SPM HD® Case Study

Wash Press, Zellstoff Pöls AG

by

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Contents

1 Introduction ............................................................................................................................................. 3
2 Conclusion and summary ...................................................................................................................... 3
3 Application description ....................................................................................................................... 4
4 System setup ......................................................................................................................................... 5
5 Case description .................................................................................................................................... 6
1 Introduction

This case story describes test measurement performed at Zellstoff Pöls AG in Austria using the SPM HD® method. The method has been applied on a wash press in the pulp mill’s bleaching plant.

2 Conclusion and summary

Until the time of the test installation, this pulp mill had exclusively been using vibration measurement. The customer, therefore, was quite reluctant when informed about the possibilities of the new SPM HD® method.

We agreed to do a test installation on a machine where vibration measurement did not deliver reliable results.

A decision was made to perform the test on a 'Metso' wash press. The measuring system was running smoothly for a couple of months, but unfortunately there were no indications of deteriorating bearing condition. It was therefore agreed to move the installation to a different machine.

However, when evaluating the results in early November together with the customer, we noticed an increase in the BPFO trend. Therefore, the decision was made to keep the test running for some period of time to see if the readings would increase further. The customer also performed an oil analysis, but this analysis showed no indication at all that a bearing problem was developing.

During the monitored period, the HDm and BPFO values were steadily increasing, then dropping for a short period of time, only to increase again soon after. As this is a typical behavior in early damage development in spherical roller bearings, we were sure that the bearing had a beginning damage.

Based on this commonly accepted knowledge, it was decided that it was safe to run the machine for another four months until the next planned stop at the end of April.

This case study is a textbook example that SPM HD® can give the customer a forewarning time of six months and more.
3 Application description

The wash press, as the name suggests, has two major functions; it cleans the pulp and dewatered it.

Washing is an important unit operation for bleaching. The purpose of this operation is the removal of both dissolved material released in the bleaching reaction, and residual bleaching chemicals. The wash press provides a ‘barrier’ between the bleaching stages as a relatively small amount of liquor is carried with the pulp into the next stage.

The wash press consists of a vat and two rolls, which are pressed against each other to form a parallel gap, i.e., nip. The pulp is fed into the press and transported by the two rolls into the nip, where the final dewatering takes place. The speed of such a press roll is approximately 8 RPM.

Each roll is driven by a hydraulic motor. These hydraulic motors are designed for low operating speed and deliver full torque over the whole RPM range.

The hydraulic motor has an even number of pistons which are acting against a commutation, i.e., it works similar to a gear. Therefore, the commutation frequency is also visible in the spectrum.

For the monitoring, four shock pulse transducers and one RPM transducer were installed.
4 System setup

For this test, we used an Intellinova Portable INP20 with four shock pulse transducers and one RPM sensor connected.

The default setup for SPM HD was used:

- Upper frequency: 100 orders
- Lines in spectrum: 1600
- Symptom enhancement factor: 10
- Measuring time: Same as FFT
- Measurement interval: 4 hours

Installed bearings:

- SKF 23160 CC on the drive side
- SKF C3160 K (CARB bearing) on the front side
5 Case description

Measuring point: Movable Press Roll, DS
Bearing: SKF 23160 CC

Fig. 3 Trend from May, 2012 until November, 2012.

As the readings were stable and repeated, but no real sign of deterioration was visible, we and the customer decided together in mid-October to move the installation to a different machine during the next opportunity in November.

However, when evaluating the results together with the customer in early November, we noticed an increase in the BPFO trend, while the increase of HDm was rather small.
Next to the commutation frequency (36X, 72X), which was present from the beginning, there were now also clear peaks visible at BPFO.

Because of this clear indication that the bearing was deteriorating, the decision was made to continue with the measurements on this wash press.

**Fig. 4** SPM HD Spectrum from November 12, 2012.
Soon after the first indication that the bearing was deteriorating, HDm and BPFO both started to increase dramatically, but dropped again after about three weeks.
Now the commutation frequency (36X, 72X) is by far exceeded by the BPFO amplitudes.

The BPFO symptom value (1149 on November 12) had now increased to 8877 (there was hardly any change in the amplitude of the commutation frequency).
During the monitored period, HDm and BPFO were increasing, dropping again for a short period of time, and then started to increase again. As this is a typical behavior for developing damages in spherical roller bearings, we were sure this was a sign of a beginning damage, i.e. although the readings were sometimes "extremely" high, the actual damage should still be small.

Fig. 7 Trend from May, 2012 until August, 2013.
As there were only peaks from BPFO and the commutation frequency in the spectrum and no other peaks at all, we were sure it was safe to run the machine until the planned stop at the end of April.

Fig. 8 SPM HD Spectrum from April 26, 2013.
The "Colored Spectrum Overview" also showed very clearly that the only peaks present in the spectrum are from BPFO and the commutation frequency.

Please note that after the bearing was replaced at the end of April (circled), all distinctive peaks in the spectrum disappeared.
**Fig. 10** Spectrum from the new bearing.

The new bearing shows a small peak at BPFO (this is an indication that the shock pulse transducer is properly mounted) and the commutation frequency.
As expected, the bearing showed small spalls - corresponding to a stage three damage - on the outer race.

The remaining lifetime of the bearing in this application can be expected to be another six months; this means the total prewarning time before this bearing would have failed would have been close to one year.

Fig. 11  The replaced bearing.