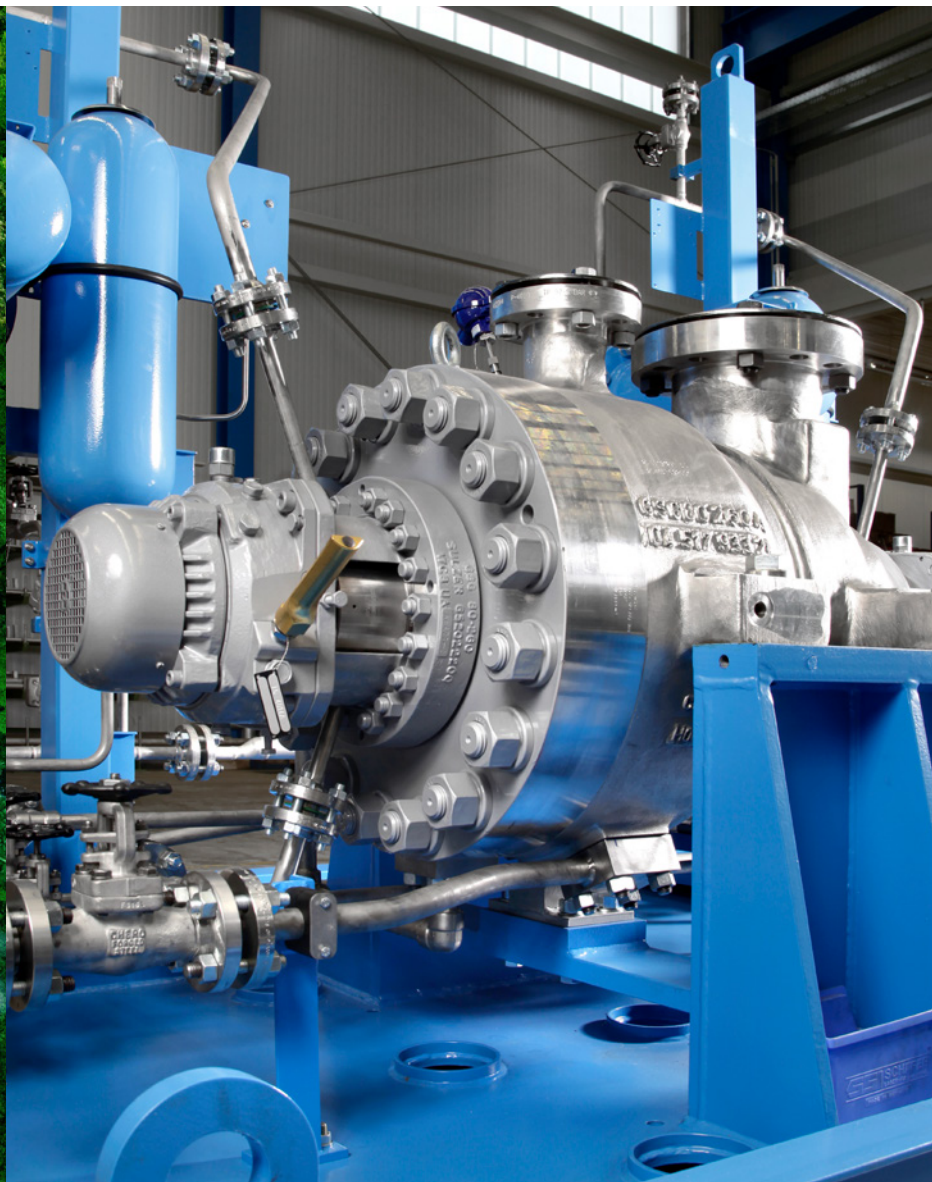
SULZER

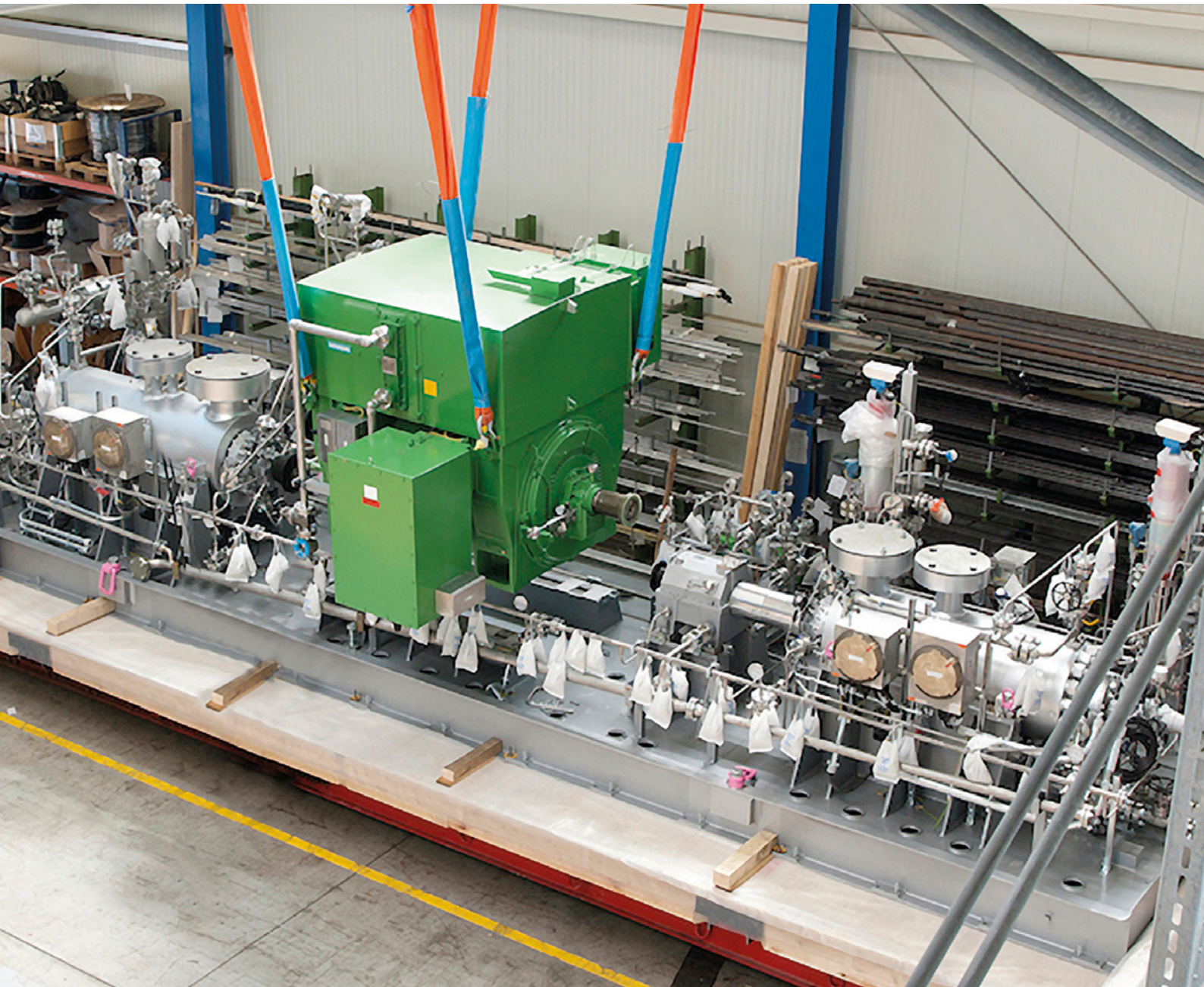
HPRT energy recovery

Making money
from wasted energy



Unlock wasted energy into usable power

With over 100 years of designing energy recovering turbines, our proven solutions help your business reduce emissions and operating cost. With the most extensive range of products in the industry, Sulzer has a solution for your challenges.



You set out the challenge, we present the solutions

The HPRT may be used to drive a pump, generator, compressor or other rotating machinery. Speed is governed by the inlet control valve, motor or generator and the electrical grid frequency. If required, a one-way clutch between a motor and the HPRT prevents the HPRT from absorbing power from the train under low flow startup conditions. Due to high gas volume fraction carryover, experience strongly indicates that conservative speeds are prudent on pump-motor-HPRT trains in fertilizer plants.

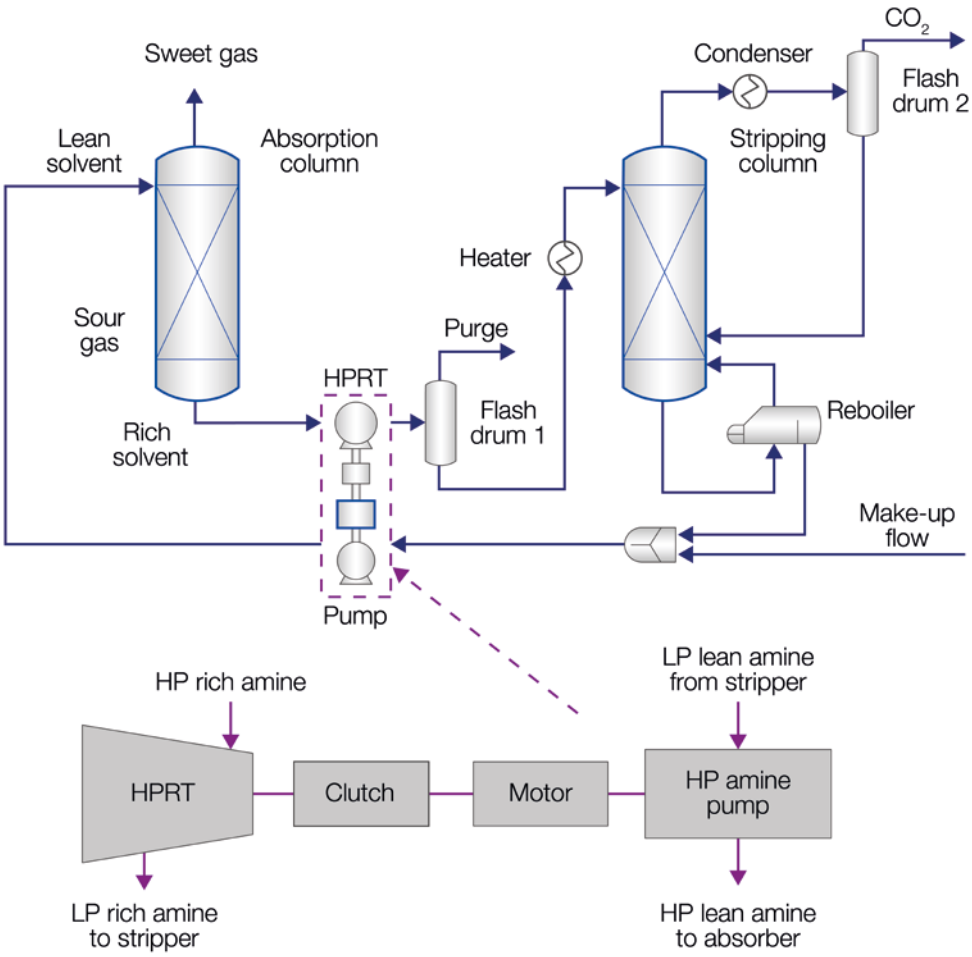
Typical hydraulic turbine installations

Split range liquid level controllers are typically used to regulate turbines. The controller adjusts the HPRT inlet valve or further open the bypass valve when the turbine is overpowered.

Overspeed trip devices are often furnished with hydraulic turbines. This device shuts the HPRT inlet valve and activates overspeed alarms when required.

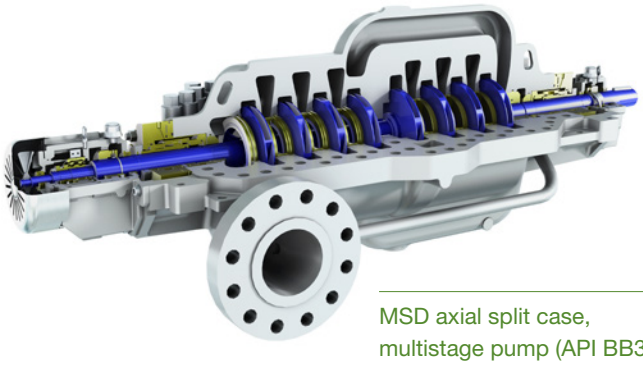
High pressure process

Low pressure process

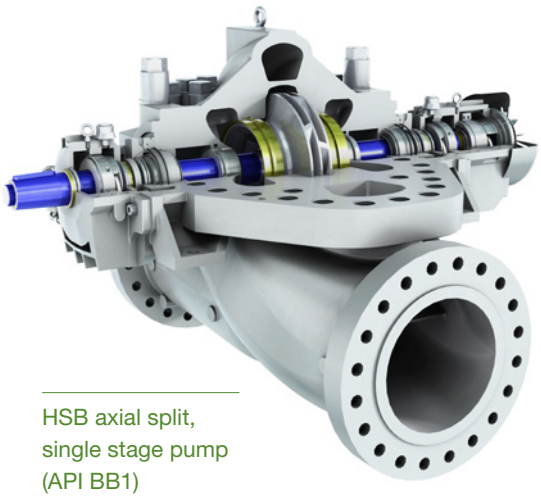


A gas-scrubbing HPRT application can recover more than 2 MW

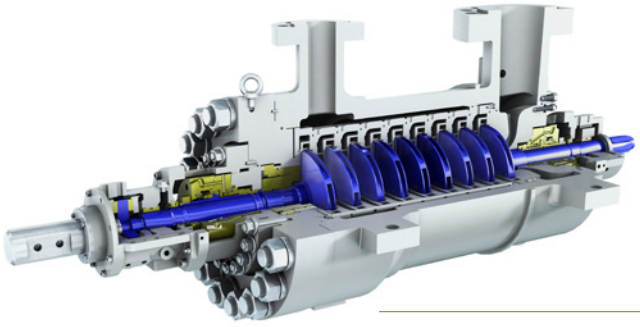
Any pump from our extensive range can be operated as a HPRT



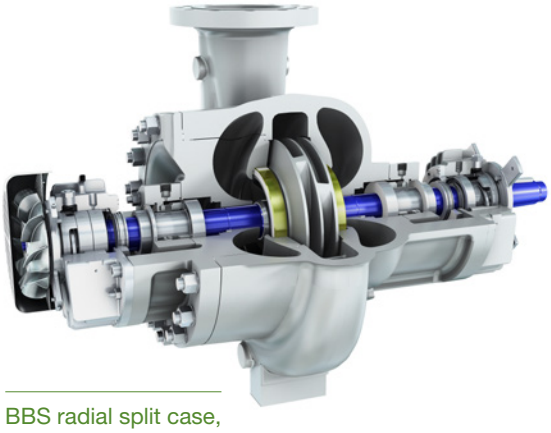
MSD axial split case, multistage pump (API BB3)



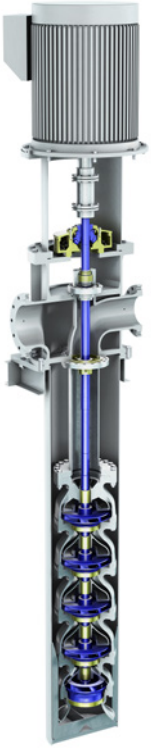
HSB axial split, single stage pump (API BB1)



GSG radial split case, multistage pump (API BB5)



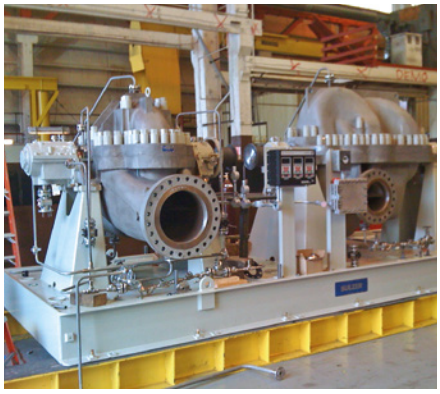
BBS radial split case, single stage pump (API BB2)



SJD-API vertically suspended, double casing pump (API VS6)

References

MSD-D 3 stage double suction pump with a HT-HSB single stage HPRT (USA)



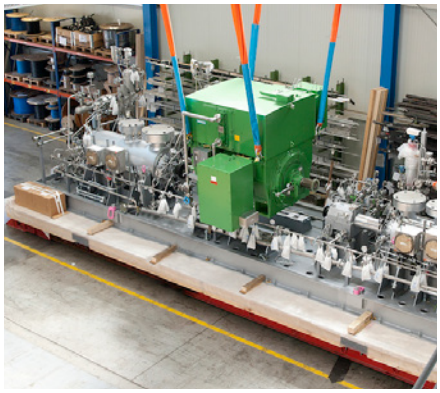
Challenges
CO_2 flashes out of solution as pressure is reduced through HPRT, and when excited through pump. Resulting shock loads can impact reliability.

Solution
Sulzer deploy special seal configuration to isolate seal faces from CO_2 and heavy duty shaft for rotor rigidity. Pump and HPRT speed optimized for efficiency and reliability.

Customer benefits
HPRT converts pressure drop into 1'600 KW of shaft power and increases the overall process efficiency.

Products
Pump 16x18x26 MSD-D, 3-stage
HPRT 16x18x27 HT-HSB

Hydrotreater charge pump with the HPRT (China)



Challenges
A separate booster pump is installed on the pump skid to increase the pressure of the available quench oil for Plan 32 from 12 bar to 40 bar. Due to safety concerns, mechanical seals and seal system static pressure designed to pump and HPRT Maximum Allowable Working Pressure (MAWP) and Maximum Allowable Working Temperature (MAWT).

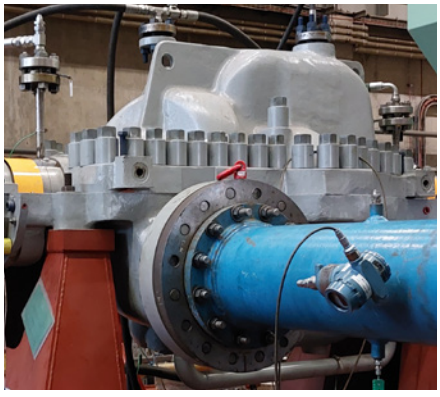
Solution
HPRT train: pump with API 682 plans 23 & 52, double extended shaft motor, over-running clutch, and HPRT with plans 32 and 53C. API 614 lube system supplies entire train.

Customer benefits
HPRT converts pressure into 631 KW shaft power and increases the overall process efficiency.

Products
Pump 12-stage, type BB5, 260 bar @ 318°C
HPRT 12-stage, type BB5, 176 bar, @ 400°C

Pump/motor/HPRT skid is nearly 12 m long x 3 m wide and weighs nearly 40 tonnes.

CO_2 and H_2S removal from natural gas (Saudi Arabia)



Challenges
In the process of amine gas stripping, a pressure breakdown is required between the rich amine leaving the absorber column and the regenerator column. Traditionally this pressure breakdown was achieved by a throttling device such as an orifice or valve. This method is effective, however wastes the potential energy of this high-pressure stream.

Solution
HPRT expander train connected to a double extended shaft motor by an over-running clutch. The HPRT provides the pressure breakdown from the rich amine saturated with H_2S and CO_2 whilst reducing the motor absorbed power driving the lean amine pump.

Customer benefits
This arrangement increases efficiency, reduces energy absorption and costs whilst the process is also removing CO_2 from natural gas.

Products
Pump 4-stage, type BB3
HPRT Single stage, type BB1

Cost savings in blue hydrogen production (USA)

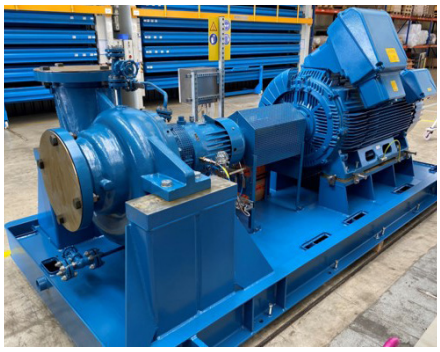
Challenges
Optimum process efficiency required in production of blue ammonia using solvent based CO_2 removal.

Solution
HPRT expander train package was carefully designed using dual shaft 5.4MW motor, connected by an overrunning clutch.

Customer benefits
Cost savings whilst also removing CO_2 in the production of blue hydrogen.

Products
Pump Single stage, type BB2
HPRT Single stage, type BB1

Not just large pumps as turbines



Challenges
Long-standing customer looking to reduce operating expenditure (OPEX) with a short payback period.

Solution
Single stage, overhung pump as turbine was proposed to drive a generator. Small package size ensured minimal modifications to surrounding infrastructure.

Customer benefits
The HRPT generated 470 kW from a 10 bar pressure drop with an efficiency above 80%, contributing to the local power grid. Calculations show a short ROI exceeding customer expectations.

Products
HPRT Single stage, type OH2

Large pressure breakdowns

Challenges
Recovering potential energy from 87 bar pressure breakdown.

Solution
Using a multistage pump enabled a significant pressure breakdown, whilst utilizing this hydraulic energy to reduce the power absorption of the electric motor.

Customer benefits
When in operation the HPRT is recovering 630 kW of power, providing a significant energy saving for the operator a significant energy saving for the operator.

Products
Pump 5-stage, type BB5
HPRT 6-stage, type BB5

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The Sulzer Flow division keeps your processes flowing. Wherever fluids are treated, pumped, or mixed, we deliver highly innovative and reliable solutions for the most demanding applications.

The Flow division specializes in pumping solutions specifically engineered for the processes of our customers. We provide pumps, agitators, compressors, grinders, screens and filters developed through intensive research and development in fluid dynamics and advanced materials. We are a market leader in pumping solutions for water, oil and gas, power, chemicals and most industrial segments.