

# Specialist Pumps for FPSO Applications



**The Heart of Your Process**



# Sulzer Pumps – World Leader in Oil & Gas Pump Applications

**Expertise to meet your present and future needs.**

## Expertise

Sulzer Pumps success in Oil & Gas is based on its unique ability to push back technical barriers and provide reliable high quality equipment. This is achieved by the fundamental principles nurtured throughout the corporation's existence to develop the world's finest engineers in their respective fields. This experience is the key thread throughout the Oil & Gas disciplines within Sulzer Pumps from the concept phase through to design, manufacture, testing installation and reliable operational support.

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## Reliability

Sulzer Pumps' reliability in Oil & Gas applications is renowned across the world. Should this be production (offshore and onshore), pipeline, LNG or any other upstream process, Sulzer pumps products reputation for first time start-ups, availability, reliability and ease of maintenance receives frequent compliments from our clients.

Sulzer Pumps' ground breaking technology led to the worlds first 40,000 hour life guarantee on a high energy injection pump being given and then achieved in operation. With over 1,000 MW installed power and more than 1,000,000 operating hours, Sulzer HPcp pumps deliver 99% availability for their operators.

**Your competitive edge through our reliable solutions.**

## Research & Innovation

Sulzer Pumps continues to create world records in the Oil & Gas business and our list of firsts is un-equaled. Having produced the world's most powerful centrifugal barrel pumps in the 1980's we broke our own record in 2004 by 50% with injection pumps supplied reaching 27MW drive power. We also achieved a similar feat on the world's high-

est pressure centrifugal barrel pumps between the 1980s and 2003, with injection pumps supplied reaching 605 bar discharge pressure and designs available up to 750 bar. Add to this the world's highest pressure axially split injection pump, the world's

**Our R&D secures your future production.**

largest multiphase pumps and LNG send out pumps as further examples and it underlines Sulzer Pumps leading position terms of technical ability.

## Presence

Sulzer Pumps has 13 manufacturing plants located around the globe, over 55 service centers and numerous regional office locations to support our customers from the first exploration and FEED stage through to operations, retrofits and upgrades. Our core aspiration is making our customers more competitive and our global presence and culture facilitates this.

**Global reach backed up by local support.**



A number of our manufacturing facilities are particularly focused on the needs of the Oil & Gas industry. All aspects of the manufacturing process are tailored to the industries exacting demands from material traceability and procedure qualification through to project management, full string testing and field commissioning.

## Future

New oil deposits are being found in ever more aggressive or remote environments. The ongoing need for increased pressures and flow rates in injection applications coupled with remote and underdeveloped production locations makes pump reliability critical to the success of the entire investment. Protecting FPSO vessels against fire hazards and meeting the challenges of ship mounted process systems including LNG production drives Sulzer Pumps to continuously develop their products to meet these challenges while still maintaining the legendary reliability of their equipment.

**Investing  
in the future  
of our  
customers.**

## SULZER FIRSTS

### 1975

World's first duplex injection pumps.  
Sonatrach – Algeria – 13 units

### 1977

World's largest injection pumps.  
Saudi Aramco – 15.7 MW – 2 units

### 1981

World's largest injection pumps.  
Sohio – Alaska – 18.8 MW – 2 units

### 1984

World's largest offshore injection pump.  
Zadco – Abu Dhabi – 14.2 MW – 1 unit

### 1992

World's largest vertical injection pumps.  
Statoil – Norway – 6.7 MW – 2 units

### 1994

World's largest LNG send out pumps.  
Botas – Turkey – 2,121 m – 5 units

### 1999

World's largest offshore multiphase pumps.  
Total – UK North Sea – 4.5 MW – 2 units

### 2000

World's largest multiphase pumps.  
Yukos Oil – Siberia – 6.0 MW – 2 units

### 2001

World's highest pressure injection pumps.  
BP – Gulf of Mexico – 605 Bar – 4 units

### 2002

World's largest injection pumps.  
AIOC – Caspian Sea – 27 MW – 4 units

### 2007

World's largest LNG send out pumps.  
Zeebrugge – Netherlands – 1.43 MW - 3 units

### 2008

World's largest East to West oil pipeline.  
ESPO – Russia – 14.5 MW – 24 units



# The Answer to Your FPSO Pump Needs

## Injection

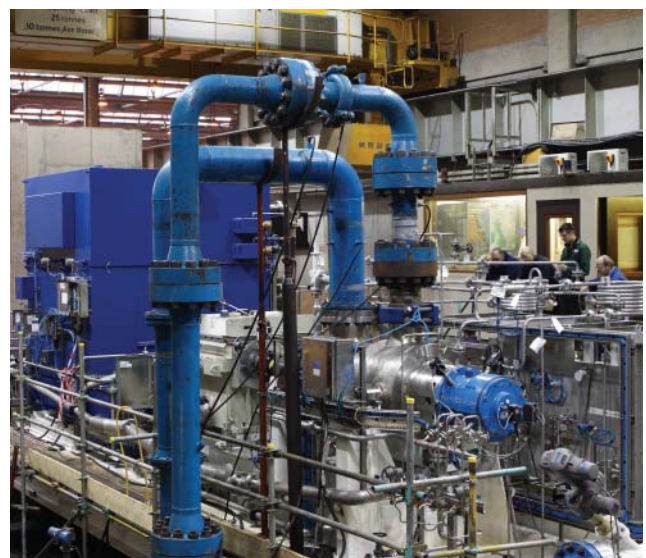
Reliable water injection is critical to modern oil production processes and relies on efficient, reliable pumps that can operate for extended periods before needing maintenance. Sulzer Pumps manufactures four pump ranges specifically tailored for injection applications. As the search for oil leads to the development of ever more extreme fields in terms of depth or geographical remoteness, the pumps selected become critical to the fields practical operation and viability. Sulzer Pumps reputation is second to none for delivering ground braking designs that keep the 'state of the art' ahead of the demands of these new developments.

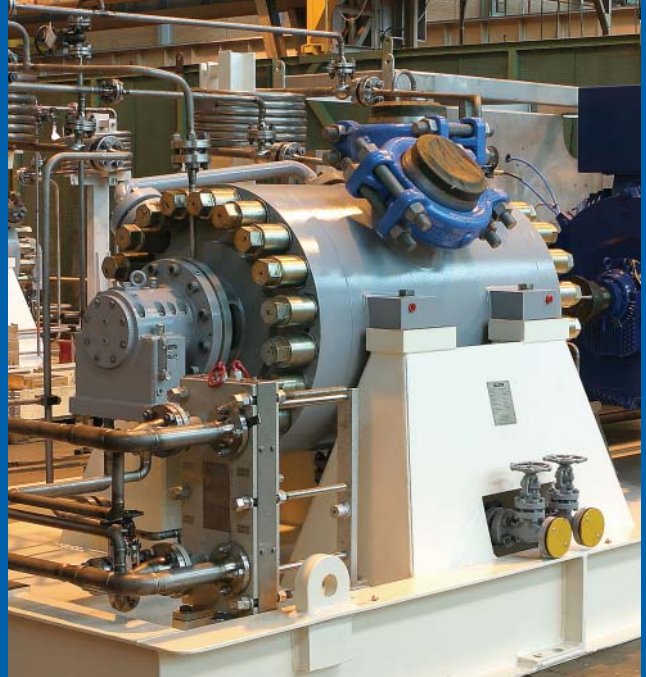
## Firewater

Firewater pumps lie at the heart of a FPSO firefighting system. The ability to run reliably under extreme conditions for extended periods of time is a key customer requirement. Sulzer Pumps self contained hydraulic drive fire pump system delivers optimal firefighting performance coupled with features to ensure minimum maintenance is required due to long periods on standby. Conventional shaft drive fire sets are also available. Both options are fully packaged and tested by Sulzer to meet exacting customer needs.

## Seawater Lift

Provision of seawater for cooling and other service requirements demands efficient, compact pumping solutions. Sulzer Pumps range of vertical axially split pumps are ideally suited to this application. Mounted inside the hull, their compact dimensions minimize space demands with the added advantage of being more reliable and simpler to maintain than external electro submersible solutions.





## Off Loading

Depending on the FPSO design, a booster pump is often required to export crude oil delivered to deck level by the FPSO cargo system. These pumps need to take the available output from the cargo pumps and boost it to sufficient pressure to allow transportation to an offloading tanker or pipeline to shore. Years of experience designing pumps for transcontinental pipelines allow Sulzer Pumps to produce engineered solution specifically tailored to individual FPSO and customer requirements.

## Process and Auxiliary

The complex processes performed on a typical FPSO rely on the performance of dozens of pumps handling a variety of liquids under widely varying process conditions. Pumps are available fully complying with the latest ISO13709 (API610) and ANSI standards as well as pumps designed for general industrial applications. Whatever the process or auxiliary application, Sulzer Pumps has a selection optimized to deliver economic, reliable performance.





# The World's Best Production and Testing Facilities

## UK Facility

The UK facility in Leeds specializes in building and packaging highly engineered pumps for the Oil & Gas market. The purpose-built factory is dedicated to the production of centrifugal pumps, some of the world's largest and most powerful pumps have been designed, manufactured, packaged and tested here for customers on all continents. Extensive facilities ensure the highest quality production from design and machining through to assembly and testing. A highlight at this site is a 30MW GT drive pump string test facility, the best of its kind in the world.



## USA Facility

Portland (OR) plant is a producer of engineered pumps focusing on the Oil & Gas upstream and hydrocarbon processing markets. This large facility contains state of the art manufacturing processes and machines for producing multistage axially split pumps. Internationally recognized as one of the world's leading suppliers to the petroleum industry Sulzer Pumps USA leads many strategic global alliances with major oil companies for the supply of new pumps and after sales services.





## Brazil Facility

Our Sao Paulo facility is a newly built factory including the largest pump test facility in the south hemisphere. The plant focuses on the supply of a wide range of engineered pumps to both the South American market and other Sulzer group companies. As part of the factory complex we have our own foundry (Fundinox) which supplies high quality castings throughout the Sulzer pump division. Key markets include offshore Oil & Gas production, hydrocarbon processing plus water and waste water projects.

## Abilities and Testing (including gas turbine drive)

Sulzer Pumps manufacturing plants all have excellent testing facilities, capable of demonstrating the pump performance required and proving much of the pump ancillary equipment to ensure smooth commissioning and start-up. One example is our unique in house gas turbine string testing capabilities. Having supplied hundreds of gas turbine driven pumps, Sulzer are aware of the need to prove the full train prior to dispatch and have the capability to undertake string testing with GT drivers up to 30MW within our own manufacturing environment. Our capability to string test electric motor, VFD, diesel and gas engine driven pump trains provides a high level of security to our clients.

## Packaging and Project Management

Sulzer's experience from its corporate background in rotating equipment has resulted in our ability to provide high quality packages, project managed by a global team who understand the importance of customer relationships. Whilst every project in itself is managed professionally we also aim to ensure there is a continuous improvement process which reflects the needs of today's Oil & Gas market. As challenges grow in terms of technical, geographical, environmental pressures, you can be sure of Sulzer Pumps support.



# Pumps for FPSO Applications

## HPcp/HPcpV – Record Breaking Injection Pumps

HPcp ISO13709 BB5 radially split barrel pumps are custom engineered to suit each application. Using the Sulzer Twist-lock system of barrel closure to minimize weight, these pumps represent the state-of-the-art for FPSO high-energy pumps with high speed and back to back designs also available. The world's largest onshore, offshore and highest pressure centrifugal injection pumps are all HPcp designs.

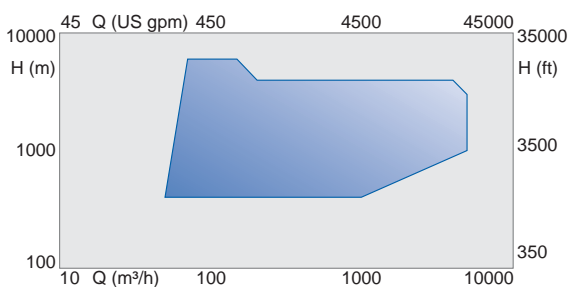


## GSG – Performance Optimized Injection Pumps

GSG ISO13709 BB5 radially split barrel casing pumps are optimized for synchronous speed direct drive applications thus avoiding unnecessary, heavy and expensive construction features. Their full cartridge design makes the most of the compact Sulzer Twistlock system of barrel closure. A back-to-back high pressure design option is also available.

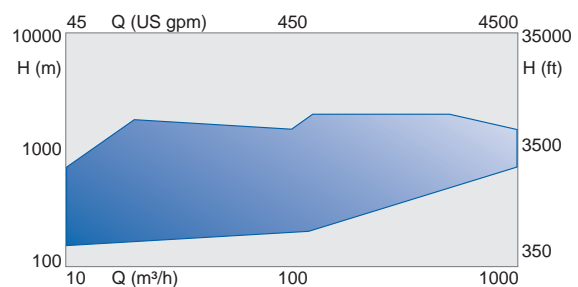


### Performance range



Pressure 600 bar / 8700 psi  
Temperature 90 °C / 195 °F

### Performance range



Pressure 250 bar / 3625 psi  
Temperature 425 °C / 800 °F



## CP – Volute Barrel Injection Pumps

CP ISO13709 BB5 axially split barrel casing pumps feature a axially split inner case making removal of the complete rotor for maintenance a quick and simple procedure. They are particularly also suited to low specific gravity LNG applications where the back-to-back design and center bush provide natural axial balance and additional shaft support. These pumps also utilize the Sulzer Twistlock design for the casing cover and are available in high speed variants.

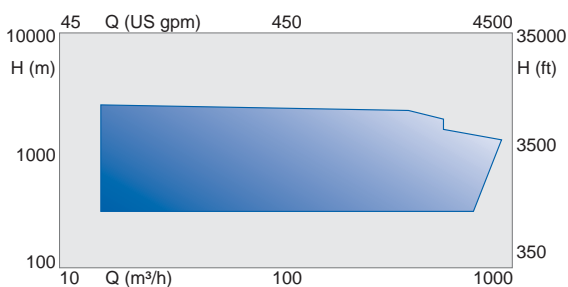


## MSD – Axial Split Injection Pumps

MSD ISO13709 BB3 multistage pumps are ideally suited to lower pressure injection duties. The broad range of standard hydraulics and mechanical design options ensure an optimum fit to customer's duty requirements, using proven pre-engineered solutions. Double bolt casing closure technology allows safe use of the design to higher than normal pressures saving weight and cost.

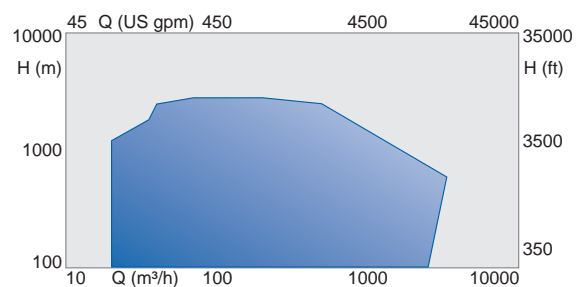


### Performance range



Pressure 410 bar / 6000 psi  
Temperature 425 °C / 800 °F

### Performance range



Pressure 310 bar / 4500 psi  
Temperature 200 °C / 400 °F

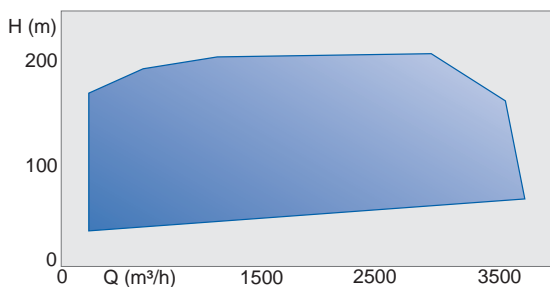


## Hydraulic Drive Fire Fighting System

The Sulzer Pumps hydraulic drive fire fighting system consists of a submersible lift pump driven by a hydraulic motor. A self contained, containerized module supports a diesel drive, booster pump, hydraulic power unit, fuel and all other systems required to operate the unit. The absence of external 90° gearboxes for lineshaft pumps or the HV electric cables associated with electro-submersible solutions makes the extremely robust in an emergency situation.



### Performance range



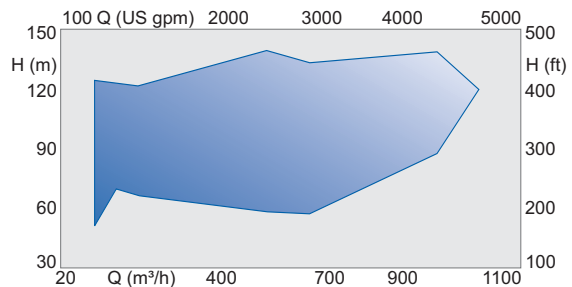
Pressure 300 bar / 4350 psi  
Temperature 60 °C / 140 °F

## JF Range – Conventional Fire Pumps

The JF range of vertical line shaft pumps are primarily used conventional fire fighting installations. A self contained diesel drive package is connected to the pump via a gearbox. The lineshaft drive ensures the pump will operate under emergency conditions (no exposed electrical cabling). The pump is designed to produce the full pressure needed at deck level meaning a booster is not required.



### Performance range



Pressure 48 bar / 700 psi  
Temperature 135 °C / 275 °F



## SMHV – Seawater Lift Pumps

The SMHV is a vertically mounted double suction axially split design complying with ISO13709 (the SMNV, an industrial variant, is also available). The layout ensures minimum space requirement below deck with the suction being taken directly through the hull of via the sea chest. The mounting frame supports the drive motor and allows the thrust bearing and seal assemblies to be changed without dismantling the pump. High a range of efficiency hydraulics maximizes performance from a compact unit.

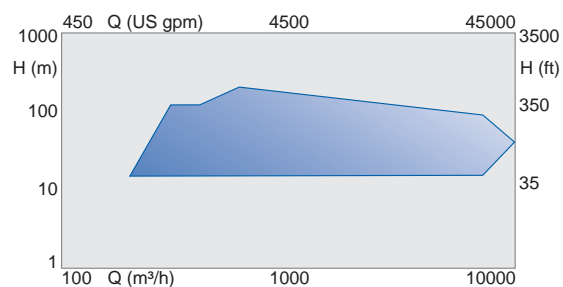


## HSB – Cargo Off-loading Booster Pumps

HSB ISO13709 BB1 pumps are specifically designed for transport duties. An extensive range of sizes and hydraulic options allows precise matching to individual booster duty needs. Heavy duty construction and generous shaft/bearing sizing delivers low vibration operation and provides an ideal environment for the mechanical shaft seals leading to high real world reliability. Available in a wide range of materials, the HSB is the ideal solution for export booster applications.

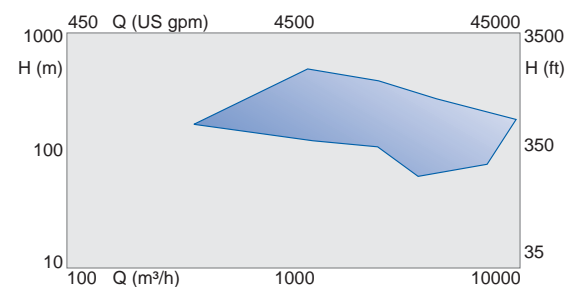


### Performance range

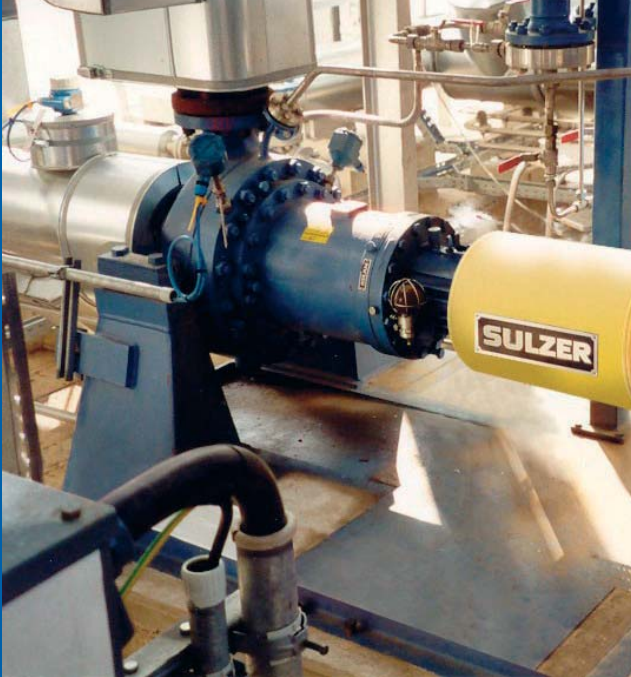


Pressure 30 bar / 435 psi  
Temperature 160 °C / 320 °F

### Performance range



Pressure 30 bar / 435 psi  
Temperature 160 °C / 320 °F



## OHH – Modular Process Pumps

OHH ISO13709 OH2 pumps are designed for process and general liquid boosting applications. The pump is continually upgraded to meet the requirements of the latest generation of ISO standards. Key to the design is the widest hydraulic performance coverage on the market coupled with the smallest size steps. This means better quality selections no matter what the duty delivering optimized process performance.

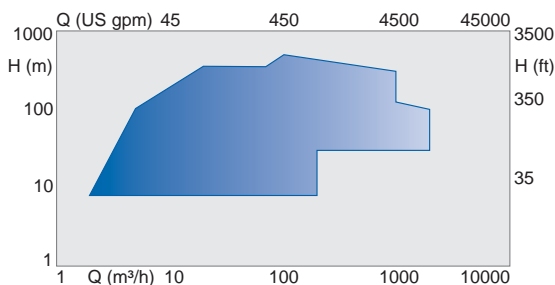


## BBS – Heavy Duty Process Pumps

BBS ISO13709 pumps are primarily used in higher flow/head process and booster applications. The broad pressure and temperature capabilities of this design allow it to be used in the most arduous situations while still providing long and trouble free service. The double entry impeller is particularly suited to low NPSHA duties. This allows process packages to be as compact as possible minimizing deck space requirements.

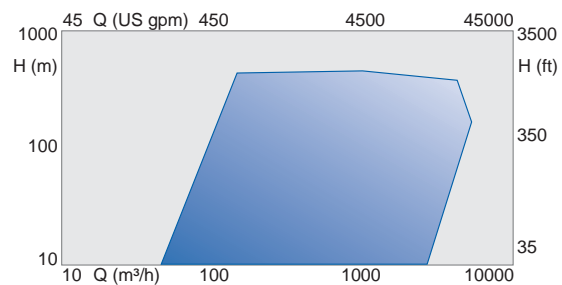


### Performance range



Pressure 50 bar / 725 psi  
Temperature 425 °C / 800 °F

### Performance range



Pressure 100 bar / 1450 psi  
Temperature 425 °C / 800 °F



## SMH – Axially Split Process Pumps

The SMH ISO13799 BB1 compliant design and the SMN industrial variant are used for boosting, transfer, firefighting and low pressure auxiliary applications. The pre-engineered range provides robust design options specifically intended for production applications.

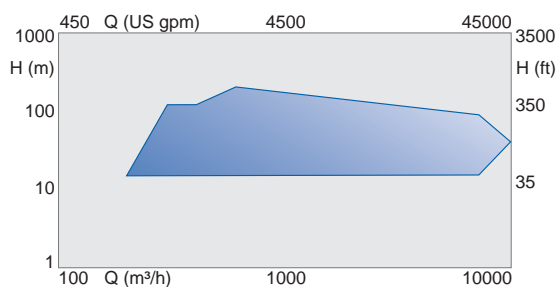


## CPT – ANSI Process Pumps

CPT ANSI B73.1 process pumps offer rugged construction in a compact and economic package. Designed specifically for arduous process and auxiliary duties, the CPT allows considerable savings to be made vs ISO13799 designs without sacrificing quality or durability. A wide range of standard materials of construction including duplex stainless steels provide extended operating life and high levels of reliability.

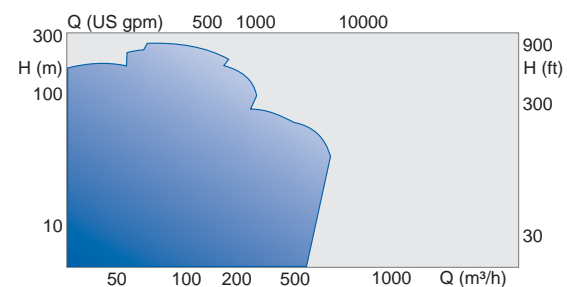


### Performance range



Pressure 30 bar / 435 psi  
Temperature 160 °C / 320 °F

### Performance range



Pressure 16 bar / 230 psi  
Temperature 180 °C / 355 °F



# Quality, Environment, Safety and Occupational Health

## Product Life Cycle

Sulzer considers the total life cycle of its products to reduce cost as well as environmental impact. This includes the design, manufacturing, marketing, packaging, transportation, operation, recycling, and disposal of the products. Similar considerations apply to the provision of services. To identify relevant influences on product life cycle efficiency, Sulzer has implemented a screening tool that focuses on energy consumption during production, material usage, and costs over simplified product life cycle. The tool generates “footprints”, showing costs, energy and material consumption, and environmental impact. It thereby helps to identify room for improvement, e. g. through a reduction in material used or the energy consumed. The tool has been successfully tested for selected products and will be used continuously to assess relevant Sulzer products.

## Sulzer Pumps

Reliability and availability of pumping systems and equipment depend on the quality of their design, technical competency and manufacture. To achieve these goals, a Quality Management System covering all operations is essential. This covers not only our internal operations but also our relationship with the customers. Our innovative products and services create high life cycle value for our customers. We monitor our customer satisfaction in accordance with a planned procedure, and we utilize the feedback to improve our processes. In manufacturing operations Quality Assurance (QA) begins with contract review and continues throughout the process in a planned and controlled way. Our globally recognized Quality Management System complies with national and international standards using ISO 9001:2000 as its basis. All our manufacturing locations are certified in accordance with this international standard.





# Maintaining and Improving Pump Performance

## Sulzer Pumps – Customer Support Service

The continuous availability and high operating performance of pumps is the key target for our customer support service organization. Through our highly experienced personnel and application knowledge, we provide a full range of innovative service solutions to our customers to keep their pumps running including;

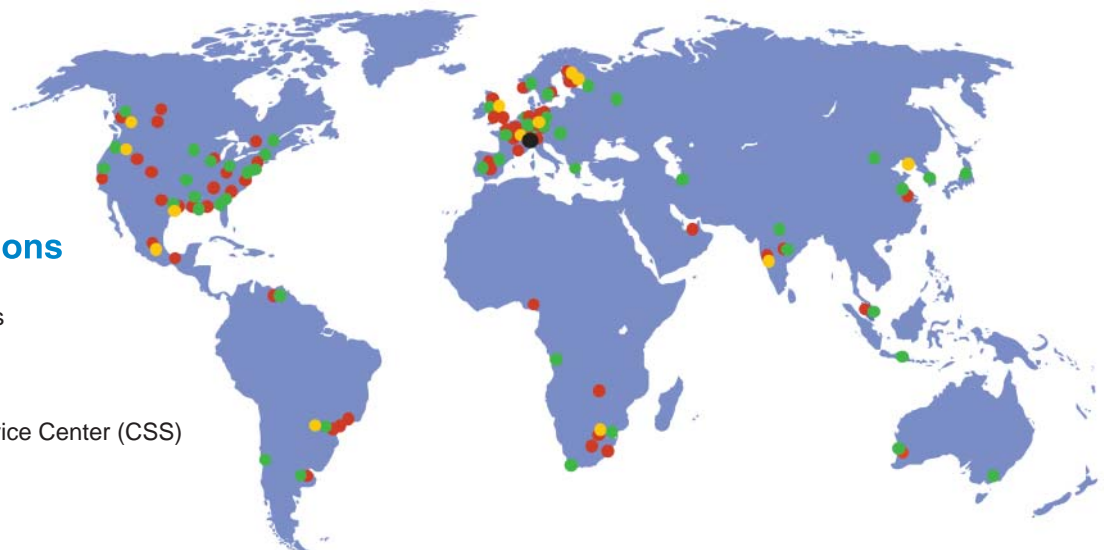
- Spare Parts
- Field Service
- Repair Services
- Retrofits
- Maintenance Agreements
- Operation Agreements

## Flexibility

With services ranging in scope from supplying spare parts to operating pumps and associated systems under contract, we are uniquely placed to make your process run smoother. A dedicated team of CSS specialists based at either our manufacturing facilities or one of over 50 service centers located around the world is dedicated to maintaining the performance of our customers' pumps and associated equipment. This service is not just limited to Sulzer products, all the pumps our customers operate can benefit from the support of Sulzer CSS specialists. Our service center locations are well matched to the regions where concentrations of FPSO vessels operate making Sulzer Pumps your ideal service partner.

## Network of Locations

- Divisional Headquarters
- Manufacturing Facility
- Customer Support Service Center (CSS)
- Sales Office



Check our worldwide offices at  
[www.sulzerpumps.com](http://www.sulzerpumps.com)



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