



## Rodelta ETL

The pump type ETL (OH5) vertically inline mounted, close coupled, radial split case, single stage, single suction, heavy duty centrifugal process pumps. The design complies with the latest edition of the American Petroleum Institute standard 'Centrifugal Pumps For General Refinery Services', also known as API 610/ ISO13709. The inline configuration is a compact pumping solution with mounting the impeller to an extended motor drive shaft presents a very compact pumping solution. The ETL (OH5) offers a space saving footprint and eliminates expensive baseplates.



### Features:

- According API 610 (OH5)
- Diffuser design reduces radial loads
- Reduces minimum flow requirements
- High efficiency at any duty
- Alignment free construction
- In line suction & discharge
- Space saving construction
- Stable head characteristics
- Meets API nozzle load requirements
- Accommodates API 682 seal systems

### Specifications:

- Delivery size up to 200mm
- Capacity up to 600m<sup>3</sup>/hr
- Head up to 180m
- Suitable for liquid Temperature: Up to 250°C depending on Pump size
- Sealing Arrangement: mechanical seals
- Flange rating: Cl. 150/300
- API material options available, NACE & ATEX approvals available on request
- Suction and discharge flens according British standard BS 4082
- The footprint of the foundation plate corresponds to the DEP standard drawn up by Shell

### Applications:

- Fluid handling in oil refineries and petrochemical industry
- High temperature and high pressure critical applications in chemical and allied industry
- Upstream, pressure booster
- Midstream, process transfer, bottom reflux, propane/butane/LPG handling, diesel oil/gasoline/naphtha/lube oils etc., sodium carbonate/caustic sour water, MEA/DEA/TEA
- Fertilizer, carbamates/lean and semi lean solutions, NH<sub>3</sub> feed, other removals
- Power plant, Hot water circulation, condensate transfer, fuel oil
- Onshore/Offshore installations
- FSPO platforms
- Hydrocarbon storage and Liquid gas plants

### Constructional features:

- Suction and discharge flanges are available drilled to either ANSI or DIN-EN standards, flange rating comply with API 610 nozzle load requirements.
- The pump casing, cover and seal cover incorporate a fully confined gasket.
- Mechanical Seals conform to API 682 / ISO21049 and are fitted into the API compliant seal chamber, either single, double or engineered seals can be accommodated that meet the full process requirements. All seals are provided with the relevant API compliant flushing, cooling, heating, quench and buffer fluid systems and associated pipework. Use of standard electric motor design
- Impeller is directly mounted on extended motor shaft (close coupled design).

### Monitoring features

Monitoring features like SPM vibration nipples and PT 100 temperature measurement provisions are optional.

### Explaining the ETL redesign

The Rodelta ETL (API 610-OH5) pump is fully designed according to the latest edition of the API 610, 11th edition. The design is even ready for the expected changes of the 12th edition. Rodelta's choice was not to lean back on there proven record by there installed base, but to redesign the OH5 successfully to the latest standard of the API without any deviations. We believe that current markets requests innovators with regard to working according latest guidelines. Mainly because these guidelines are an abstract of the customer processes which ensures smooth running of their critical processes.

Goal of the redesign is maximum reliability with minimum rotating and stationary parts. Our experience of the OH5 pump type in the field made is feasible to conduct this exercise for redesign. Evaluating the hydraulic field chart (figure 1), one can see that both flexibility and coverage were our main parameters for defining the hydraulics of the pump.

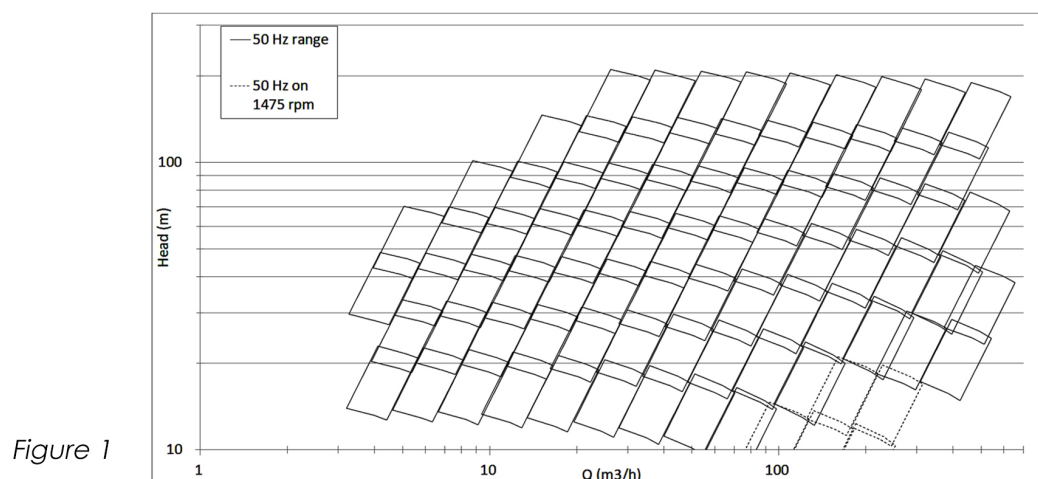


Figure 1

As NPSH is a crucial topic in selecting a pump, we have designed an unique suction box, "on which a patent is pending", enabling the customer to find a good match in the overhung pump range without using tools like an inducer (not allowed by API). Alternative for conditions with low NPSHa would be change of pump type to between bearing type. Besides cost this would also effect footprint.

The OH5-ETL pump type complies with the most stringent emission requirements considering shaft seals. For instance, the seal chamber is fully compliant with the API 682 and suitable for all mechanical seal styles, including advanced gas barrier seal technology.

### Maintenance

For easy maintenance we designed the pump to have 240 degrees opening accessibility (figure 2) to the seal. The mechanical seal is positioned to allow seal connections not being affected by the studs and nuts on the pump cover. In conjunction with the redesign of the pump housing, this has no adverse consequences to the shaft span. The shaft span is even one of the shortest in the market and also complies with the shaft flexibility index as described within the API 610.

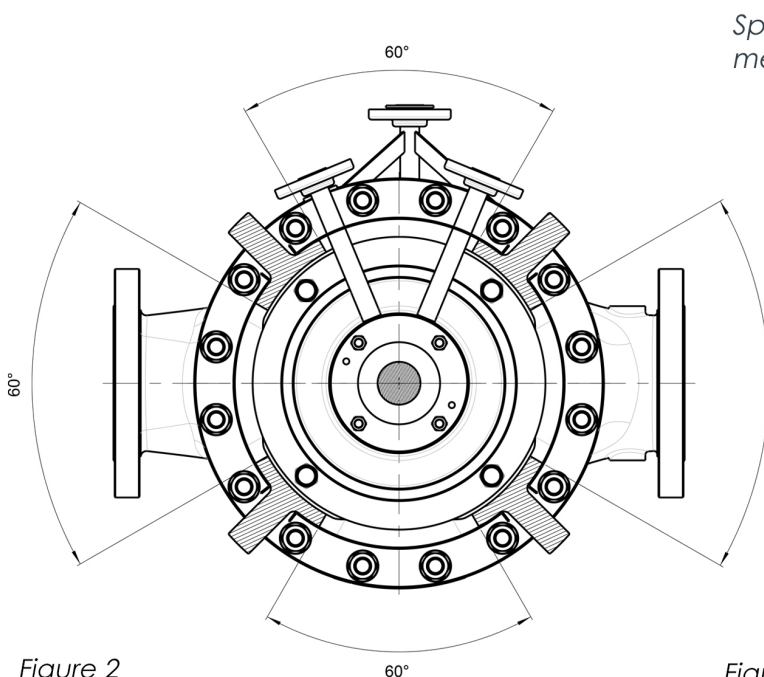


*Figure 2*  
*Max accessibility to the seal*

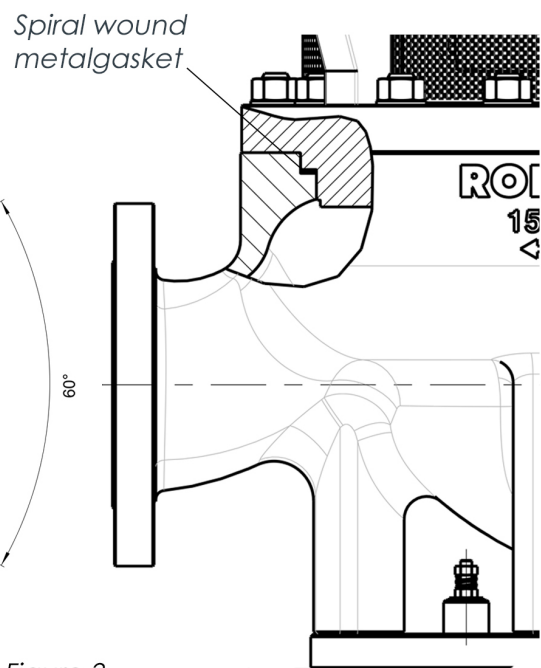


*Figure 3*  
*metal to metal fit for  
controlled compression  
of the gasket.*

Pump casing and cover have a metal-on-metal fit (figure 3) to ensure complete enclosed and controllable compression of the gasket. This guarantees good alignment and sealing. There is sufficient space everywhere for the use of mechanical torque wrenches in order to enable easily set pre-tension in a controllable manner. The cable can be connected to the motor through the closed sides of the motor support. All possible motor options can be rotated in steps of 45 degrees relative to the pump housing.

The ETL has milled and interchangeable diffuser channels, which are generated specifically for each customer duty. This offers a high degree of flexibility when dealing with changing production parameters. An infinite number of hydraulic solutions can be generated with 13 pump housings and 13 specific speeds on impellers in this family.

The connection dimensions of the pressure- and suction flange are made according to the British Standard BS4082. (figure 4) Complying to the British Standard ensures this OH5 pump type can easily be exchanged in situations where pipe work meets this standard with regard to centreline and distance between flanges. The footprint of the pump is in accordance with the DEP requirements set by Shell in which the anchors and ground dimensions for fixing the pump are normalized.

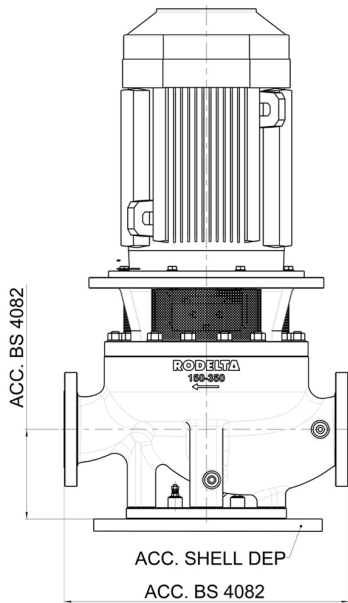


Figure 4  
BS 4082  
Shell DEP

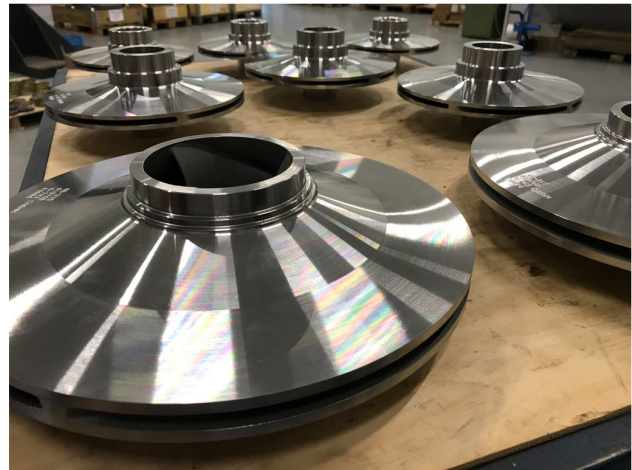


Figure 5 ETL Impeller

The impeller is casted with ceramic mouldings to make sure the high quality and efficiency demands are met with the most sophisticated casting and production techniques. (figure 5) All impellers are dynamically balanced according to the latest requirements set by the API. This ensures flawless performance for the given operation range with vibration levels of nearly zero.

Reviewing the ETL (OH5) pump to a similar size OH2 pump, the ETL offers many advantages. Besides the fact that a large number of parts are made redundant due to the construction, the OH5-ETL has a much smaller footprint. (Figure 6) This makes it ideal for installations where floor space is limited. In addition, the simple drop-in assembly makes maintenance much easier in tight, confined spaces.

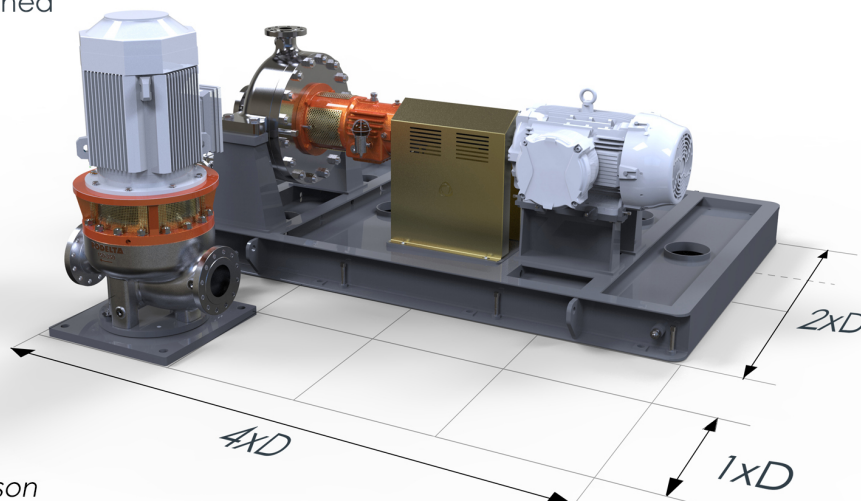
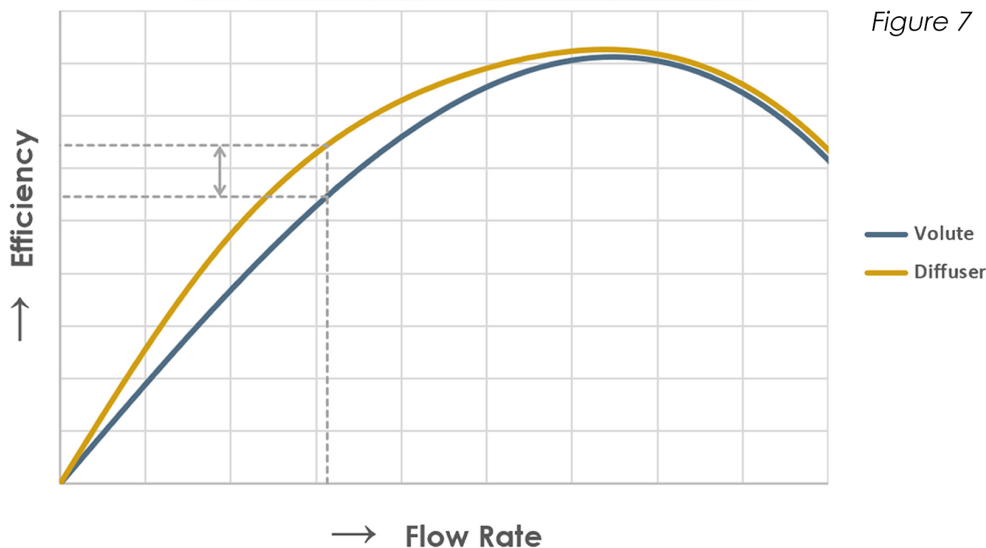


Figure 6  
Footprint comparison

## Why using diffuser technology in ETL pumps?

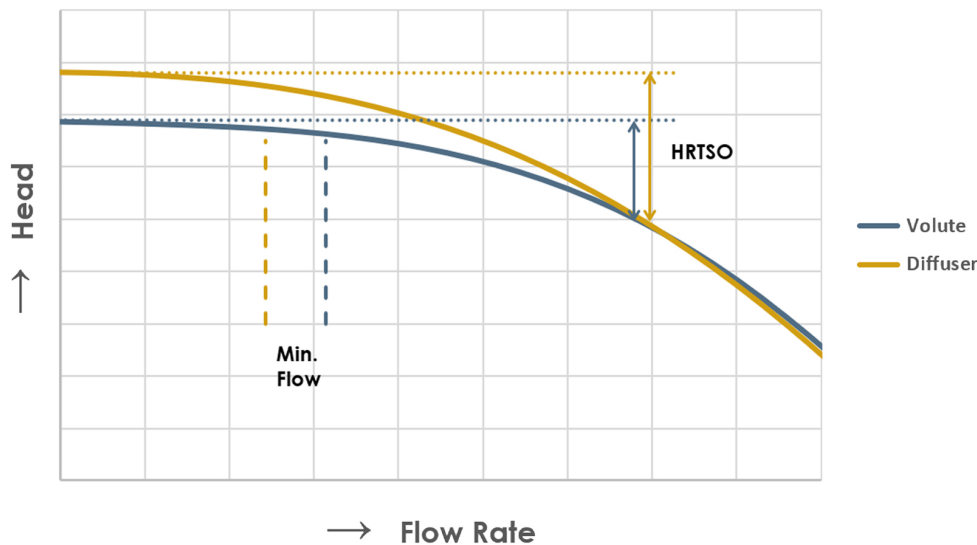
The working principle of centrifugal pumps is based on adding energy to the working medium using a rotating impeller. This process, in addition to increasing the static pressure, also increases the velocity of the fluid. The added energy in the form of velocity (or dynamic pressure) can be partially converted into static pressure by properly slowing down the fluid. This is often done by using a volute which is a spiral-formed casing around the impeller, collecting and guiding the fluid towards the discharge pipe while gradually decreasing its velocity.

A volute pump casing combines two functions: providing the hydraulic flow path and the pressure casing for the fluid. In diffuser pumps, these functions are split into two separate parts. A casing (or collector) is used for creating the pressure boundary, while the velocity-pressure conversion is done by employing a diffuser, which is a ring with multiple diverging channels, placed around the impeller. This provides more guidance for the decelerating flow which can be beneficial from several points of view. Especially for pumps made for operation at relatively low flow rates, diffuser pumps outperform volute pumps efficiency wise. In addition to the higher maximum efficiency, the efficiency does not collapse as fast when operating in part load conditions ( See figure 7 )



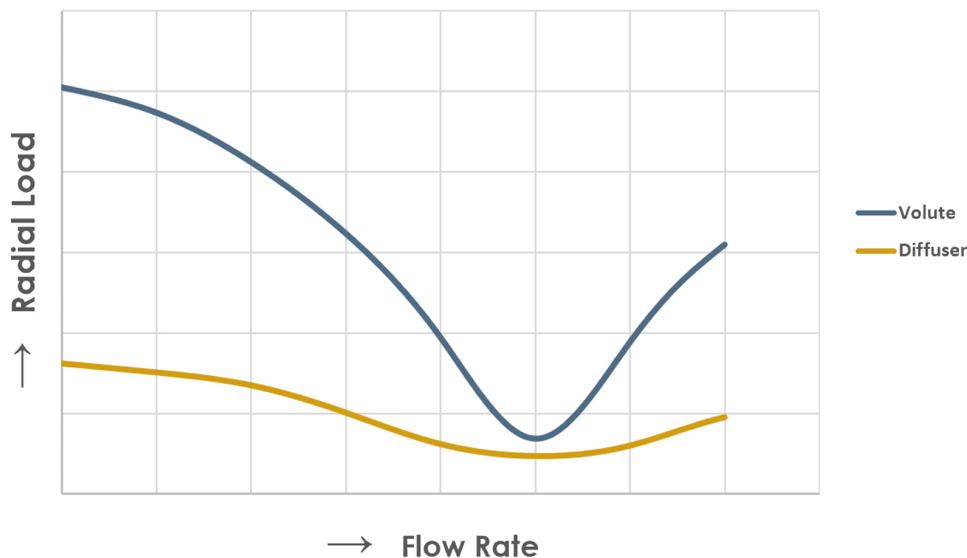
Furthermore, diffuser pumps mostly have higher head rise to shut-off (HRTSO) and greater steepness and stability of the head curve, which is especially required for pumps operating in the API market and for parallel operation (see figure 8).

Figure 8



Diffuser pumps are not just advantageous from an efficiency standpoint. The multi-channel diffuser geometries show more axial symmetry than the asymmetric volute shapes. As this axial symmetry is also present in the pressure distribution of the flow field, most of the radial loads are cancelled out (see figure 9)

Figure 9

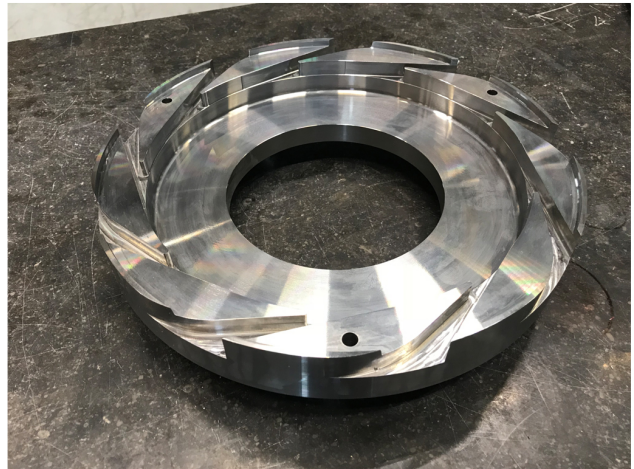


Also, due to a series of diffuser vanes as opposed to a single volute tongue, pulsations from the passing impeller blades and other unsteady flow phenomena are greatly reduced. Lower unsteady behavior means lower vibration and noise levels, which is especially noticeable at off-design operating conditions. The reduced loading and vibrations in turn lead to longer mean time between maintenance, mean time between failure and lower minimum continuous safe flow rates. Although diffuser pumps are generally more expensive than their volute counterparts, the higher investment can be easily returned by the longer life-cycle of the pump, lower spare part cost and the significant reduction in down-time of the entire process.

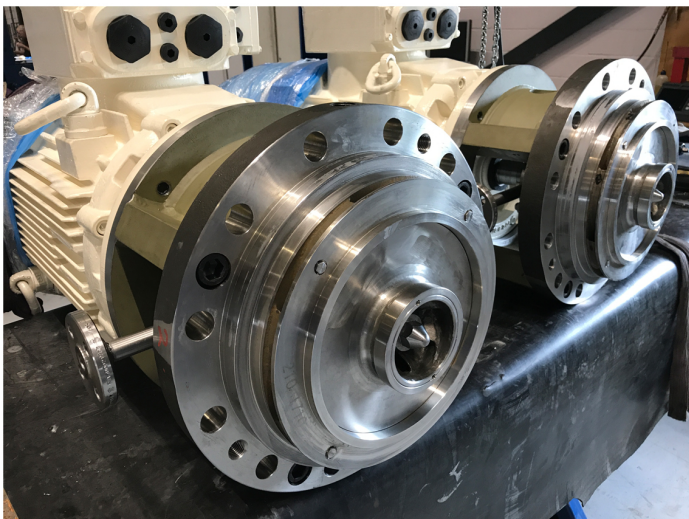
Another advantage arises from the fact that the diffuser is a separate part from the pump (pressure) casing. A lot of design flexibility is introduced because a single casing can fit a

wide range of diffuser geometries. As the diffuser channels are machined, they do not suffer from the limitations of a casting process, which is the case for volute casings. This also provides the opportunity to make custom diffusers for every order, which can be done very rapidly. Doing this for a volute would be an almost impossible task, as designing a volute is more complex and casting patterns would have to be made and stored for every single volute. This means that volute pumps will mostly be a compromise: due to the limited number of volute pumps in a range, the customer duty point will deviate from the best efficiency point of the pump. This problem can be circumvented using diffusers. By trimming the impeller diameter and creating a custom diffuser geometry, the required pump performance can be achieved where the best efficiency point is located exactly where the customer needs it. This even provides possibilities for retrofitting existing diffuser pumps with a new impeller and/or diffuser, in order to completely change the duty point of the pump, increasing the life cycle of the pump even further.

*Machined diffuser*



*Pull out unit OH5*



the simple drop-in assembly  
ensures easy installation.  
especially in places where  
space is limited.

