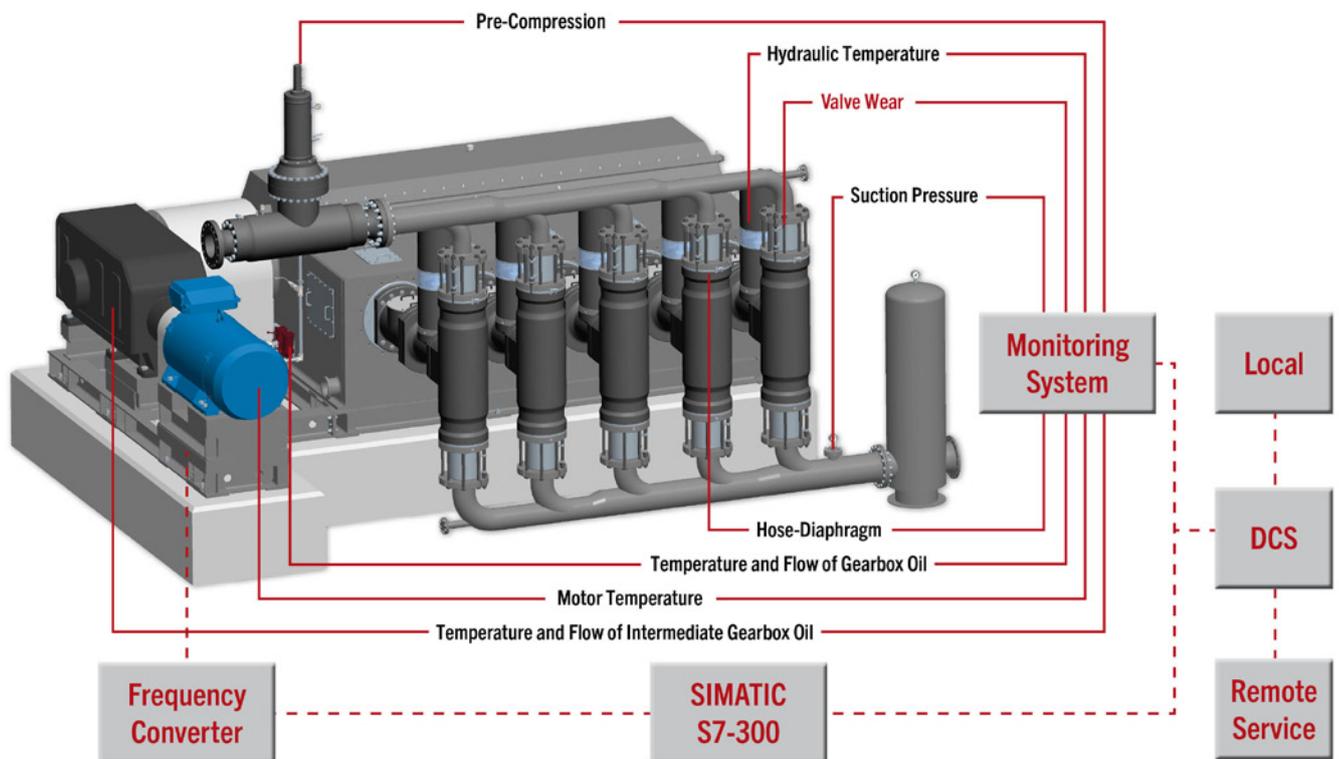


FELUWA Online Diagnostics

Pump Condition Guard (PCG)



MULTISAFE double hose-diaphragm pumps are designed to avoid sudden deviation from admissible working conditions and unplanned downtime. For additional backup of failsafe characteristics, MULTISAFE pumps utilise an overall diagnostic system for permanent con-

dition monitoring of essential components and parameters. Readings are recorded with trend and allow for complete tracking of the history over weeks.

Permanent Online Diagnostics

Diagnostics of Check Valves (see Fig. 1 and 2)

The measuring principle is based on the analysis of solid-borne sound and capable of detecting leaks between valve seat and ball/cone even if the loss of flow is < 1.5 %. By means of the FELUWA Valve Performance Monitoring System (FVPMS) availability and operating safety of the pumps are significantly increased and maintenance costs decreased accordingly. The FVPMS provides reliable information as to which of the check valves is leaking and might require replacement. Preventive maintenance is thus turning into a phase-out model.

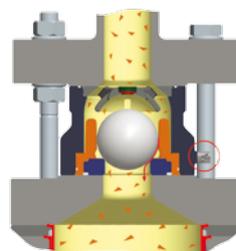


Fig. 1: Sensor at the valve casing



Fig. 2: Sensor

Diagnostics of Hose-Diaphragms including Clamping Area

The space between the two hose-diaphragms is unpressurised. If one of the hose-diaphragms leaks or fails, either conveyed fluid or actuation fluid will penetrate into the space and build up pressure, which is inevitably led to the hose-diaphragm condition monitoring unit. Unlike traditional diaphragm piston pumps, no conductive measurement is required for condition monitoring, but a pressure sensor only (see Fig. 3 and 4). Since the pump only requires one of the hose-diaphragms to perform, operation can be maintained without reduction of pressure or volume until the system allows for a shutdown for repair. Condition monitoring of hose-diaphragms also includes the clamping area. It ensures reliable detection of even smallest leaks in the clamping area of both hose-diaphragms.

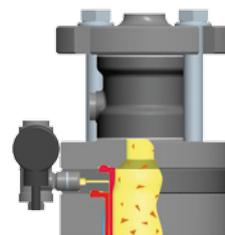


Fig. 3: Pressure sensor

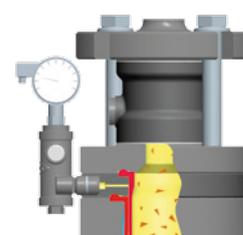


Fig. 4: Pressure gauge (or contact pressure gauge)

Diagnostics of Inlet & Suction Pressure

Unrestricted inflow is essential for trouble-free pump operation. For reliable supervision of the suction pressure, diaphragm-type pressure gauges are applied, which have especially been designed for slurry handling applications (see Fig. 5).



Fig. 5: Special diaphragm-type pressure gauge

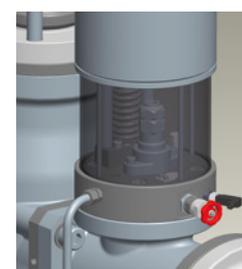


Fig. 6: PT 100

Diagnostics of Hydraulic & Gearbox Temperature

Supervision of hydraulic and gearbox oil and motor temperature is made by means of PT 100 temperature sensors (see Fig. 6).

Diagnostics of Precompression of Pulsation Dampeners

Of course, precompression of pulsation dampeners is likewise subject to permanent control by the Pump Condition Guard.