RUHRPUMPEN

Specialist for Pumping Technology







Session 8 –

Double Case Pumps (Barrel Pumps – BB5)

Simon Smith October 2021

Presenter Profile – Simon Smith

Simon graduated with an honours degree in Chemical Engineering from the University of Surrey in 1978 and began a long career in the engineered pump industry spanning 40 years (so far!) with Peerless Pump, BW/IP International / Flowserve, SPP Pumps, Ruhrpumpen and Ebara Cryodynamics.

Over his long career he has filled various roles as Applications Engineer / Manager, Project Manager, Key Account Specialist, Vertical Pump Product Specialist, International Sales Engineer / Manager / Director and he has considerable experience in Training & Mentoring young engineers.

RUHRPUMPEN

RUHRPUMPEN AT A GLANCE

VERTICAL INTEGRATION

SALES OFFICES IN +35 COUNTRIES

MANUFACTURING **FACILITIES** IN 10 COUNTRIES

+70 YEARS OF EXPERIENCE

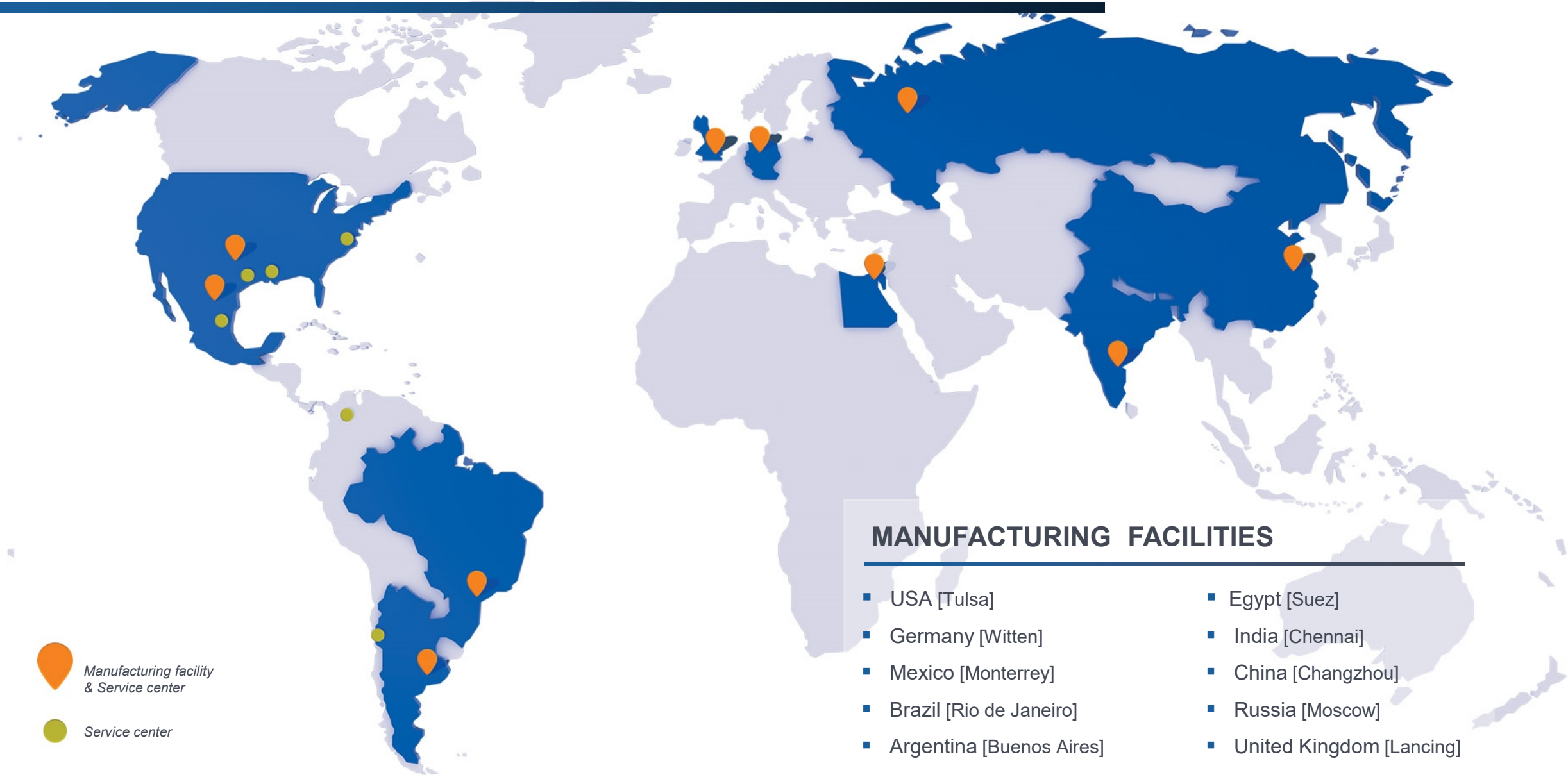
+2,000 EMPLOYEES

15 **SERVICE CENTERS**

+70,000 PUMPING SOLUTIONS INSTALLED WORLDWIDE

A GLOBAL COMPANY

RUHRPUMPEN



MANUFACTURING FACILITIES

- USA [Tulsa]
- Germany [Witten]
- Mexico [Monterrey]
- Brazil [Rio de Janeiro]
- Argentina [Buenos Aires]
- Egypt [Suez]
- India [Chennai]
- China [Changzhou]
- Russia [Moscow]
- United Kingdom [Lancing]

MARKETS WE SERVE

Our commitment to create innovations that offer reliable solutions to our customers allow us to provide a complete range of pump systems to support **core markets** as:

RUHRPUMPEN

OUR PUMP LINES

Ruhrpumpen offers a broad range of highly engineered and standard pumping products that meet and exceed the requirements of the most demanding quality specifications and industry standards.

Our pumps can handle head requirements as high as 13,000 ft (4,000 m) and capacities up to 300,000 gpm (68,000 m^3/hr). Moreover, our pump designs cover temperatures from cryogenic temperatures of -310 °F (-196 °C) up to 752 °F (400 °C).

Products include:

- Single Stage Overhung Pumps
- Between Bearings Pumps
- Horizontal Multi-Stage Pumps
- Vertical Multi-Stage Pumps
- Vertical Mixed Flow & Axial Flow Pumps
- Positive Displacement Pumps
- Full Range of Industrial Pumps
- Submersible Pumps
- Magnetic Drive Pumps
- Decoking Systems
- Packaged Systems
- Fire Systems

Session 8 –
“Double Case Pumps (Barrel Pumps – BB5)”

Aimed at Process and Mechanical Engineers and Consultant Engineers specifying pumping equipment for refineries and oilfield installations as well as Applications & Sales Engineers selecting and quoting them.

Double Case Pump Type BB5

When do you need them?

- BB2 (1 stage) pumps run out at heads of about 300m (50Hz) and 500m (60Hz)
- BB2 (2 stage) pumps run out at heads of about 600m (50Hz) and 800m (60Hz)
- Beyond that you are going to have to look at Multistage Pumps of which there are four types BB3, BB4 & BB5 and VS6
- BB4 (ring section, tie-bolt design) is not fully compliant with API610 but is frequently used for Boiler Feed and Desalination Feed services.

RING SECTION PUMPS

BB4 PUMPS – GP

- The GP pump is a diffuser type, horizontal, multi-stage, between bearings, ring section pump-type BB4.
- It is engineered to be the most reliable and exceptional pumping solution for the most demanding high-pressure and high temperatur applications across many industries, but specifically for Boiler Feed Water service
- Its compact design, together with high efficiency hydraulics, provides superior performance and exceptional reliability combined with easy maintenance and minimal operating costs.
- Wide range of hydraulics (A and B impellers for same casing are available to cater to different flow/head requirements with optimum efficiency)
- Optimum NPSH performance with special, low NPSH first stage available
- Specially designed stages to accommodate interstage take-off flow

Capacity	1,500 m3/hr
Head	3,657 m
Temperature	260°C
Pressure	370 bar

Double Case Pump Type BB5

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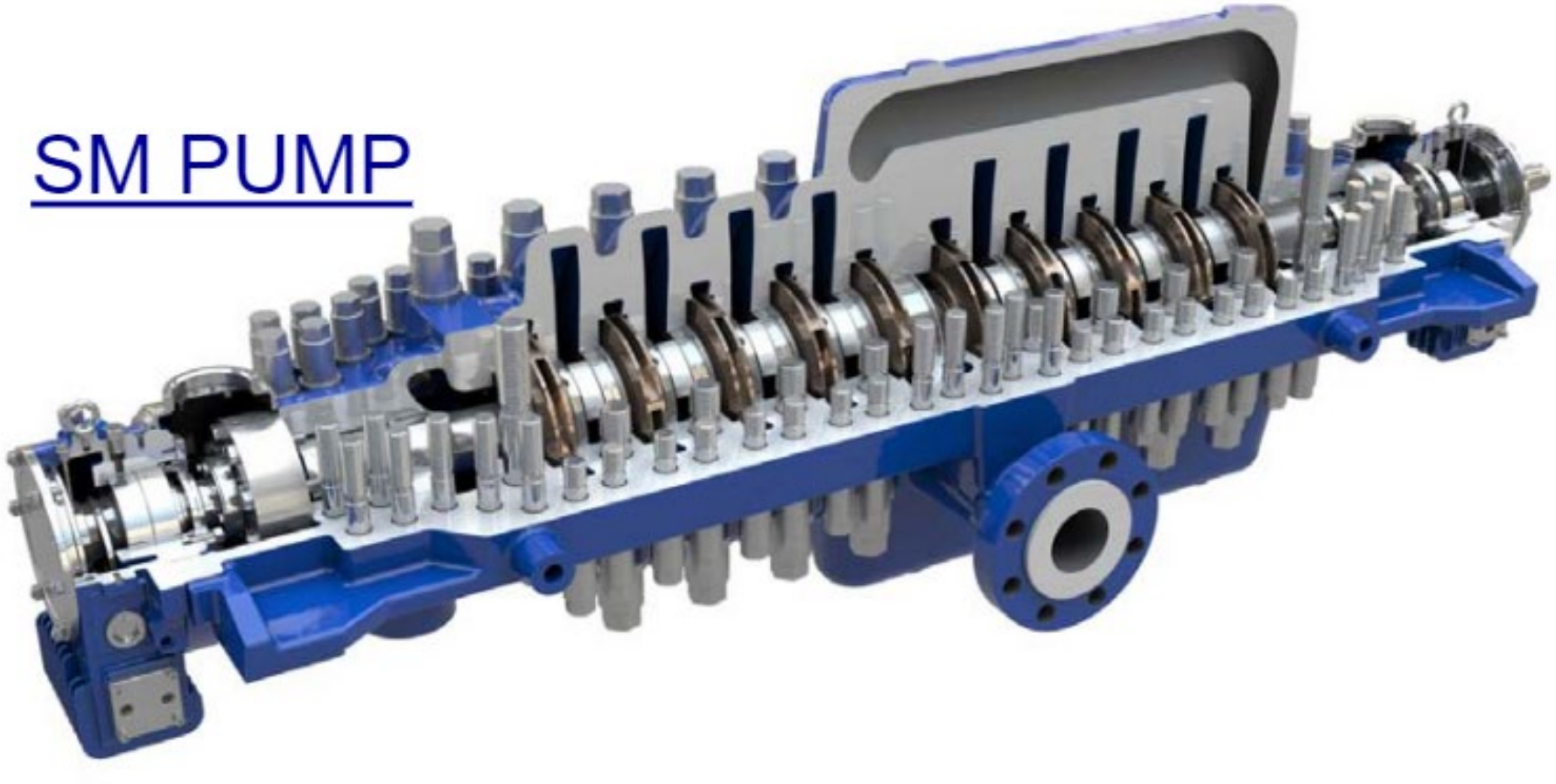
- BB4 (ring section, tie-bolt design) is not fully compliant with API610 but is frequently used for Boiler Feed and Desalination Feed services.
- BB3 pumps have limitations on temperature (200C, 400F), pressure (100Bar, 1450psi) & SG (0.7) – BUT DON'T LET THAT NECESSARILY STOP YOU CHOOSING THEM

Axially Split Pumps BB1 & BB3

Limitation from API610 on use of axially split pumps

- *6.3.9 Unless otherwise specified, pumps with radially split casings are required in services for any of the following conditions:*
- *a) pumping temperature of 200 C (400 F) or higher (a lower temperature limit should be considered if thermal shock is probable);*
- *b) liquids with a relative density of less then 0,7 at the specified pumping temperature;*
- *c) liquids at a rated discharge gauge pressure above 10 MPa (100 bar; 1450 psi).*
- *Axial split casings have been used successfully beyond the limits given above, generally for off-plot applications at higher pressure or lower relative density (specific gravity). The success of such applications depends on the margin between design pressure and rated pressure, the manufacturers experience with similar applications, the design and manufacture of the split joint, the user's ability to correctly remake the split joint in the field. The purchaser should take these factors into account before specifying an axial split casing for conditions beyond these limits.*
- For an excellent article by Simon Bradshaw on this subject, follow this link
- https://www.linkedin.com/pulse/thngs-api-610-got-wrong-part-5-simon-bradshaw/

Axially Split Multistage Type BB3



Axially Split Type BB3

Interstage Bolting ensures gasket compression in this area and prevents erosion caused by fluid washover.

It means this design is good for SG as low as 0.4 and pressures to 180 Bar.

API 610 PROCESS PUMPS

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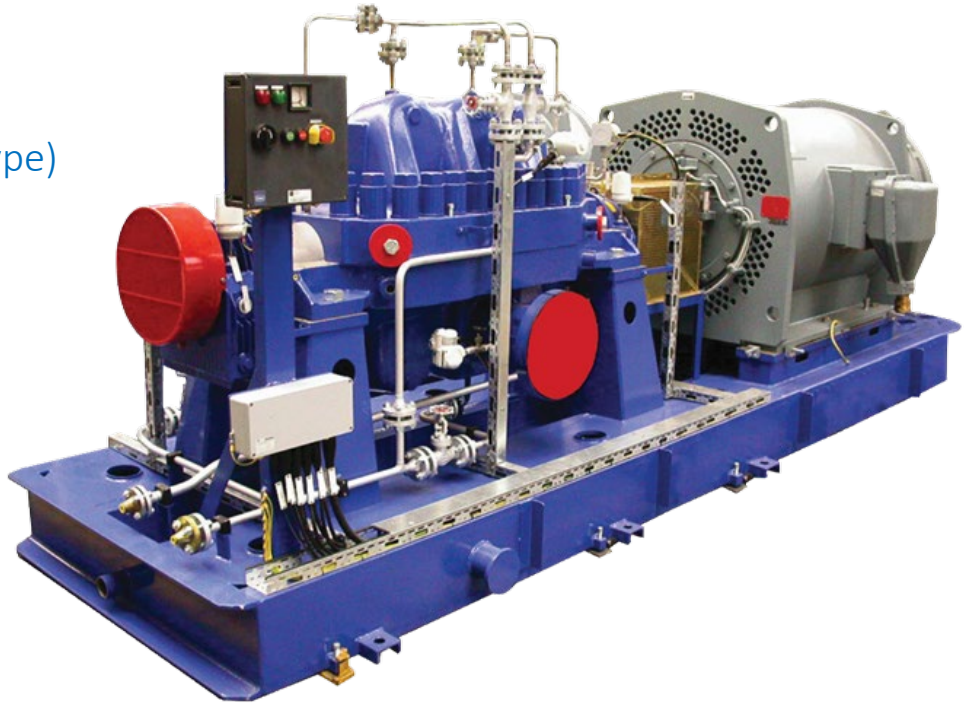
BB3 PUMPS – JTN / SM

Characteristics

- Heavy duty process design according to API 610 latest edition (BB3 type)
- Axially split, horizontal multi-stage centrifugal pump
- Near-centerline mounted
- Double volute casing (SM)
- Diffuser casing (JTN)
- Single suction, closed impeller
- Thrust compensation by opposed impeller groups
- Side-Side nozzle arrangement
- Replaceable wear rings for casing and impeller
- Ring oil lubrication with option for hydrodynamic bearings for higher powers



Applications

- Oil fields and terminals
- Crude oil and oil product pipelines
- Water pipelines
- Fluid injection
- High pressure services
- Power plants

SM

Capacity	50 to 3,000 m^3/h
Head	200 to 3,000 m
Temperature	205°C
Pressure	420 bar

JTN

Capacity	10 to 350 m^3/h
Head	100 to 1,000 m
Temperature	220°C
Pressure	130 bar

BB3 (diffuser) pump – Model ‘JTN’

- Pacific Heritage product and Ruhrpumpen Global product
- The impellers are arranged in opposed groups to reduce axial forces and thus help to reduce bearing loads
- Shaft deflection less than 0.05 mm in the area of the mechanical seal due to the ample pump shaft dimensions and the balancing of the hydrodynamic radial loads
- One piece diffusers ensure proper balancing of the radial forces and thus help to reduce the bearing load.

Capacity	up to 480 m³/h	up to 2,100 gpm
Head	up to 1,200 m	up to 3,900 ft
Pressure	up to 130 bar	up to 1,880 psi
Temperature	up to 200 °C	up to 400 °F

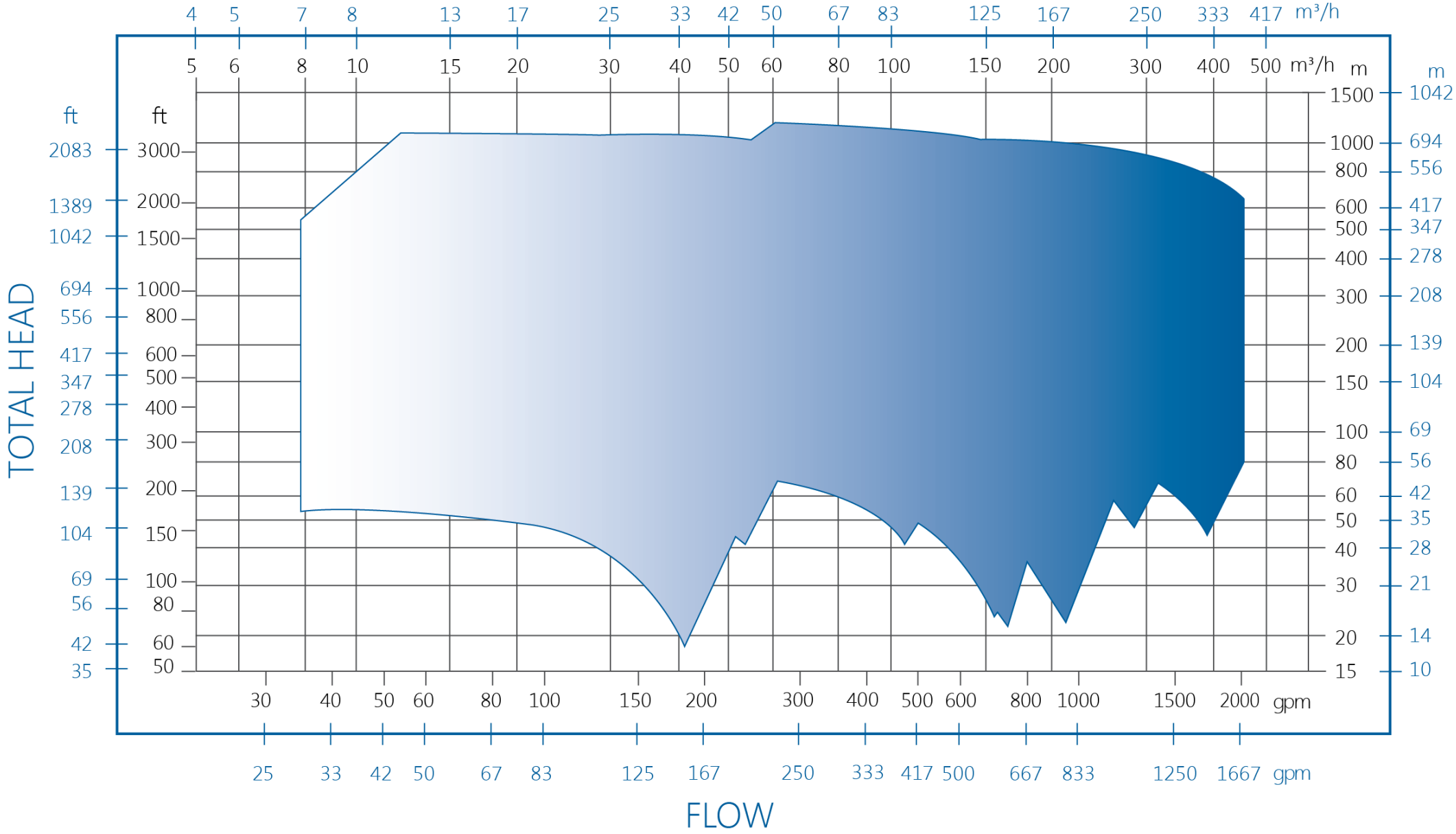
- Refineries
- Oil fields
- Petrochemical plants
- Chemical plants
- Pipeline

- Power plants
- Boiler circulation
- Desalination
- Solar power plants
- Reinjection Pumps

Selection Chart JTN

BB3

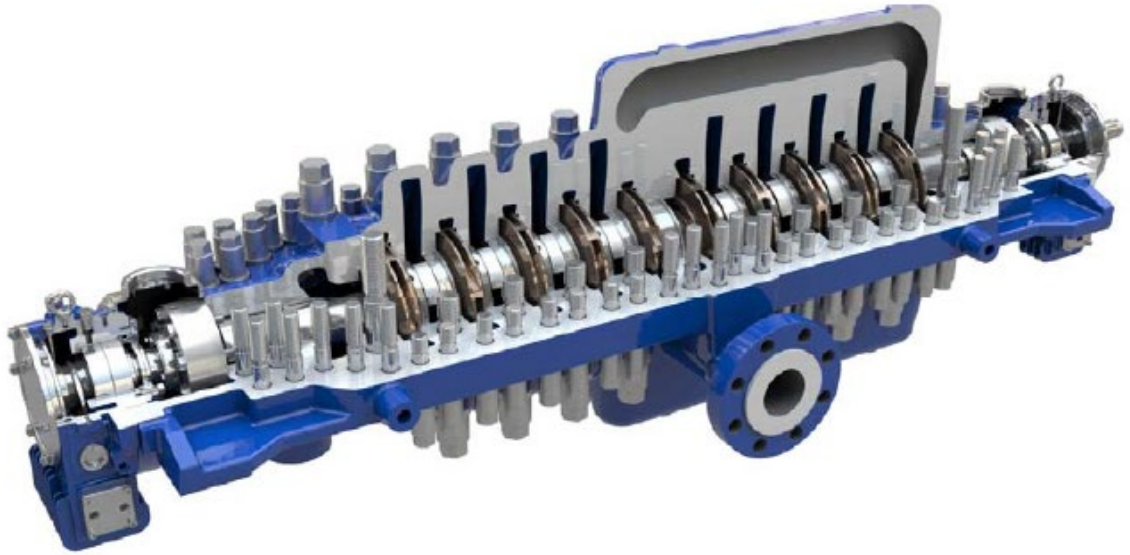
2 Poles
— 50 Hz — 60 Hz



BB3 Smaller Sizes, 50 & 60 Hz, 2 Pole

BB3 (volute) pump – Model ‘SM’

- Double row bolting (2 or 3 different bolting sizes including row located between stages) and shortest lever length ensures uniform gasket compression, especially between stages (confirmed by FEA analysis)
- Optimized bolting design prevents fluid wash-over between stages and allows application of BB3 below API limit of SG>0.7.
- Balance line provides axial thrust compensation and removes the need for high pressure seal on NDE end
- Axial split volute design allows rotor to be removed quickly and easily for maintenance



Capacity	up to 2,000 m³/h	up to 8,800 gpm
Head	up to 1,600 m	up to 5,330 ft
Pressure	up to 276 bar	up to 4,000 psi
Temperature	up to 200 °C	up to 400 °F

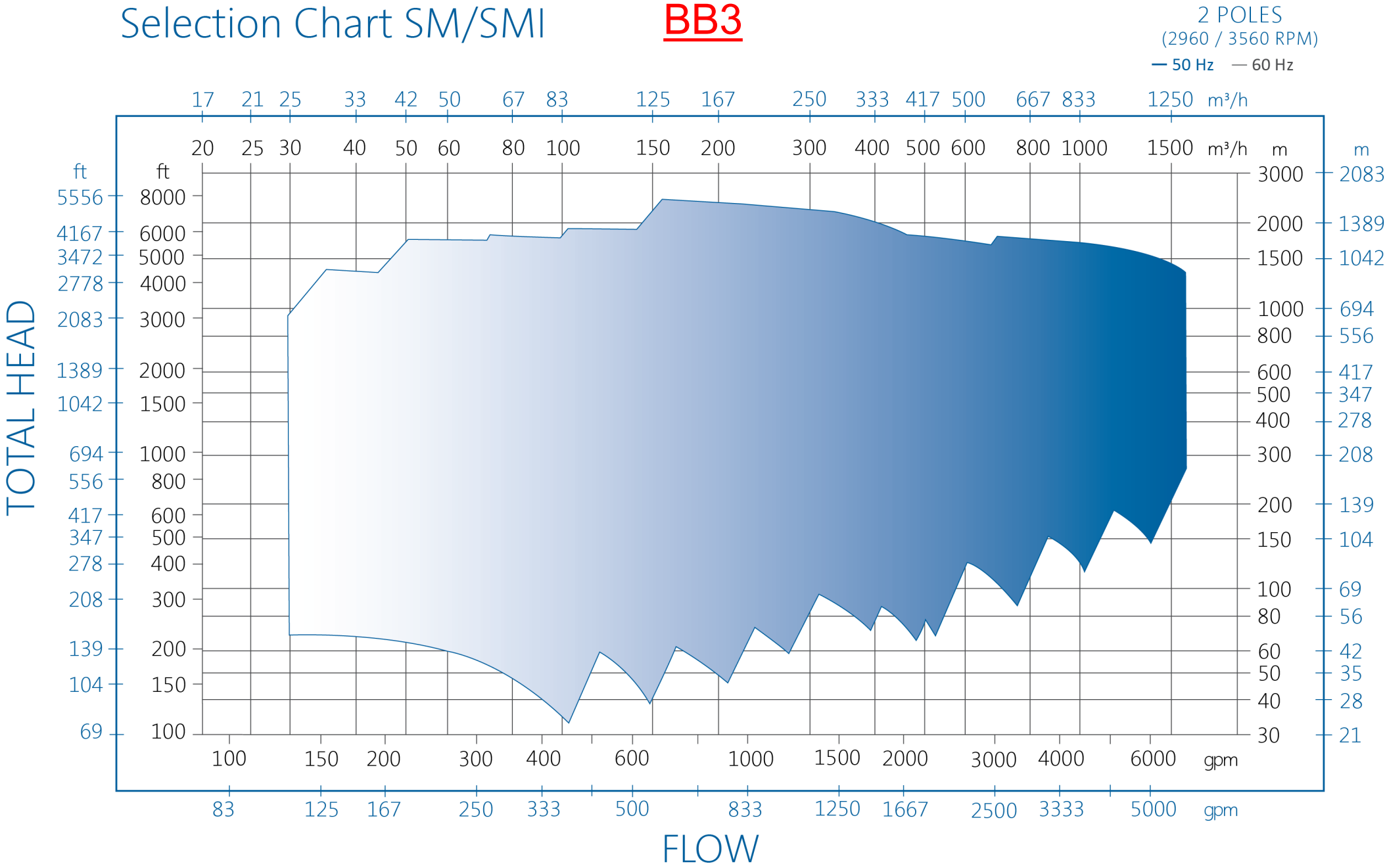
- Refineries
- Oil fields
- Petrochemical plants
- Chemical plants
- Pipeline

- Power plants
- Boiler circulation
- Desalination
- Solar power plants
- Reinjection Pumps

Selection Chart SM/SMI

BB3

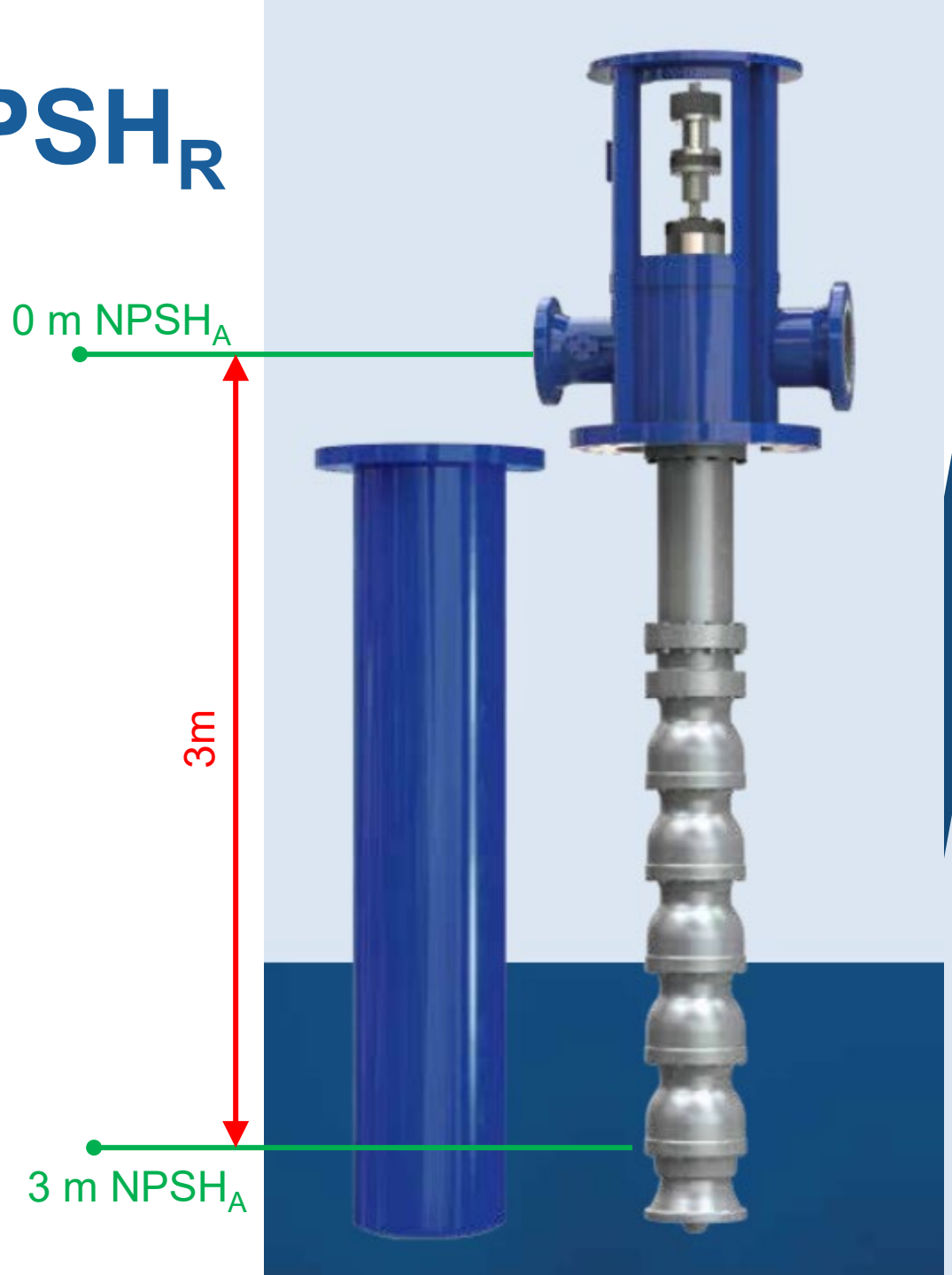
BB3 Larger Sizes, 50 & 60 Hz, 2 Pole



VS6 Pumps – Zero $NPSH_R$

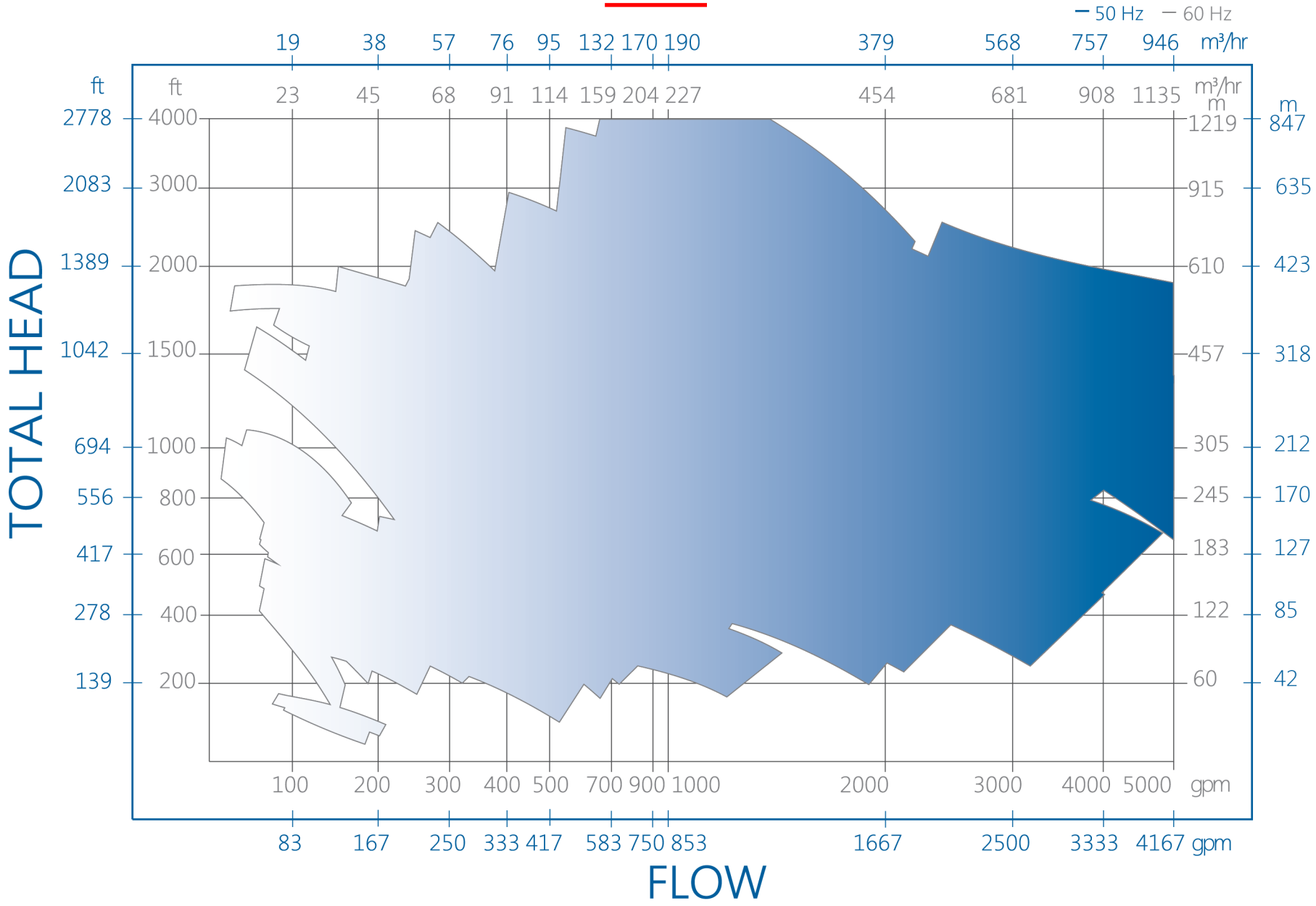
The Spacesaver and Costsaver

- You've looked OH2 pumps and at BB2 pumps and you still have an NPSH problem
- Not just an NPSH saver but a space saver too. Around 20% of the floorspace of the equivalent BB2 or BB3
- And a cost saver too. Less expensive than the equivalent BB2 or BB3
- One seal, one sealing system
- Once you can persuade your civil engineers to dig a hole you are saving all the way.



Selection Chart VLT VS6

VS6 – Multispeed – Semi Engineered Range



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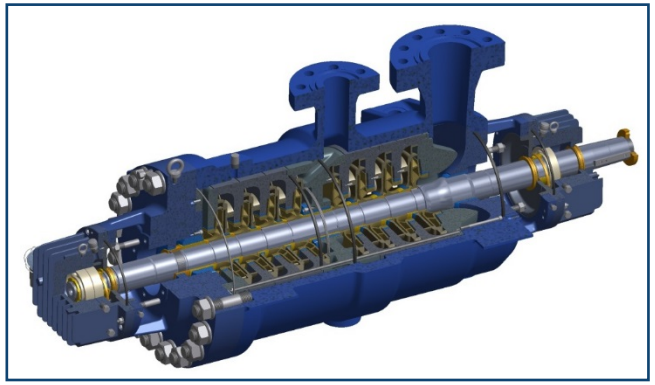
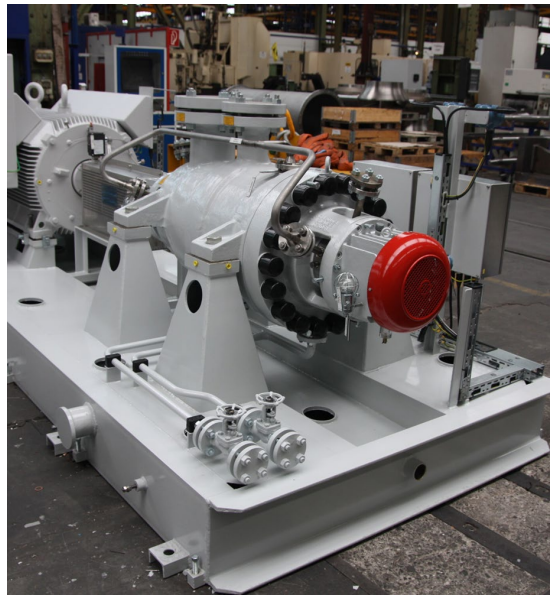
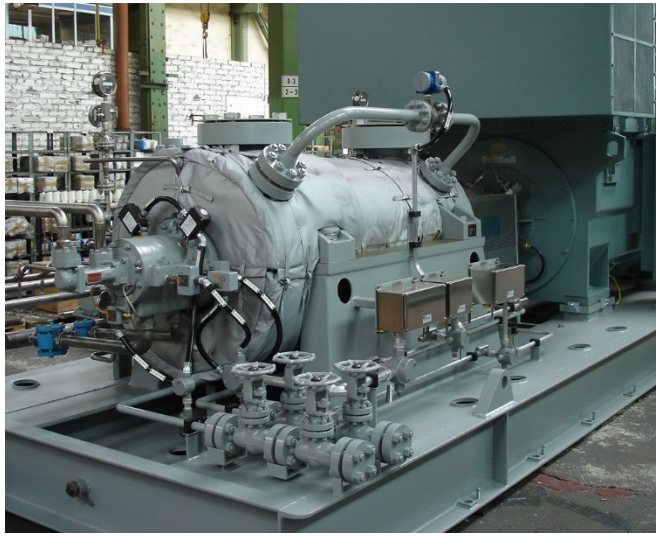
BB5 - DOUBLE CASE PUMPS







Double Case Pump Type BB5

Characteristics

- Heavy duty process design according to API 610 latest edition (Type BB5)
- Radially split, horizontal multi-stage centrifugal pump
- Centerline mounted
- Diffuser type (most common) or Volute type
- Single / Double suction, enclosed impeller
- Top-Top nozzle arrangement
- Alternate nozzle arrangements available
- Thrust compensation by balance drum or rotor design with opposed impellers
- Speeds up to 6000rpm for high head requirements

Applications

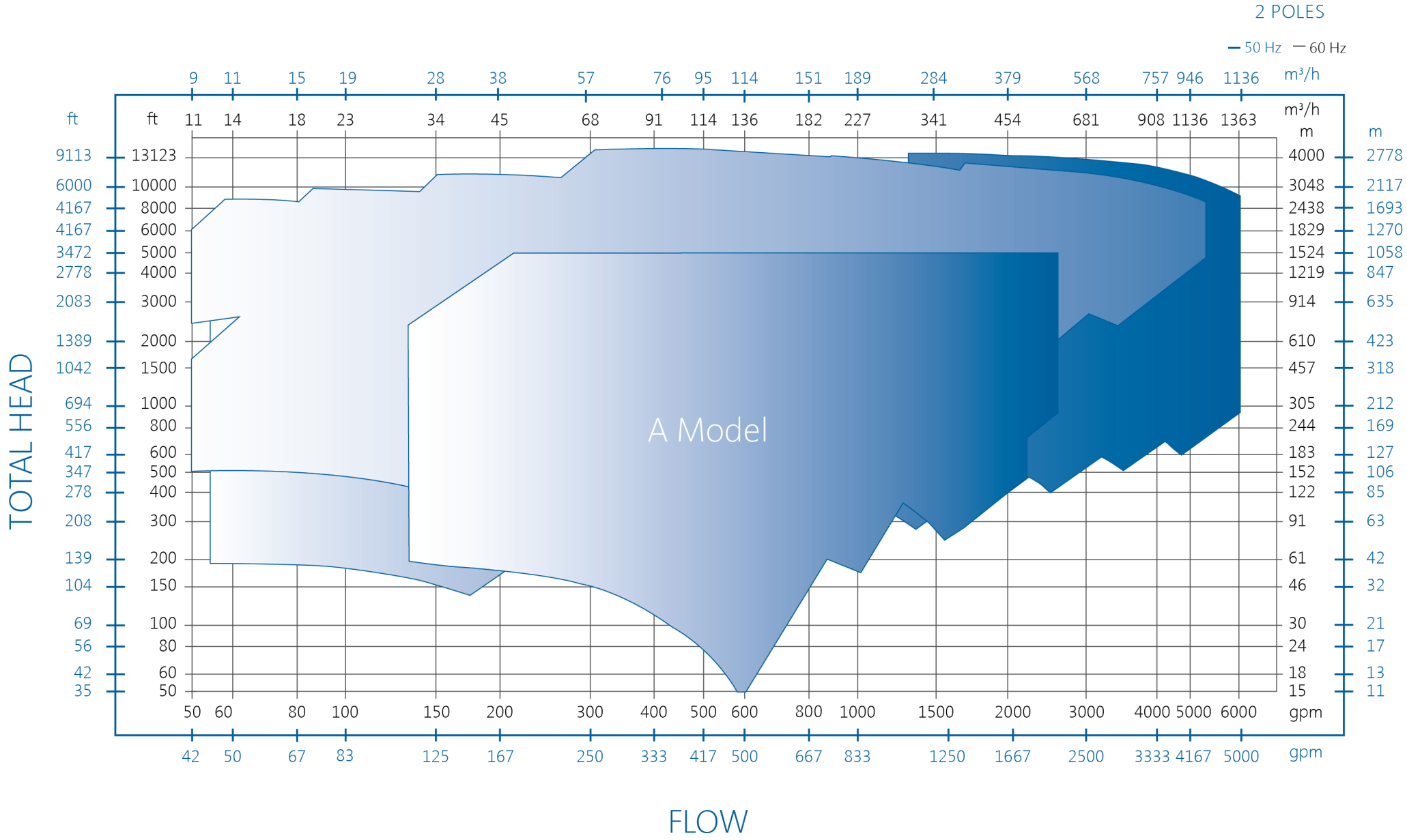
- Hydraulic decoking
- Boiler feed
- Pipeline
- Reverse osmosis
- Amine / ethylene feed
- Hydrocarbon charge
- Injection and Reinjection Pump

Capacity	Up to 2,000 m^3/h
Head	Up to 4,572 m
Temperature	Up to 450°C
Pressure	Up to 420 bar

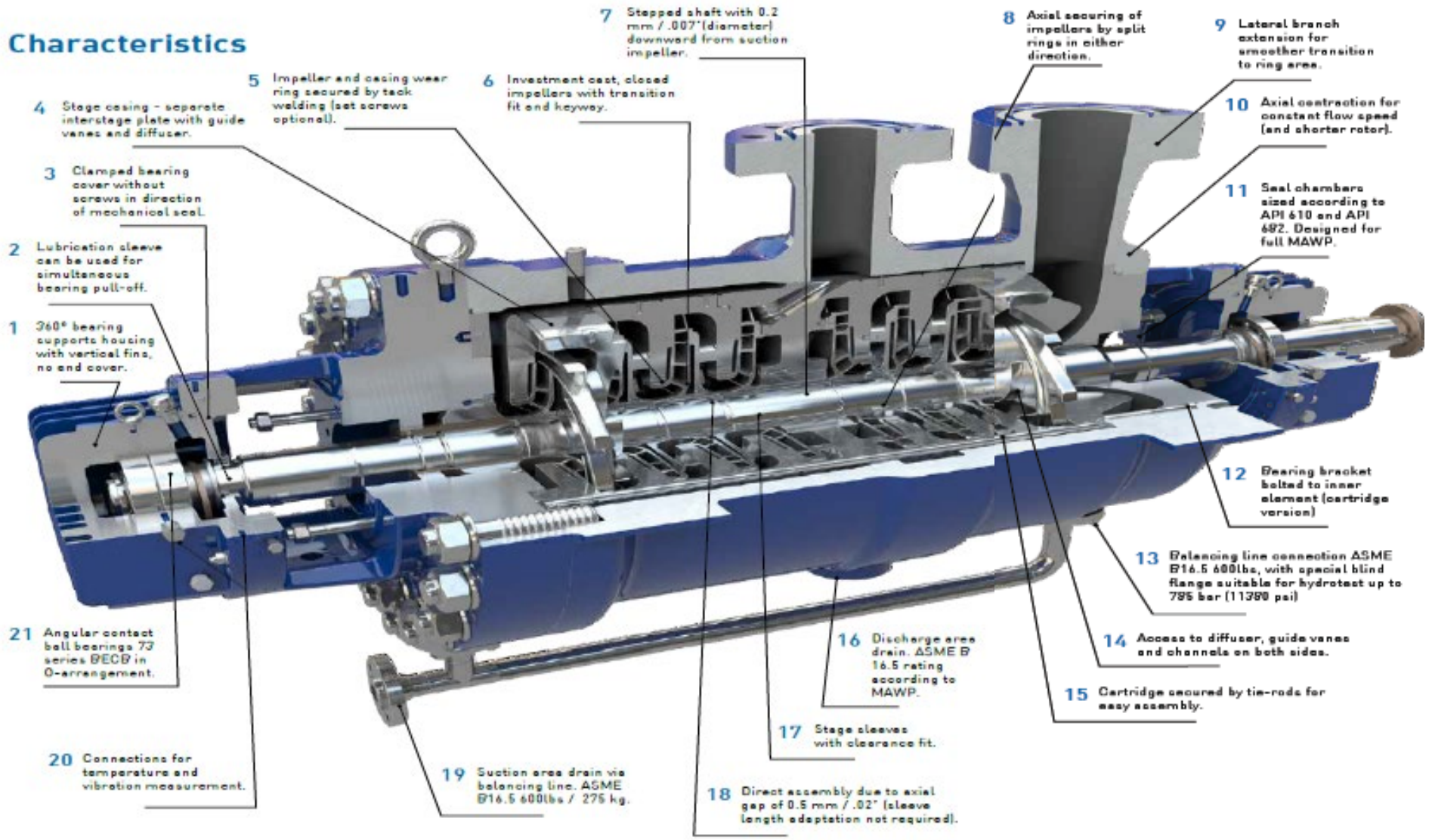
BB5, 50 & 60 Hz, 2 Pole

SELECTION CHART A-LINE

BB5

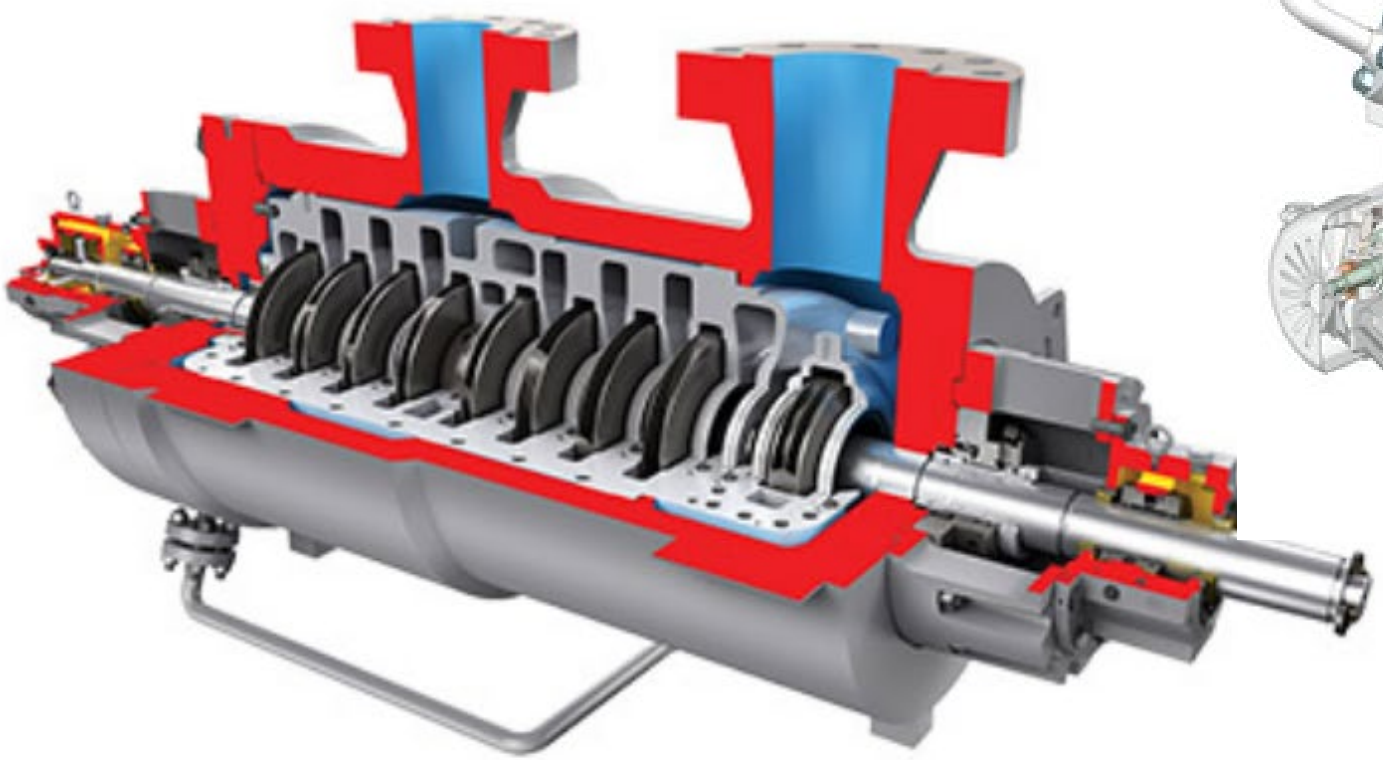


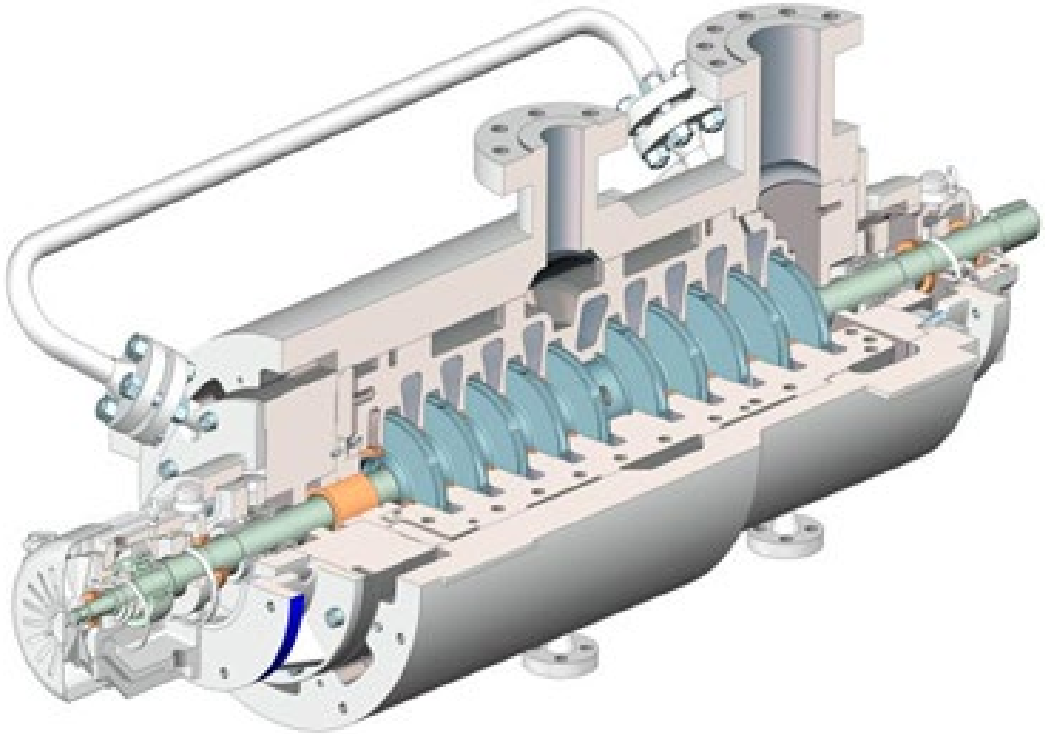
Double Case Pump Type BB5



Double Case Pump BB5

Volute Designs





Double Case Pump BB5

Diffuser vs Volute Designs

Diffuser designs are more frequently seen than the older volute designs for the following main reasons:

- Volute designs are generally bigger and heavier than diffuser designs (the inner case is a casting, is bigger in diameter and has more material)
- In diffuser designs multiple diffuser channels effectively balance the radial loads compared with volute designs
- In the diffuser design it is simple to provide blank/dummy stages to allow easy change-out for future conditions
- Diffuser design allows replacement of individual stage pieces rather than the entire inner volute assembly
- Future duty conditions can be achieved by changing the hydraulic combination of impeller & diffuser (several hydraulic combinations are available) without changing the barrel size.

Double Case Pump BB5

Complete Pullout vs Integrated Cover Design

- Complete pullout Design: Cartridge with **separate drive end cover**, which is mounted on inner element and therefore can be pulled out fully assembled (complete with DE bearing housing and seal) to save assembly/disassembly time and minimize number of loose part to be tracked and handled on site

- Integrated Cover Design: Heavy-Duty Casing with integrated suction cover.

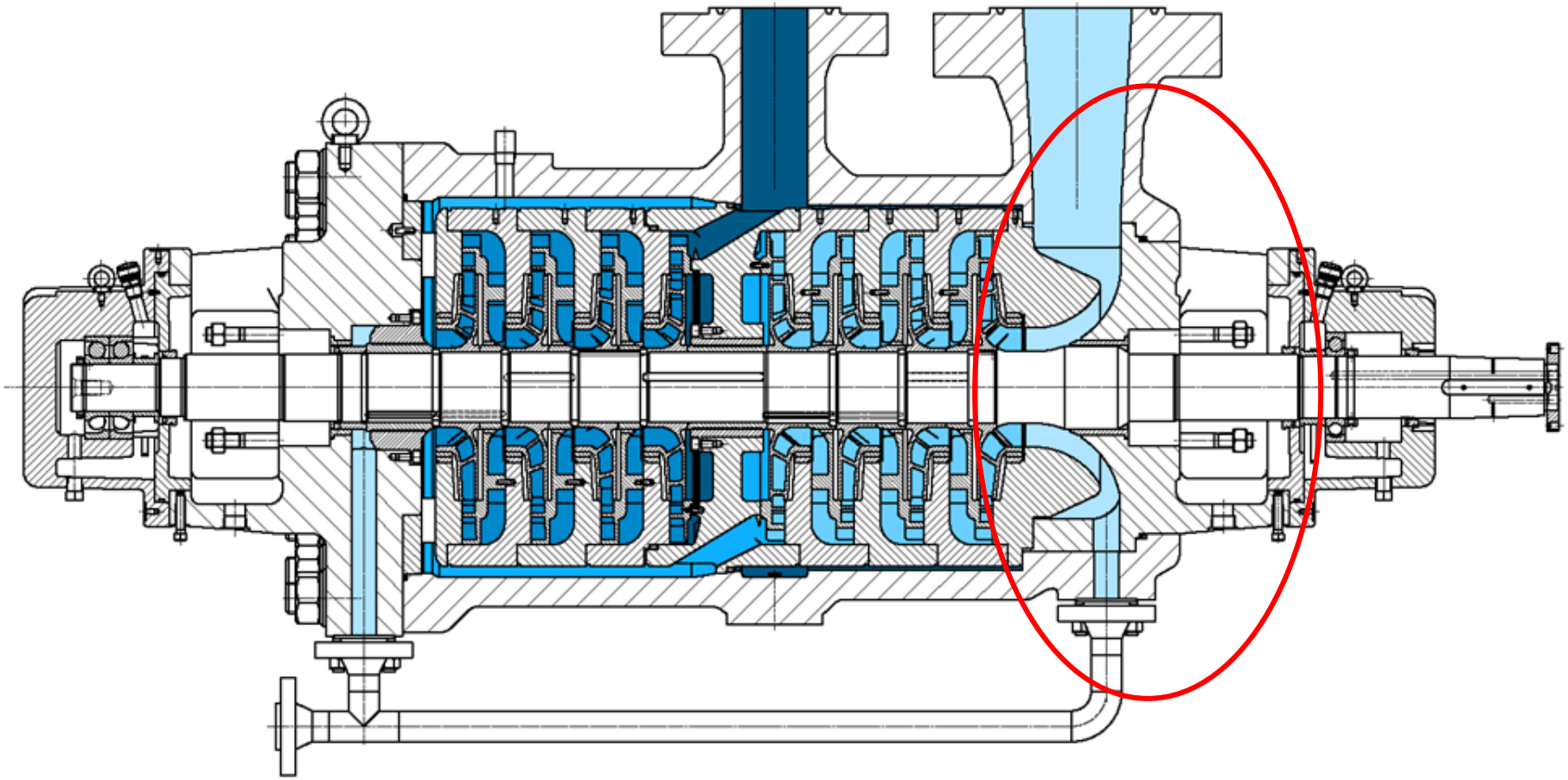
  DE-bearing and DE-seal is quickly and easily dis-assembled before the cartridge is pulled from the casing.

  (Heavier duty more rigid design)

Double Case Pump BB5

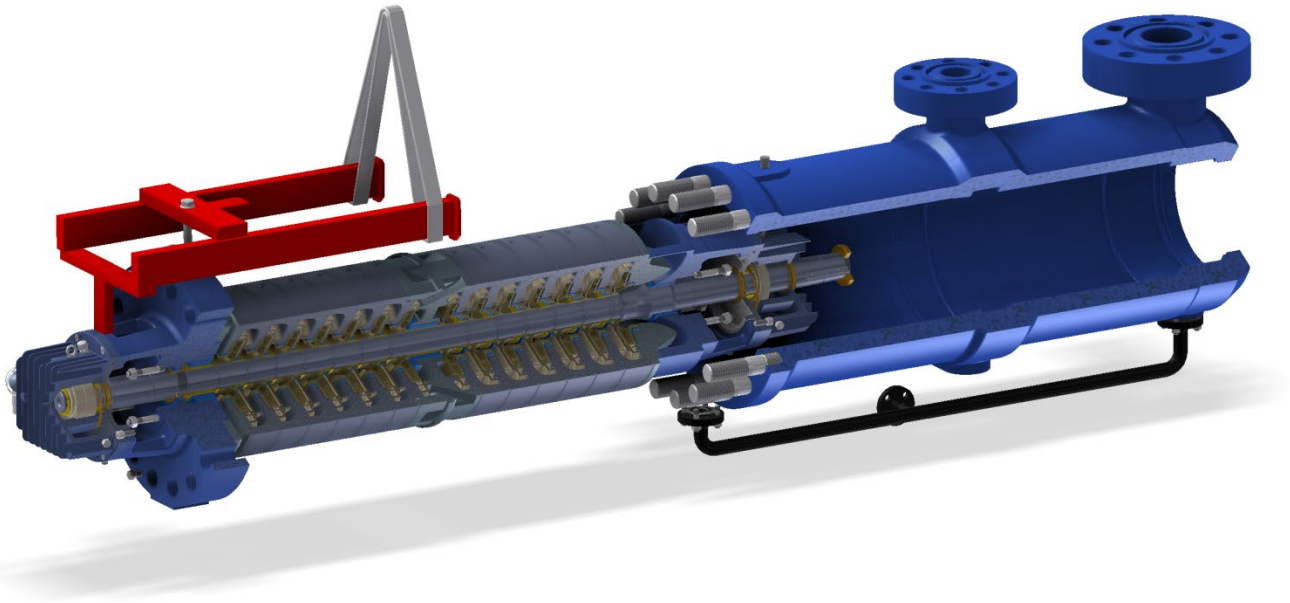
Complete Pullout Design

Separate suction cover, which is mounted on inner element – Advantage
Full pullout design. No disassembly required before cartridge removal



Cartridge Installation / Removal

Complete Pullout Design



Double Case Pump BB5

Complete Pullout vs Integrated Cover Design

- Complete pullout Design: Cartridge with separate suction cover, which is mounted on inner element and therefore can be pulled out fully assembled (complete with DE bearing housing and seal) to save assembly/disassembly time and minimize number of loose part to be tracked and handled on site

- Integrated Cover Design: Heavy-Duty Casing with integral suction cover.

  DE-bearing and DE-seal is quickly and easily dis-assembled before the cartridge is pulled from the casing.

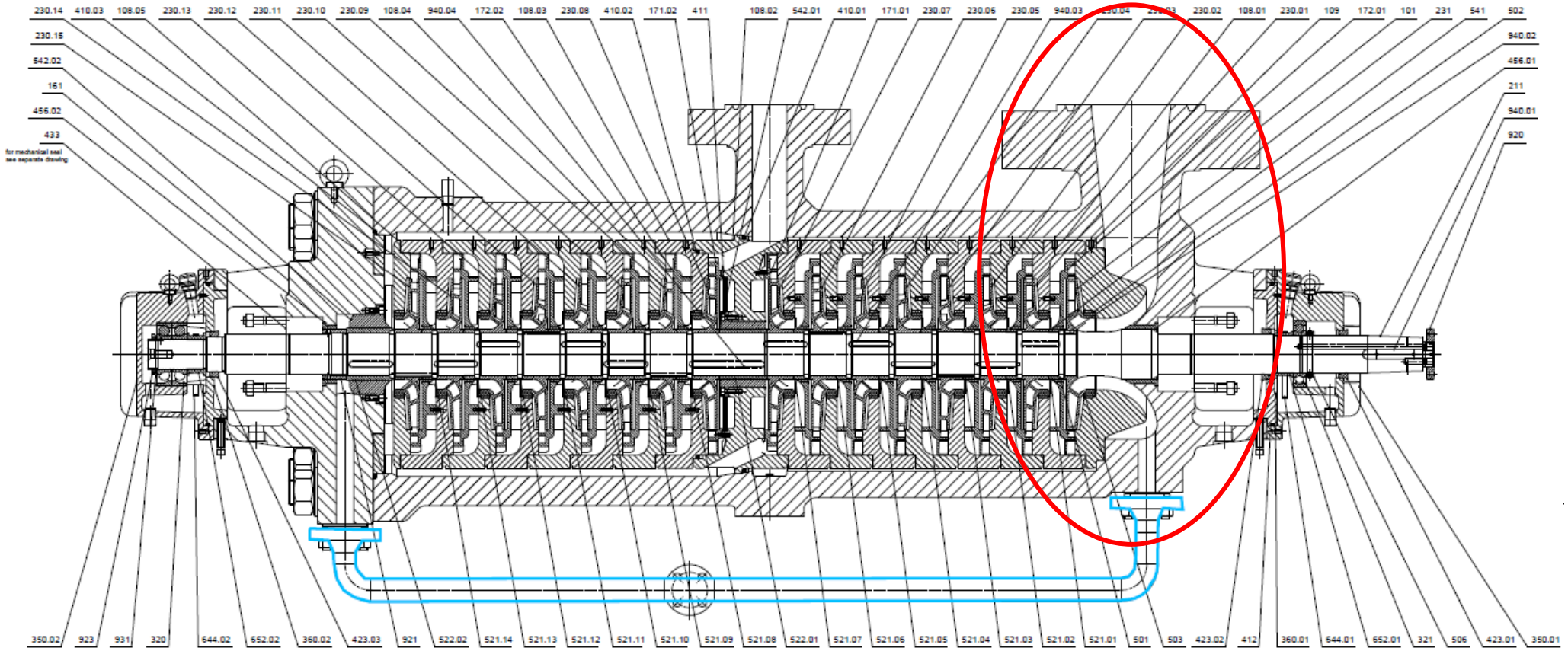
  (Heavier duty more rigid design)

Double Case Pump BB5

Integrated Cover Design

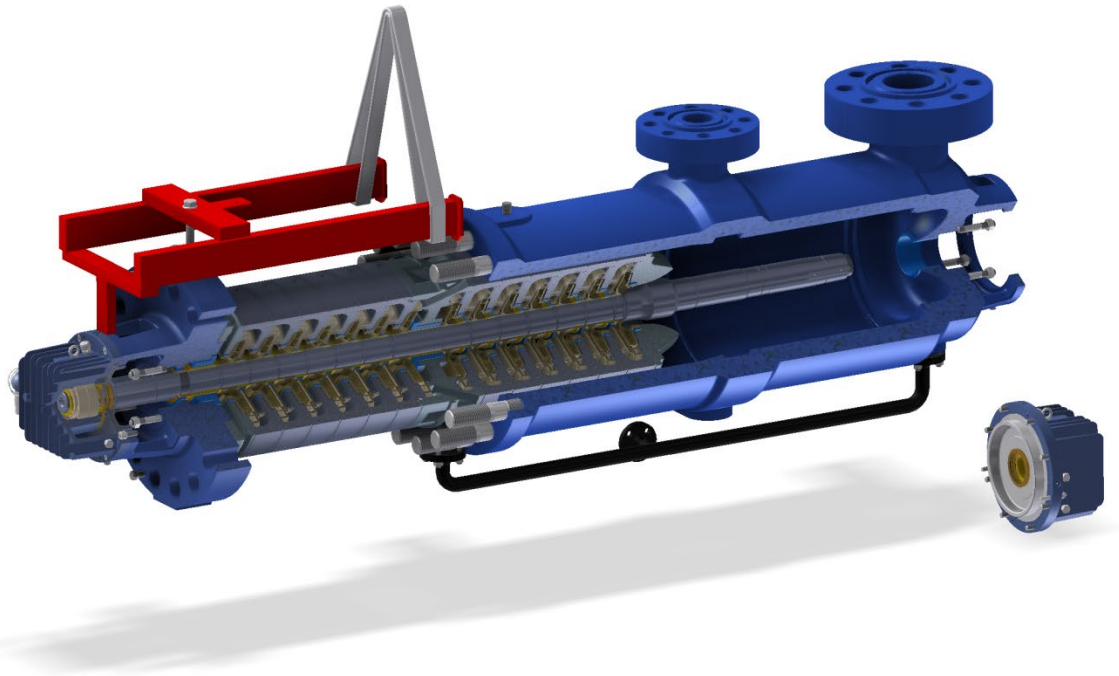
Suction is integrated into the barrel casting/forging – Advantages

More rugged design. No O ring case/cover seal at drive end required



Cartridge Installation / Removal

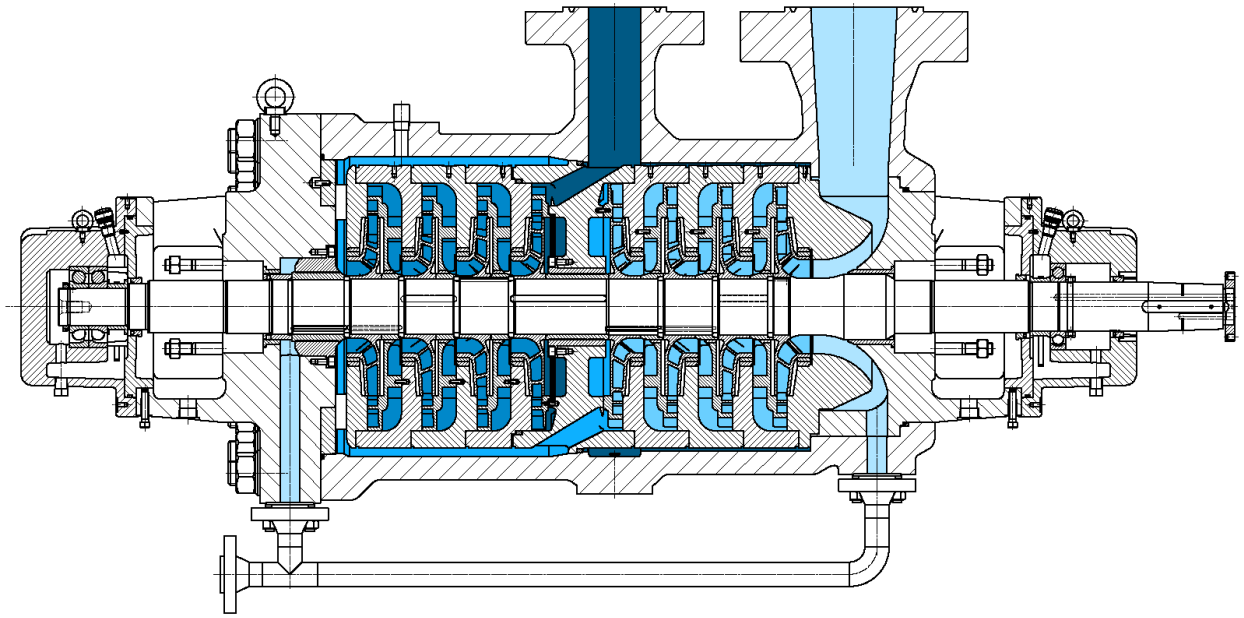
Integrated Cover Design



Double Case Pump BB5

FEATURE – Back-to-Back Arrangement

In a back-to-back arrangement the thrust is compensated so we can use antifriction bearings for many applications



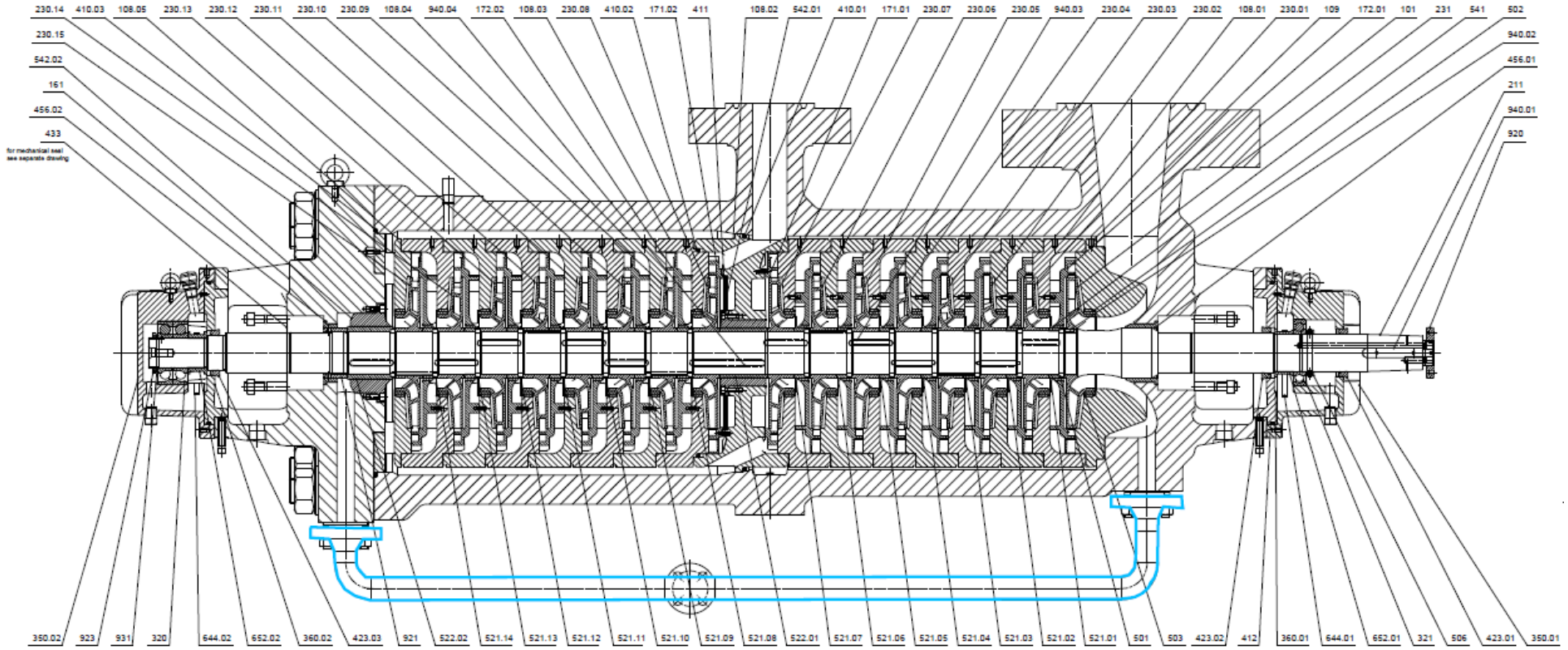
- Antifriction bearings are cheaper, simpler, easier to maintain, more readily available as spare parts
- Removes the need for lube oil system
- Reduced weight / cost / footprint / maintenance / Lube oil system Less instrumentation

- Hydrodynamic bearing option (Sleeve / Tilt Pad bearings) available for the most stringent applications
- Back to back configuration provides excellent rotor dynamic performance at low specific gravity and high number of stages (due to center bushing and the resultant Lomakin forces)

Double Case Pump BB5

Balance Line / Suction Drain Connection

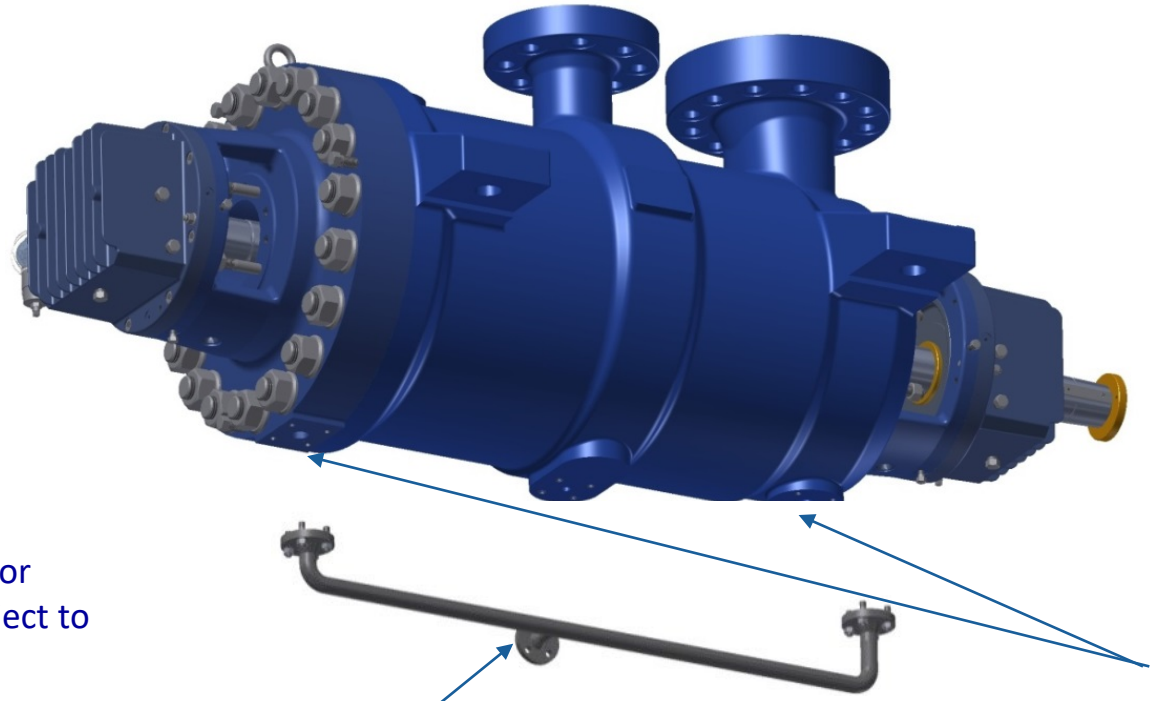
Integrally flanged case connection for Balance / Drain Line



Double Case Pump BB5

Balance Line / Suction Drain Connection

Integrally flanged case connection



Balancing Line rated for 600lbs (since it is subject to suction pressure)

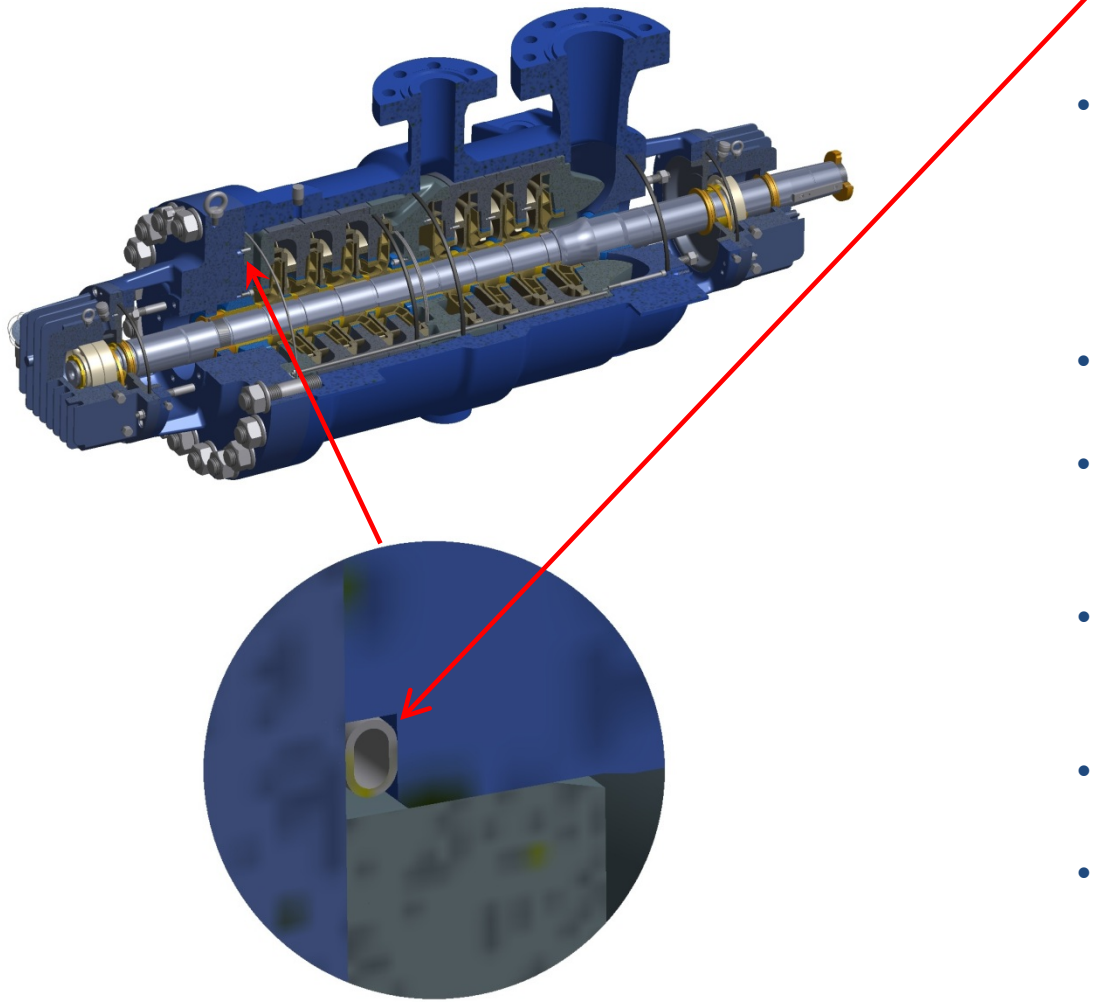
Integrally flanged casing connections

- 1“, 1.25“ or 1.5“ casing connection depending on size of pump
- B16.5 Flange

Drain of the suction areas via balancing line

Double Case Pump BB5

Features – Barrel Sealing – Axial Seal



- Metal O-Ring (Stainless Steel Grade 321 silver coated or Inconel X750 for corrosive applications)
- Confined, no additional bending moment on the casing cover flange
- The metal O-ring offers superior sealing ability because it is simultaneously under compression and tension. Compression achieved by clamping, tension achieved by small holes in the inner diameter allowing high pressure liquid to enter
- Requires low clamping forces
- Temperature range from -296°C (-180°F) to 816°C (435°F)
- No tight-fit seal between the cartridge OD and the barrel ID
- Allows easier and faster assembly/disassembly.
- No possibility to damage o-rings or shear rings during assembly
- No hydraulic ram needed for assembly

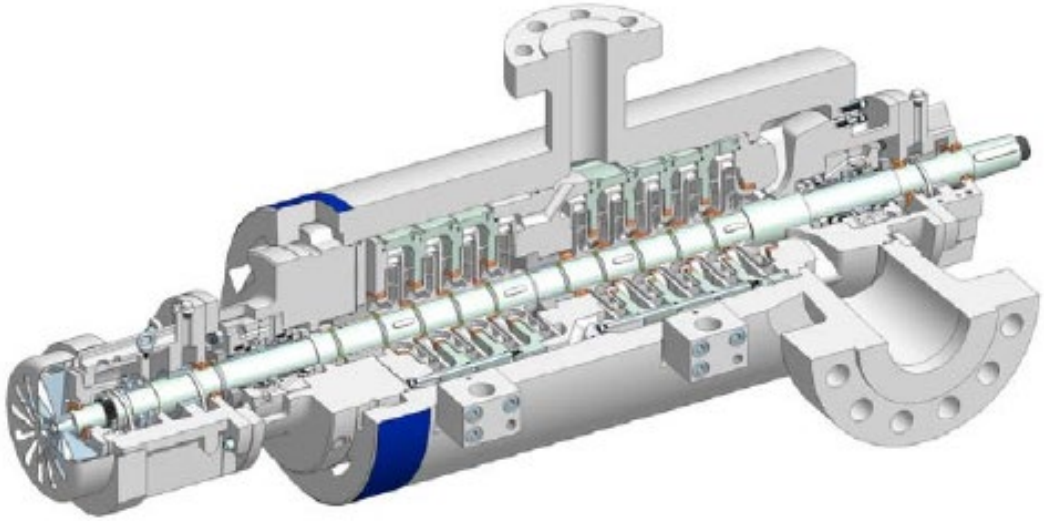
Double Case Pump BB5

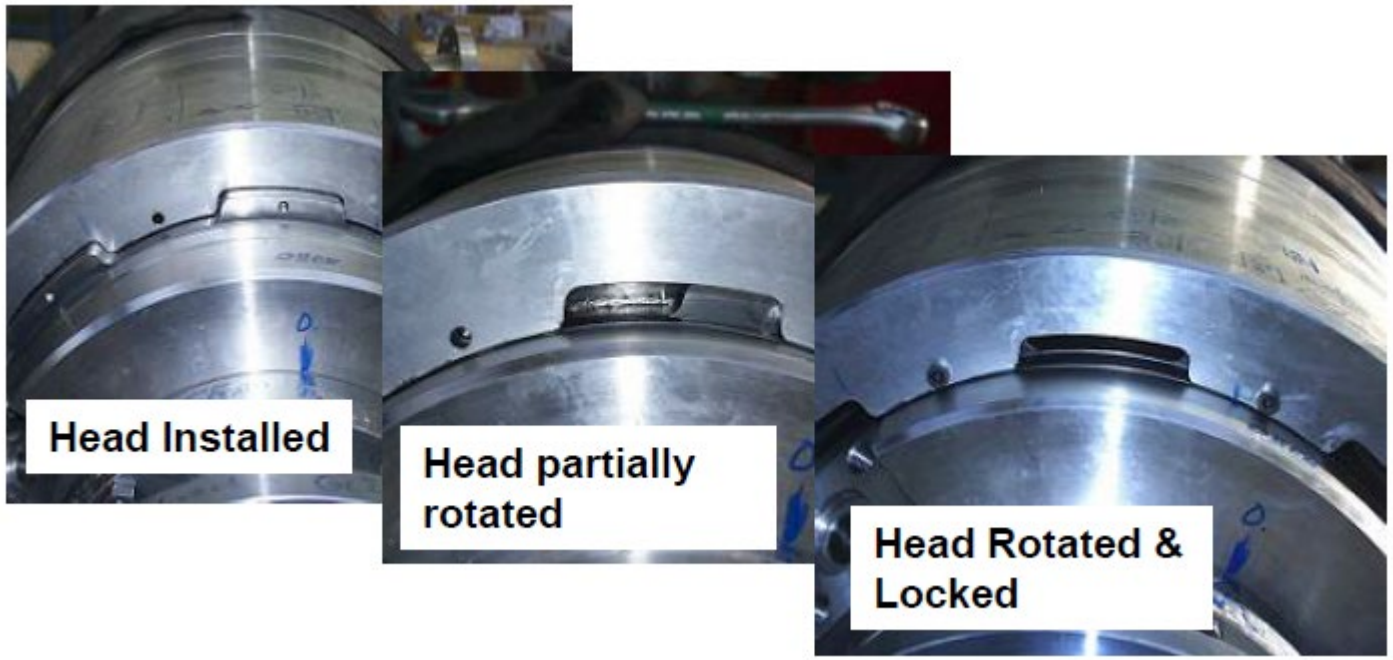
Features – Barrel Sealing – Radial Seal

Sulzer “Twist-Lock” design

No casing bolts

Axial seal not possible – requires Radial Seal

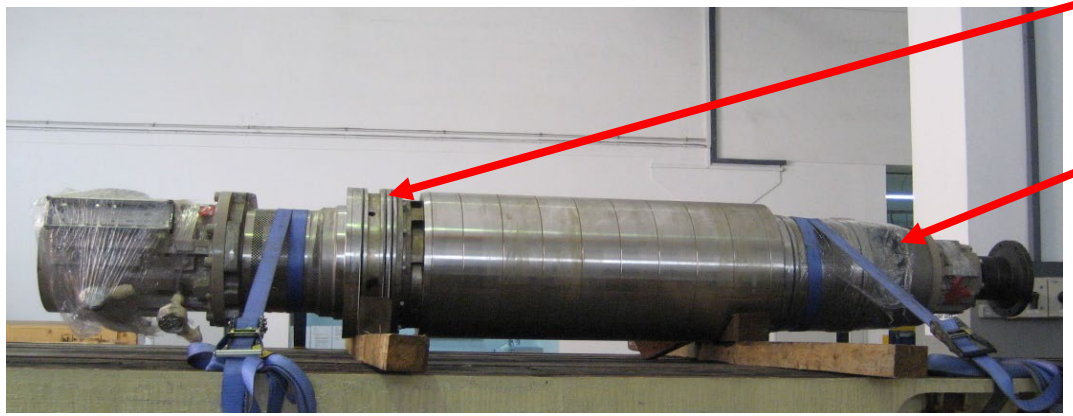


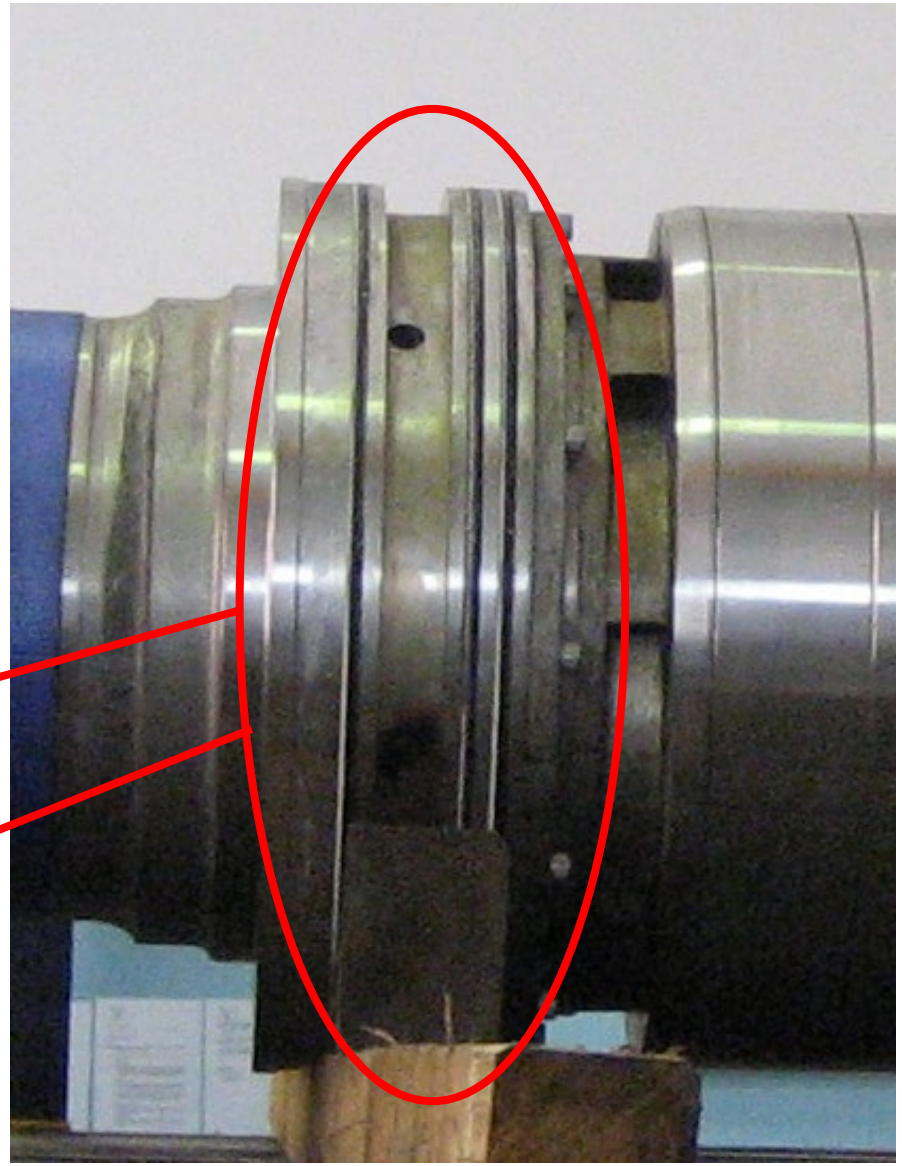


Double Case Pump BB5

Alternative Radial Seal Design (Shear ring)

- Radial O-rings (elastomer)
- Supported by anti-extrusion rings
- Demands accurate levels of concentricity for sealing and perpendicularity
- Interference fit within barrel
- Needs hydraulic ram to install/remove
- Risk of damage to O-Rings

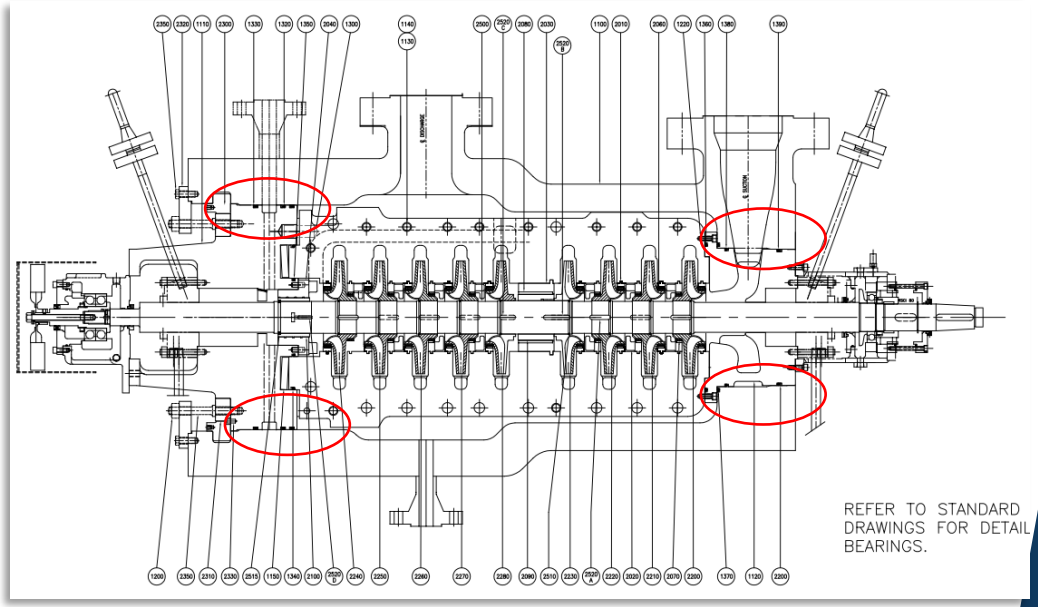




Double Case Pump BB5

Alternative Radial Seal Design (Shear ring)

- Cartridge can be sealed radially only
- High probability for snagging the O-rings while installation/ removal of the cartridge
- High pressure acts against the O-rings; Anti-extrusion rings necessary to ensure O-rings are not extruded
- O-Rings & anti extrusion rings are custom made
- Alignment of cartridge to casing during installation is critical to avoid damage to close clearance regions, particular in the region of radial seal annulus between the barrel and cartridge
- Shear rings are process wetted and vulnerable to localized corrosion, resulting in difficulty to remove after prolonged periods of operation



Double Case Pump BB5

Features – Barrel Bolting – “Superbolts * ” (Multi-Jackbolt Tensioning – (MJT))

What is Superbolt?

Superbolt tensioners are designed as direct replacements for conventional nuts and bolts. These devices can be threaded onto a new or existing bolt, stud, threaded rod or shaft. The main thread serves to position the tensioner on the bolt or stud against the hardened washer and the load bearing surface. Once it is positioned, actual tensioning of the bolt or stud is accomplished with simple hand tools by torquing the jackbolts which encircle the main thread. The jackbolts transfer the preload evenly into the main thread and, consequently, onto the joint. The main thread is tightened in pure tension.

The Superbolt principle.

How Superbolt tensioners work:

1) By tightening the jackbolts, a strong thrust (axial) force is generated. This thrust force is directed against a hardened washer. Jackbolts have a small friction diameter and can therefore create a high thrust force with relatively little torque input.

2) The loads are transferred through the nut body which is positioned on the main thread by hand.

3) A hardened washer is used to transfer the force while protecting the flange face.

4) The thrust (axial) force of many jackbolts and the opposite reaction force of the main bolt head create a strong clamping force on the flange.

5) The thrust (axial) force from the jackbolt creates an equally strong reaction force in the main bolt.

Proven in the field

Superbolt tensioners are used in many industries: Hydropower, wind turbines, gas and steam turbines, nuclear, steel, mining, shipbuilding, offshore, chemical, transportation, to name a few.

Advantages:

- **Higher preload** - Tightening in pure tension allows higher preloads on the same size bolt versus other tightening methods.
- **Proper bolted joint** - Generating preload high enough above the separating forces means your bolting will not vibrate loose on properly designed joints. This can eliminate costly equipment downtime.
- **Elasticity** - Added elasticity increases fatigue life of the bolted joint.
- **Design options** - High preload capacity and accuracy can allow for the design of smaller bolt sizes. Compact dimensions and reduction of tooling sizes allows for reduction of the size of machinery, reducing material and machining cost.

Advantages:

- **Hand tools only** - Ordinary hand wrenches or pneumatic wrenches are the only tools required to generate immense bolt stresses.
- **Increased safety** - Installations are safe because only small hand tools are required. This means no safety hazards from immense hydraulic pressures, pinching hazards, heavy lifting of large tools, or sockets breaking under high pressure.
- **Space restrictions** - Multi-jackbolt tensioners are easy to install in confined spaces.
- **Save time** - Superbolt tensioners can be tightened in a fraction of the time compared to most other methods. Even though there are multiple jackbolts to tighten, field experience has proven that by using air tools installation times are fast and easy. Case studies available at **www.superbolt.com**

* Trade Mark - Nordlock Group

Double Case Pump BB5

Features – Barrel Bolting – “Superbolts * ” (Multi-Jackbolt Tensioning – (MJT))

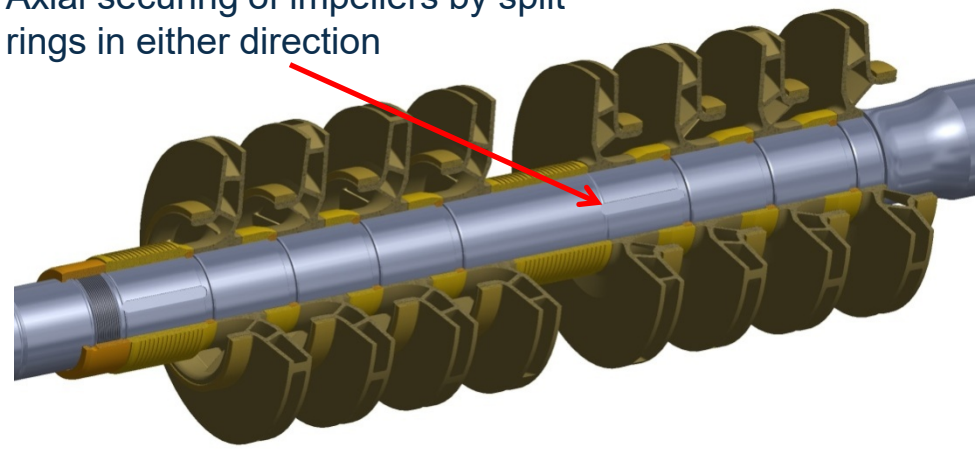
https://www.nord-lock.com/superbolt/products/superbolt-tool/

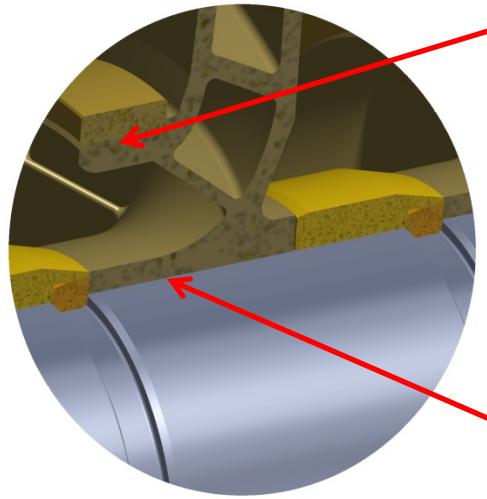
* Trade Mark - Nordlock Group

Rotor

- Impellers of the RP design pump are **individually secured with split rings** in either direction as required by API610 11th edition para 9.2.2.1 “Impellers of multistage pumps shall be individually located along the shaft by a shoulder or captive split ring in the direction of normal hydraulic thrust”.
- Ruhrpumpen provides **stepped shaft design** for ease of rotor assembly/disassembly
- Some ‘API 610 style’ pumps from competitors may offer designs where impellers are not individually secured, but are in a ‘stacked’ design and held in place by impeller nuts on each end of the rotor
- Ruhrpumpen recommends individually secured impellers. This ensures that impellers are ideally located with respect to diffuser positions and cannot move. It also allows the axial forces to be evenly distributed along the whole shaft, instead of concentrated to the impeller nut locations

Axial securing of impellers by split rings in either direction

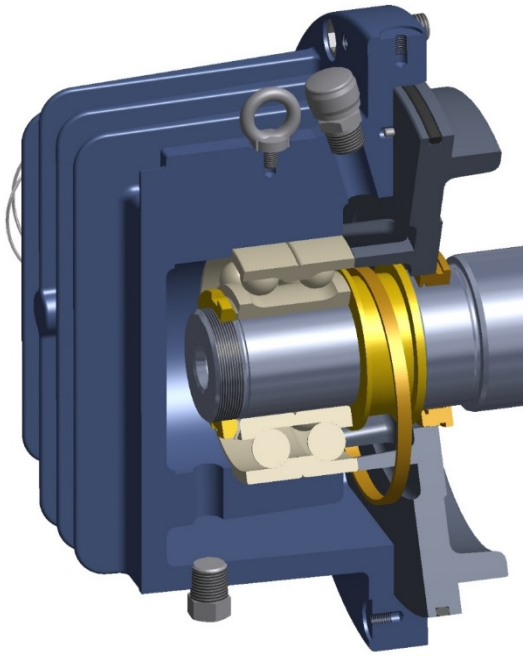




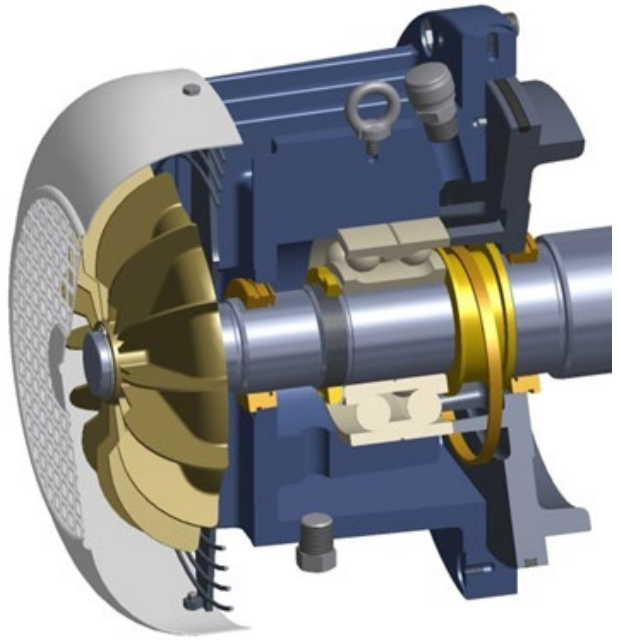
Double Case Pump BB5

Bearing Cooling Options (A/F Bearings)

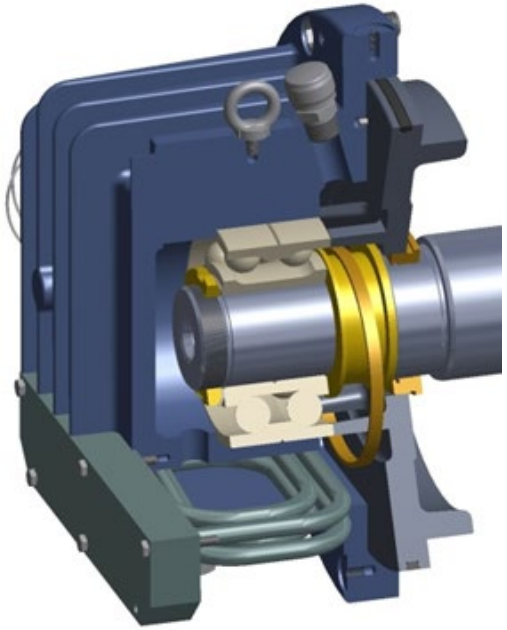
Air Cooled



Fan Cooled

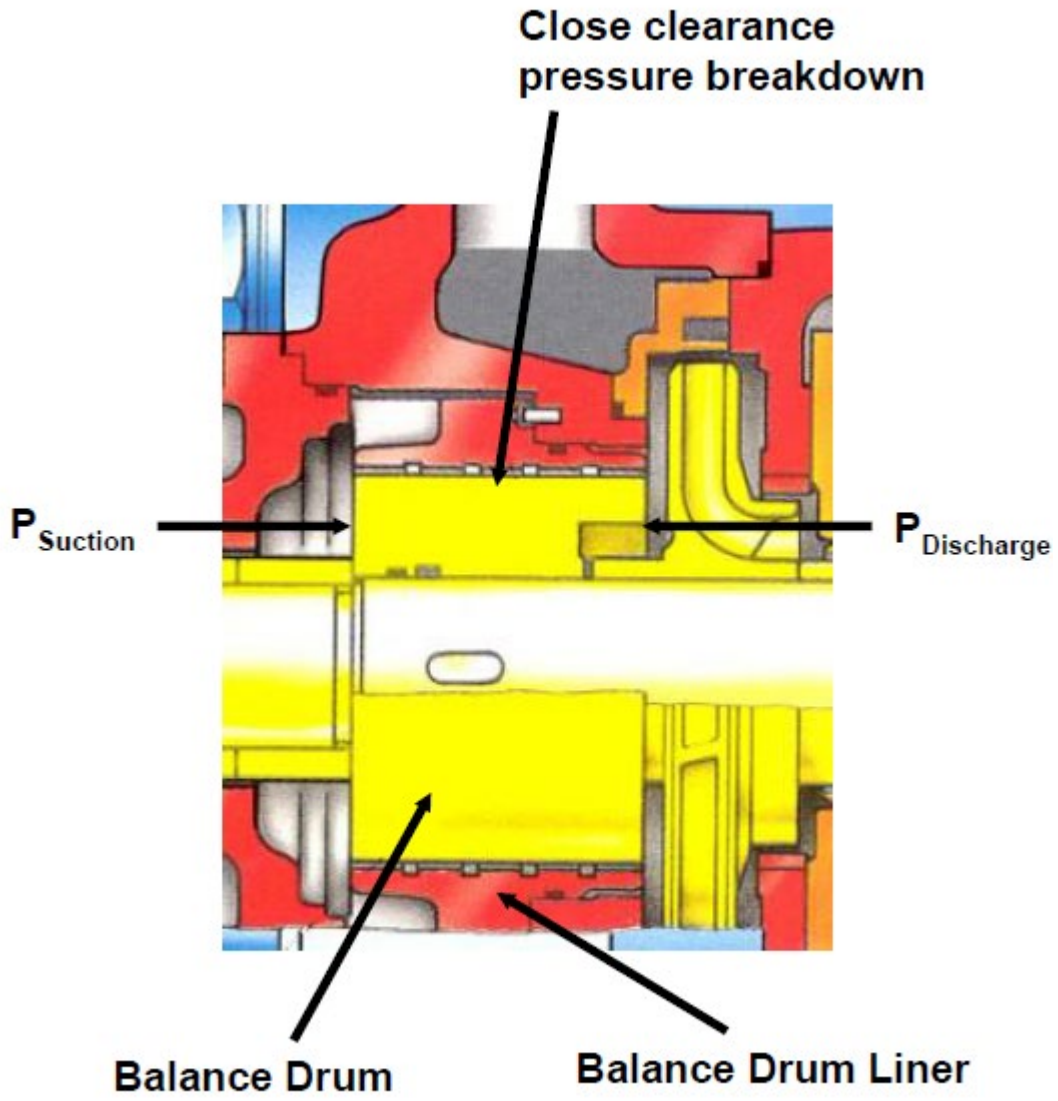


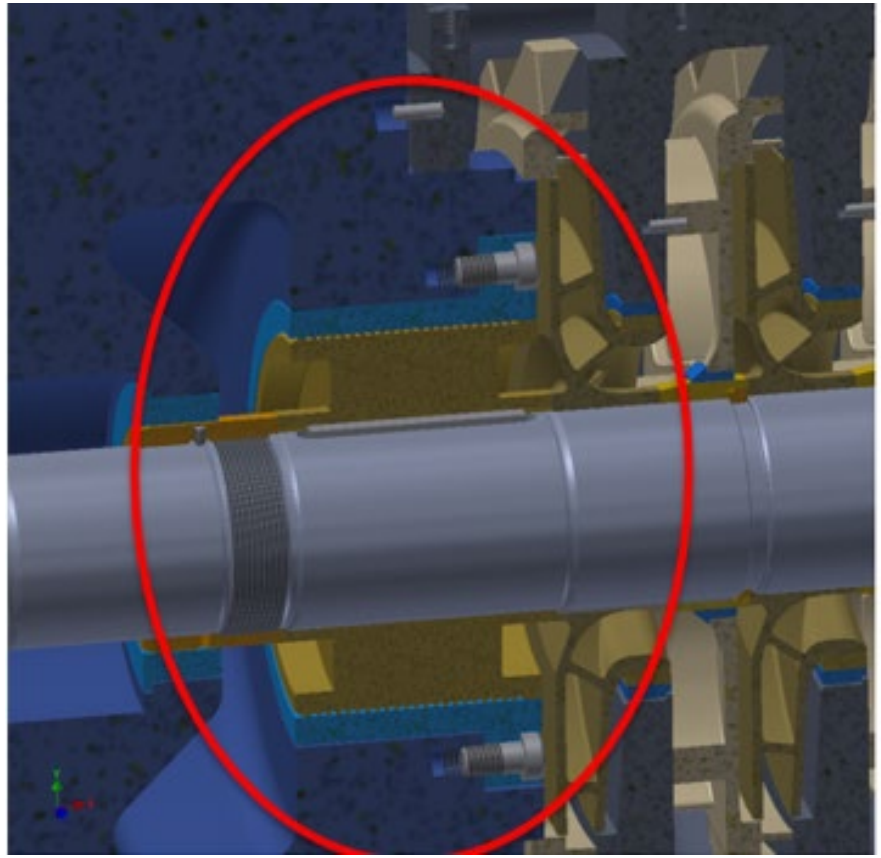
Water Cooled



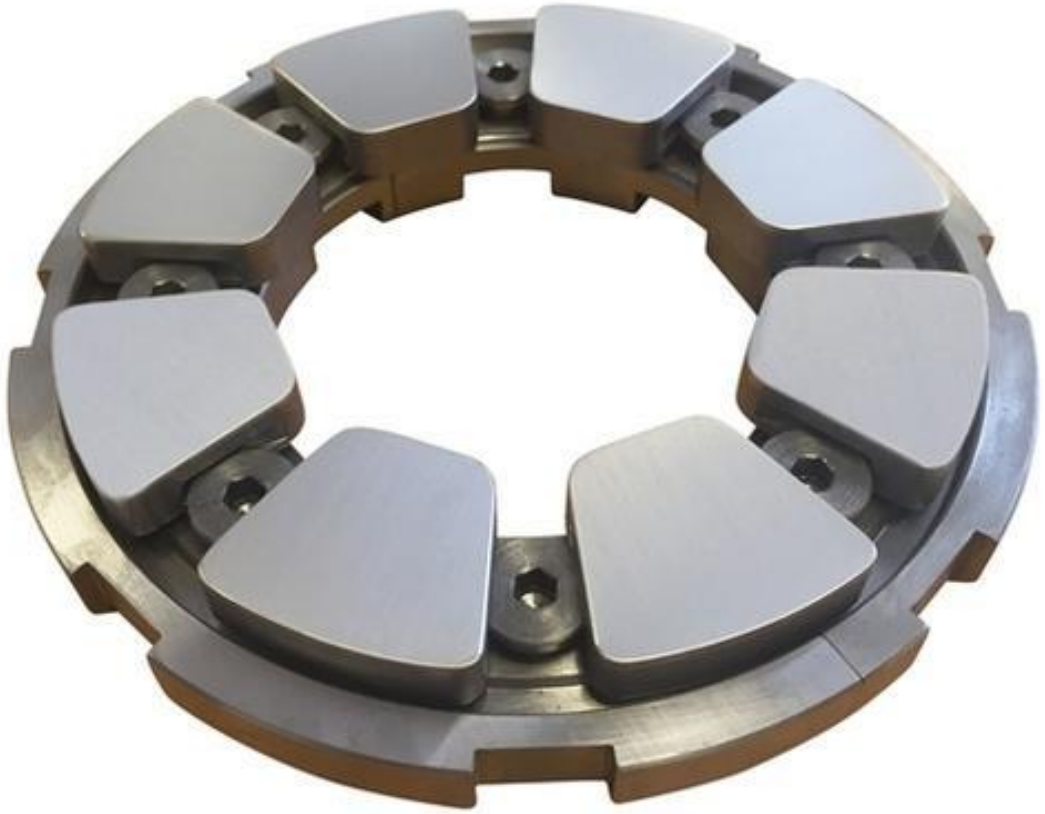
Non-Drive End @ 30 °C ambient
Expected oil temperature @ no load : 75 °C
Expected oil temperature @ load : 80/85 °C

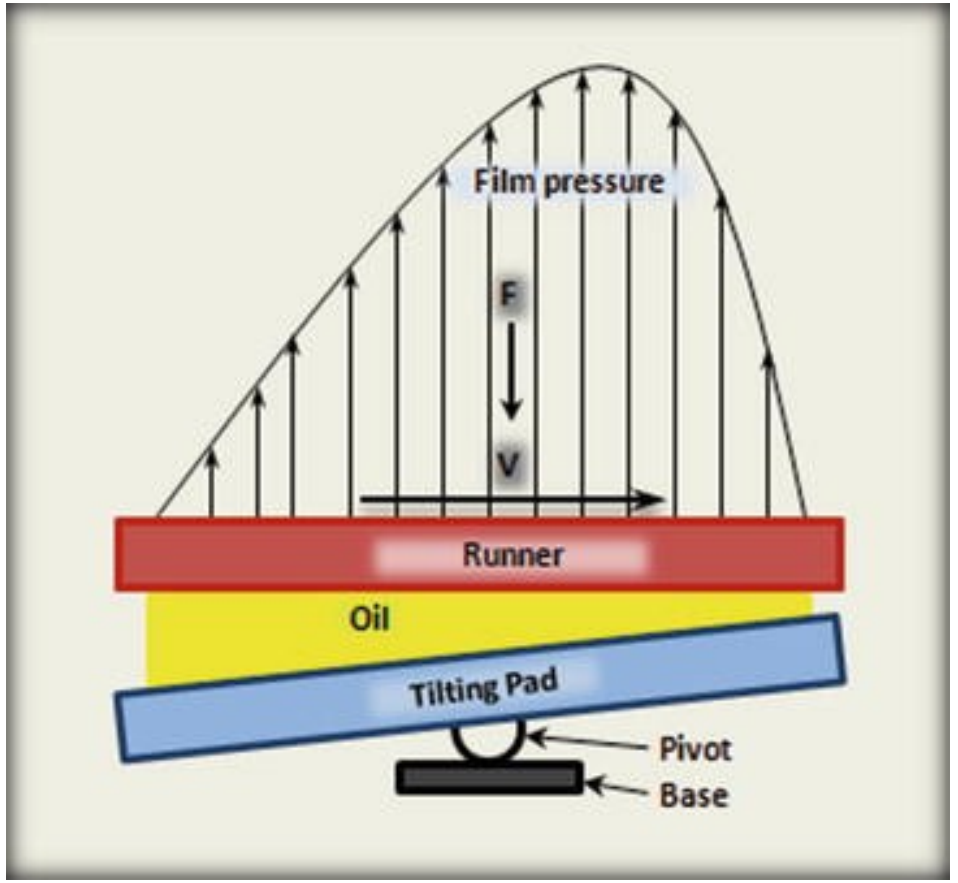
Balance Drum (for In-Line Impellers)





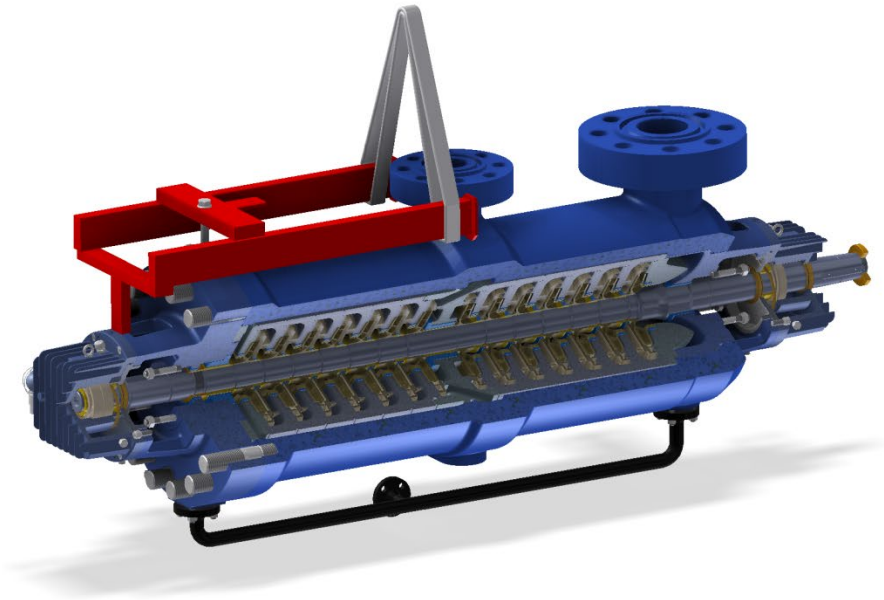
Tilting Pad (Pivot Shoe) Hydrodynamic Bearing





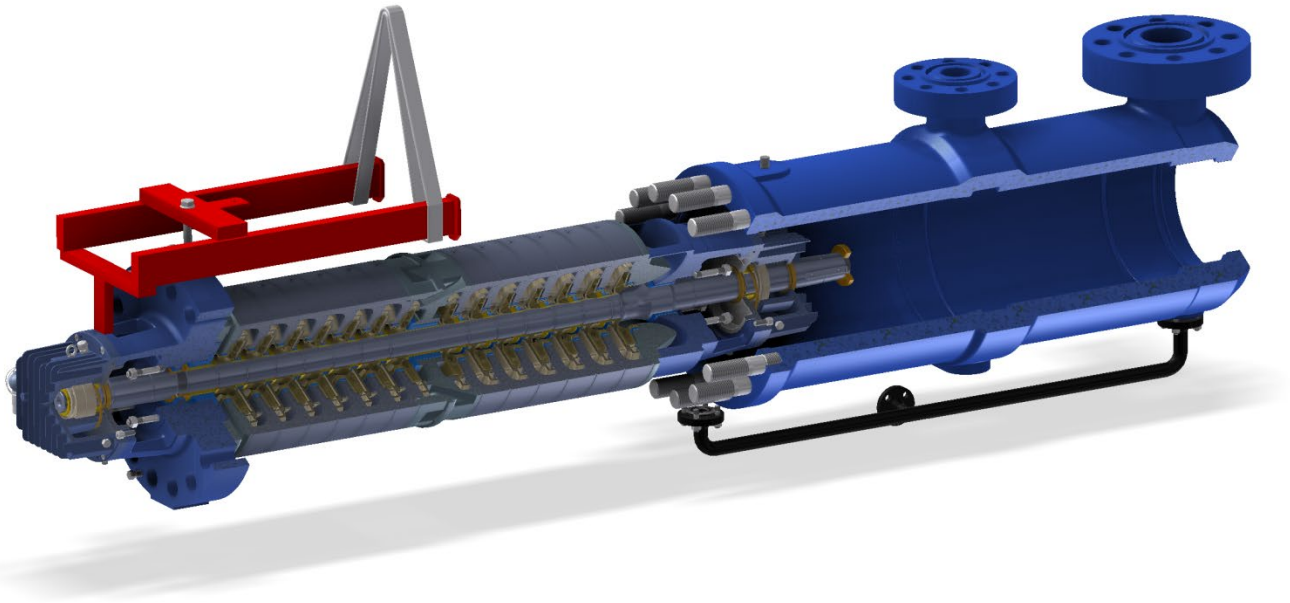
Cartridge Installation / Removal

Complete Pullout Design



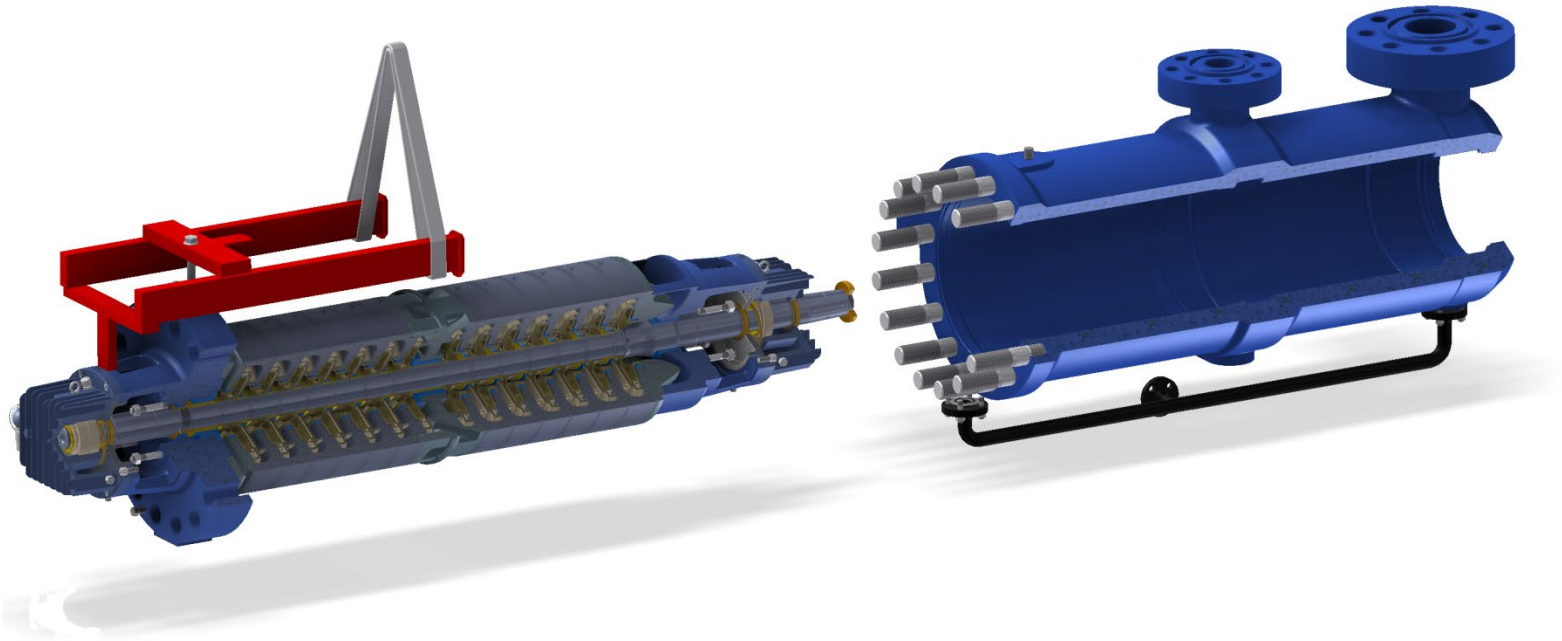
Cartridge Installation / Removal

Complete Pullout Design



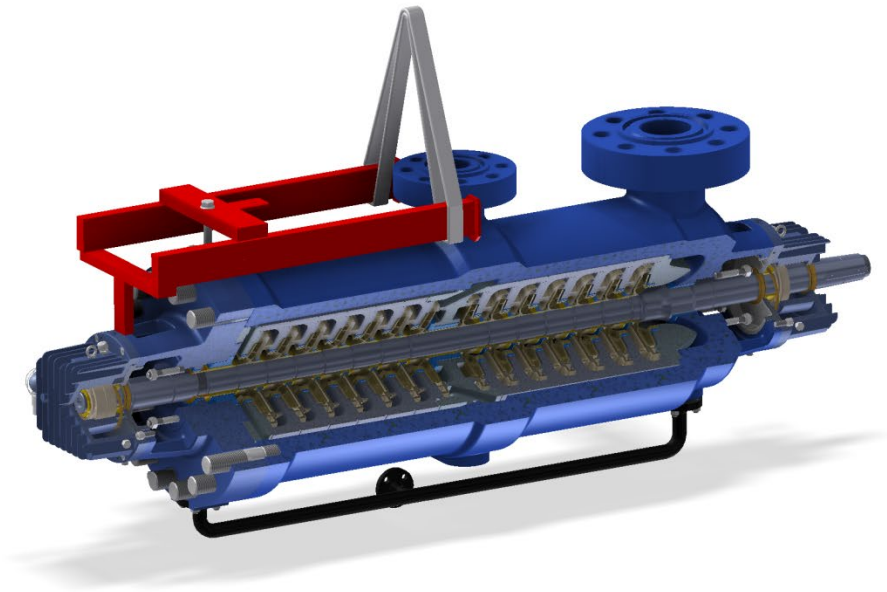
Cartridge Installation / Removal

Complete Pullout Design



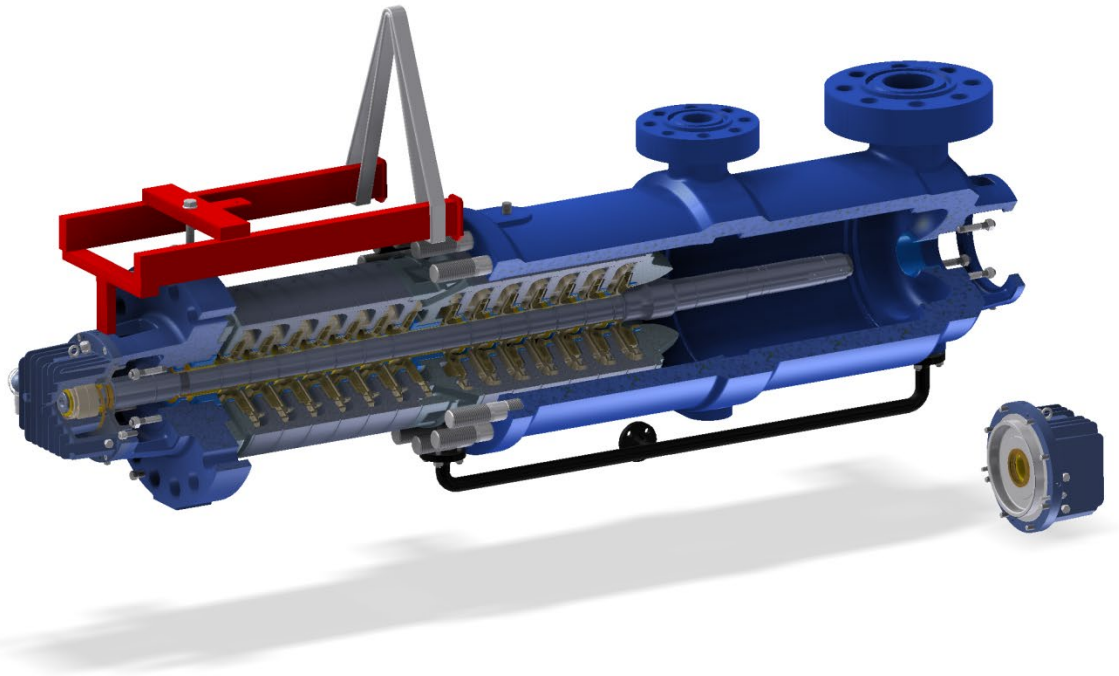
Cartridge Installation / Removal

Integrated Cover Design



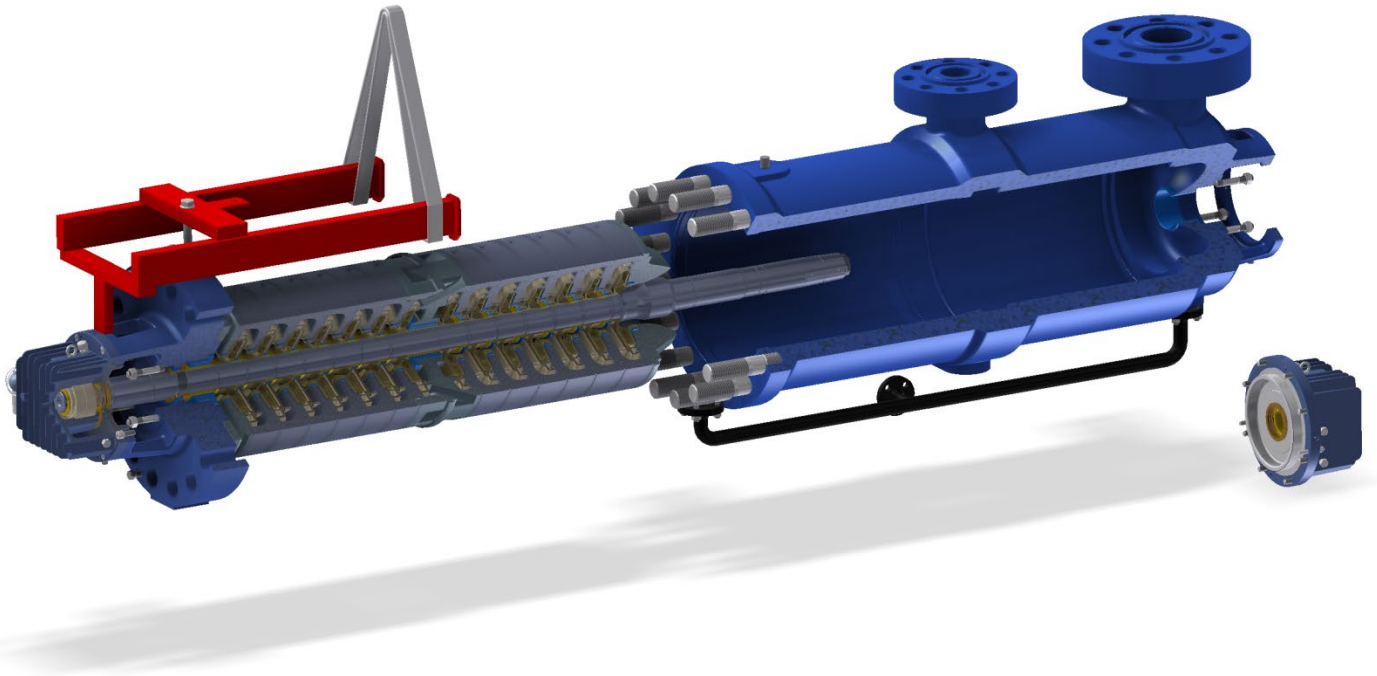
Cartridge Installation / Removal

Integrated Cover Design



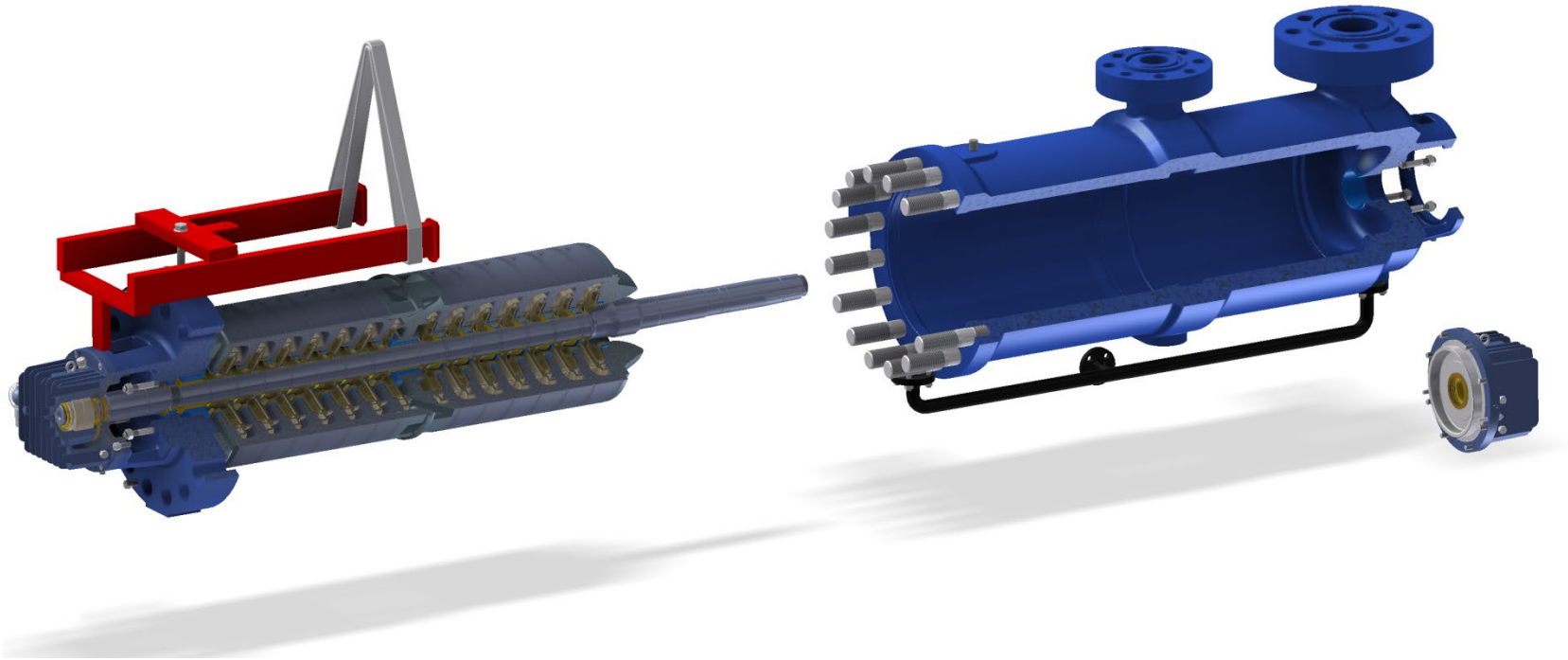
Cartridge Installation / Removal

Integrated Cover Design

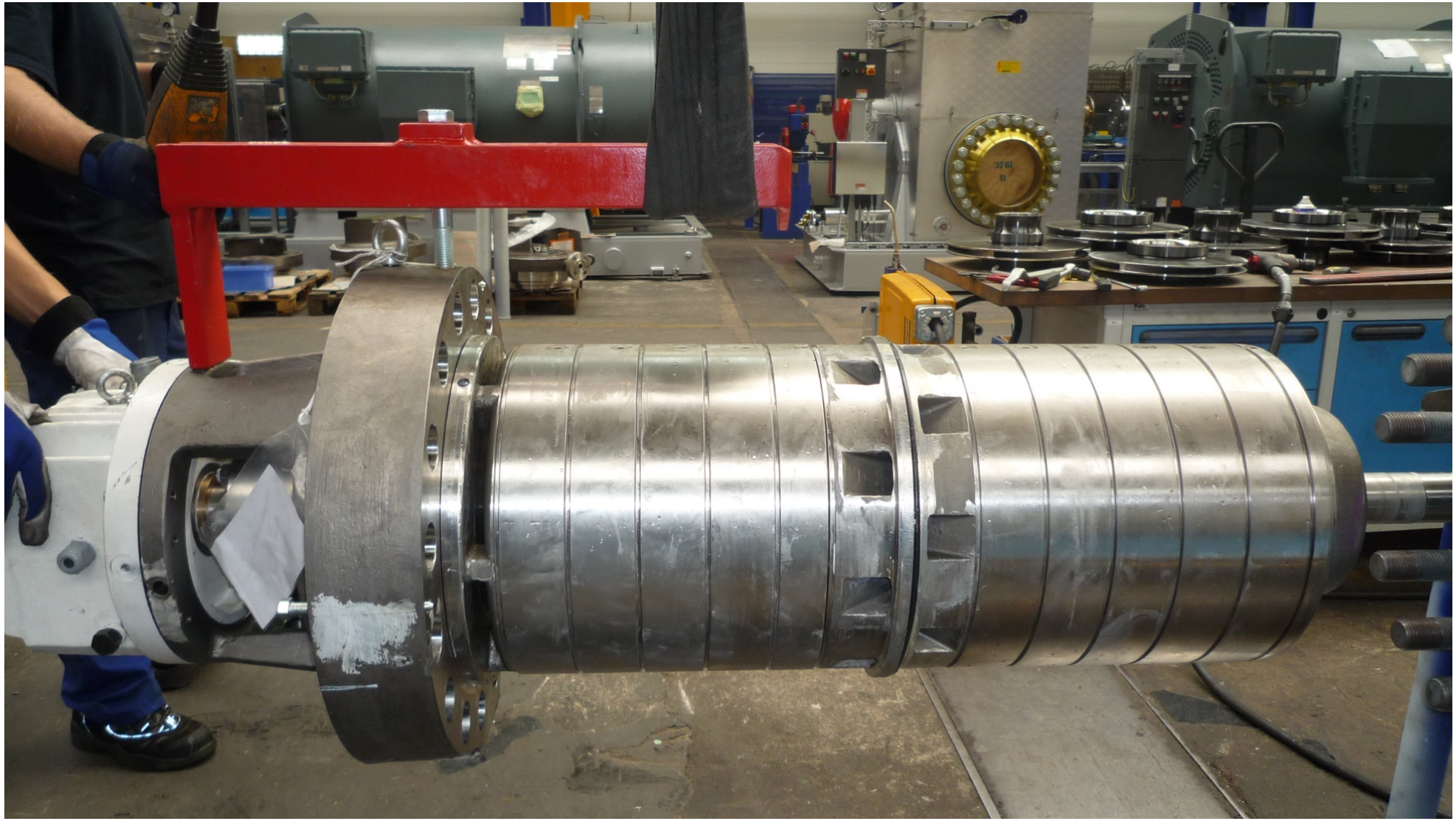


Cartridge Installation / Removal

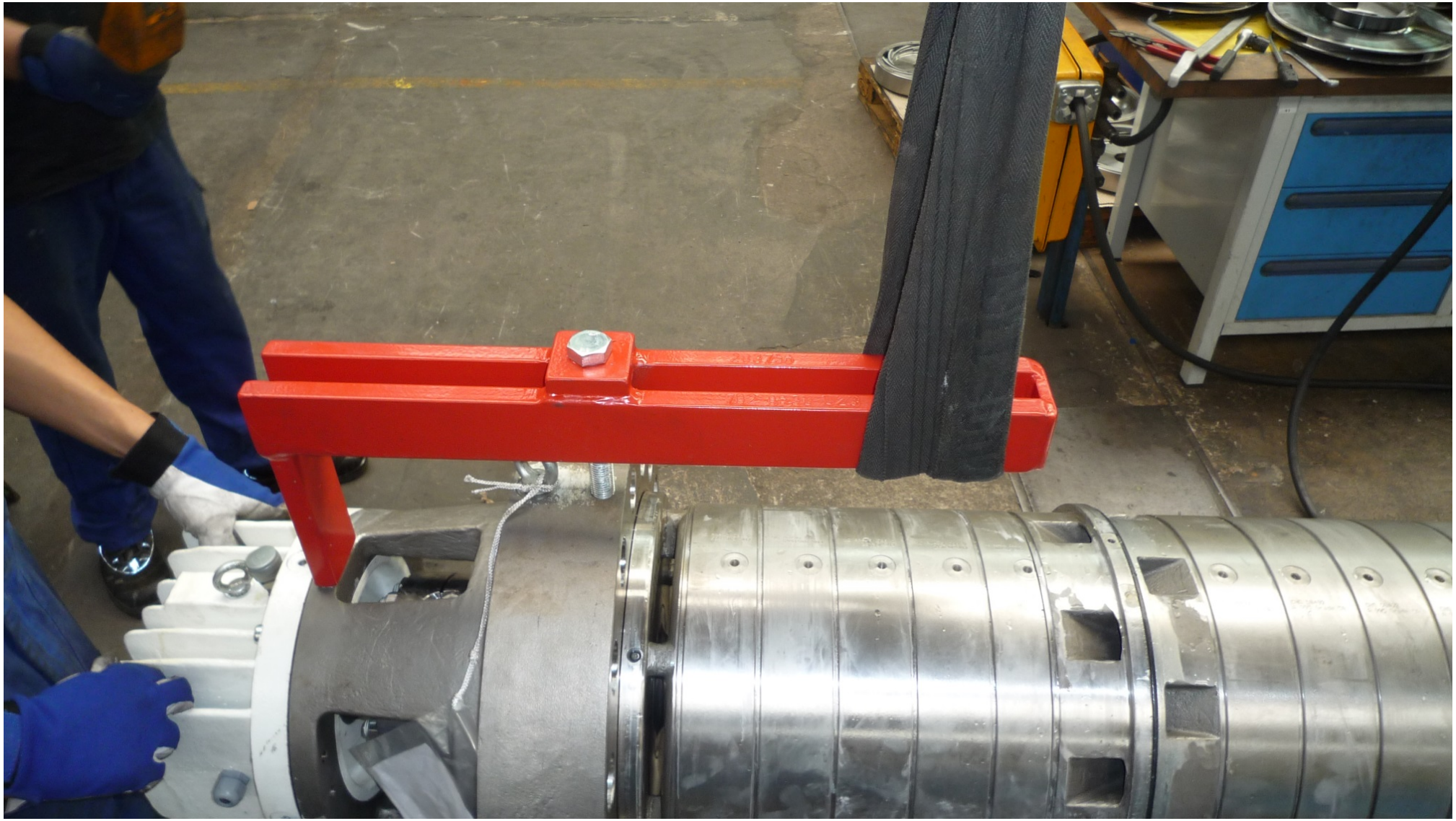
Integrated Cover Design



Cartridge Installation Tool



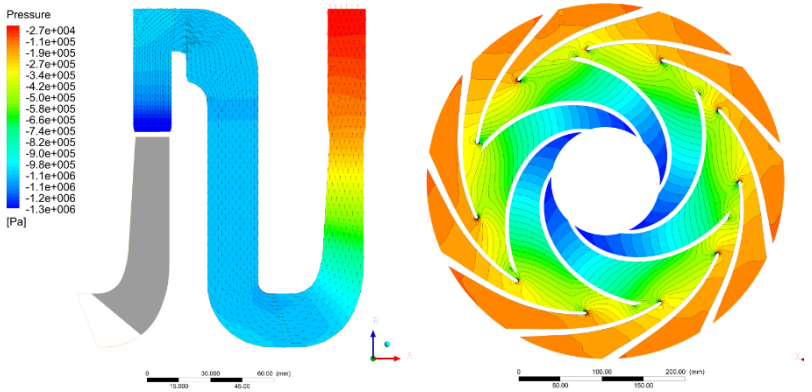
Cartridge Installation Tool



Cartridge Installation Tool

“Specialist for Pumping Technology”

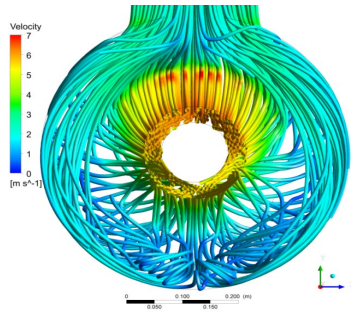
PUMP DESIGN OPTIMISED BY USE OF LATEST ENGINEERING TOOLS



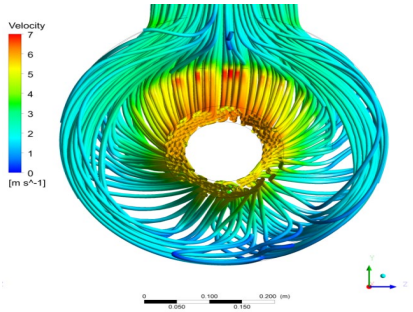
Verification of impeller and return stage with CFX *

Minimizing flow separations

Optimising inlet angles

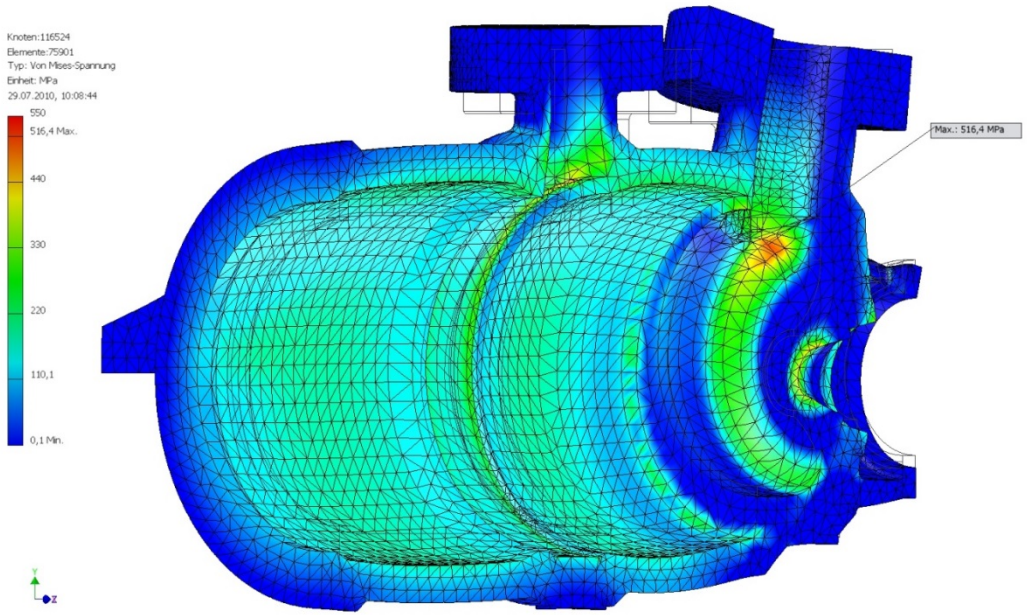


flow optimization in the transition to the suction chamber (vortex reduction)



flow alignment in suction chamber (reduction of turbulence losses)

Verification of AD 2000 code calculations and strength factors by FEA



* computational fluid dynamics (CFD) software program

PUMP DESIGN OPTIMISED BY USE OF LATEST ENGINEERING TOOLS

Rotodynamic Verification

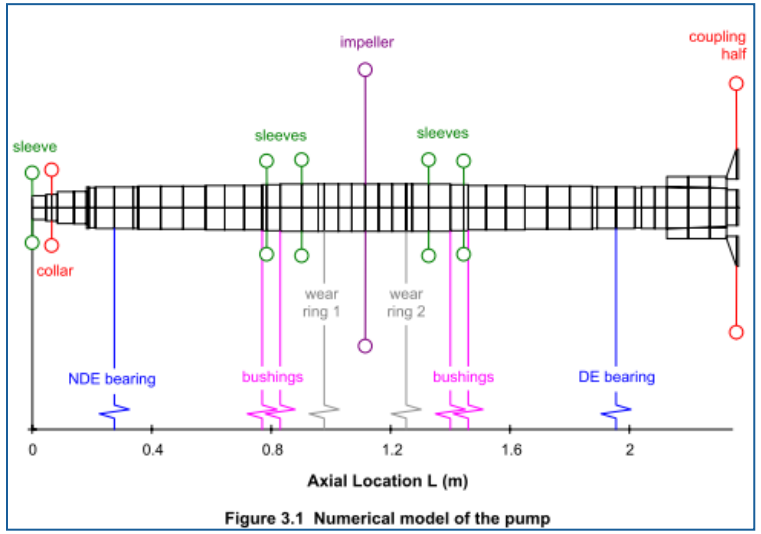
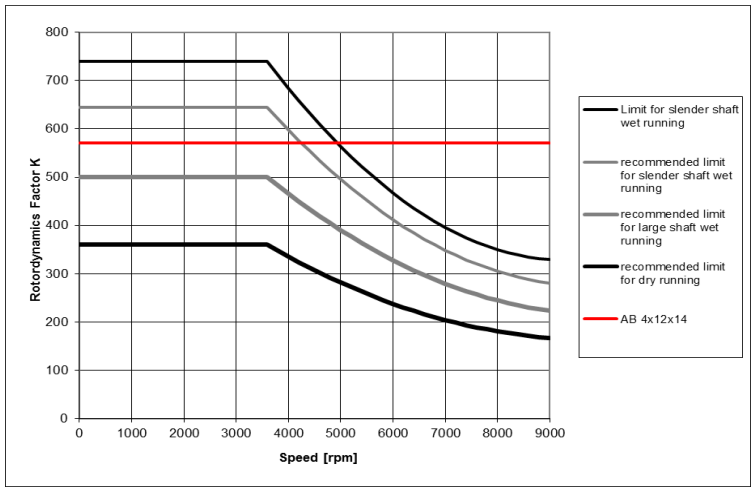


Figure 3.1 Numerical model of the pump



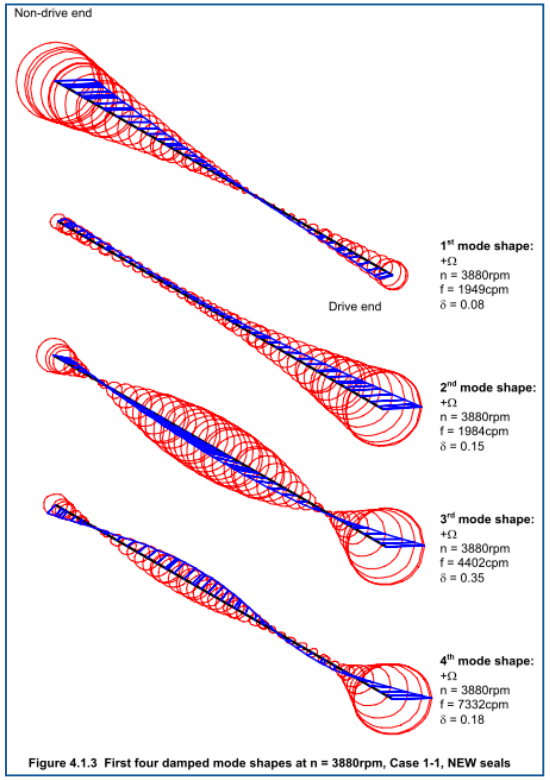
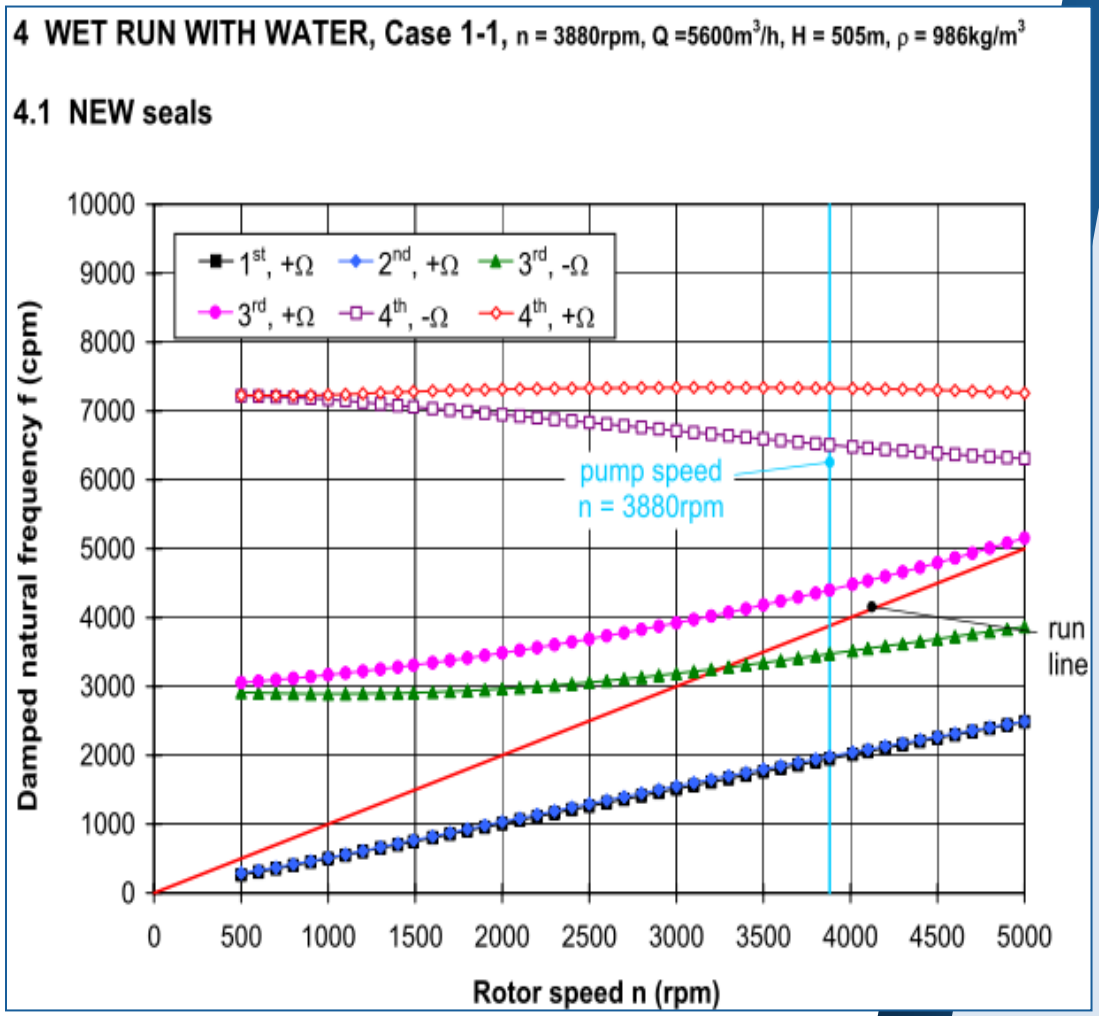


Figure 4.1.3 First four damped mode shapes at n = 3880rpm, Case 1-1, NEW seals



A LINE 4x2x8 12 stage (BB5)

Fluid Hazardous Open Drains Injection

Operating data:
Duty 45 m3/h @ 678 m
Speed 2,980 rpm
Power 160 kW
Full Statoil NORSOK D" design and construction

BB5 PUMPS – A LINE

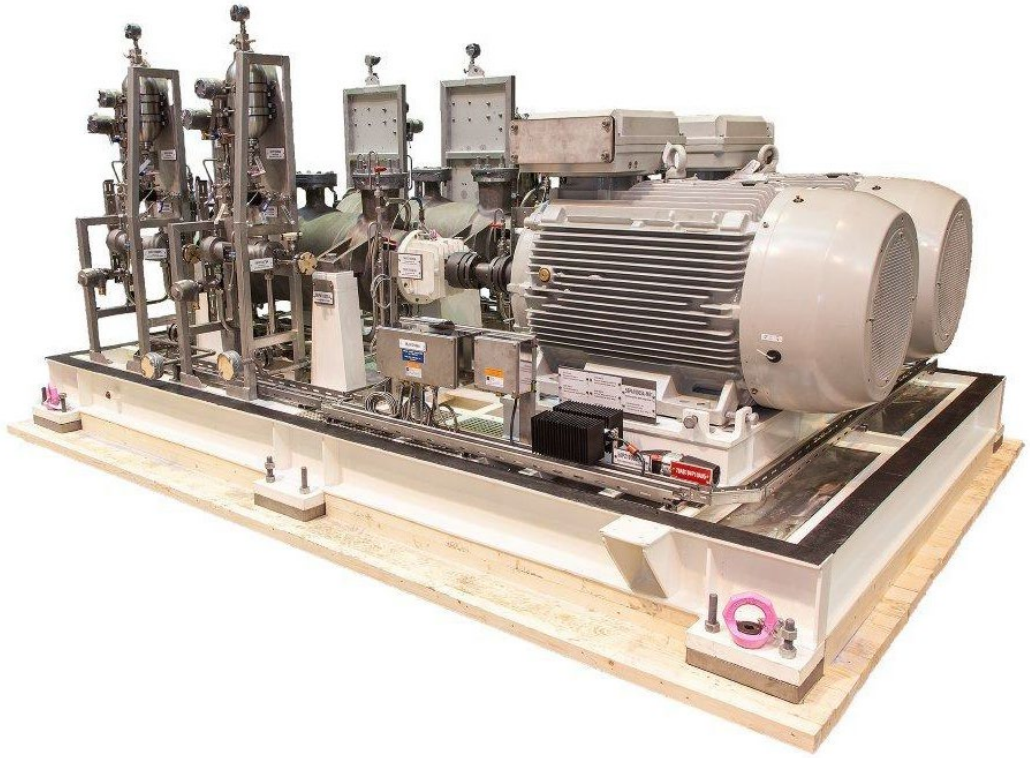
RUHRPUMPEN

Statoil : Valemon gas / condensate platform
Norwegian sector North Sea
Engineering by Technip, construction Samsung
Valemon field is one of Statoil's largest ongoing development with recoverable resources estimated at 206 million barrels of oil equivalent

Technip

Statoil

SAMSUNG HEAVY INDUSTRIES

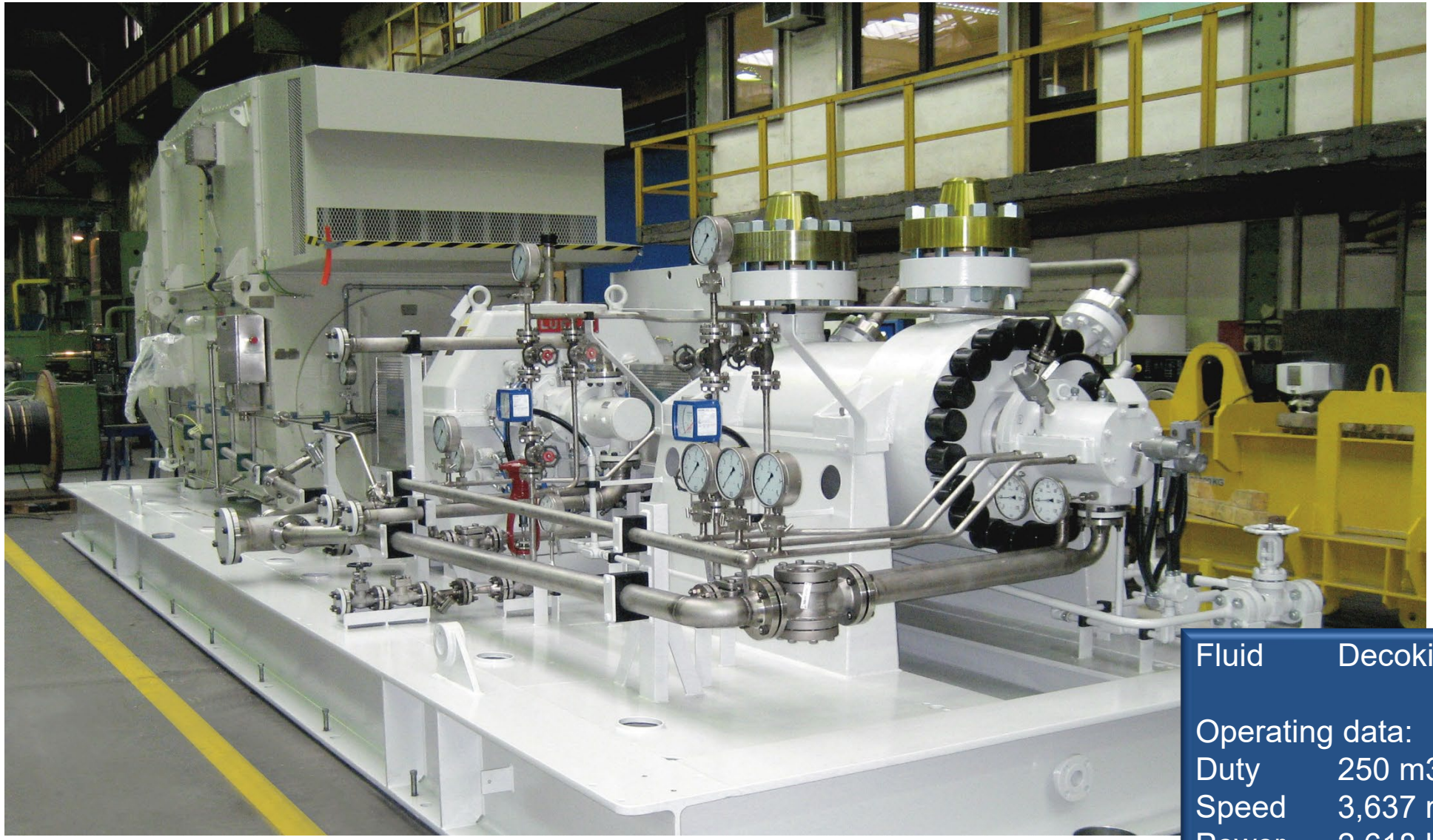


Statoil Valemon Platform

- Condensate export
- API 610 BB5 : A 4"
- Dual mechanical seals Plan 53 B
- Full NORSOK compliance
- Super Duplex construction

A LINE 8x6x15 10 stage (BB5)

RUHRPUMPEN

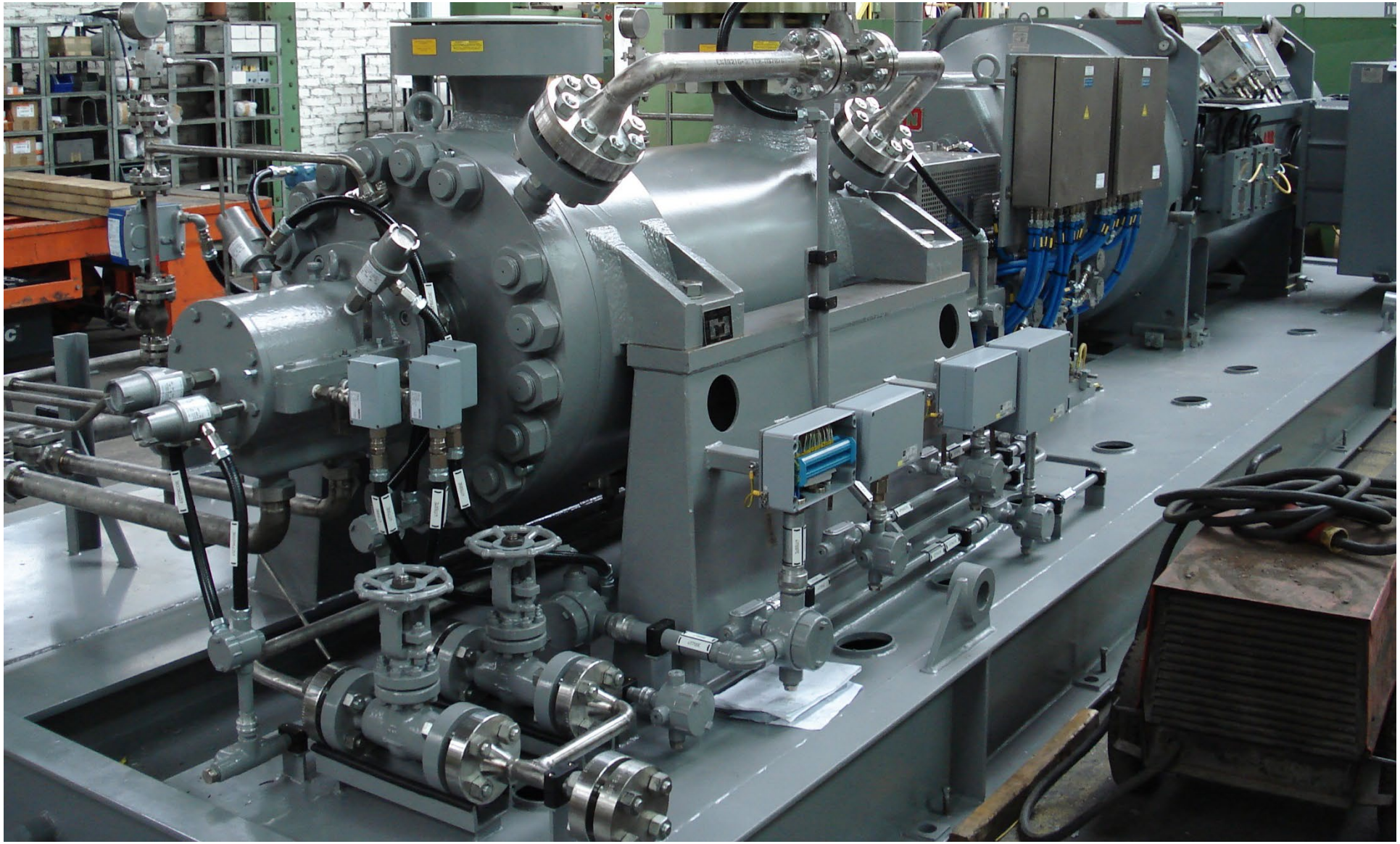


Fluid	Decoking Water
Operating data:	
Duty	250 m3/h @ 2,745 m
Speed	3,637 rpm
Power	2,618 kW

A LINE 8” BB5

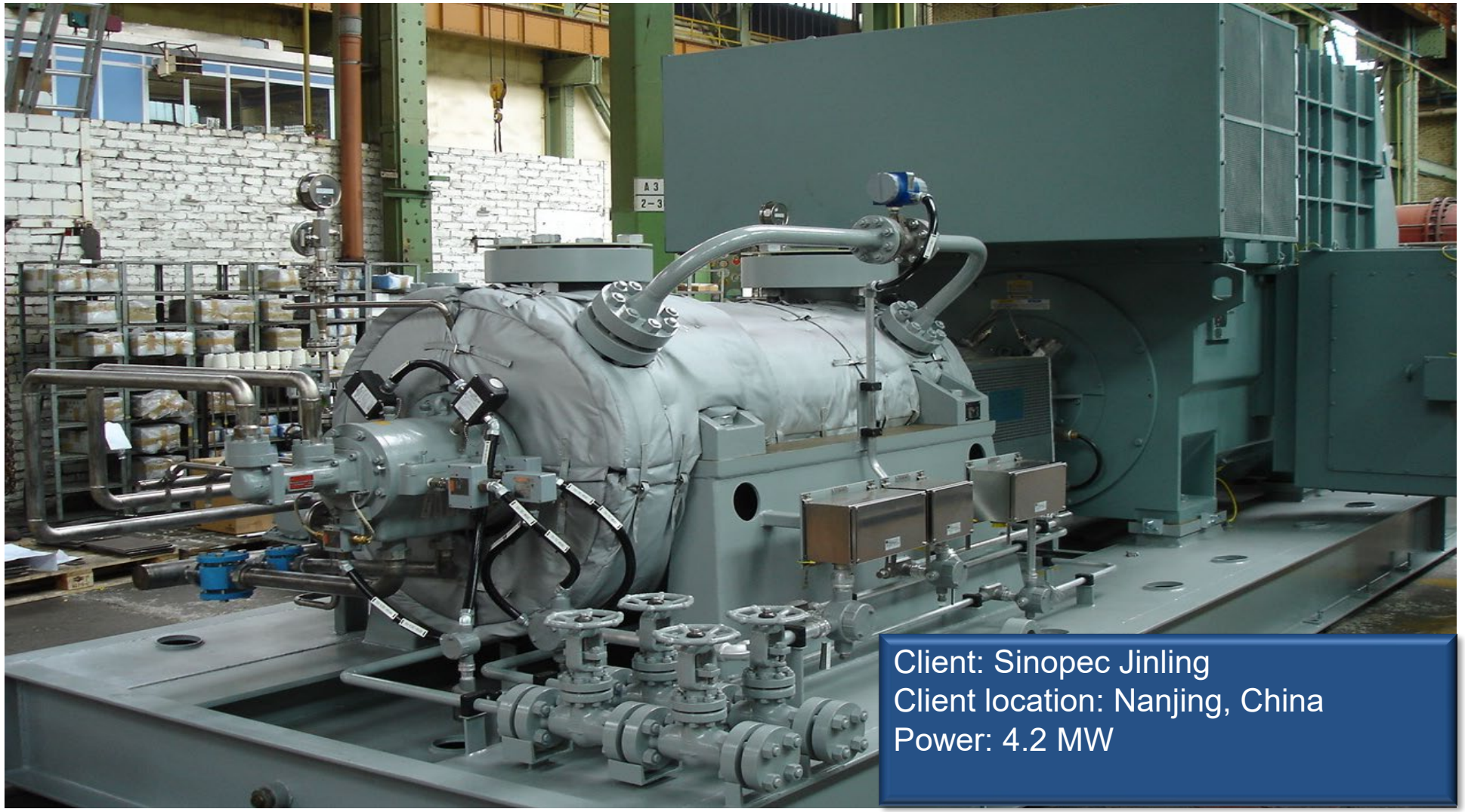
3.2 MW HV Motor / API 614 Lube oil system / Control valves
Capacity 312m³/h / Head : 3587 m / Speed 2900 rpm
Pumped liquid : Water + abrasive solids liquid temperature 75 °C

RUHRPUMPEN



A LINE – 10x8x17 (12 stages)

RUHRPUMPEN



Client: Sinopec Jinling
Client location: Nanjing, China
Power: 4.2 MW

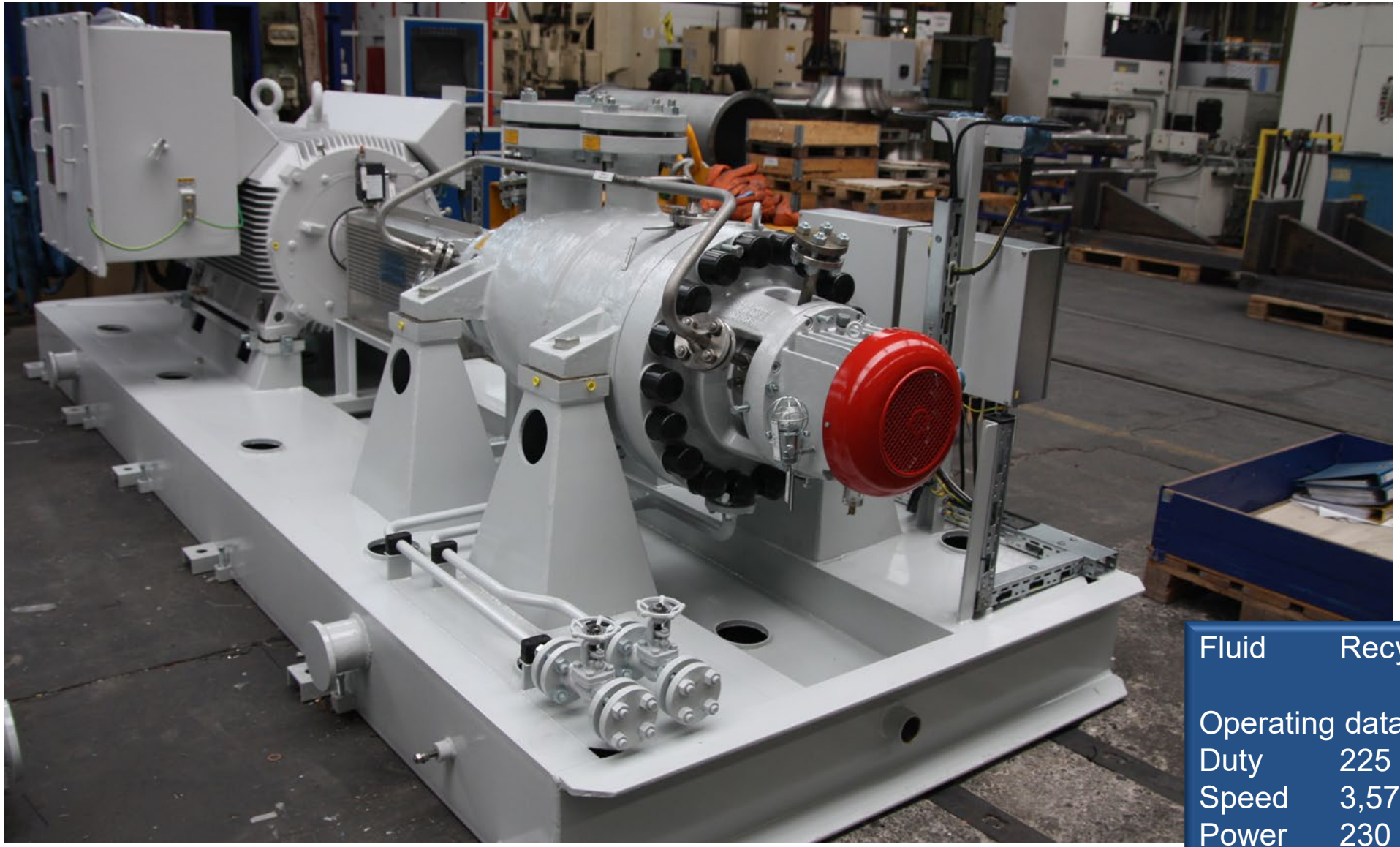
A LINE 8x6x15.5

3.2 MW HV Motor / API 614 Lube oil system / Control valves
Capacity 272 m³/h / Head : 2850 m / Speed 2900 rpm
Pumped liquid : Water + abrasive solids liquid temperature 70 °C

Shown on string test test in RP factory :
Full speed / load 3.2MW motor 2980 RPM

AB 6x4x11.5 4 stage (BB5)

RUHRPUMPEN



Fluid	Recycle Solvent
Operating data:	
Duty	225 m3/h @ 425 m
Speed	3,572 rpm
Power	230 kW

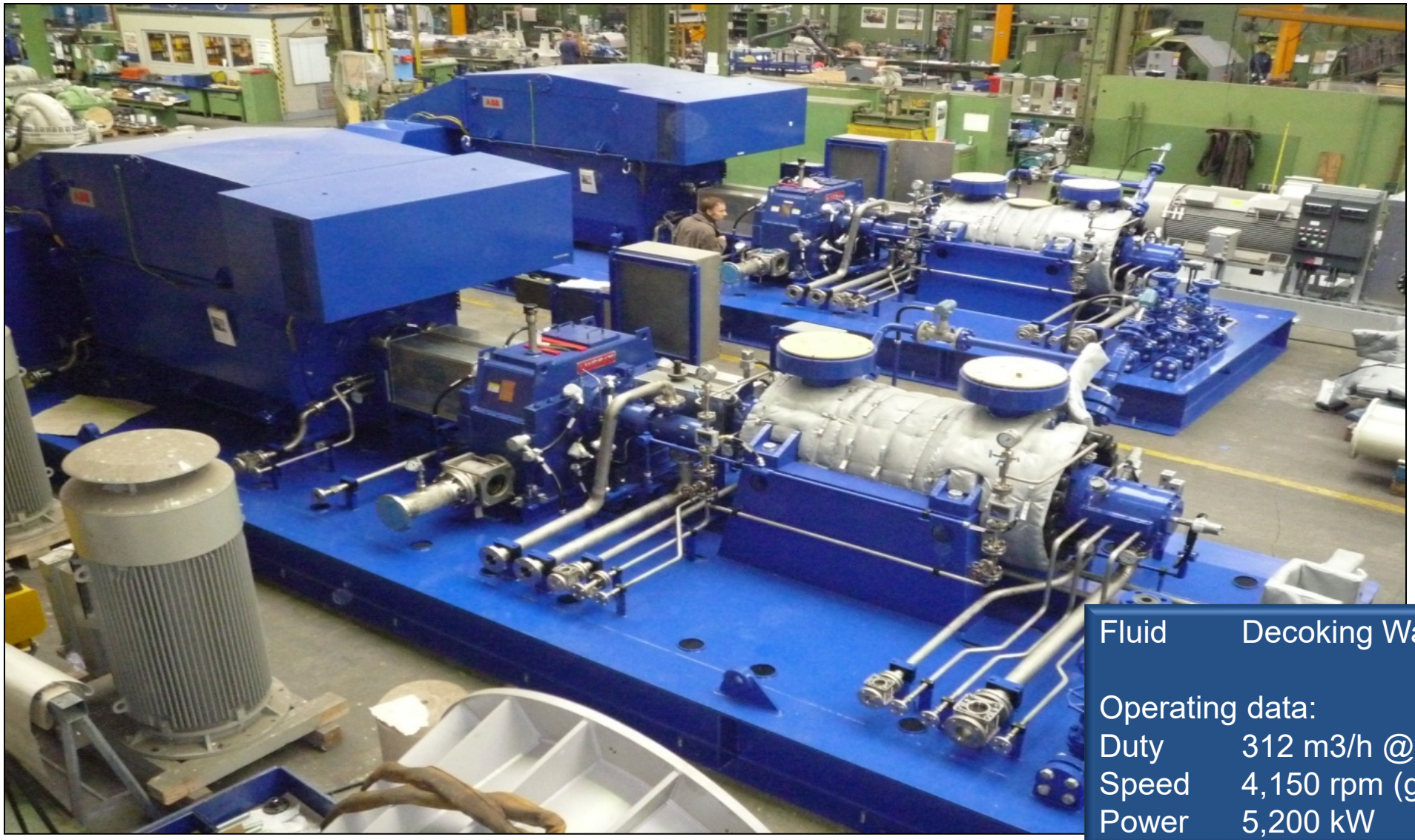
AB 8x6x15.5 12 stage (BB5)

RUHRPUMPEN

Fluid	Vaccum Gas Oil + Hydrowax
Operating data:	
Duty	226 m3/h @ 1,857 m
Speed	2,984 rpm
Power	1,648 kW

A6” 10 stage (BB5)

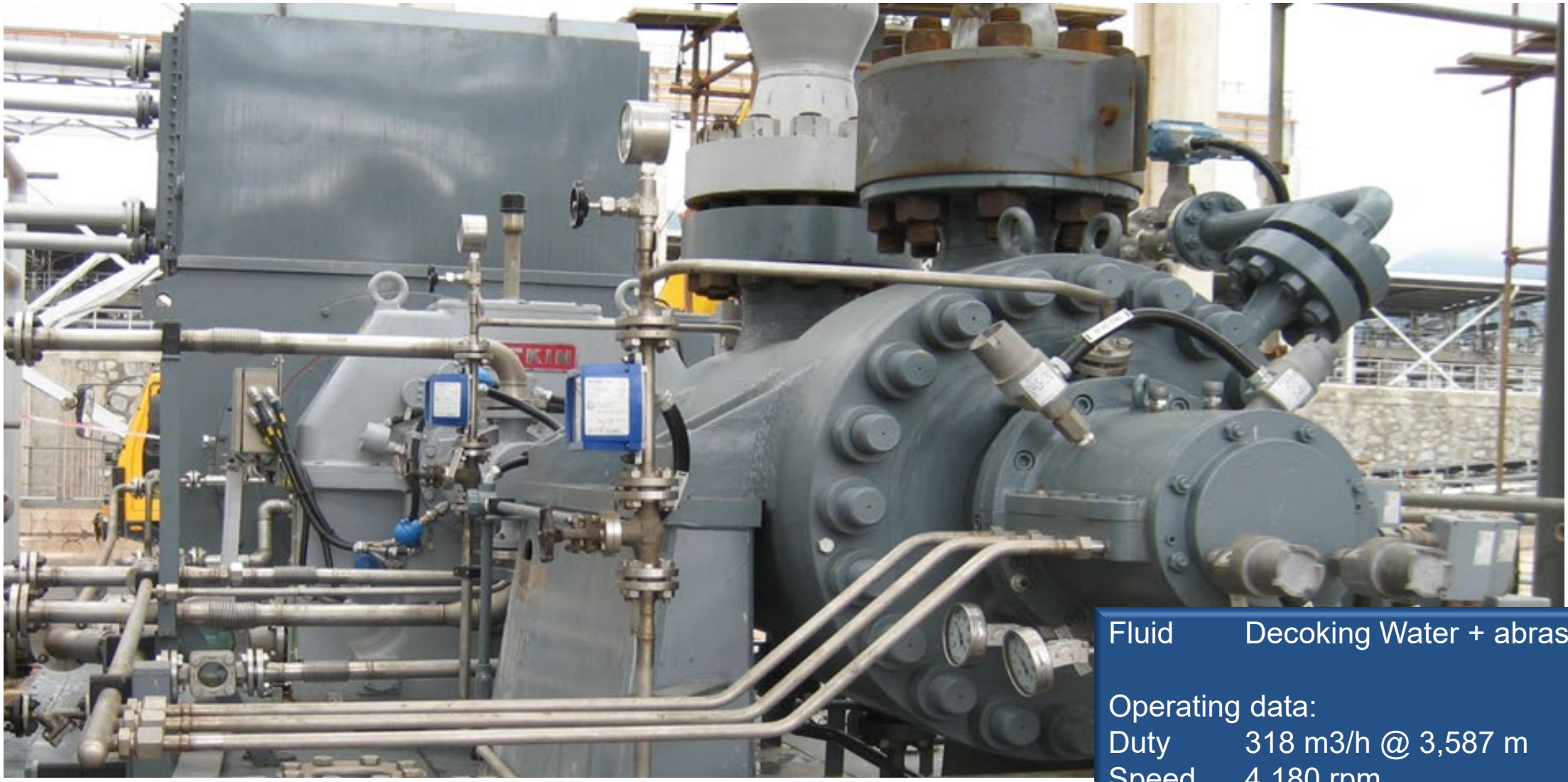
RUHRPUMPEN



Fluid	Decoking Water
Operating data:	
Duty	312 m3/h @ 3,436 m
Speed	4,150 rpm (gear box)
Power	5,200 kW

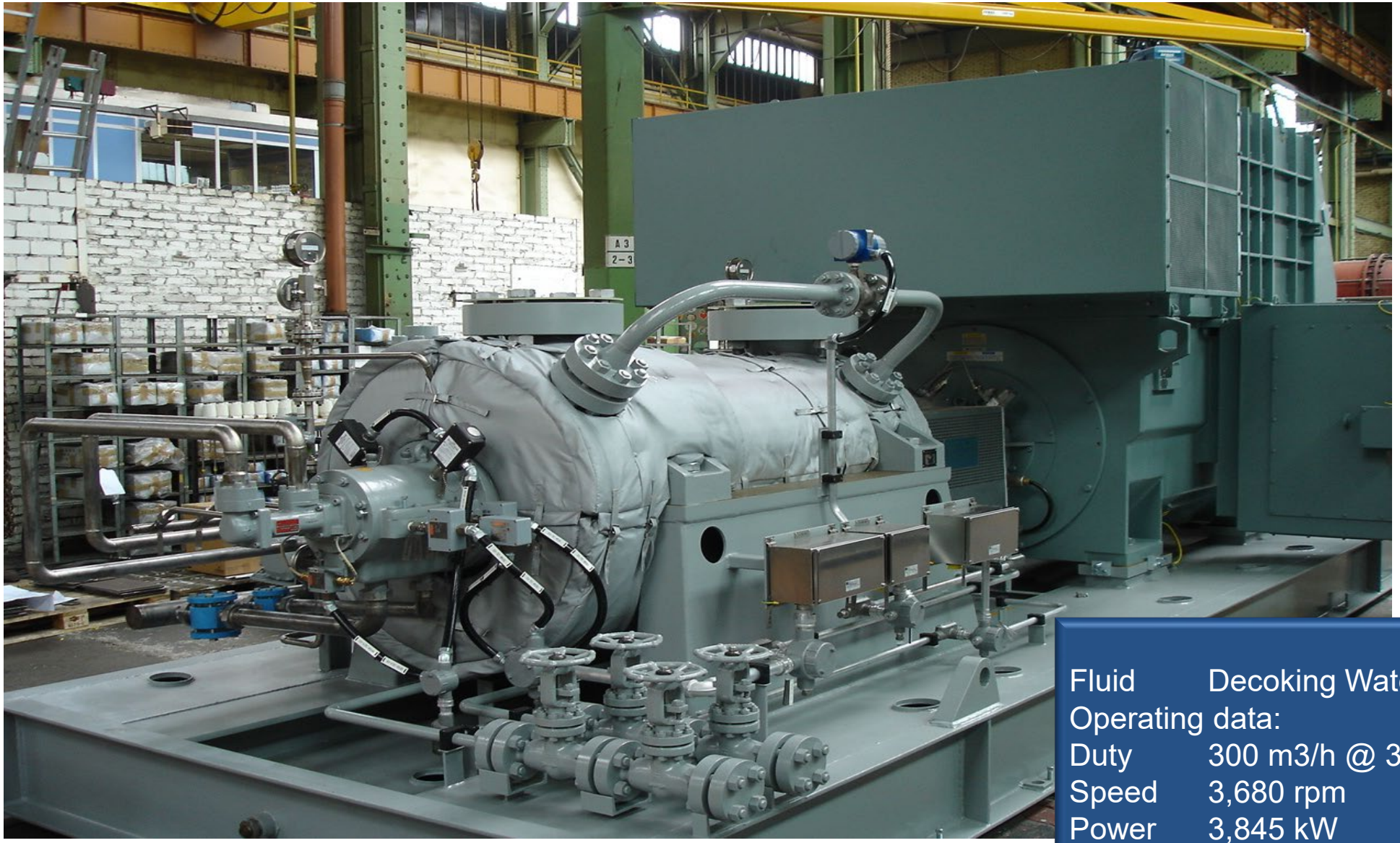
A6” 10 stage (BB5)

RUHRPUMPEN



Fluid	Decoking Water + abrasive solids
Operating data:	
Duty	318 m3/h @ 3,587 m
Speed	4,180 rpm
Power	4,290 kW

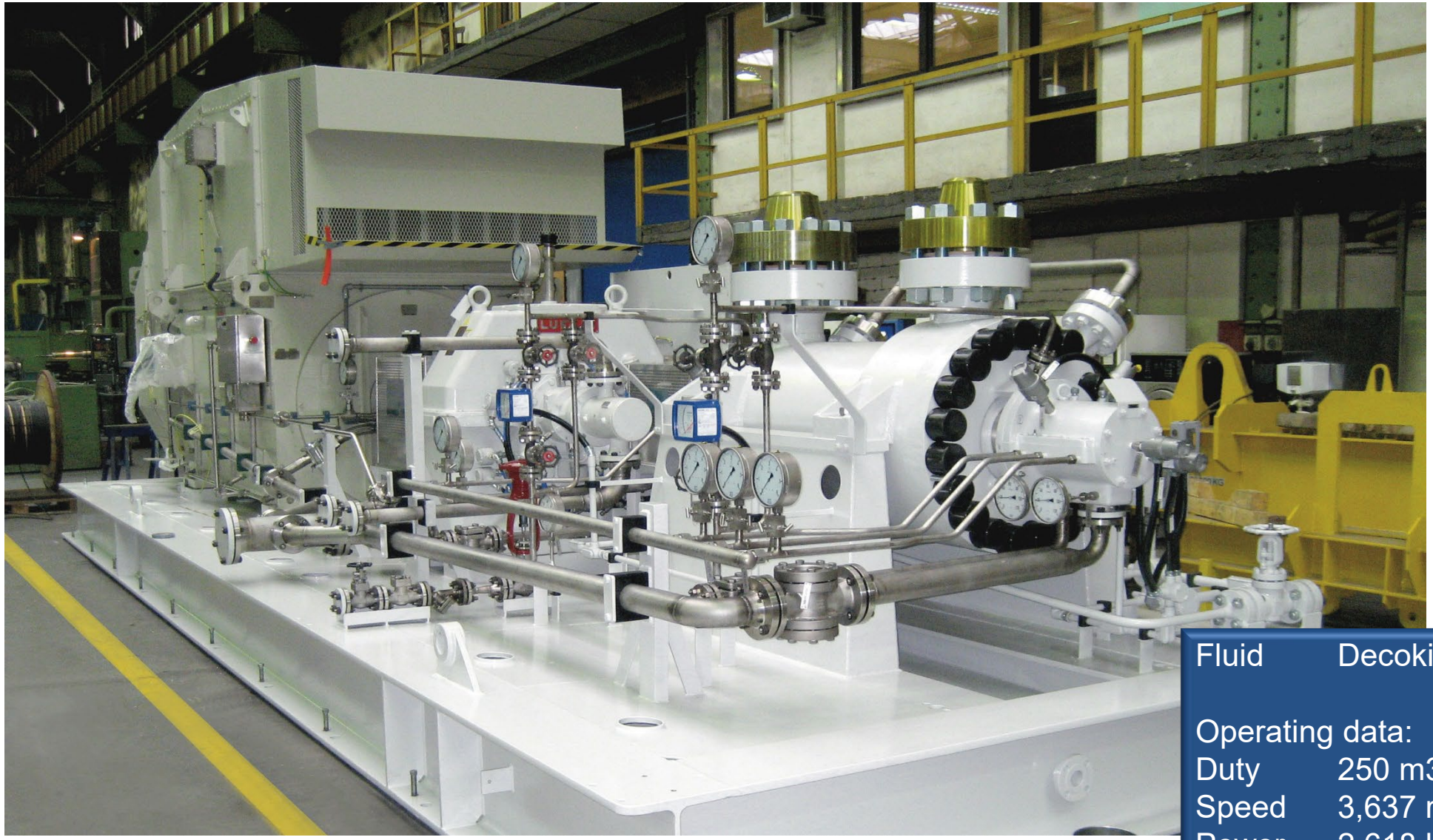
A6” 12 stage (BB5)



Fluid	Decoking Water
Operating data:	
Duty	300 m3/h @ 3,300 m
Speed	3,680 rpm
Power	3,845 kW

A6” 10 stage (BB5)

RUHRPUMPEN



Fluid	Decoking Water
Operating data:	
Duty	250 m3/h @ 2,745 m
Speed	3,637 rpm
Power	2,618 kW

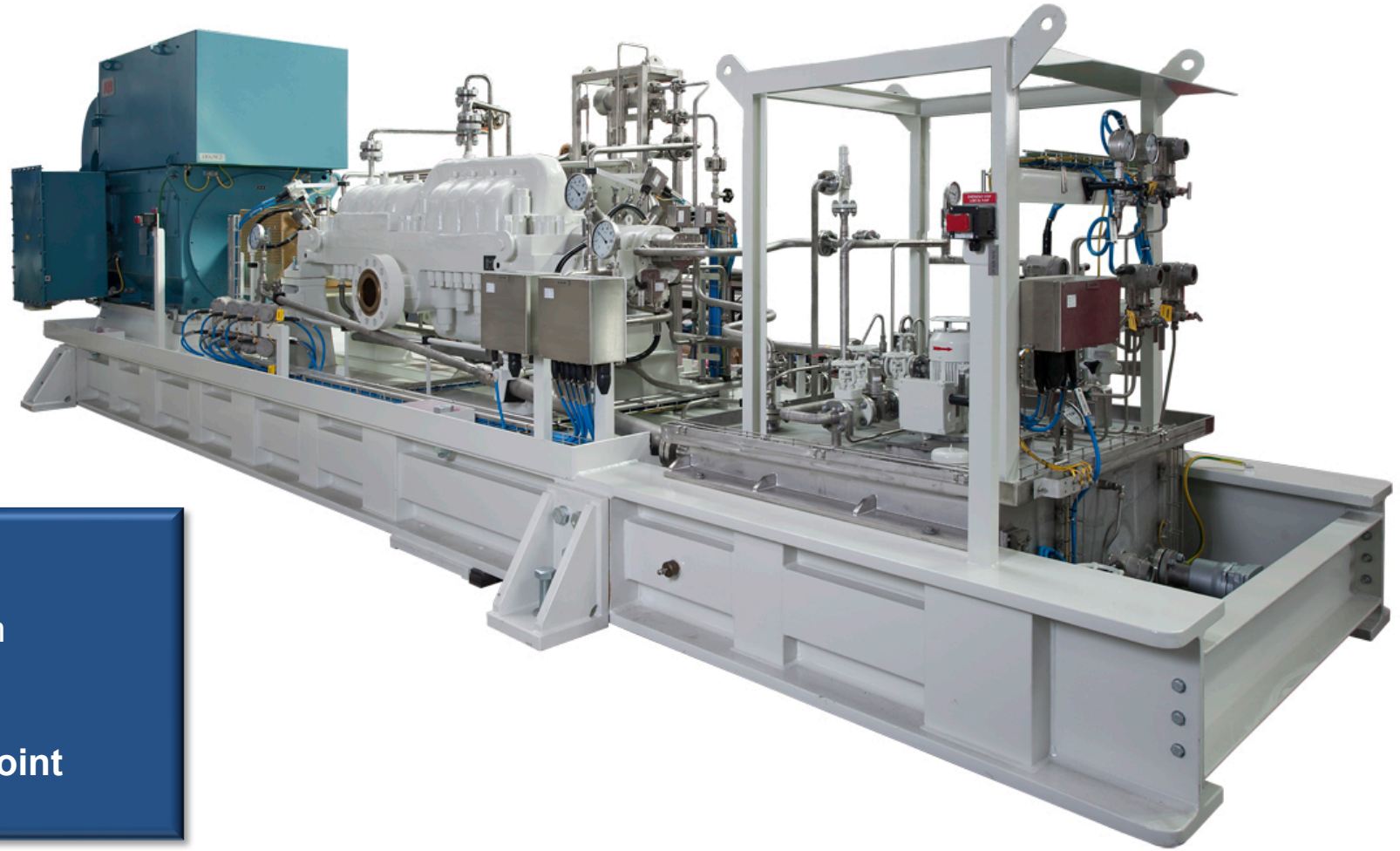
AB 8x6x15.5 12 stage (BB5)

RUHRPUMPEN

Test Bay Capability
Power: 6.5 MW
Flow: 15000 m³/hr
Supply : up to 10kV
Crane capacity: 32 tonnes

Option to use the Siemens facility at Duisburg 50 km from Witten for up to 17 MW

SM 6x13x10 10 stages (BB3)



Fluid	Water Injection
Duty	320 m3/h @ 1,800 m
Speed	3,600rpm
Power	2,000 kW

Offshore design with three point mounted baseplate


When your client asks
if you can do it cheaper

Coming Attractions ☺

"Understanding Pump Instrumentation"

Thur 4th Nov – 08.00 (UK GMT) (Eastern Hemisphere) & 17.00 (UK GMT) (Western Hemisphere)

Aimed at Process and Mechanical Engineers, Consultant Engineers and possibly even Instrumentation Engineers who specify pumping equipment as well as Applications & Sales Engineers selecting and quoting them.

This course will look at commonly supplied pump instrumentation (especially vibration monitoring) and understanding what the readings obtained tell you about your pump installation.

Future sessions :

– *Non Destructive Examination (NDE)*

– *What would YOU like us to cover?*

Send me a mail at ssmith@ruhrpumpen.com and let me know.

RUHRPUMPEN

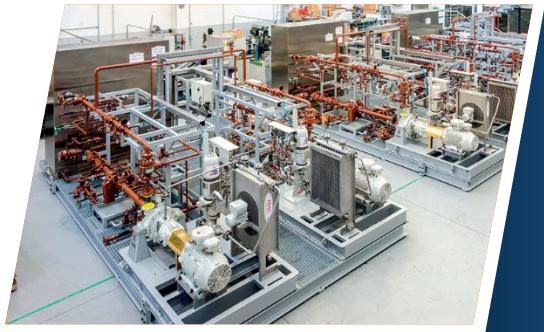
Specialist for Pumping Technology

www.ruhrpumpen.com

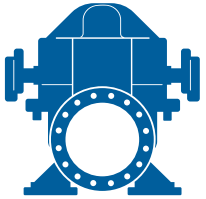
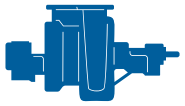
info@ruhrpumpen.com

OVERHUNG PUMPS

CATEGORY	RP MODEL	DESIGN STANDARD
Sealless Magnetic Drive Pumps	**CRP-M / CRP-M-CC**	ISO 2858 & 15783 HI design (OH11)
	SCE-M	API 685
Foot Mounted OH1 and General End Suction Pumps	**IPP**	HI design (OH1)
	CPP / CPP-L	HI design (OH1) ANSI B73.1
	CPO / CPO-L	HI design (OH1) ANSI B73.1
	CRP	HI design (OH1) ISO 2858 & 5199
	GSD	HI design (OH0)
	SHD / ESK / SK / SKO SKV / ST / STV	HI design (OH1)
	SWP	HI design (OH3A)
Centerline Mounted	**SCE**	API 610 (OH2)
Vertical In-Line Pumps	**SPI**	API 610 (OH3)
	IVP / IVP-CC	HI design (OH4 / OH5)
	IIL	HI design (OH5) Dimensionally compliant with ANSI B73.2
	SPN	API 610 (OH5)



BETWEEN BEARING PUMPS

CATEGORY		RP MODEL	DESIGN STANDARD	
1 and 2 stage	Axially split	**HSC / HSD / HSL HSR / ZW**	HI design (BB1)	
		HSM	HI design (BB3)	
		ZM / ZMS ZLM / ZME	API design (BB1)	
	Radially split	**HVN / J**	API design (BB2)	
		RON / RON-D	API design (BB2)	
Multi-stage	Axially split	**SM / SM-I**	API design (BB3)	
		JTN	API design (BB3)	
	Radially split *single casing*	**GP**	API design (BB4)	
	Radially split *double casing*	**A LINE**	API design (BB5)	

VERTICAL PUMPS

CATEGORY		RP MODEL	DESIGN STANDARD	
Single casing	Diffuser	**VTP**	HI & API 610 (VS1)	
		VCT	HI & API 610 (VS1)	
		HQ	HI & API 610 (VS1)	
		VLT	HI & API 610 (VS1)	
	Volute	**DSV / DX**	HI & API 610 (VS2)	
	Discharge through column – Axial flow	**VAF**	HI & API 610 (VS3)	
	Separate discharge line	**VSP / VSP-Chem**	HI & API 610 (VS4)	
Double casing	Diffuser	**VLT / VMT**	HI & API 610 (VS6)	
	Volute	**DSV / DX**	HI & API 610 (VS7)	
Submersible pumps		**SMF**	HI design (OH8A)	
		VLT-Sub / VTP-Sub	HI design (VS0)	

SPECIAL SERVICE PUMPS

CATEGORY	RP MODEL	DESIGN STANDARD	
Pitot tube pumps	**COMBITUBE**	HI design	
Reciprocating pumps	**RDP**	API 674 ISO 13710	
Vertical turbine generator	**VTG**	HI design (VS6)	
Barge	**LS BARGE**	HI design	
Floating dock pumps	**ZVZ**	HI design	
	LVZ	HI design	
Cryogenic pumps	**SVNV**	-	
	VTG Cryogenic	-	
	VLT Cryogenic VLTV	-	
Pre-packaged fire pump systems	Fire systems incorporate pumps, drivers, control systems and pipework in a single container. They can be skid mounted, with or without enclosure and supplied with electric motor or diesel engine.	**NFPA-20-850** UL and FM approved components