

SULZER

Sulzer Pumps

Your Partner for Geothermal Power Generation



The Heart of Your Process



Experience and Solutions You Can Rely on

Around the world, the power industry is taking on the challenge to produce clean, dependable energy from renewable resources. Geothermal power provides a sustainable solution to energy needs today and in the future. Sulzer Pumps has been working with customers to provide reliable and cost-efficient pumping solutions for geothermal power plants since 1982.

We combine our expertise in geothermal power and in other renewable technologies with our experience in industrial power to develop and tailor pumps and auxiliaries that meet the unique demands of geothermal power generation.

Understanding Your Process

With Sulzer Pumps, you have the single-supplier advantage of our comprehensive portfolio, which supports the leading geothermal technologies and all major processes in a geothermal plant. From a single pump to a total system solution, we work closely with you to develop the most optimized solution. We focus on delivering efficient, total life cycle performance to enable you to produce competitive geothermal power.

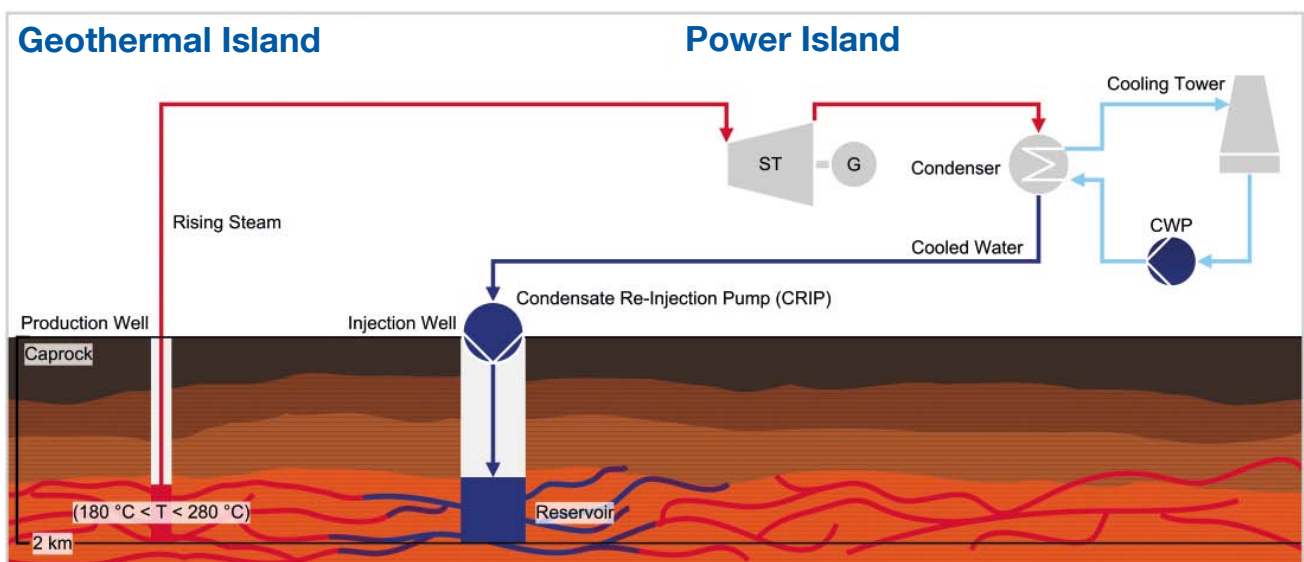
About Sulzer Pumps

Sulzer Pumps is recognized for excellent product quality, performance reliability and technical innovation. We provide a full line of pumps, equipment and related technologies to the Oil and Gas, Hydrocarbon Processing, Power Generation, Pulp and Paper, Water and Wastewater and General Industries. Combining global capabilities, local market understanding and application expertise we support customers with more than 150 locations around the world, including manufacturing facilities, sales offices and service centers close to our customers.



Dry Steam Geothermal Plant

A dry steam plant has production wells that are drilled down to the geothermal reservoir. The superheated pressurized steam ($180\text{ °C} < T < 280\text{ °C}$) is brought to the surface at high speeds and passed through a steam turbine to generate electricity. The steam passes through a condenser and is converted into water. The condensate is then re-injected into the ground through wells. Sulzer Pumps supports these processes with Condensate Re-Injection pumps (CRIP), Cooling Water pumps (CWP) and auxiliary pumps.



ST = Steam Turbine

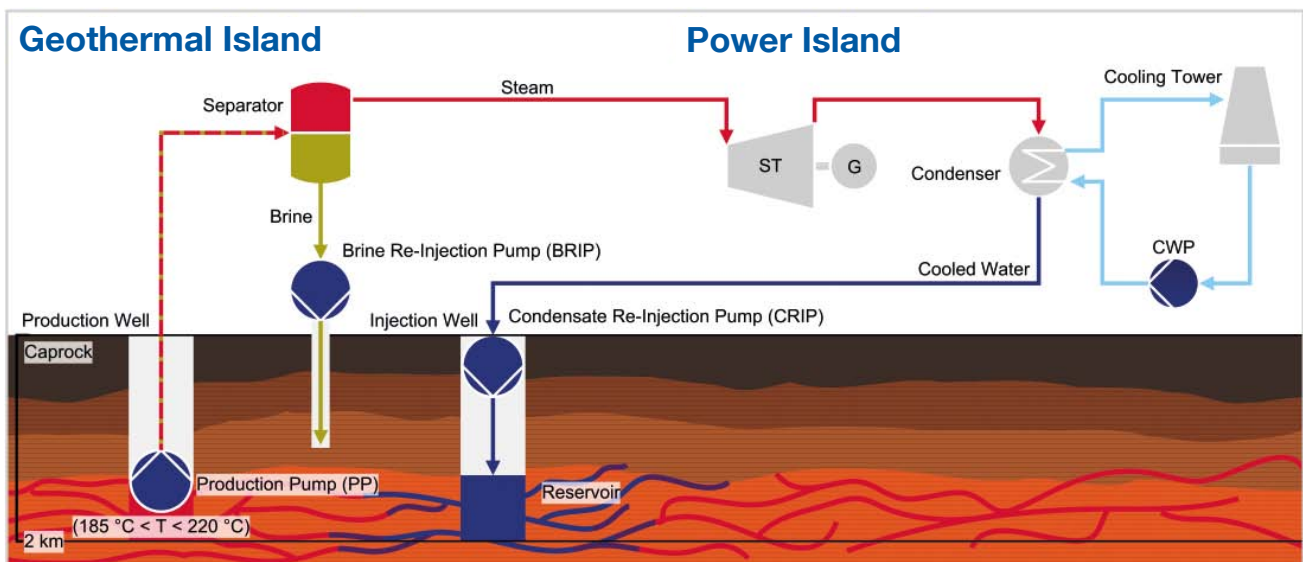
G = Generator

CWP = Cooling Water Pump



Flash Steam Geothermal Plant

In a flash steam plant, pressurized water is heated using geothermal resources. The hot and high-pressure liquid ($185\text{ }^{\circ}\text{C} < T < 220\text{ }^{\circ}\text{C}$) is converted into steam by flashing the extracted liquid through reducing the pressure. The liquid is separated into steam and brine. This brine is pumped back down into the reservoir again and the steam is sent to the turbine, which powers a generator. After passing through the turbine, the steam enters a condenser and is cooled to a liquid state, then pumped back down into the reservoir. Sulzer Pumps supports these processes with Production pumps (PP), Brine Re-Injection pumps (BRIP), Condensate Re-Injection pumps (CRIP), Cooling Water pumps (CWP) and auxiliary pumps.



ST = Steam Turbine

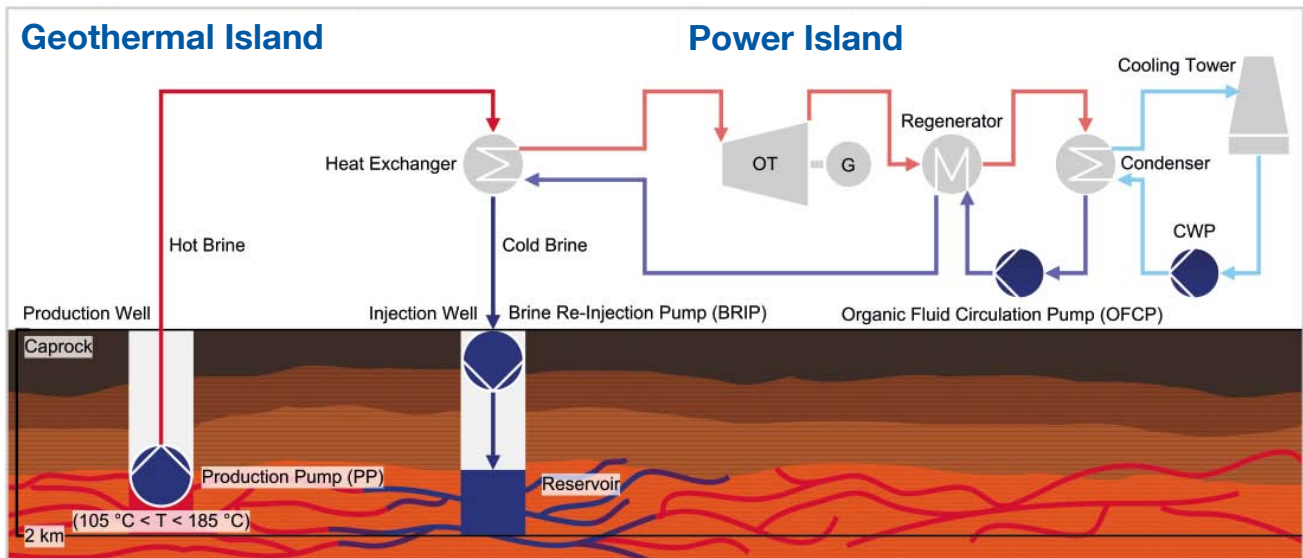
G = Generator

CWP = Cooling Water Pump

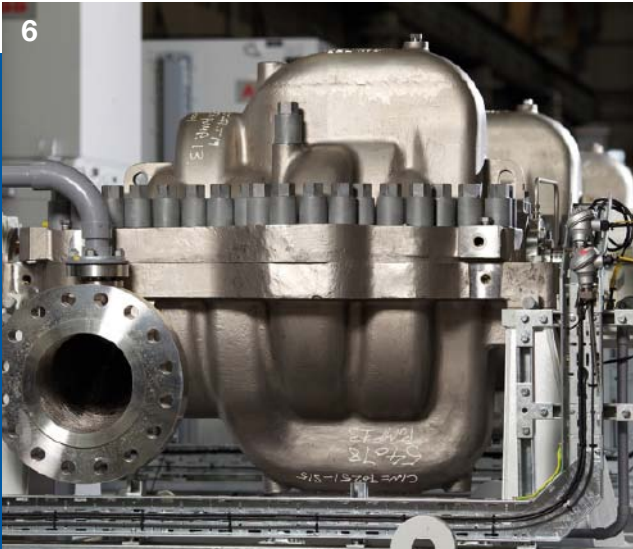


Binary Cycle Geothermal Plant Organic Rankine or Kalina Cycle

A binary cycle plant transfers heat from the hot geothermal fluid ($105\text{ }^{\circ}\text{C} < T < 185\text{ }^{\circ}\text{C}$) that is sent through a heat exchanger to vaporize a secondary working fluid such as pentane, iso-butane in the Rankine Cycle, or ammonia in the Kalina Cycle. The working fluid is then expanded in a turbine, condensed and reheated in a closed loop cycle. The brine is disposed of by re-injection into the ground. Sulzer Pumps supports these processes with Production pumps (PP), Brine Re-Injection pumps (BRIP), Organic Fluid Circulation pumps (CRIP), Cooling Water pumps (CWP) and auxiliary pumps.

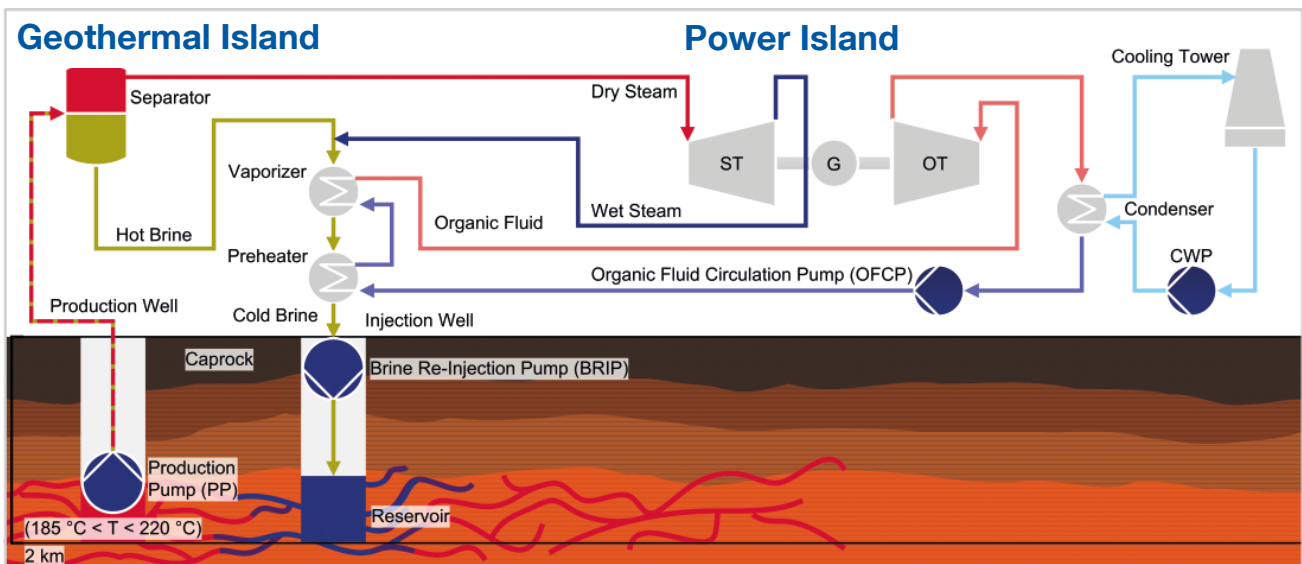


- OT = Organic Turbine
- G = Generator
- CWP = Cooling Water Pump



Flash/Binary Cycle Geothermal Plant

A flash/binary cycle plant uses a combination of flash and binary technology. The portion of the geothermal fluid ($185\text{ °C} < T < 220\text{ °C}$) which “flashes” to steam under reduced pressure is first converted to electricity with a backpressure steam turbine. The low-pressure steam exiting the backpressure turbine is condensed in a binary system. Sulzer Pumps supports these processes with Production pumps (PP), Brine Re-Injection pumps (BRIP), Organic Fluid Circulation pumps (CRIP), Cooling Water pumps (CWP) and auxiliary pumps.

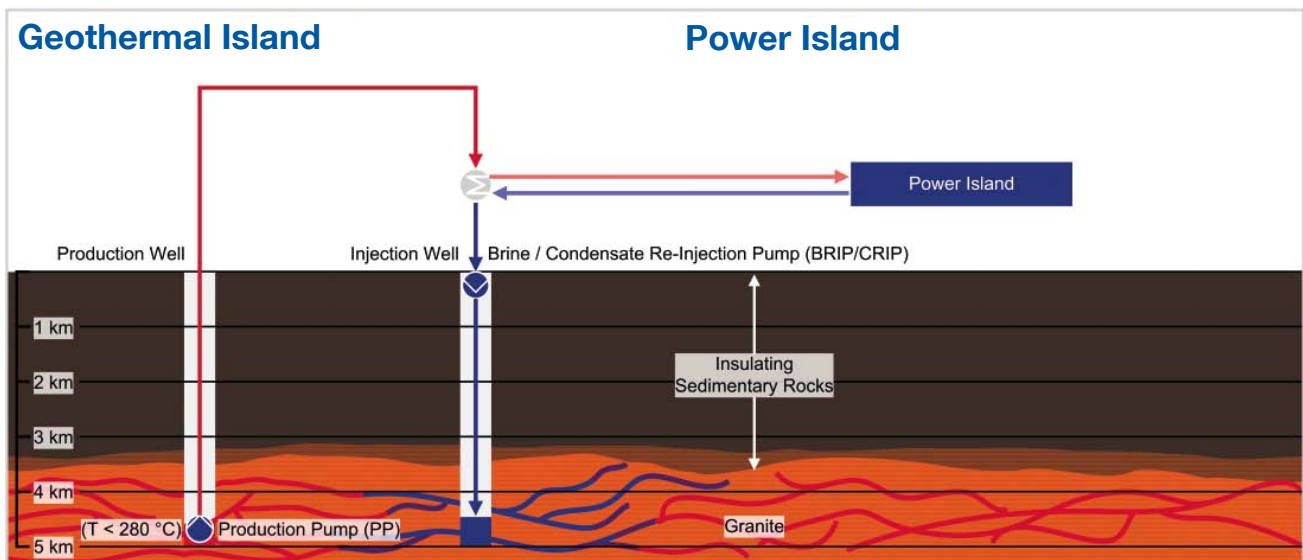


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Enhanced Geothermal System (EGS)

Enhanced Geothermal Systems (EGS) have an injection well (deeper than the ground water tables) drilled into hot bedrock that has limited permeability and fluid content. Water is injected at very high pressure usually by reciprocating pumps, to ensure fracturing and re-opening of existing fractures some distance from the injection wellbore. The production well, which intersects the stimulated fracture network, has water circulated to extract the heat from the hot rock. The temperature of the water extraction can be higher than in the natural geothermal fields, resulting in higher vaporization pressures and thermodynamic efficiencies. Depending on the production hot water temperature ($T < 280\text{ }^{\circ}\text{C}$), the EGS fields can be typically combined with binary cycle or flash steam power plants. Sulzer Pumps supports these processes with high pressure Brine Re-Injection pumps (BRIP), Condensate Re-Injection pumps (CRIP), Organic Fluid Circulation pumps (CRIP), Cooling Water pumps (CWP) and auxiliary pumps.





Pumping Solutions for Your Geothermal Needs

Reliable, cost-efficient geothermal plant performance begins with the selection of the right equipment and continues with the constant life cycle monitoring. Drawing on our extensive product portfolio and services, we work with you to select and customize pumps to meet your needs.

	Production Pump (PP)	Brine Re-Injection Pump (BRIP)	Condensate Re-Injection Pump (CRIP)	Organic Fluid Circulation Pump (OFCP)	Cooling Water Pump (CWP)	Auxiliary Pump
Dry Steam Geothermal Plant			ZE OHH MBN MC MSD SJD		SMD SMN ZPP SJM SJT	AHLSTAR SJM SJT
Flash Steam Geothermal Plant	SJT Geo	ZE OHH MBN MC MSD SJD	SJD		SMD SMN ZPP SJM SJT	AHLSTAR SJM SJT
Binary Cycle Geothermal Plant	SJT Geo	ZE OHH MBN MC MSD SJD		SJD	SMD SMN ZPP SJM SJT	AHLSTAR SJM SJT
Flash/Binary Cycle Geothermal Plant	SJT Geo	ZE OHH MBN MC MSD SJD		SJD	SMD SMN ZPP SJM SJT	AHLSTAR SJM SJT
Enhanced Geothermal System (EGS)		SJD HPcp	SJD HPcp	SJD	SMD SMN ZPP SJM SJT	AHLSTAR SJM SJT



Pumps for Geothermal Applications

SJT Geo

The SJT Geo are vertical line-shaft deep well pumps (up to 650 meter / 2,130 feet settings) specifically designed for geothermal water production application at shallow field depths.

Pressure 80 bar / 1,160 psi
Temperature 190 °C / 374 °F



SJD

The SJD is a vertical, can mounted, multistage bowl diffuser pump typically used for condensate extraction in power generation plants, pumping liquefied gases as well as general refining and industrial applications. The SJD is specified wherever limited NPSH is available, either due to system constraints or liquids operating near to their vapor pressure.

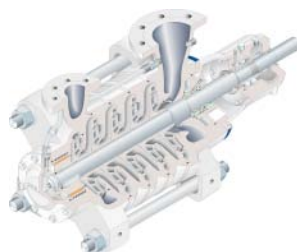
Pressure 93.8 bar / 1,360 psi
Temperature 100 °C / 212 °F



MBN

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 chrome steel and duplex stainless steel grades. The pump utilizes integrated diffusers and a product lubricated NDE bearing to simplify construction, minimize dimensions and reduce cost.

Pressure 100 bar / 1,450 psi
Temperature 180 °C / 356 °F



MC

MC pumps are horizontal, radially split ring section multistage pumps of modular design. MC pumps are suitable for pumping clean or slightly polluted, hot or cold, chemically neutral or aggressive liquids. These pumps are primarily designed for power applications, i.e. boiler feed and condensate services in power plants.

Pressure 180 bar / 2,610 psi
Temperature 180 °C / 356 °F



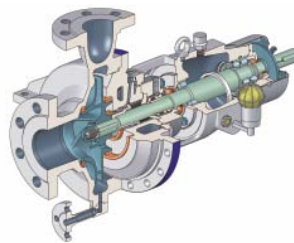


Pumps for Geothermal Applications

ZE

The ZE pumps are overhung, horizontal, single stage, radially split heavy duty centerline mounted process pumps with single flow closed radial impeller and are ideal for arduous applications.

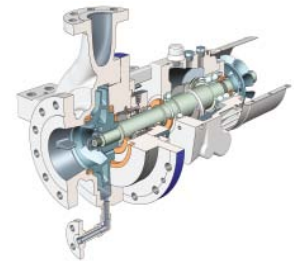
Pressure 100 bar / 1,450 psi
Temperature 425 °C / 797 °F



OHH

The OHH pumps are overhung horizontal single stage radially split heavy duty centerline mounted process pumps with single flow closed radial impeller and are ideal for arduous applications.

Pressure 51 bar / 740 psi
Temperature 425 °C / 797 °F



ZPP

ZPP double suction, axially split pumps are designed for cooling water services in power plants and other industries requiring high efficiencies.

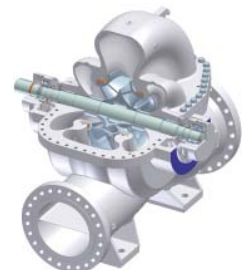
Pressure 10 bar / 145 psi
Temperature 120 °C / 248 °F



SMD/SMN

The SMD/SMN axially split pumps are designed for cooling water services in power plants and other industries requiring high efficiencies.

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





Pumps for Geothermal Applications

SJT/SJM

SJT/SJM vertical pumps are ruggedly designed providing long service 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.

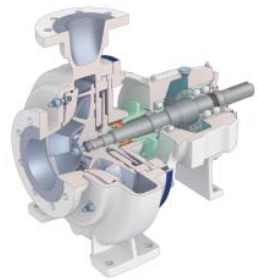
Pressure 64 bar / 923 psi
Temperature 50 °C / 122 °F



AHLSTAR

AHLSTAR pumps are used for pumping clean, abrasive or corrosive liquids. Optionally, this pump type can be equipped with the Sulzer Dynamic Seal specially designed for difficult liquids offering reliable operation and low total sealing costs.

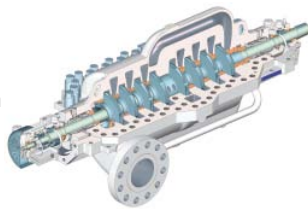
Pressure 16 bar / 232 psi
Temperature 180 °C / 356 °F



MSD

MSD multistage pumps are widely used in power generation applications. The broad range of standard hydraulics and mechanical design options ensure optimum fit to customers' duty requirements, using proven pre-engineered solutions.

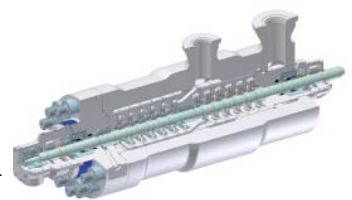
Pressure 300 bar / 4,351 psi
Temperature 200 °C / 392 °F



HPcp

HPcp are radially split barrel pumps used for injection and main oil line services. Using the Sulzer Twist-Lock system of barrel closure to minimize weight, these pumps represent the state-of-the-art for high energy pumps.

Pressure 650 bar / 9,427 psi
Temperature 100 °C / 212 °F



www.sulzerpumps.com



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