Multiple Screw Pumps for Upstream Applications

The oil and gas industry offers a wide range of upstream applications to screw pumps. Besides the single screw pump, better known as the progressive cavity pump, pumps with multiple screw arrangements are in use for a large variety of duties in upstream applications, both onshore and offshore.

BY HANS-JUERGEN SCHOENER

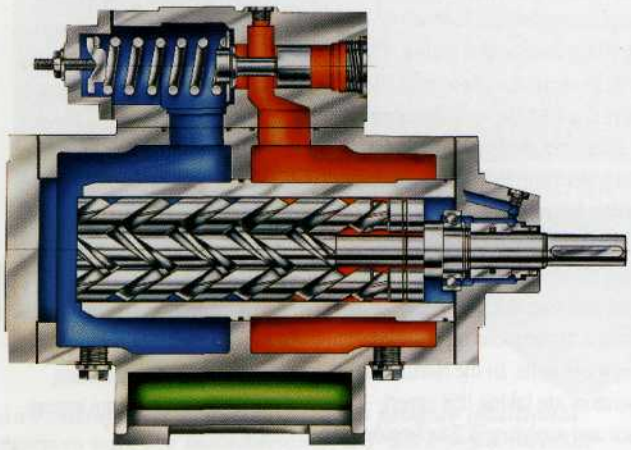
Screw pumps are rotary positive displacement pumps, which have certain advantages over other pump designs as centrifugal pumps or reciprocating pumps:

- The capability of handling liquids with low or very high viscosities.
- Higher efficiences, hence, lower power requirements.
- Low shear pumping of oil/water mixtures and crude oil emulsions.
- Pump flow rate almost independent of the back pressure.
- Self priming with high suction capability.
- Smooth and almost pulsation-free operation with low noise level.
- Capable of handling liquids with entrained gas. Multiphase pumps can handle up to 100 percent gas.
- Easy flow control by speed variation.

Founded in 1905, Leistritz, with headquarters in Nuernberg, Germany, is one of the largest global manufacturers and suppliers of screw pumps. The product program offers a vast range of screw pumps for upstream applications.

Three-Rotor Screw Pumps

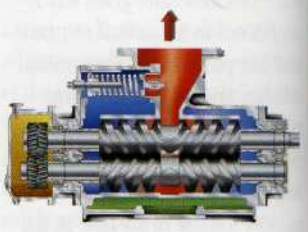
A set of three screws is installed in a pump casing. The centre screw drives the idler screws which are located on either side. The pumped product is carried in cavities formed between the three screws and the casing from the suction to the discharge side of the pump. A hydrodynamic liquid film between the drive screw and the idlers prevents immediate contact between the screws and ensures friction-free operation with no wear. Internal hydraulic balancing guarantees low load on the bearing. A single acting mechanical seal is provided for the drive screw.



Leistritz three-rotor screw pump -L3 Series

Three-rotor screw pumps can handle liquids with good lubricating properties and flow rates up to 720 m^3h at differential pressures up to 250 bar with viscosities ranging from 3 to 15,000 mm^2/s.
The majority of three-rotor screw pumps in upstream applications are used for the lube oil supply on diesel or gas engines, turbines, compressors and large gear units. The pumps are either directly installed to the equipment or part of lube oil systems, such as in accordance with API 614.
For crude oil with a low API gravity and differential pressures up to 130 bar, three-rotor screw pumps can also be employed as pipeline pumps or booster pumps. In these applications, screw pumps are often more cost effective than centrifugal pumps.

A variety of construction materials, including NACE compliant materials, is available for the pipeline pump range. The screws are usually surface hardened and a wear resistant coating for the liner can be provided. The units could be skid mounted with all required controls and driven by electric motors, gas or diesel engines.

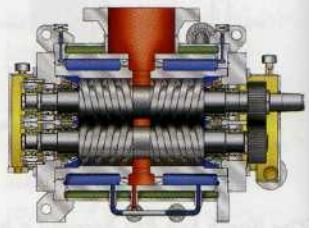


Leistritztwin-gearedscrew pump - L4 Series

Three-rotor screw pumps have only a few moving parts which results in long service life and easy maintenance.

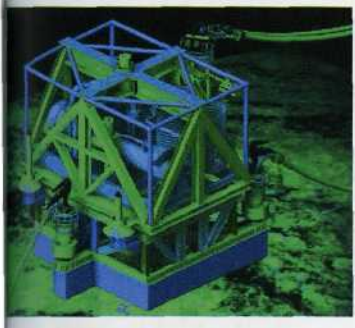
Twin-Geared Screw Pumps

Twin-geared screw pumps are usually of double volute design. The flow splits after entering the pump suction and is pressurized within the screw packages with opposed helix, which are installed in a replaceable casing insert (liner). As a result of this design, the pump bearings are not exposed to axial forces. The torque from the drive screw is transmitted to the idler screw by oil lubricated timing gears. Both screws are not in contact with each other. This makes twin-geared screw pumps particularly suitable for handling non-



Leistritzhigh-pressuremultiphasepump

Most multiphase pump applications can be found in remote locations with difficult infrastructure. They are installed in deserts, jungles or in arctic climates. The installations are mostly unmanned and subject to remote control. Beside the pump and drive, motor driven block valves, strainers, relief valves, lube and/or seal oil systems with on-skid piping and wiring are provided. Extensive skid instrumentation permits monitoring of the actual operating conditions and protects the unit against failures.



SBMS-500subseamulti-phase pumping system

Beside inverter driven electrical motors, gas or diesel engine driven pumps are used in areas with no power supply, such as in wellhead platforms.
An increasing field of application for multiphase twin-geared screw pumps is the subsea technology. A vast number of oil and gas reservoirs are located offshore at water depths of 1,000 m 3,280 ft) and more.

Based on a co-operative agreement between Petrobras, Curtiss-Wright (EMD) and Leistritz Pumpen GmbH, the SBMS-500 Subsea Multiphase Pumping System has been developed. After extensive testing at differential pressures in excess of 60 bar (870 psi), the system will be installed subsea in Brazilian waters at a depth beyond 500 m (1,640 ft) in the first half of 2006.

Increasing demands for higher flow rates and pressures have initiated research and development programs with the target to design new pump ranges for dry and subsea installations for differential pressures up to 150 bar (2,175 psi).

Leistritz Pumpen GmbH Joins Forces With Eptec AS

Eptec AS became a part of the Bj0rge Group in late 2004 and now belongs to Bj0rge Products & Systems. The Bjorge Group is listed on the Oslo stock exchange. As one of the leading suppliers of pumps to the oil & gas, land based process and marine industries in Norway, Eptec has been a market player since the 1980's. Eptec provides service to its customers through the main pump engineering centre in Oslo and their service support centres in Moss and Stavanger during the complete life cycle of the pumps.

Eptec endeavours to offer more cost effective solutions by focusing on better pump performance. The goal is always to enhance the customer's value chain using our experienced people, high ethical standards, products and engineering capabilities. Contracts for the Ormen Lange project and major FPSO converters/builders have been recently secured.

With over 650 employees, Bj0rge ASA delivers products and performs project and maintenance services for the oil and gas, land-based and marine industries. It is divided into two business areas - Products & Systems and Modifications & Maintenance Support. While the group's activities are mainly concentrated in Norway, export accounts for a substantial proportion of the sales of several of its companies.