Result

- ✓ Oil contamination was detected early and the service organization notified in time to avoid break down
- ✓ Planned and limited loss of production

Solution

- ✓ Online condition monitoring
- ✓ Automated alarm tuning
- ✓ Standard Machine Module with criteria's for approx. 120 values – both for vibration and other process values
- ✓ MIVA® Master with the Software PEMAC for Condition Monitoring.
- ✓ PEMOS – PEMAC Operation Services – VIKONs remote operational services

Challenge

- ✓ Running the machine as long as possible without jeopardizing the production
- ✓ How to predict non-linear fault occurrences
- ✓ Implement condition based maintenance

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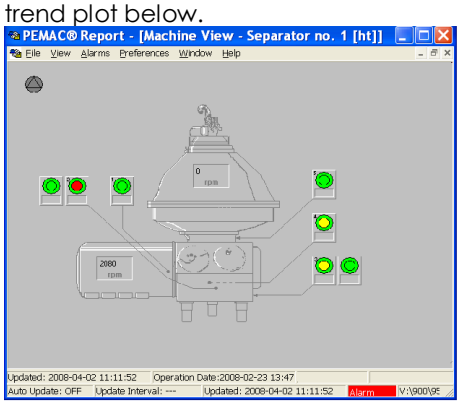
Detection of gearbox oil contamination

A separator had been running good for a long time. After service in February gear and bearing indications suddenly appeared. A significant drop in bearing temperature could also be noted. An additional service action in the beginning of March managed to improve the condition temporarily but the underlying problem was not solved. At the end of March the condition deteriorated quickly. The MIVA® system provided accurate indications of the problem; gearbox oil contamination. This made it possible to plan and perform proper service actions in good time before breakdown. This case confirms that temperature measurements can be used to detect leaks and oil contamination. It also demonstrates the power of the RFA Trend and the Standard Machine Module.

Indications from MIVA® Master

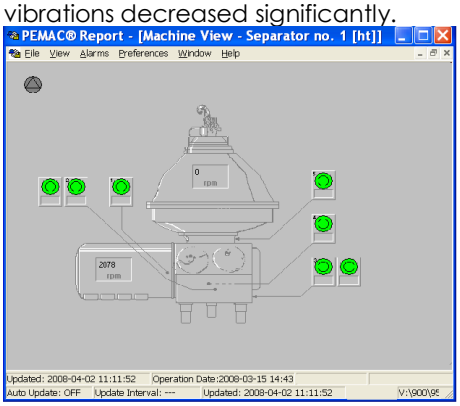
According to the MIVA® system the Separator 1 had been running very good for a long time except some spurious warnings on high acceleration on measurement point 2. The bearing temperature was around 97°C and the oil temperature 63°C.

Service was performed on the 4 February. Seal rings on the sliding bowl bottom were replaced. The separator seemed to be OK when it was started after service. However, the bearing temperature almost immediately dropped to 80°C and soon vibration warnings started to appear in the MIVA® system. Indications on high acceleration and friction forces were reported in the PEMOS-report of weeks 6, 8 and 10. The K-model indicated problems with the gear. The bearing temperature level kept around 80°C but with large fluctuations, see the trend plot below.



Machine condition at 23 February, after first service

The next service was performed during the 10 and 11 March. The bowl speed had been lower than normal according to the customer. The engineer found that a seal ring on the bowl hood was not in the correct position; dirt was found under the ring. The sliding bowl bottom may also have been slightly out of position. A minor service was performed and the vibrations decreased significantly.



Machine condition at 15 March, after second service

The oil temperature continued to decrease after service and occasionally went below 50°C. The bearing temperature decreased even more and the 23 March it reached the same level as the oil temperature. The vibration condition also started to

VIKON
Smart Condition Monitoring and Rotor Balancing

VIKON is a global supplier of Smart Condition Monitoring Solutions and Rotor Balancing for all kinds of machinery. Our systems and products are found in many different Industries, in more than 20 countries worldwide. We have been helping our customers for over 30 years in achieving the best possible Overall Equipment Effectiveness(OEE) and Asset Management(AM).

Solution components

MIVA® Master

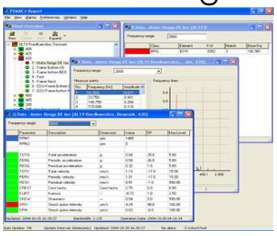
MIVA® Slave

Vibration Sensor

Speed Sensor

Temp. measurement

PEMAC® SW for Condition Monitoring



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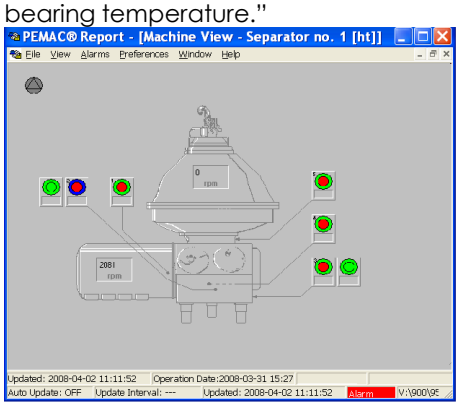
deteriorate again. The vibration pattern was similar to that found in February and the K model indicated gear and multiple bearing defects. The first blue(serious problem) MIVA® alarm breached on the 23 March. The condition continued to deteriorate quickly. Acute gear and bearing indications were reported in the PEMOS report issued on the 31 March. Sudden multiple component indications are usually caused by oil contamination. Therefore, the report also stated: "Machine condition is quickly deteriorating. Check oil and consider major service. Very low bearing temperature."



Machine condition at 31 March, at time of COSMOS Report

The outsourced service organization responded to the PEMOS Report and visited the plant at the 1 April. Plenty of product was found in the oil; there should be 12 liters of oil but the gearbox contained 20 liters of liquid. The spindle and all the bearings were replaced. The gear was not replaced because it seemed to be in good condition. Data collected by the MIVA® system the day after service confirmed that the vibrations are back to normal as well as the bearing and oil temperatures.

RFA and Temperature Trends

The Risk Factor Average (RFA) is a single parameter which represents the general condition of a machine by measuring the "distance" from normal machine condition. The larger the value is the further from normal condition the machine is. The RFA can be used to track changes in condition over time. The RFA does not point out any particular fault source. The power of the RFA trend is in its simplicity and its ability to indicate when it is time to perform a deeper investigation.

The diagram below shows the RFA and the temperature trends for Separator 1. The labels indicate the reported service actions. Note that the temperature readings are not included in the calculation of the RFA value. In this case the RFA Trend has proven to be an excellent measure of the overall machine condition. Also note that the bearing temperature provides a very early indication of incipient the problem.

Conclusions

The MIVA® system provided clear indications of the deteriorating machine condition. This made it possible to plan and perform proper service actions in good time before breakdown.

The main problem in this case was contamination of the gearbox oil which damaged the bearings and caused increased gear vibrations. The contaminating liquid was probably leaking from the bowl. The drop in bearing and oil temperature indicate that the first leaks appeared after service at the 4 February. The next service improved the condition temporarily but did not solve the problem. Maybe the leak was sealed but the oil was already contaminated. This case confirms that temperature measurements can be used to detect product leaks and oil contamination at a very early stage.

This case shows that the RFA trend is a powerful tool for machine condition monitoring. It provides a simple but reliable indication of the overall machine condition.

The EDU signals, which were missing, had probably been very useful in the vibration analysis during this case. However, the available data was sufficient to draw correct conclusions. Actions will be taken to detect missing EDU signals in the future.