HYDAC INTERNATIONAL

Fluid Condition Monitoring

Continuous Fluid Monitoring on Hydraulic Test Rigs

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HYDAC Your Professional Partner for Condition Monitoring on Test Rigs.

The importance of monitoring oil

Hydraulic manufacturer Casappa in Italy is installing a Condition Monitoring solution from HYDAC on test rigs in its Production and Development departments as part of its quality assurance.

Solid particles and other contamination in the hydraulic oil can be monitored continuously with the aid of simple solutions. Oil ageing can also be identified in this way.
The hydraulic manufacturer Casappa in Italy has achieved remarkable results in this way with regard to quality management and savings.

In dynamic hydraulic systems which are operating continuously, every disruption in the cycle means a loss of time and money which is no longer acceptable. In addition to good filtration, an understanding of the oil condition, oil quality and the contamination present can be a crucial step in achieving higher operating reliability in the system. This is also particularly important for the manufacturers of test rigs.

One reason: End customers stipulate that the system suppliers provide certification of the fluid conditions during testing and demand a test report giving the contamination class of the oils used. Sometimes they even require a report showing how the contamination altered during the test. Conclusion:
The manufacturer needs a functioning condition monitoring system like the one the system specialist, HYDAC, has supplied.

Reliable monitoring is a measure of quality

The hydraulic manufacturer Casappa in Italy deals with numerous test rigs. In this situation it was necessary to implement reliable and continuous monitoring of the oil condition.
At Casappa there are two main groups of test rigs: the test rigs which are used in the Research and Development department and those used in the Production department.

The test rigs used in R&D **(Fig. 1)** have two basic purposes. First and foremost they are used to validate the performance of new solutions and prototypes as well as the operating characteristics of the products – or parts thereof – and to determine the effectiveness of product modifications before going into production.

A second group of test rigs, however, is used to carry out fatigue tests on pumps, motors and flow dividers. All these test rigs are therefore in continuous operation. There are 14 test rigs, each of which has its own tank and a 3 µm filtration unit. The continuous monitoring is important not only because of the solid particles but also as a means of monitoring the ageing of the oil. On test rigs like this with a constant pressure load, it is imperative to have specific oil change cycles.

Fig. 1: 14 Pumps and motor test rigs

Quality management in routine production

In addition it is also important to monitor the viscosity in the test rigs since any change will have a direct effect on many of the pump's operating parameters – for example the flow rate.
The test rigs in the Production department **(Fig. 2)** on the other hand have to meet a variety of requirements: In this case the test rig represents a system which completes the production cycle.
This means it is a station through which all manufactured pumps and motors pass, at which the pumps and motors are function-tested and at which the settings of the monitoring instruments – if present – are set. 12 multi-station test rigs are in operation with a total of 24 testing stations.

Fig. 2:
12 test rigs with a total of 24 work stations

These test rigs are more complex because they have to remove the solid contamination resulting from machining and which are still in the pump: each test rig therefore has two tanks, one of which is for the “dirtier” oil. This is used for initial commissioning of the pump and during the “running-in”, and is where the majority of the solid contamination is collected.

The oil in the second tank, called the “flushing tank”, is not used during the running-in phase and remains cleaner. This tank is used for the end phase of testing and for “cleaning” the pump. In this end phase, the pump is running at top speed and therefore at a high oil supply rate to remove any remaining microparticles. The certification of the characteristics of the oil used to carry out the test is in correlation with the cleaning phase.

The filtration in the two tanks is also different: in the running-in tank, there is a pre-filter and a filter with a filtration rating of 25 µm and a 10 µm offline filter. In the “flushing filter” a 3 µm filter is provided. The monitoring in the two tanks differs too: in the tank containing the oil for the running-in phase, the particle sensor is essential since it monitors the presence of solid contamination and is an efficient way of determining when the filter cartridges are to be changed. In the flushing tank the main function of the sensor is to certify precisely the conditions in which the pump was cleaned.

Correct measurement results rely on coordination of pressure and flow rate

For the test rigs in the Production department, monitoring the oil ageing is less important because the large number of tests carried out in one day consumes a considerable amount of oil

which is frequently topped up. After using a variety of widely available equipment during testing, experience has shown how important it is to monitor pressure and flow rate on the contamination sensor.

These were factors for consideration at the time it was decided that the Contamination Sensor CSM 2000 was more suitable.
This is a self-sufficient unit with built-in motor-pump unit **(Fig. 3)**. The flow and pressure supplied is monitored and this has a very positive effect on the quality of the results of the built-in particle sensor CS 2000.

On the version which Casappa installed, the module has an ethernet output to enable each unit to be connected to

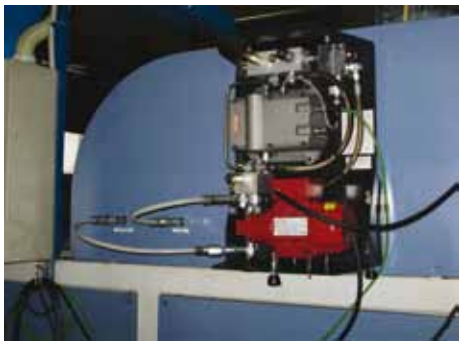

Fig. 3:
HYDAC Module CSM 2000, installed next to the tank on test rig in the R&D department. To the left, connections (IN/OUT) to the tank.

the computer network and to carry out monitoring and data management in real time.

Up to 30 test rigs monitored simultaneously

In this connection it must be mentioned that HYDAC developed special software to Casappa's specification which is capable of monitoring all installed units (up to 30 modules) and to manage the data.

On the test rigs in the R&D department, the CSM 2000 is supplemented by what is known as the HYDACLab® **(Fig. 4).** This is a multi-functional sensor used to monitor the relative humidity as well as changes in viscosity and in the dielectric constant. On the test rigs in Production, the CSM 2000 **(Fig. 5)** is however replaced by an AS 1000 **(Fig. 6)**, a sensor which detects water in oil.

The user is more than satisfied with the results

Pietro Dardani, Test Department Manager at Casappa, is won over by the new Condition Monitoring solution. Until now monitoring was carried out by taking oil samples at specific intervals and these were then analyzed in a particle counter. This involved a huge commitment of time and expense.
Since the Condition Monitoring solution from HYDAC is now in operation, some important results have already emerged. Pietro Dardani explains: “On the test rigs in the R&D department, monitoring has meant we can extend the intervals for changing the oil and filter cartridges.”

A further important factor is the time saved, as the specialist underlines: “Previously, one person had to take oil samples from all 14 test rigs each

Fig. 4:
Oil condition sensor HYDAC Lab®

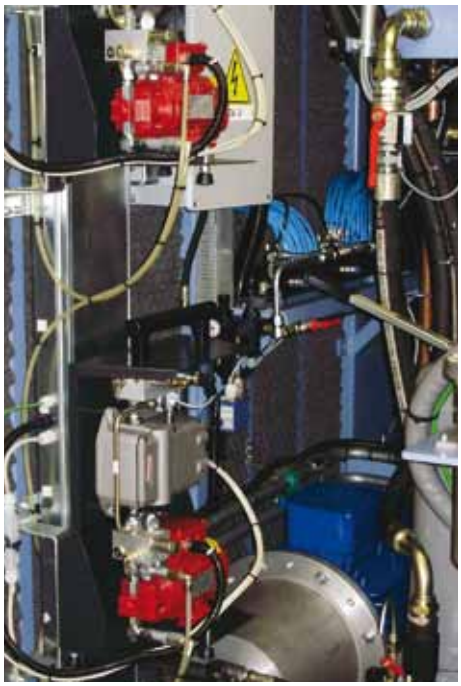

Fig. 5:
Each module monitors the contamination in a tank

week and test the oil samples using a mobile particle sensor. This was a time-consuming procedure which also only produced out-of-date results.”

In the course of the project, Pietro Dardani also recognized, “that you certainly

Fig. 6:
The AquaSensor built into Casappa's test rigs in the Production department measures the water saturation

develop a greater awareness of the oil through Condition Monitoring” **(Fig. 7).** He and his team are confident that starting next year, oil consumption might be reduced by 25%. The figures have yet to be confirmed precisely, but it is likely even greater savings are proposed in terms of the quantity of filter cartridges, now that filter changes are based on accurate data. And what is more, the member of staff who was responsible for maintaining the test rigs, is now gradually being freed from this duty in favour of more productive tasks.

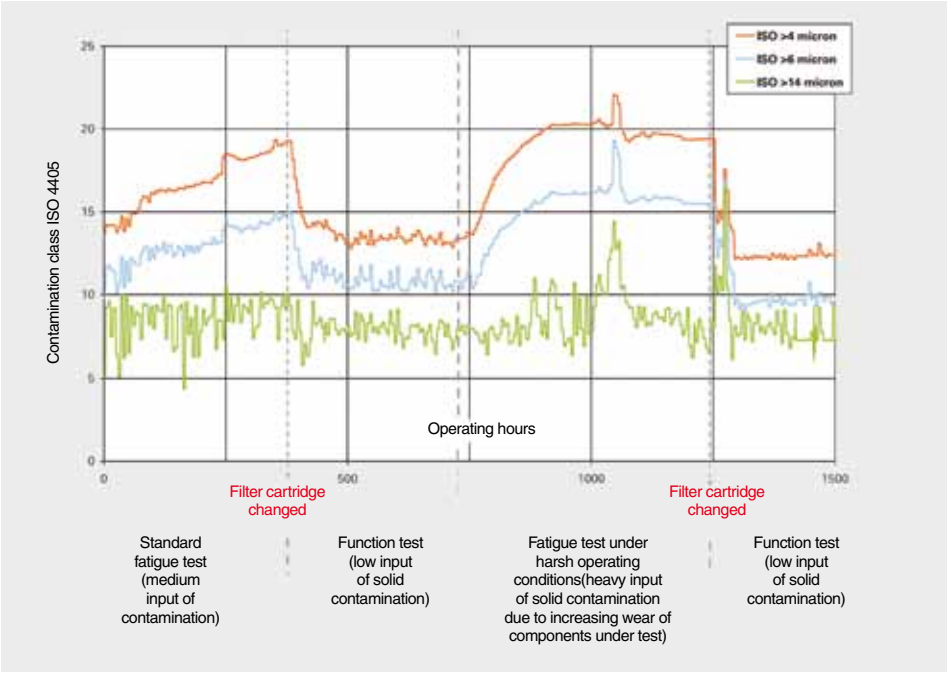

Fig. 7:
Levels of contamination according to ISO classification and the change in levels

Cat.: Accumulators E 30.000

Catalogue: Fluid Filters E 70.000

Cat.: Process Technology E 77.000

Brochure: Filter Systems DEF 7.929

Br.: Compact Hydraulics DEF 5.300

Catalogue: Accessories E 61.000

Catalogue: Electronics E 180.000

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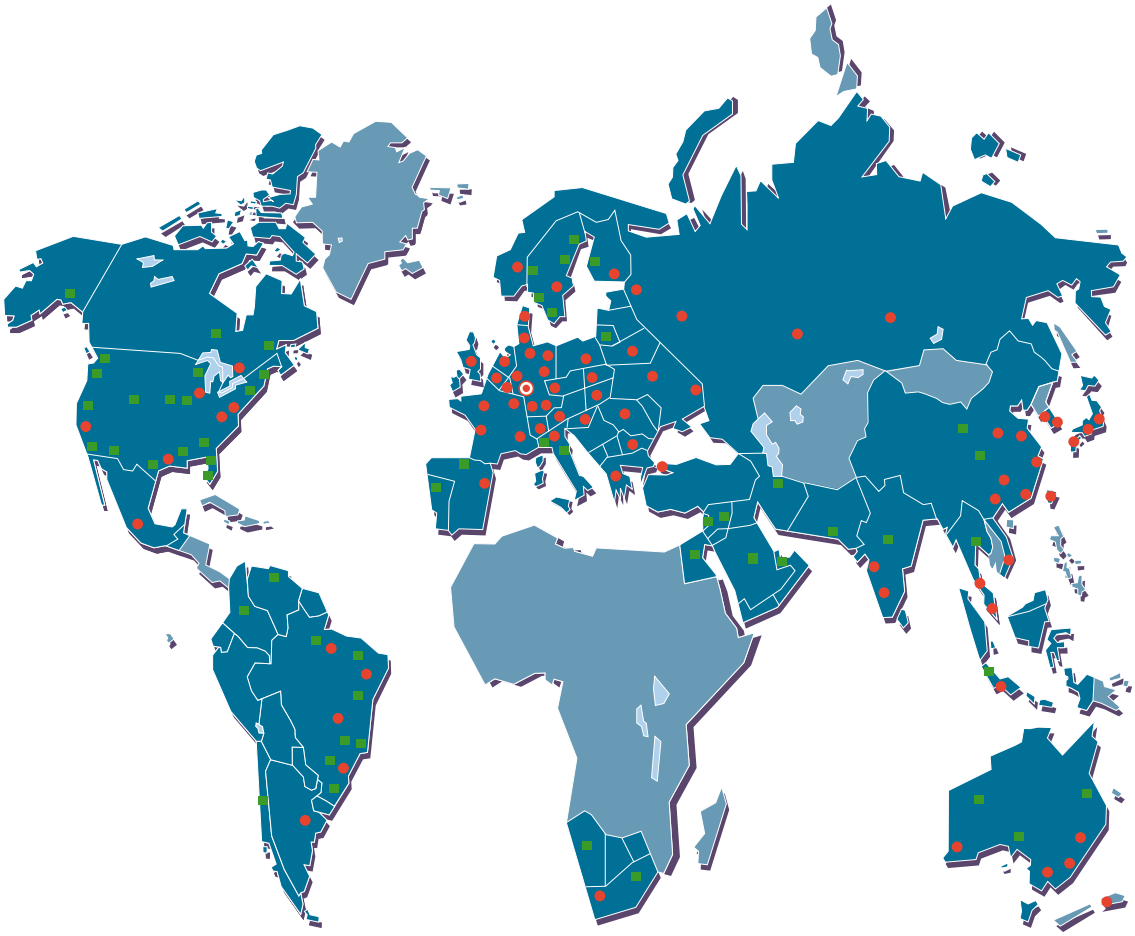

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