Leistritz Screw Pumps & Systems

Cargo and Liquid Handling
Leistritz Screw Pumps and Systems

Leistritz Pumpen GmbH

Leistritz Pumpen GmbH with its headquarters in Nuremberg/Germany has been producing Screw Pumps since 1924. The first Leistritz Screw Pump was developed by Paul Leistritz as Main Lube Oil Pump for bearings of Steam Turbine Generator Sets.

With the worldwide largest product range of Twin, Triple and Five Screw Pumps, Leistritz offers today complete pump packages for a variety of applications.

Latest technology in combination with strictly controlled quality is the basis for the globally recognized efficiency and reliability of Leistritz Screw Pumps.

The testing of the pumps through all well known classification societies as ABS, BV, DNV, GL, LRS, RINA and others is made on Leistritz test fields to generate contribution to international shipping safety and maritime regulation.
FPSO and Produced Water

The offshore oil and gas industry uses Floating Production, Storage and Off-loading (FPSO) vessels in order to process and store gas or oil until it can be unloaded onto tankers or forwarded through a pipeline. FPSOs are very flexible and cost effective since they can also be used in deepwater locations without installing long-distance seabed pipelines.

During oil production not only crude oil is pumped but also produced water. The main elements of produced water are dispersed oil, chemicals resulting from treatment, salts and radioactive elements from minerals and heavy metals. For that reason all medium wetted parts of the Leistritz Screw Pumps are built of special materials in order to prevent pitting corrosion.

Leistritz Screw Pumps are responsible for boosting the produced water into a hydro cyclone where the remaining oil and sand will be extracted.

Tankers for Oil, Refined Products, Chemicals and Asphalt

The transport of liquid cargos at sea is done by different types of tankers depending on the nature of the cargo and how it can be transferred and off-loaded safely and efficiently. The pumps required have to be selected for most efficient operations taking into account pumping rate at different viscosities, stripping of tanks and flow lines and offering the best environmental together with safe service.

The reliability of Leistritz Screw Pumps provides the optimum pumping solution for most types of liquid cargo.
1. Leistritz Screw Pumps as Cargo Pumps for Asphalt Carrier

The cargo (asphalt) had been loaded into the tanks of the asphalt carrier at the tank terminal before transport. Leistritz Screw Pumps are used mainly for unloading the cargo from the asphalt carrier at the arrival port. Control of the trim and list of the ship can be done by transferring the cargo from tank to tank on board. The Leistritz Screw Pumps (cargo pumps) will also be utilized as circulation pumps to keep the cargo temperature or property under control during transportation of the highly viscous cargo. Arrangement with gas tight bulkhead additionally available.

1.2 Stripping Pump

There is no separate stripping pump installed on the asphalt carrier. The work of cargo and line stripping will be done through the cargo pump as well.

1.3 Slop Tanks

The slop tanks are designed to collect any cargo rests after tank cleaning from the connecting manifolds or pipes on the deck and spills.
Submerged Installation

2 Leistritz Screw Pumps as Deep Well Asphalt Cargo Pump

For unloading of the cargo products, Leistritz Screw Pumps can also be arranged as vertical submerged pump inside the tank of the asphalt carrier. Cargo of all viscosities – from kerosene to asphalt – can be unloaded and effectively stripped from tanks and suction lines. The pumps are designed as five-screw (or two-screw), single flow pumps for high-capacity unloading and stripping. Drives are suitable as electrical- or hydraulic motor.
Chemical and Oil Tanker

simplified illustration

Unloading Pipe Line
Unloading Pipe Line
Unloading Pipe Line
Unloading Pipe Line
Valve

Cargo Pump
Stripping Pump
Cargo Tank
Cargo Tank
Cargo Tank
Cargo Tank
Cargo Tank & Slop Tank
Manifold
Manifold
Blending station
Blender
Hose Crane
**Cargo Pump**
All different fluids from low viscosity diesel oil to high viscosity crude oil or molasses are handled with Leistritz Screw Pumps. The design principle and operation of these pumps ensure a very low noise level and almost pulsation free discharge.

**Stripping Pump**
All different fluids from diesel oil to crude oil or molasses are handled with Leistritz Screw Pumps. Good suction ability and capability to empty the tank, manifolds and lines.

**Special Applications: Bunkering Tanker**
Leistritz Screw Pumps can handle the wide changes of the viscosity in bunkering refueller tanker equipped with blending station. Viscosity ranges from 1 to 2000 cSt are possible without additional heating system.

**Pumping System adders available**
With the use of frequency controlled motors and nearly linear relation of speed and flow rate can be adjusted easily by changing the speed of the pump. Frequency convertor with air cooling or water cooling are available.
For changes of the viscosity and temperature, Leistritz offers a PLC to automatically adjust the speed of the pump.
As alternative, Leistritz Screw Pumps can be driven by hydraulic motors.
For pump room installation Leistritz offers a gastight bulkhead penetration seal (with type approval) allowing the motor to be installed in a non-hazardous area.
Available materials for pump casings are cast iron, nodular cast iron, cast steel, bronze and stainless steel for handling all different kind of fluids.
**Selection of material for wetted parts of Leistritz Screw Pumps for Produced Water Treatments**

### Chloride Content of Water

<table>
<thead>
<tr>
<th>Description</th>
<th>Chloride Content (PPM x 1000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshwater</td>
<td>+/- 1</td>
</tr>
<tr>
<td>Saline Water</td>
<td>1-25</td>
</tr>
<tr>
<td>Seawater</td>
<td>25-50</td>
</tr>
<tr>
<td>Salty Water</td>
<td>&lt;50</td>
</tr>
</tbody>
</table>

In order to select the optimal pump material, it is necessary to know the chloride content of the produced water.

The influence on critical temperature for initiation of pitting (CTP) for different rust-resistant steels in chloride solutions is mentioned in the adjoining diagram.

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**Electric Dehydrating System**

- **A**: Oil Well
- **B**: Settling Tank
- **C**: Storage Tank
- **Electric Dehydrator**: Leistritz Dehydrating Pump, Leistritz Forwarding Pump
- **Heat Exchanger**: Fresh water, brackish/saline/salty water, seawater/salty water ppm

*ppm = parts per million (e.g. 1ppm = 1 part oil in 1 million parts water)
One method used to separate water from oil in offshore oil fields is the principle of electrostatic separation. Leistritz Dehydrating Pumps, series L4, are used for the supply of the electrostatic separator. The water content of crude oil is a very important parameter that characterizes the grade or quality of the crude oil. In general a water content (BSW) of 0.2 % to 0.5 % by volume is considered as acceptable.

The small water drops in crude oil are getting separated in a strong electric field. Cathods and anods attract small water drops in order to form bigger ones. This procedure enables an easily water separation from crude oil.

After the electrostatic separation Leistritz Triple Screw Pumps, series L3, are used for transferring oil from the settling tank to the storage tank in the FPSO vessel.

Formation water or produced water are usually produced along with oil and gas from a well or well cluster. The produced water is separated and treated to minimize the oil and solids content. Leistritz L4 Pumps are used to boost high pressure produced water injection pumps for pressure maintenance of the reservoirs.

As boosting equipment, Leistritz L4 Pumps will transfer oil from the first stage separator to the electrostatic Dehydrator. Two Pumps shall run in parallel, one standby. Leistritz L4 Pumps will be part of the process treatment module (FPSO deck).

Leistritz L4 Pumps will transfer the crude oil from the crude oil tank to the Oil Tanker. Low NPSH requirements and reliable flow, free of turbulence are the major advantage for Leistritz L4 Pumps.
**Electro-hydraulic Control System**

The Independent load control of cargo pumps and side thruster connected to main close loop hydraulic system is generally arranged both remotely and locally.

The Cargo Pumping System is controlled by a Programmable Logic Controller (PLC) installed inside the control panel. The PLC is programmed by HHI and provides the logic for safe operation and easy maintenance of the control system.

The control panel contains a potentiometer and pressure gauge for each pump, for stepless independent load control. Electrical connections run between the control panel and a proportional valve/amplifier located in a safe area, where the electronic control signals are transformed into hydraulic signals.

Only hydraulic pilot lines run between the proportional valve/amplifier and the individual pumps. This control system can be interfaced to any central ship computerizing system.
Leistritz Cargo Control

Ex-Zone

- Ex d/Ex i
- Lub Oil System
  - Flow switch
  - Pressure Transmitter
  - Level Switch
  - Temp. Transmitter

- Local Control Panel
  - Start, Stop, ESD

- 2 x Bearing Temp. Transmitter
  - 1 x Medium Temp. Transmitter
  - 1 x Vibration Sensor

- Junction Box
- Ex d/Ex e

Non-Ex-Zone

- PLC Based (Cabinet)

- VFD (Cabinet)
  - Control Panel

- Power Supply
  - Customer

simplified illustration
# Leistritz Screw Pump Programm

<table>
<thead>
<tr>
<th>Series</th>
<th>Use for</th>
<th>Leistritz Screw Pump</th>
<th>Maximal Performance Data</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>L2</strong></td>
<td>Low pressure duty, suitable for transport of light abrasive and corrosive, high or low viscous fluids with poor or good lubricity.</td>
<td><img src="image" alt="Leistritz Screw Pump" /></td>
<td>Capacity: 900 m³/h [3,960 gpm]</td>
</tr>
<tr>
<td><strong>L3N</strong></td>
<td>Low pressure duty, suitable for transport of non abrasive lubricating fluids.</td>
<td><img src="image" alt="Leistritz Screw Pump" /></td>
<td>Capacity: 700 m³/h [3,100 gpm]</td>
</tr>
<tr>
<td><strong>L3M</strong></td>
<td>Medium pressure duty, suitable for transport of non abrasive lubricating fluids.</td>
<td><img src="image" alt="Leistritz Screw Pump" /></td>
<td>Capacity: 300 m³/h [1,320 gpm]</td>
</tr>
<tr>
<td><strong>L3H</strong></td>
<td>High pressure duty, suitable for transport of non abrasive lubricating fluids.</td>
<td><img src="image" alt="Leistritz Screw Pump" /></td>
<td>Capacity: 200 m³/h [880 gpm]</td>
</tr>
<tr>
<td><strong>L3V/U</strong></td>
<td>Ultra high pressure duty suitable for transport of light abrasive and corrosive, high or low viscous fluids with poor or good lubricity.</td>
<td><img src="image" alt="Leistritz Screw Pump" /></td>
<td>Capacity: 180 m³/h [792 gpm]</td>
</tr>
<tr>
<td><strong>L4</strong></td>
<td>Low, medium and high pressure duty, suitable for transport of abrasive/non abrasive, corrosive/non corrosive, lubricating/non lubricating, high or low viscous fluids.</td>
<td><img src="image" alt="Leistritz Screw Pump" /></td>
<td>Capacity: 5,000 m³/h [22,000 gpm]</td>
</tr>
<tr>
<td><strong>L5</strong></td>
<td>Low pressure duty, suitable for transport of light abrasive and corrosive, high or low viscous fluids with poor or good lubricity.</td>
<td><img src="image" alt="Leistritz Screw Pump" /></td>
<td>Capacity: 1,700 m³/h [7,500 gpm]</td>
</tr>
</tbody>
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