

CONTINUOUS PUMP-MONITORING IN HEAT-TRANSFER SYSTEMS WITH IN-1000

PUMP-MONITORING IN TIMES OF INDUSTRY 4.0 & IOT

High-performance ALLHEAT® pumps from Allweiler® are essential for moving heat transfer oils in many of their production processes. Top priorities in selecting a pump are the safety of employees and systems, system availability, and a low total cost of ownership.



ALLHEAT® thermal oil pumps used at Alpenhain

HIGH PUMP REQUIREMENTS

In order to maintain a high level of quality in the production process, heat-transfer pumps must work safely and reliably. These pumps are commonly subjected to high loads. At the same time, failure of a pump can have serious consequences, especially if hot oil escapes. This makes operators of heat-transfer systems very sensitive to leakage. Consequently, engineers walk a fine line when designing shaft seals in heat-transfer pumps. While it is normal for water (mostly in vapor form) to escape through the sealing clearance, any escaping heat transfer oil will be readily visible. Therefore, although leakage must be kept low, it is critical to avoid overloading the seal. The high loads on the pump are the result of high temperatures and large temperature differentials as well as decomposition reactions that may occur when the heat transfer liquid is subjected to excessive thermal loads. In particular, chain-like hydrocarbons decompose over time into "low boilers" and "high boilers". If the proportion

of low boilers is too high, the pump may cavitate. High boilers accelerate wear on the pump and appear in many forms, from bitumen-like consistency to extremely hard carbonized products. Both threaten the pumps' bearings and shaft seals. Using synthetic heat-transfer oils reduces formation of low and high boilers, but the low viscosity and low lubricity of these materials means that they have disadvantages as well. Tribological loads on the gliding components of mechanical seals are particularly high.

THE BENEFITS OF CONTINUOUS MONITORING

Manufacturing processes use special Allweiler® heat-transfer pumps to move oil at about 250 up to 400°C. Pumps of the ALLHEAT® series are in service in the main train 24 hours per day, seven days per week.

Additionally, the "IN-1000" condition monitoring platform from Allweiler® monitors the mechanical seal, the temperature of the bearing and the pump vibration. If any of the monitored parameters reach predefined initial or secondary thresholds, IN-1000 reacts with appropriate warning or alarm messages. Status is indicated directly at the pump on the graphical display, so pump operators can react quickly. Optionally the signal can be transferred via Ethernet to a possible control room or wireless to mobile devices. "Green" indicates normal operation; in most cases, "yellow" simply means that service must be planned for the pump. Excessive leakage or high temperature at the bearing indicate that the seal has begun to wear out or that the pump bearing requires replacement. A high level of vibration indicates faulty alignment or damage to the coupling. This gives the operator an opportunity to plan ahead for replacement or repair and avoid unanticipated interruptions to production. However, if the traffic light turns "red", immediate intervention is required, maybe up to causing the production to stop.

In some cases, environmental conditions are very harsh. Some of the pumps (and IN-1000) are even located outdoors, but this poses little problem thanks to the IP 54 protection class and robust design of IN-1000.

POSITIVE EXPERIENCES

The Condition-Monitoring-System, IN-1000, is designed in a modular manner. This flexibility allows the System to tailor the module combination to a best fit for the monitored process. The system is using a Master-Satellite-Combination to be able to serve the needs from a simple condition monitoring task to complex monitoring of an multi pump system with product family. The desired capability to have remote access via network is reflected in the IN-1000 Master module already. Right now the Master Module is equipped with an integrated Web-Server. This connection allows remote access to the Master Module via a Web-Browser or a customized interface from an existing process monitoring system through an Ethernet link.

Customers are pleased with the results. From the very beginning, IN-1000 has given them an effective way to optimize their pump units. Regularly, investment in IN-1000 quickly pays for itself. For example, at one particular customer site, monitoring with IN-1000 revealed that 75% of their pumps were improperly aligned. Improper alignment results in extreme vibration, which causes long-term damage to the pump bearing and premature failure. This alone has saved several thousand euros in damages.

Customer's next step is to accurately determine how their pumps are used on a daily basis and then dimension the pumps accordingly. The integrated data logging function of IN-1000 will provide valuable data for this project. They can then find other ways to optimize their pumps, such as speed control or pump replacement.

CUSTOMER FEEDBACK

Together with our Service Partner FI.W (Fischer Industrie- & Wärmetechnik) we installed a pilot system at the company Alpenhain. Alpenhain is a leading company at the food industry.

At Alpenhain the Allweiler® Thermal Oil Transfer Pumps are a major component in the production process. Starting with a pilot application, Alpenhain decided to expand the IN-1000 Pilot system.

A System with one Master and three Satellite devices, to monitor their high critically transfer thermal oil pumps, is in preparation. The focus of the IN-1000 operation is to monitor the pump leakage, the pump bearing temperature, and the vibration for pump and motor.

At the last customer visit, Mr. Eckl, Alpenhain's technical leader, and Mr. Fischer from company FIW, are very pleased with the system setup – pump and monitor device “IN-1000”.

“The monitor device “IN-1000” full fill all our requirements and we are thinking about to add the IN-1000 system to three further Allweiler® pumps” – Mr. Eckl from company Alpenhain.

LONG-TERM SAVINGS

Another benefit of using IN-1000 will be noticed over the next few years. Since it reliably detects when the seal has actually worn to a critical level, there is now much less need for preventive maintenance. IN-1000 gives operators the ability to fully exploit the long service life of high quality pumps. As a result, typical maintenance costs for pumps in heat transfer systems are reduced by up to 50%. For this reason alone, this simple yet effective system pays for itself within a short period of time and gives operators of heat transfer systems the security of knowing that they have everything under control at all times.

This monitoring device can be mounted on new pumps or retrofitted to older pumps at any time.



IN-1000 indicates normal operation of the monitored pumps.