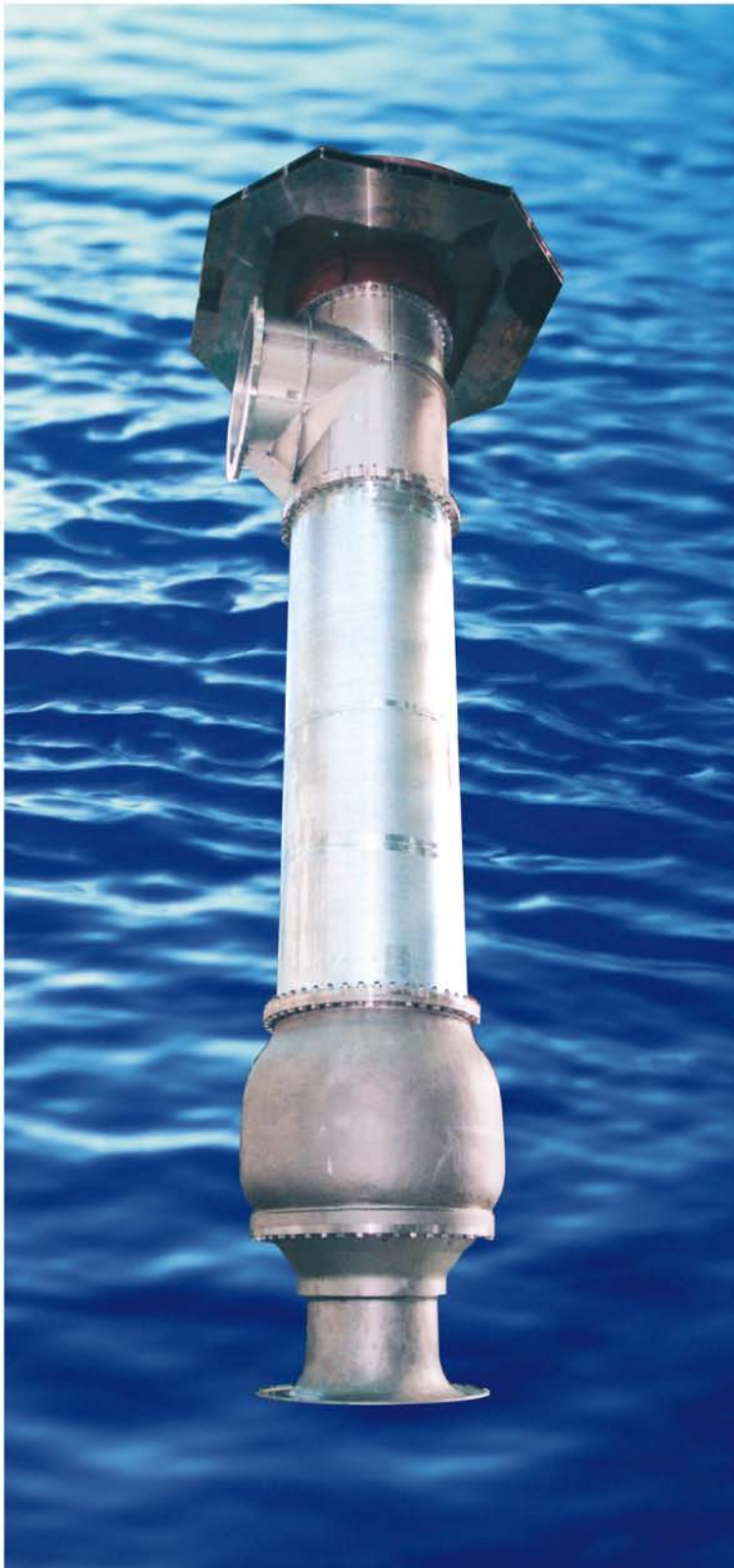


SPV

Vertical Mixed-Flow Pumps



TORISHIMA PUMP

Whatever process you operate; Power, Desalination, Petrochemical I, LNG, Water Treatment or Supply, Drainage or general industrial, the complete plant operation depends on the reliable performance of the main intake, cooling or seawater pumps. Torishima's reputation for providing reliable mixed flow pumps to operate in critical processes throughout a wide range of industries is second to none. With several thousand pump operating world wide you can count on Torishima pumps to be the driving force behind you pumping requirements.

Applications

Power

- Cooling Water
- Condensate Pumps
- Geothermal Brine Pumps

Desalination

- Seawater Intake
- Brine Recirculation / Blowdown
- Distillate

Petrochemical

- Seawater Intake
- Cooling Water
- Pipeline Transfer

Drainage Applications

Water & Wastewater

- River water intake
- Water Transfer
- Sludge transfer

Industrial

- Cooling Water
- Firewater

Performance Range

Head : up to 100m

Capacity : up to 1360m³/min (360,000 USgpm)

Temperatures : up to 80 C (176F)

Size : 300 to 2800mm (12" to 110")

Materials

Critical applications require pumps from a manufacturer who has proven experience in a wide range of applications and materials. Torishima provides a wide range of expertise in material selection and has experience in manufacturing pumps from the following materials;

Pump Diffuser Casing & Impellers

- Cast iron, Ductile Iron, Ni Resist Cast Iron
- Bronze, Aluminium Bronze
- Stainless Steel
- Duplex and Super Duplex Stainless Steel

Shaft

- Carbon Steel,
- Stainless Steel, Austenitic SS,
- Duplex and Super Duplex Stainless Steel

Discharge Bend and Rising Main

- Cast Iron, Ni Resist Cast Iron
- Carbon Steel
- Stainless Steel
- Duplex and Super Duplex Stainless Steel.

Specific materials grade are available on request and please contact one of our Sales offices to discuss your material requirements.

Product Life Cycle Support

Often the mixed flow bowl pump operates in some of the most arduous conditions particularly for seawater intake and drainage applications. As such unexpected operating conditions can occur on site, it is important that the pump supplier understands the complete plant design. As a qualified plant supplier Torishima provides a wide range of technical design services to support our mixed flow bowl pump through the product lifecycle.

Casting and Foundry Expertise

With over 60 years experience in casting pump components our in-house foundry expertise supports our Cast Iron and Ni Resist cast iron materials.

Torishima Cast Iron and Ni Resist pumps have been utilized in seawater applications for over 25 years.

Torishima Design Services

- Intake sump modelling
- Finite Element analysis
- 3D Flow Modelling
- Noise and Vibration Analysis
- Model Pump Testing
- Surge Calculations

Torishima Site Support

Torishima's site service capability backed up by our design expertise ensures the best service for our customers. Our site service support can be found in all major continents and can provide;

- Installation & Commissioning
- Pump Performance Testing
- Overhaul
- Maintenance vendor management

Torishima - Research and Development

To continue to lead the market in reliable and energy efficient mixed flow bowl designs Torishima implements an extensive product development strategy for our range of pumps. The team of around 30 engineers in research and development activities include;

- Pump Hydraulic Development
- Pump Model Development and Testing
- Bearing design and development
- Computer aided model sump design



Rational Design

Motor Support

Finite element design and proven experience are incorporated in the design of our motor support.

- **Minimal vibration**
- **Optimum rigidity**
- **Suitable access for maintenance**

Shaft Seal

Torishima sealing options are designed for;

- **Minimum maintenance, and**
- **Reduction in external flushing**

Seals Available

- Gland packing
- Mechanical seal

Flushing plans

- Wide range available from self flushed (with no external piping) to recirculation via filtration, to API plans.

Shaft

Designed to ensure:

- **Low risk of vibration,**
- **Maximum life**
- **Safe shaft critical speed throughout the operating ranges**

Hydraulic Design

Impeller and diffuser design are based on proven model designs and incorporate a wide range of pump Ns to provide,

- **Lower power consumption**
- **Higher operating efficiency**
- **Lower NPSHr characteristics**
- **Lower closed valve head**

Impeller designs available are;

- Open
- Closed

Diffuser designs available;

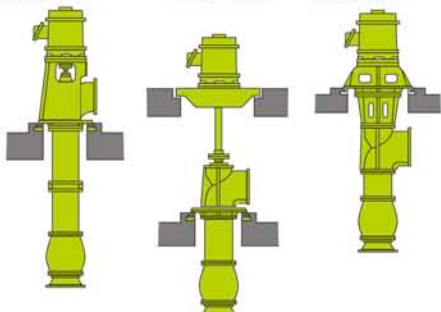
- Cast Type
- Fabricated Type

Installation Options

Discharge nozzle above floor

Two-floor installation

Discharge nozzle below floor



Thrust Bearings Options

Bearing designs are designed to provides

- **Low bearing temperature rise**
- **Maximum maintenance intervals**
- **Safe reverse running operation**

Location

- Thrust by driver
- Thrust by pump mounted thrust bearing

Designs

- Antifriction (Grease and Oil Bath)
- Tilting Pad type (Oil Bath)

Cooling

- Air cooled
- Water cooled bearings

Shaft Enclosing Tube

Is a standard option on all pump designs and provides

- **extended bearing life design.**

Enclosing tube option is available for;

- Aggressive environments, where the shaft bearings require isolation from the pumped fluid.
- Pull out design pumps

Guide Bearing

Torishima has significant operating experience in applications where no pre lubrication of the bearings is required. The method provides

- **Simplified control and operation for the operators.**
- **Less risk of pump failure**
- **Extended life of intermediate bearing**
- **A environmentally friendly option**

The options which are available at present are ;

- Ceramic (No Pre start lubrication required)
- Thermo Plastics (No Pre start lubrication required)
- Cutless rubber
- Carbon
- Bronze

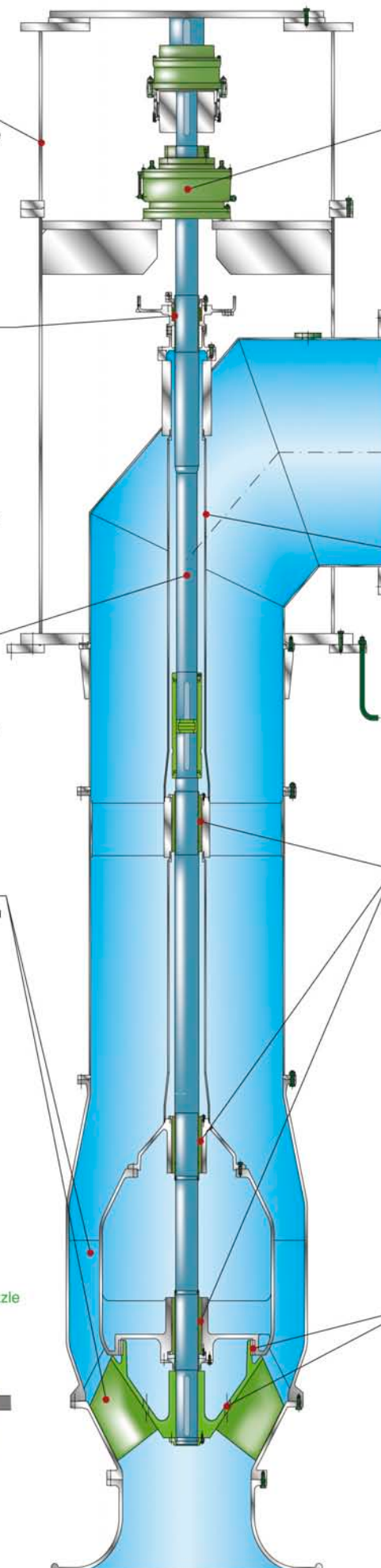
Thrust Balance

Dependant on the duty conditions, Torishima pumps incorporate a range of axial thrust compensation designs to provide;

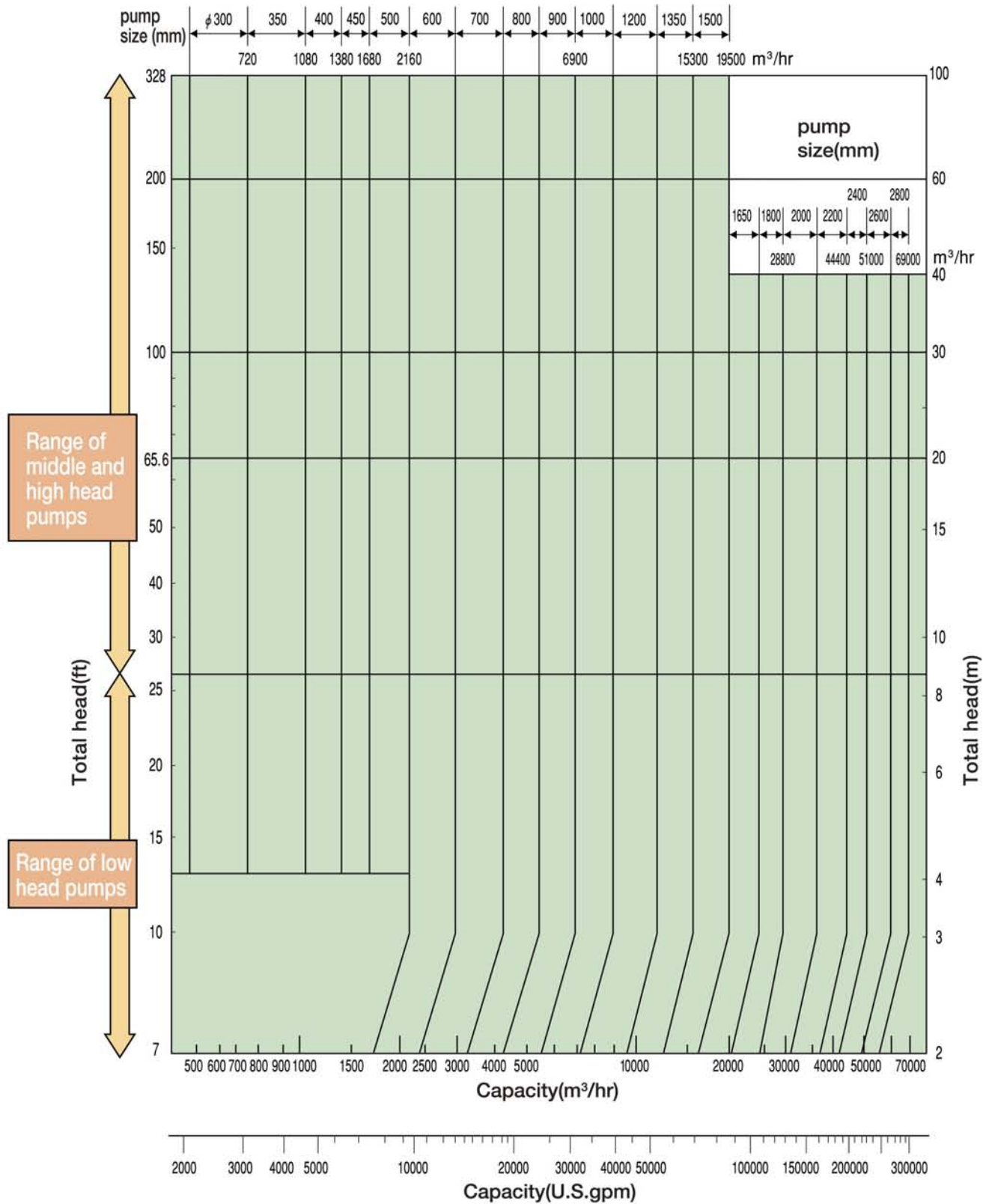
- Improved reliability
- Extended bearing life
- Lower thrust loads

Balance methods available are

- Back wear rings
- Balance holes



Selection Chart



Typical applications

Dewatering pump with adjustable vane
(Size:2400mm, Driver:1103kW)



Cooling water pump for P.A.I. Shuaiba, Kuwait
(Size:1400mm, Driver:1500kW)



Various seawater pumps in Al Taweela MSF desalination plant, Abu Dhabi, UAE



Sea water cooling pumps, Singapore
(Size:800mm, Driver:790kW)

Brine recirculation pump for Sabia MSF desalination plant, Kuwait
(Size:1000mm, Driver:3550kW)

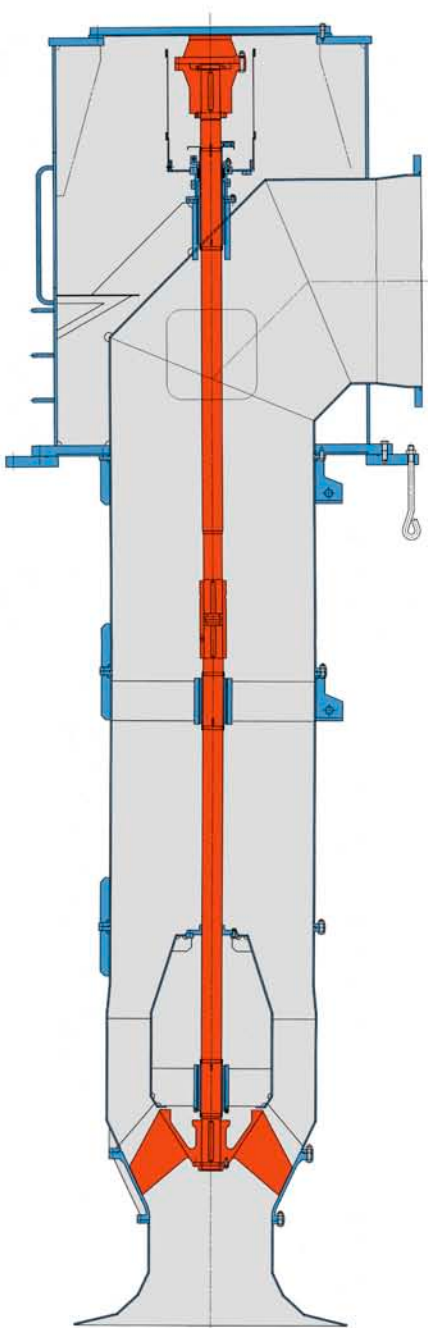


Brine recirculation pump for Ras Laffan MSF desalination plant, Qatar
(Size:1200mm, Driver:3800kW)

Options to meet the needs of Clients

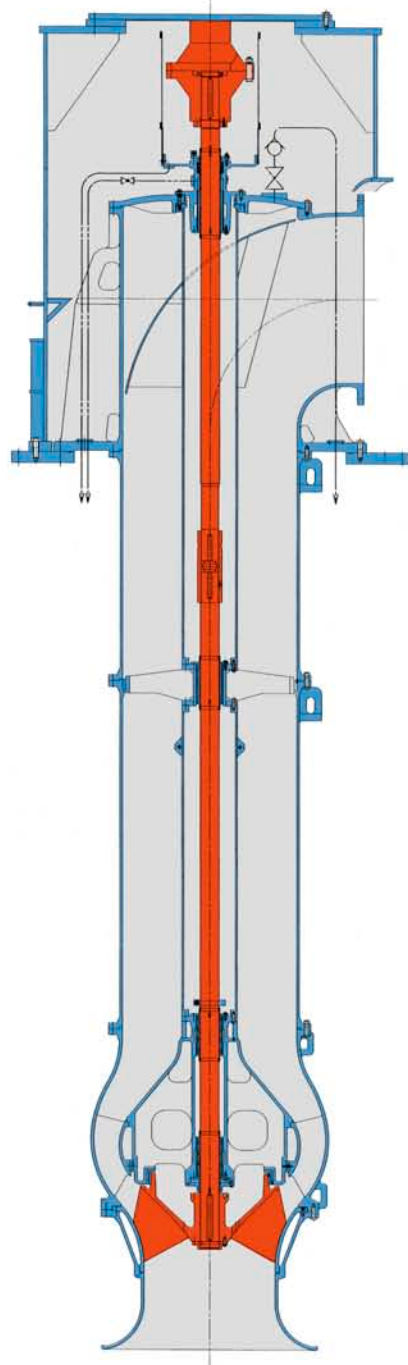
Fabricated design

- Fabricated main static parts
- Reduced weight
- Reduced spare part costs
- Reduced capital cost



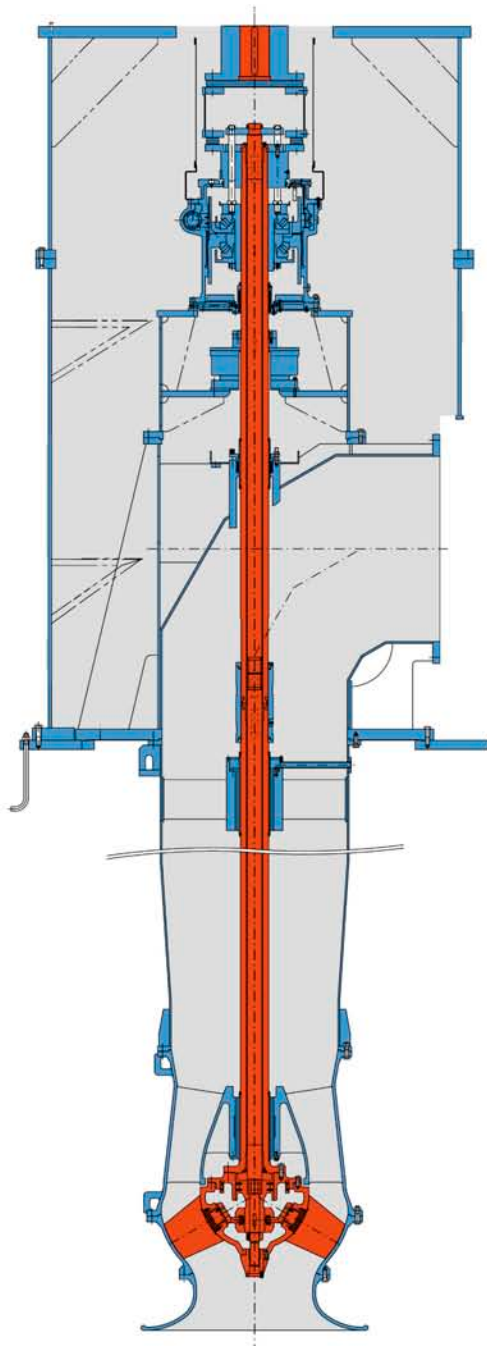
Rotor pull-out design

- Reduced maintenance cost
- Reduced maintenance time
- Elimination of standby pump, spare rotor can be held as back up



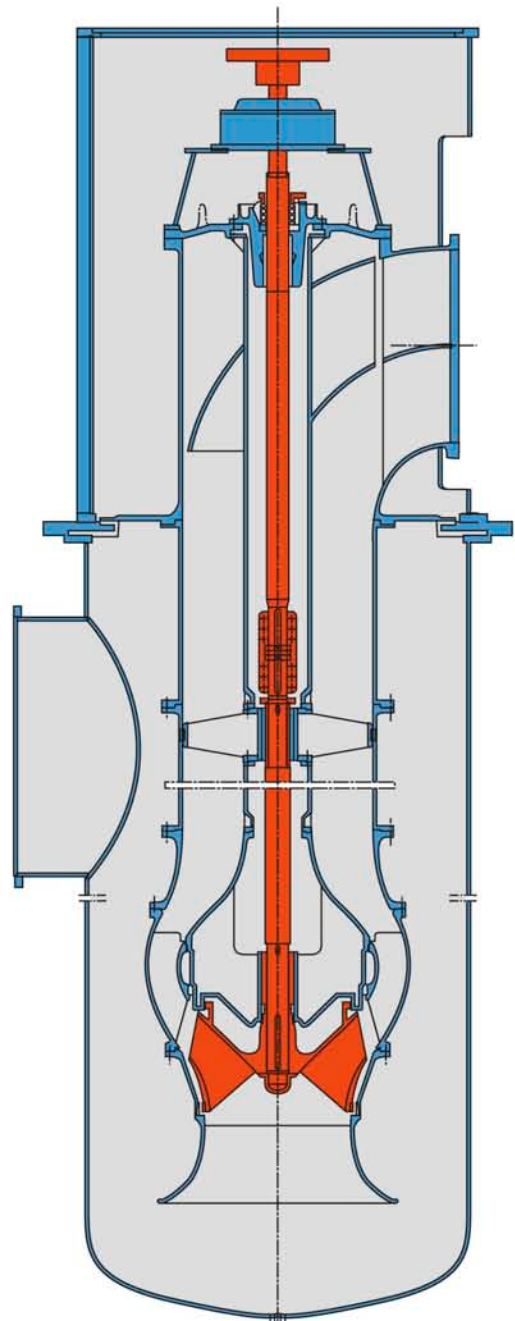
Adjustable vane

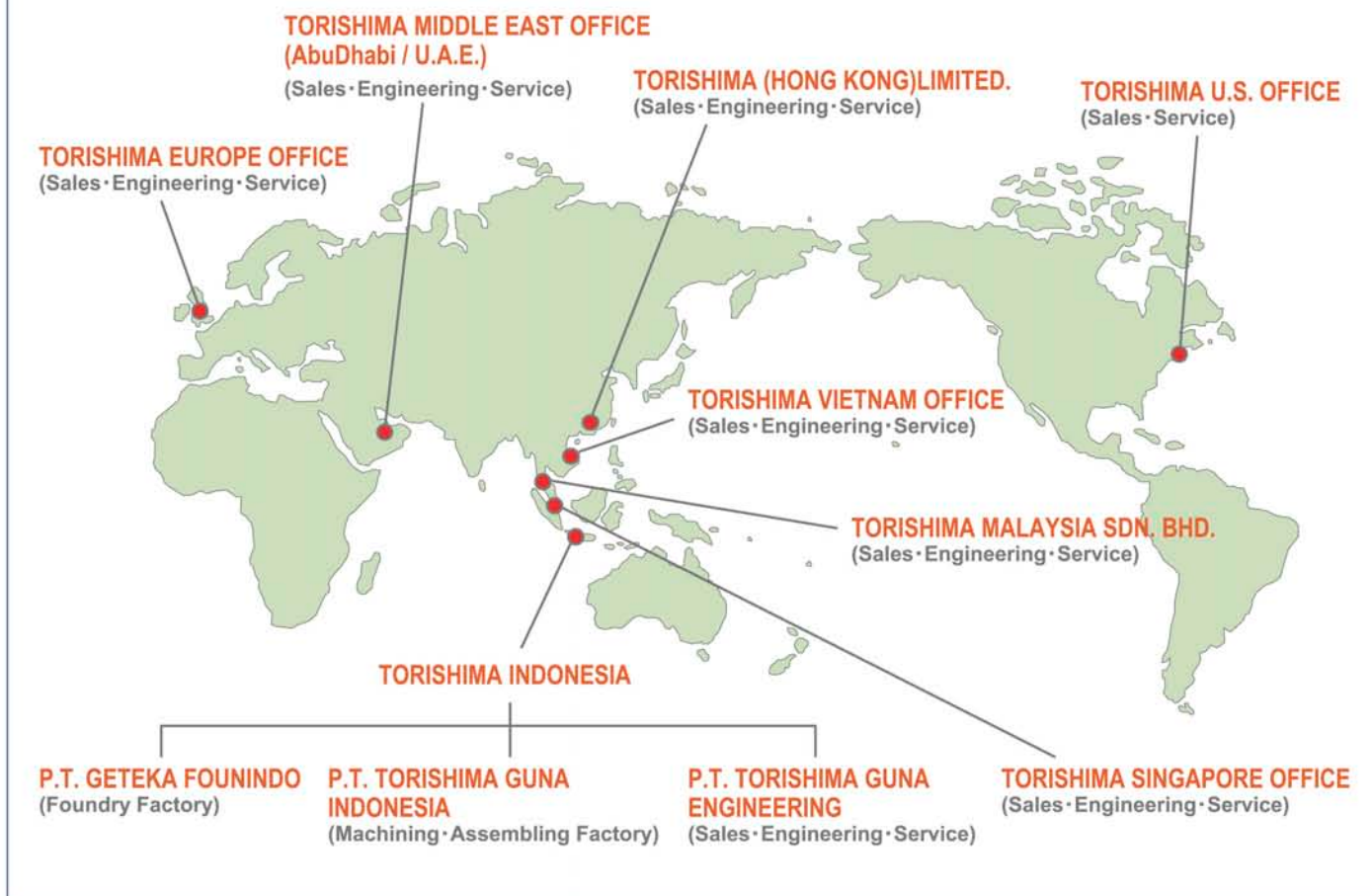
- High efficiency
- Energy cost saving



With barrel casing (SPTV)

- Low NPSH
- Reduced pumping station size





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