and execution support;
- Startup optimization and performance testing;
- Actuator sizing and selection;
- Technology upgrades and retrofit;
- Online and offline diagnostics;
- Product and system training;



What's the 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.



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

Biffi Quarter turn actuators for Overpressure Protection Valve



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

[Biffi ALGA_ALGAS product webpage](#) ▶
[Biffi OLGA_OLGAS product webpage](#) ▶

Biffi Quarter turn actuators for Automated Cryogenic Isolation Valves



Valve function - Ensure consistently tight shutoff despite temperature and pressure changes.

[Biffi ALGA_ALGAS product webpage](#) ▶
[Biffi OLGA_OLGAS product webpage](#) ▶

Biffi ALGA – ALGAS Quarter turn actuators for Loading Arm Valve



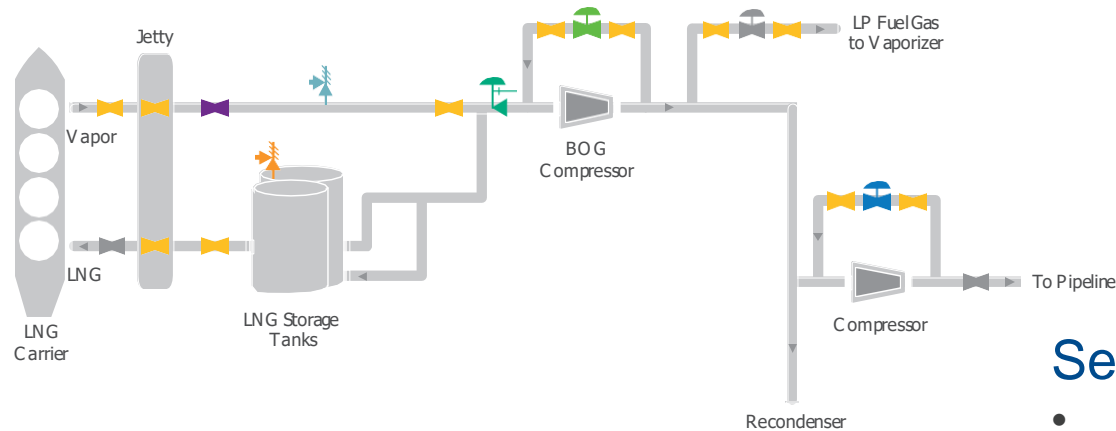
Valve function - Minimize the total installed cost of loading arms with zero leakage cryogenic valves optimized for space and weight.

[Biffi ALGA_ALGAS product webpage](#) ▶

Additional products [Biffi product webpage](#) ▶

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.



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.



What's the opportunity?

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

Services offered

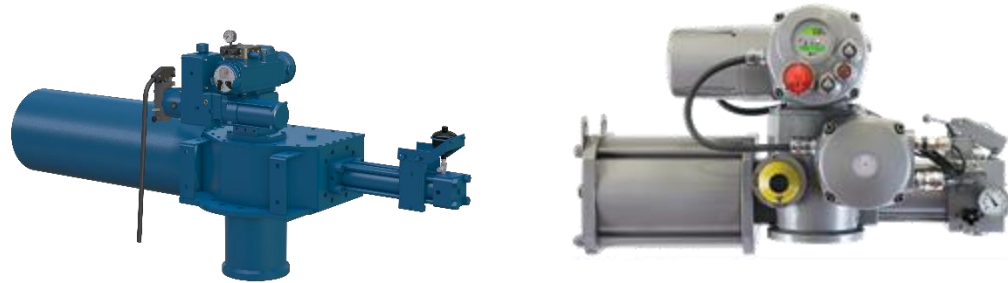
- Shutdown, turnaround, and outage planning and execution support;
- Startup optimization and performance testing;
- Actuator sizing and selection;
- Technology upgrades and retrofit;
- Online and offline diagnostics;
- Product and system training;



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

Biffi Electric fail-safe actuators for

Automated Cryogenic Isolation Valves



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

[Biffi EHO product webpage](#) ▶

[Biffi EFS product webpage](#) ▶

Biffi Quarter turn actuators for

Automated Cryogenic Isolation Valves



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

[Biffi ALGA_ALGAS product webpage](#) ▶

[Biffi OLGA_OLGAS product webpage](#) ▶

Biffi ALGA – ALGAS
Quarter turn actuators for

Loading Arm Valve



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

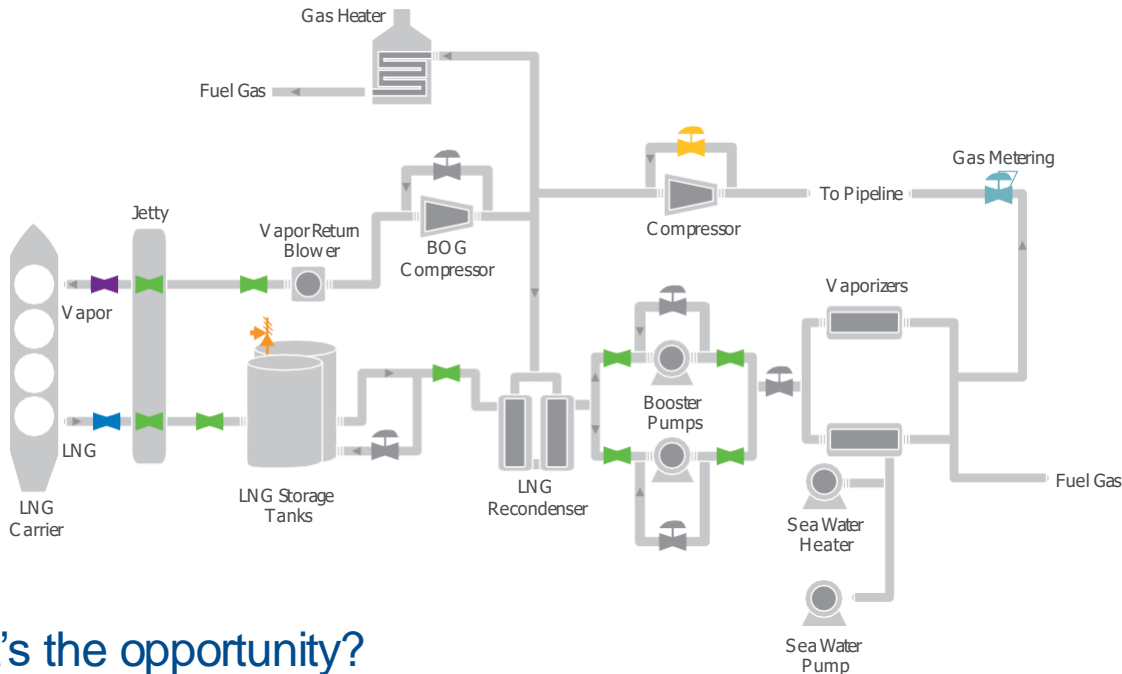
[Biffi ALGA_ALGAS product webpage](#) ▶

Additional products

[Biffi product webpage](#) ▶

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 the 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;
- Control, isolation, and pressure relief valve calibration and repair;
- Valve sizing and selection;
- Technology upgrades and retrofit;
- Online and offline diagnostics;
- Leak detection;
- Regulator configuration and repair;
- Product and system training;
- Startup optimization and performance testing.



Featured Unloading, Storage, and Regasification Solutions

Biffi ALGA – ALGAS
Quarter turn actuators for

Automated, Welded Cryogenic Valves



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

[Biffi ALGA_ALGAS product webpage](#) ▶

Biffi PLA – PLAS
Linear actuators for

Overpressure Protection Valve



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

[PLA PLAS webpage](#) ▶

Biffi ICON3000
Electric actuators for

Seawater Isolation Valves



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

[Biffi ICON product webpage](#) ▶

Biffi ALGA – ALGAS
Quarter turn actuators for

Unloading Arm Valve



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

[Biffi ALGA_ALGAS product webpage](#) ▶

Biffi PLA – PLAS
Linear actuators for

Compressor Anti-Surge Valve



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

[PLA PLAS webpage](#) ▶

Additional products
[Biffi product webpage](#) ▶

Continuous Support in the Face of Changing Market and Operating Conditions

Biffi is one of the world's leading manufacturers of valve actuators. With an engineering pedigree of 60 years plus and a truly global presence, the company is also the partner of choice for operators seeking not just a comprehensive range of standard actuators, but the finest customized solutions.

To always guarantee the best quality products, Biffi continued to invest significantly both in equipment and infrastructure over the past 60 years. The result is an exceptionally advanced and equipped plant offering in-house fully integrated design, manufacturing and testing, including:

- A state-of-the-art technical office
- A Modern machine shop
- Flexible machining centres
- Assembly & fitting shops
- In-house welding capability
- Inspection and test facilities
- Automated painting facility

Our broad portfolio of service offerings allows us to tailor our support to align with your specific business goals.

[Webpage: Biffi actuators](#) 

- **Request for quotation for Biffi actuators**
sales@biffi.it
- **Request for quotation for Biffi actuators spare parts**
spareservice@biffi.it
- **Request for service on Biffi actuators**
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