

FELUWA MULTISAFE Pumps

Working Principle

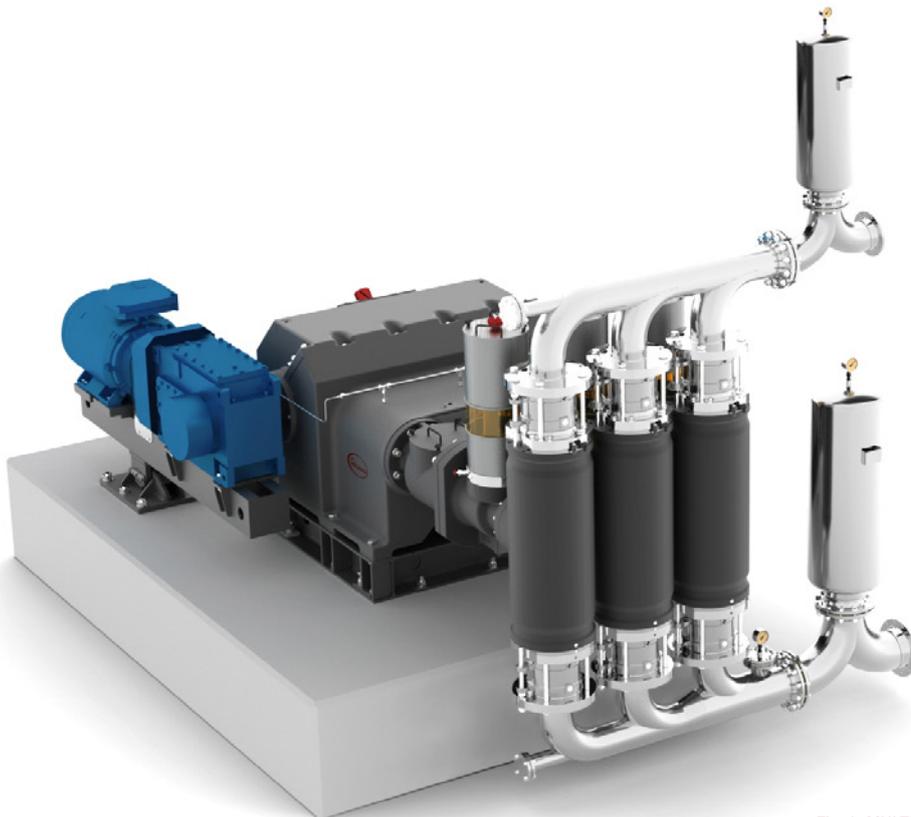


Fig. 1: MULTISAFE Double Hose-Diaphragm
Process and Transportation Pump,
Triplex Configuration

Positive displacement (PD) pumps are preferred when handling high pressure at high efficiencies. The principle of a reciprocating PD pump is shown in Fig. 2. The piston is moved by a mechanical crank shaft gear and continuously changes the volume in the pump head. Two check valves at the pump head provide flow in one direction, only. Flow is not continuous: When the piston moves towards the gear side (suction stroke), the pump head is filled with medium through the lower check valve. When the piston moves towards the pump head, the lower check valve closes and the flow is directed through the upper (discharge) valve into the (pressurised) system. The flow curve follows the motion (displacement) of the piston, thus showing a sinusoidal flow (discharge phase) followed by a phase without flow (suction phase).

However, piston pumping systems, as described above, have a great disadvantage: The slurry is always in contact with piston and sealing system. Abrasive fluids will reduce the lifetime of the seals. Special materials, like duplex stainless steel, have to be chosen for the pump housing when pumping corrosive media (e.g. tailings with sea water). Using a piston pump for these applications will result in high costs for wear parts and maintenance and low availability of the system.

To avoid this direct medium-metal contact, a flexible hose-diaphragm is inserted into the pump housing (Fig. 3). The slurry is fully enclosed by the hose-diaphragm and led in a linear flow path from the suction valve to the discharge valve. The connection between hose-diaphragm and piston is provided by a non-compressible liquid.

As per Fig. 4 and 6, the hose-diaphragm is completely filled with medium at the end of the suction stroke and shows a cylindrical shape. Fig. 5 and 7 show the compressed diaphragm at the end of the discharge stroke. The diaphragm is never stretched, thus providing an almost unlimited lifetime.

The hose-diaphragms do not cover any load, because the pressure inside and outside is always equal. Only the hydrostatic load, coming from the slurry inside and the hydraulic liquid outside, has to be covered by the diaphragms (see Fig. 8). The hose-diaphragms are not considered as wear parts in this pump, because this physical effect is the reason for the long lifetime.

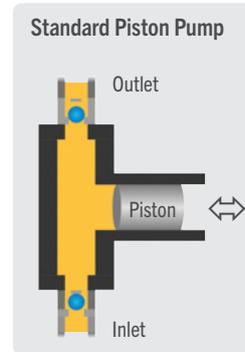


Fig. 2

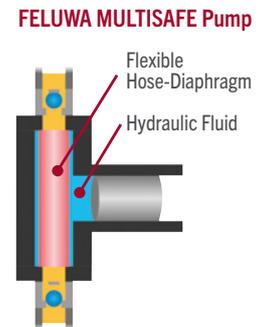


Fig. 3

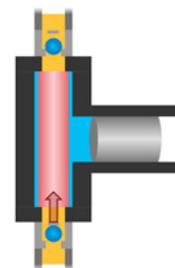


Fig. 4

End of suction stroke

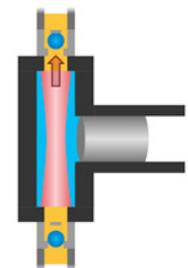


Fig. 5

End of discharge stroke

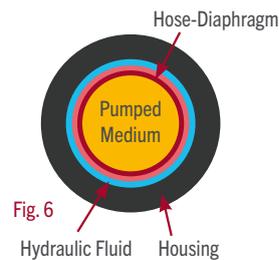


Fig. 6

Hydraulic Fluid Housing



Fig. 7

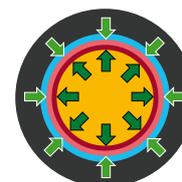


Fig. 8

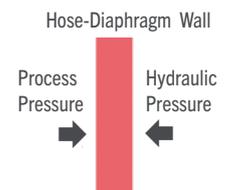


Fig. 9

Hydrostatic pressure by surrounding hydraulic liquid

- Pressure inside and outside the diaphragm is equal
- Hose-diaphragm is not covering any pressure

Medium in contact with inside of hose-diaphragm only