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**SULZER**

**Sulzer Pumps**

## **Pumps for Desalination Plants**



**The Heart of Your Process**



# Sulzer Pumps

Sulzer Pumps has been designing and building pumps since 1834. Today the company is recognized the world over for the quality and reliability of its products. Our detailed process and application knowledge has allowed us to develop innovative pumping solutions for our focus segments including tailor made systems if required.

Our active research and development supports this customer oriented approach. We design and manufacture our products to meet operator's specific needs within the industry.

## Desalination

Around the world, reserves of pure drinking water are being depleted. A ready supply of clean water is one of the basic necessities of life. Producing drinking water from the sea is a growing activity all over the world and Sulzer Pumps' technology is an essential part in desalination plants.

**Developing potential for a greater future together with the right solutions.**

**Practical pumping solutions for ever increasing environmental needs.**

## Expertise

Sulzer Pumps' innovative technological solutions and equipment support the sophisticated processes in reverse osmosis plants, where seawater is transformed into water fit for human consumption.

Sulzer Pumps has always been at the forefront of pre-engineered and engineered pump designs, using the widest range of materials to produce safe and reliable equipment. Sulzer's water and wastewater pumps are famous for their innovative and sturdy design.

## Research

Research and Development have always received top priority at Sulzer Pumps. Basic research focuses on hydraulics, cavitation, erosion, corrosion and mechanical design, which is then applied to advance product development.

Our engineers work closely with customers all over the world on the practical implementation of innovative ideas. At any point, they can call upon the diverse expertise of the many research specialists working in our laboratories. Successful research and development activities require continuous investment. Beyond immediate project results, this benefits our customers by ensuring that they have a stable business partner at the leading edge of pump technology.

**Delivering the future with Sulzer Pumps products.**

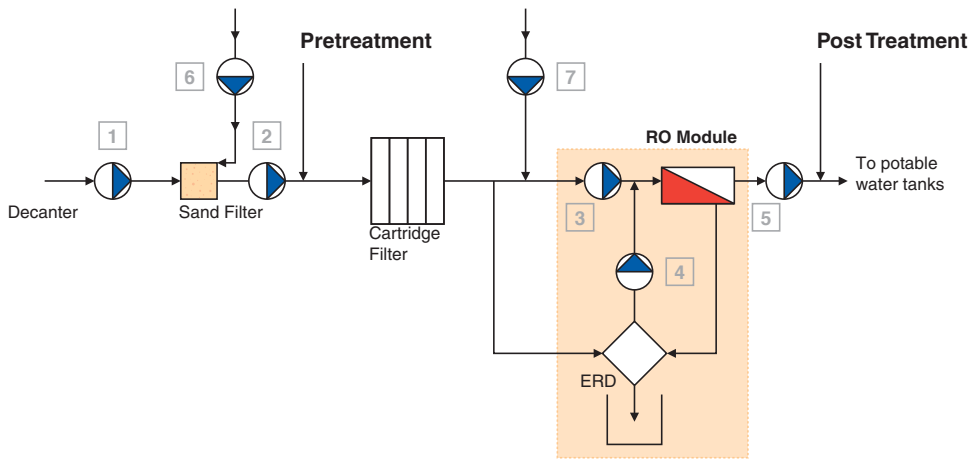


# Application Matrix

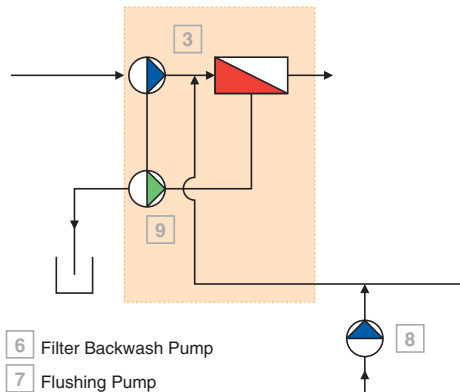
Product Types	Pump Type	Water Intake	Filter Feed/ LP Booster	HP Feed	HP Booster	Filter Backwash	Chemical Cleaning	Product Transfer	MED Applications
End Suction Pumps	A/APP	●	●			●	●	●	●
	A-LM	●							
	CPT	●	●			●	●	●	●
	ZE		●			●	●	●	●
	ZF					●			
Axially Split Pumps	SMN/SMNV	●	●					●	●
	ZPP	●	●					●	●
	HSB/HPDM			●					
Multistage Pumps	MBN			●					
	MC			●					
	MSD/HPDM			●				●	
Vertical Pumps	SJM	●	●						●
	SJT	●	●						●

# Typical Reverse Osmosis Plant Diagram

## With Pressure Exchange System



## Alternative with Pelton Turbine



- 1 Sea Water Intake / Filter Feed Pump
- 2 CF Feed Pump / LP Booster Pump
- 3 RO High Pressure Feed Pump
- 4 ERD Booster Pump
- 5 Product Water Pump

- 6 Filter Backwash Pump
- 7 Flushing Pump
- 8 Chemical Cleaning Pump
- 9 Energy Recovery Turbine

### 1 Seawater Intake / Filter Feed Pump

Typically a vertical mixed flow or horizontal pump supplying either sea or brackish water through a filtration system to the plant

### 2 Filter Feed / LP Booster Pump

Typically a horizontal pump feeds the cartridge filter and provides the required pressure to avoid cavitation in the high pressure pump

### 3 RO High Pressure Feed Pump

Feeds water through the primary reverse osmosis membranes

### 4 ERD Booster Pump

Boosts the raw water from Pressure Exchange System to RO membrane feed

### 5 Product Water Pump

Transfers permeate water to storage, post treatment and distribution

### 6 Filter Backwash Pump

Provides water for backwash cleaning of the filters

### 7 Flushing Pump

Removes remaining raw water from HP pressure pumps and membranes by pumping product water when stopping the plant for a long term

### 8 Chemical Cleaning Pump

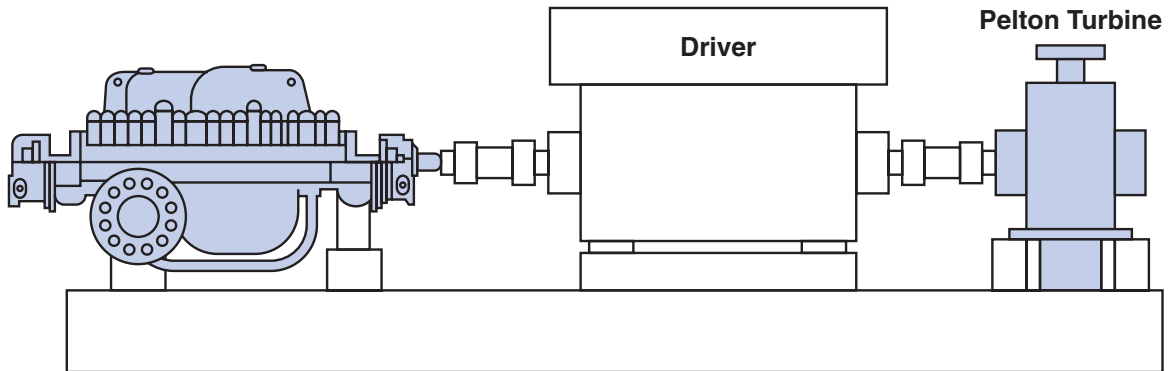
Circulates chemical cleaning solution for system cleaning

### 9 Energy Recovery Turbine (Pelton)

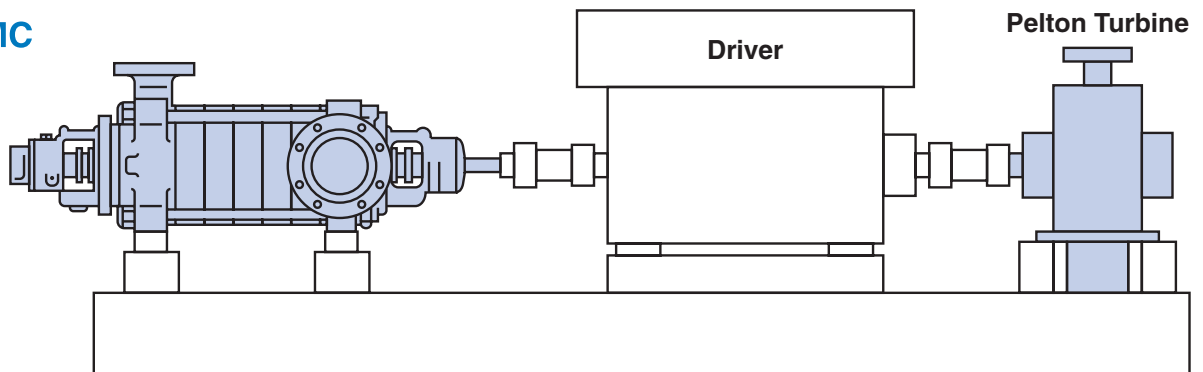
Recovers energy from the rejected brine through a Pelton Turbine

# Energy Recovery (Pelton Turbines) Arrangements

MSD



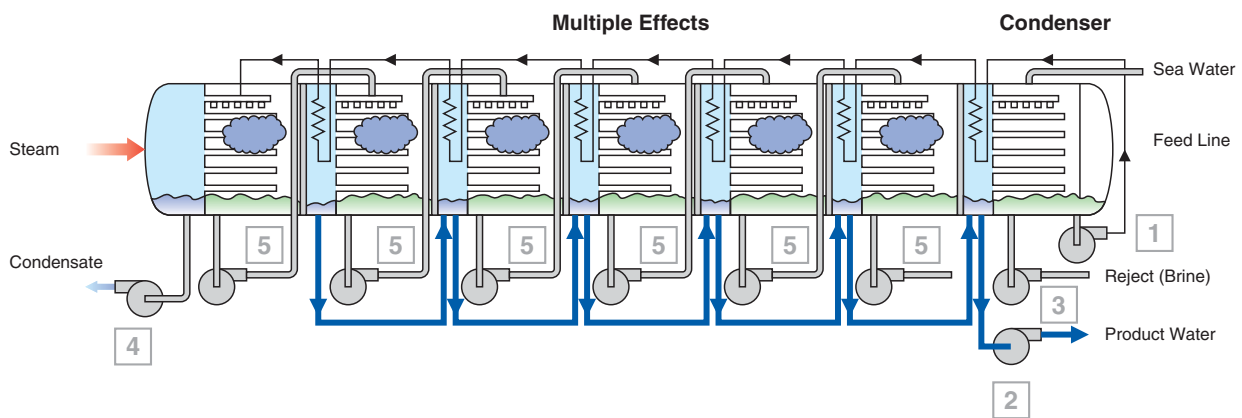
MBN/MC





# Typical Multi-Effect-Distillation Plant Diagram

## MED Diagram



- |                                     |                                  |
|-------------------------------------|----------------------------------|
| <b>1</b> Sea Water Make Up Booster  | <b>4</b> Condensate Pump         |
| <b>2</b> Distillate Extraction Pump | <b>5</b> Intermediate Feed Pumps |
| <b>3</b> Brine Blowdown Pump        |                                  |

### 1 Sea Water Make Up Booster

Feeds with sea water from Condenser to the first effect

### 2 Distillate Extraction Pump

Transfers distillate water from last effect to storage to post treatment and distribution

### 3 Brine Blowdown Pump

Removes brine from Condenser and multiple effects

### 4 Condensate Pump

Removes condensate from steam that is recovered in first effect

### 5 Intermediate Feed Pump

Boosts the distillate water from previous to next effect



## Materials

Sulzer pumps are used in many services that require both corrosion and abrasion resistance. This is why we have chosen Duplex Stainless Steel as our standard. Our standards are ASTM A 890 Gr 1C, 3A, 5A and DIN 1.4468. This range of materials covers the whole range of services in desalination applications. To complete the material range, for some pump types Sulzer Pumps offers DIN 1.4408 (AISI 316) for non-critical applications in terms of corrosion (brackish water, product water). Other material selections are available upon request.

The Pitting Resistance Equivalent (PREN) is an index which is used to help determine an alloy material susceptibility to pitting corrosion, which is a common problem in alloy steels. The higher the index number the greater the metal's resistance to pitting corrosion.

$$\text{PREN} = \% \text{Cr} + 3,3 \times \% \text{Mo} + 16 \times \% \text{N}$$

## Chemical Analysis

Name	C	Cr	Ni	Mo	Mn	Cu	Si	N	PREN
<b>DIN 1.4408/AISI 316</b>	≤ 0,07	18,00 - 20,00	10,00 - 12,00	2,00 - 3,00	≤ 1,50	-	≤ 1,50	-	27.5
<b>DIN 1.4468</b>	≤ 0,05	24,50 - 26,50	5,50 - 7,00	2,50 - 3,50	≤ 2,00	-	≤ 1,00	0,12 - 0,25	38.4
<b>A 890 Gr. 3A</b>	≤ 0,06	24,00 - 27,00	4,00 - 6,00	1,75 - 2,5	≤ 1,00	-	≤ 0,04	0,15 - 0,25	35.6
<b>ASTM A 890 Gr. 1C</b>	≤ 0,08	24,00 - 27,00	5,40 - 6,60	2,90 - 4,00	≤ 2,00	1,30 - 4,00	≤ 0,05	> 0,14	39.8
<b>ASTM A 890 Gr. 5A</b>	≤ 0,03	24,00 - 26,00	6,00 - 8,00	4,00 - 5,00	≤ 1,50	-	≤ 1,00	0,10 - 0,30	43



## References

### MSD supplied to Ashkelon

MSD-D 14x14x19A/2 axially split, high pressure, membrane feed pumps installed in the biggest RO plant ever built (330,000 m<sup>3</sup>/day). Each pump is driven by a 5.3 MW motor. Other pumping services were also supplied by Sulzer Pumps: a total of 47 pumps in different applications.



### MSD with three-injector Pelton Turbine supplied to Saudia Arabia

MSD-D 10x10x14.5/3 with separate Pelton Energy Recovery Turbine was supplied to Yanbu SWRO Plant (Saudi Arabia). It is the first three-injector Pelton Turbine installed in such application. Product Water Pumps (SMN pump type) were also supplied.



### MBN supplied to Namibia

MBN 100-300/6 multistage ring section pump was supplied to the Uramin SWRO Plant in Namibia. Sulzer Pumps supplied most of the centrifugal pumps in this plant, a total of 46 pumps in different applications.



### AHLSTAR<sup>UP</sup> supplied to Jubail Marafiq MED Plant

A total of 81 AHLSTAR<sup>UP</sup> pumps were supplied to the 800,000 m<sup>3</sup>/day Jubail Marafiq MED Plant in Saudia Arabia for the main pumping services including Sea Water Make Up, Distillate Extraction and Brine Blowdown.





# Single Stage Pumps

## CPT

The CPT chemical process pump is designed for continuous operation in process industries for pumping clean, abrasive or corrosive liquids. The pump is designed to exceed ANSI (ASME B73.1M) pump standards.

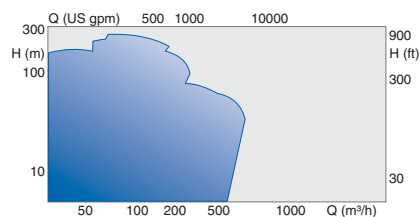
## Z Series

The Z series of end suction industrial process pumps uses modular construction to provide maximum interchangeability of spares. Manufactured in four casing pressure ranges across over 50 sizes with six bearing frames, the Z is the ideal pump for arduous applications in a wide range of industrial processes.

## AHLSTAR<sup>UP</sup> A Series

AHLSTAR<sup>UP</sup> A series process pumps are designed for pumping clean, abrasive or corrosive liquids as well as stocks of various kinds. If the liquid contains gas or air the pump can be modified with either internal or external gas removal construction which stabilizes the operation. The Sulzer Dynamic Seal is especially designed for difficult liquids offering reliable operation and low total cost.

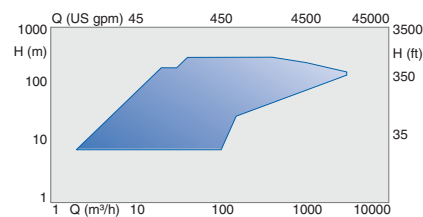
### Performance Range



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



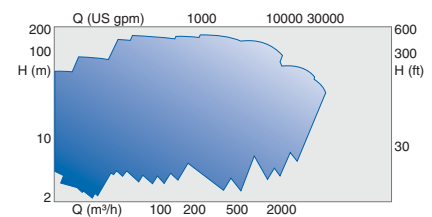
### Performance Range



Pressure 150 bar / 2175 psi  
Temperature 450° C / 840° F



### Performance Range



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





# Ring Section Pumps

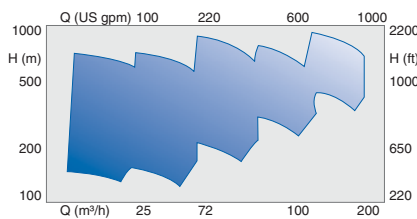
## MBN

Covering the performance range below the MC, the MBN ring section multistage pump is the ideal choice for medium pressure pumping applications. The pump is offered in a wide range of materials including duplex stainless steel grades. The pump utilizes integrated diffusers and a product lubricated NDE bearing to simplify construction, minimize dimensions and reduce cost.

## MC

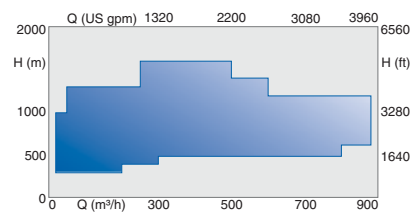
The MC high pressure ring section pump uses a wide range of materials, construction and hydraulic options, the MC can easily be configured to meet customers' needs. Selecting hydraulics that closely match the required duty point ensures highly efficient operation thus minimizing operating costs.

**Performance Range**



Pressure 100 bar / 1450 psi  
 Temperature 180° C / 355° F

**Performance Range**



Pressure 150 bar / 2175 psi  
 Temperature 210° C / 410° F





# Axially Split Pumps

## MSD

MSD axially split, multistage pumps are widely used in desalination, high pressure water applications, water transport, refineries, pipelines, and power generation applications. The broad range of standard hydraulics and mechanical design options ensures optimum fit to customers' duty requirements, using proven pre-engineered solutions.

## SMN

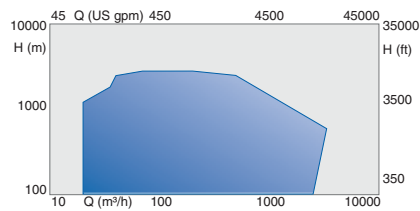
The SMN range of single stage, double entry pumps is used across a broad range of industries in liquid transport and transfer applications.

Pre-engineered standard versions include SMNV for vertical installation to save space.

## ZPP

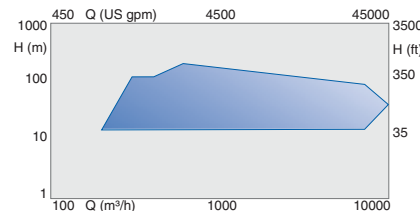
ZPP double suction pumps are especially designed for services requiring low pulsation and high efficiencies, including cooling and circulating water pumping.

### Performance Range



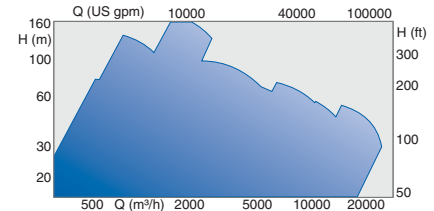
Pressure 310 bar / 4500 psi  
Temperature 200° C / 400° F

### Performance Range



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

### Performance Range



Pressure 10 bar / 150 psi  
Temperature 120° C / 250° F





# Vertical Pumps

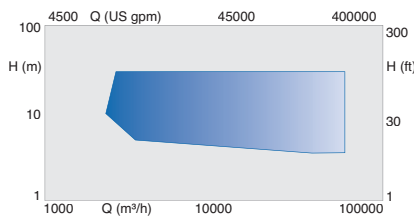
## SJM

SJM mixed flow pumps are ruggedly designed for years of trouble free operation in a wide variety of applications. The basic components of head, column pipe and bowl assembly are combined and customized to perfectly match individual duty needs. In addition, the standard range of material options ensures the materials of construction can be matched to individual installation needs.

## SJT

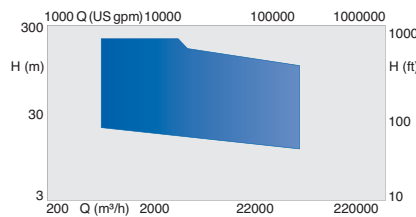
The SJT vertical turbine range offers incredible flexibility due to an extensive range of standard features. These include oil, grease, product or flushed bearing lubrication, sealing plans for all liquids, above or below ground discharge and a wide range of materials of construction. In addition, SJT pumps can be supplied to conform with ASME, ANSI, NRC and API standards.

### Performance Range



Pressure 17 bar / 250 psi  
 Temperature 135° C / 275° F

### Performance Range



Pressure 45 bar / 700 psi  
 Temperature 135° C / 275° F





# Sulzer Pumps Customer Support Services Performance Through People

If pumps and rotating equipment are critical to your operations, you seek specific qualities when selecting external service support:

- A service partner you can trust
- Reliability
- Responsiveness
- Rapid turn around
- Innovative Solutions

Our service professionals deliver these qualities and more to customers from all industry sectors around the globe. With services ranging from spare parts to trouble shooting, we can maintain your rotating equipment and improve your processes.

## Service Partner

Our goal is to be your business partner who delivers customized service solutions that improve your operations. Our measure of success is the loyalty of our customers year after year, decade after decade.

## Reliability

Reliability depends on the longevity of replacement parts and the quality of repair of damaged or worn equipment. You can count on our expertise to deliver and on our commitment to do the job right first time every time.

Our teams are known in the industry for their extreme dedication. You can rely on us to stand by you if unexpected problems occur.

## Responsiveness

You have specific needs, expectations and priorities – we are responsive to them and define with you the best possible solutions for your business. You need us urgently? We are present 24/7, 365 days per year.

## Rapid Turn Around

You expect to receive quotations quickly and have your equipment repaired rapidly to minimize disruption and costs. We aim to exceed your expectations through our continuous investment in more effective shopfloor and administrative processes.

## Innovative Solutions

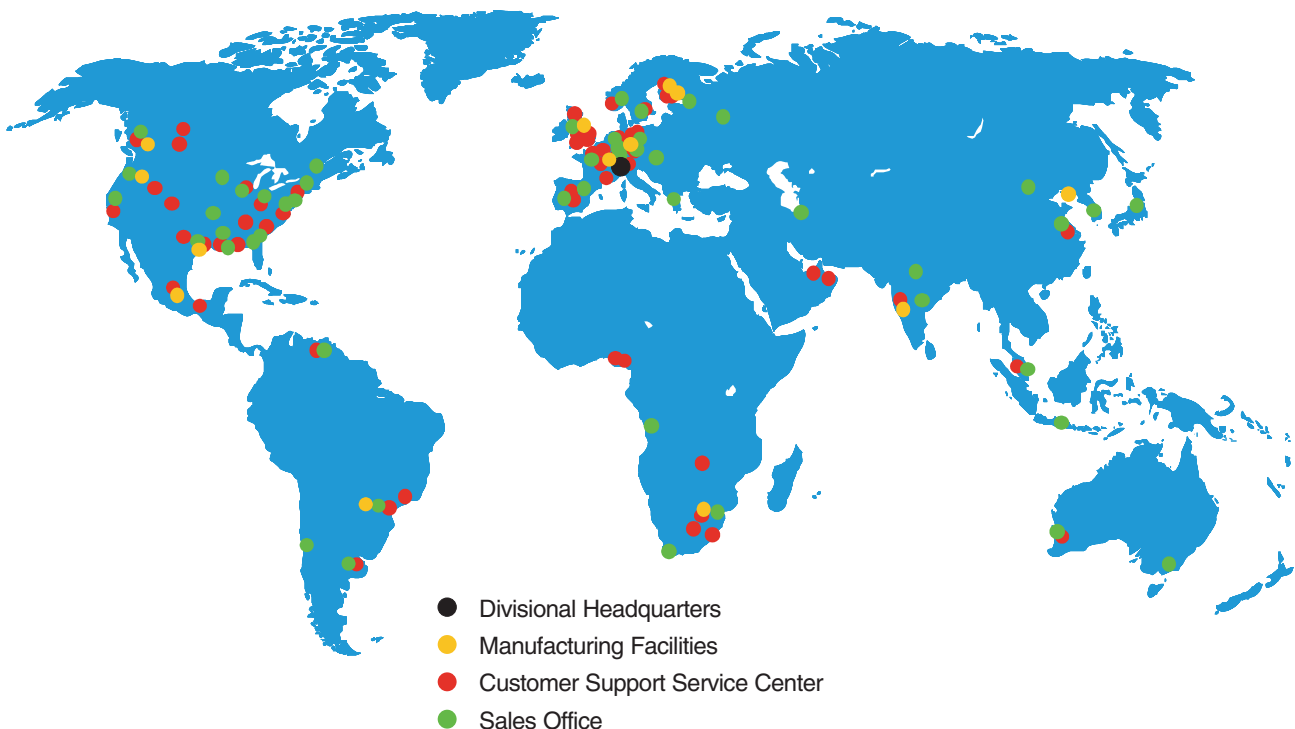
Sulzer Pumps is renowned in the industry for its innovative technology and application know how. We are able to make the best diagnostic of your installation and optimize its performance. We can achieve increased throughput, lift efficiency and improve reliability in most pumps by replacing existing hydraulics with state-of-the-art Sulzer Pumps designs.

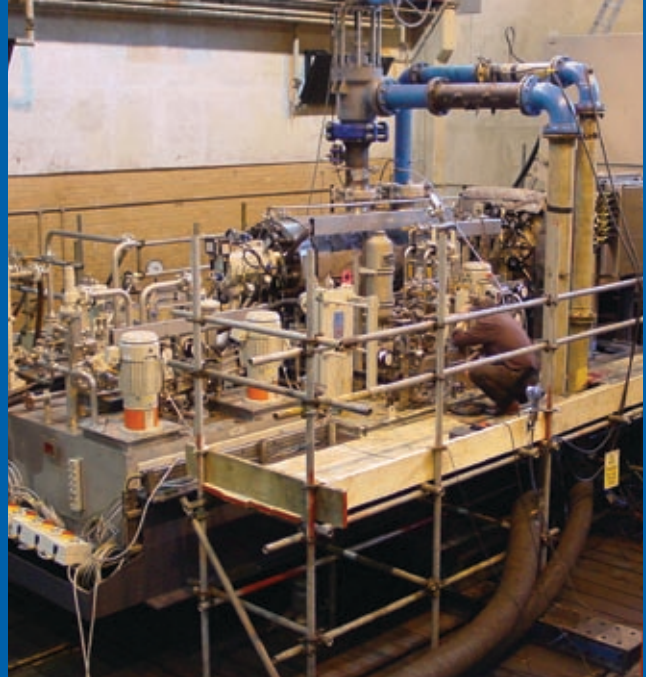


## The world's best production and testing facilities

Wherever you are, Sulzer Pumps is close-by to bring the latest pumping technology to your unique process. We constantly seek to strengthen our manufacturing base by increasing the efficiency of all our facilities, including our foundry operations in Finland and Brazil. Examples include the use of global supply partners to ensure both raw materials and factored

items are supplied to the highest quality standards and investment in state-of-the-art machine tools, packaging and test facilities. These continuous improvements will benefit you as we develop an ever more advanced manufacturing philosophy. This work is at the heart of the value we give you.





## Test Facilities

Pump performance testing, be it for hydraulic assessment or full string testing to prove package integrity is a core strength of Sulzer Pumps. We operate a range of test beds around the world, each dedicated to the needs of specific products and markets.

In Finland, the test loop is set up to allow the rapid testing of end suction pumps of all sizes for the pulp and paper, food, metal and fertilizer industries and desalination.

The high production volume for these segments demands a rapid set up / break down process. This is achieved with modular pump interface piping that can quickly be rotated into position using two custom-built rotating assemblies holding the required range of suction and discharge pipe sizes.

At the other end of the scale, the UK test bed is able to accommodate gas turbine driven pumps of up to 30MW. The building is equipped with all the required systems to run gas turbines, large diesel engines and high voltage electric motors. There is sufficient space to allow several skids to be installed at once maximizing the facilities flexibility.

Specialist vertical pump test beds are located in Houston, France and South Africa. Testing for pumps installed in nuclear power plants can be accommodated in Canada and our new plant in Brazil has the largest pump test facility in the Southern hemisphere.

Whatever the pump you purchase from Sulzer, we have the test capability to fully test it before shipping to prove performance and ensure problem free commissioning on site.



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