

# The Demand For Installing On-Line Bearing Condition Monitoring System On High Speed Paper Machine And Derived Benefits

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## ABSTRACT

Economical...

To survive in this competitive market the cost of finished products should be less than the international markets and quality should be of global standard. To be more safe the overall cost of maintenance i.e. cost of spares and consumables has to be reduced which will directly affect the overall cost.

Technical...

Ultimately the up gradation of technology is to be taken up. In order to maintain the maintenance standard and reduce the overall machine downtime, suitable systems are selected which help for the predictive maintenance practices.

The said technology is monitoring the condition of all the equipments on continuous basis and indicating the condition of rotating items of individual sections of the machine well in advance to avoid uncalled down time.

## INTRODUCTION:

- The most important goal of any maintenance team is to achieve zero downtime.
- The next goal of maintenance team is to anticipate and accurately plan for maintenance needs. This means control in spares inventories and to reduce the overtime works. Besides this, maintenance team is required to optimize the production without sacrificing machine uptime.
- The following are various maintenance practices which are being adopted.
- CORRECTIVE MAINTENANCE
- TIME BASED MAINTENANCE
- PREDICTIVE MAINTENANCE
- PROACTIVE MAINTENANCE

## LITERATURE REVIEW:

Objective with Continuous Monitoring System:

- ⊙ **Safety of the machine**
- ⊙ **No unplanned stoppage**
- ⊙ **Early detection of problems**
- ⊙ **No extra personnel for operating the system**
- ⊙ **Automated evaluation**
- ⊙ **Filter false alarms**
- ⊙ **Selected methods for the relevant problem**
- ⊙ **Reliability of the system provides fastest payback**

## EXPERIMENTAL:

- Modular Software controlled system.
- Core Values:  
Shock Pulse Monitoring - For assessing the bearing condition

Shock Pulse Spectrum - For assessing equipments condition

Analog Signal Monitoring

Provide relay output to generate alarm signals

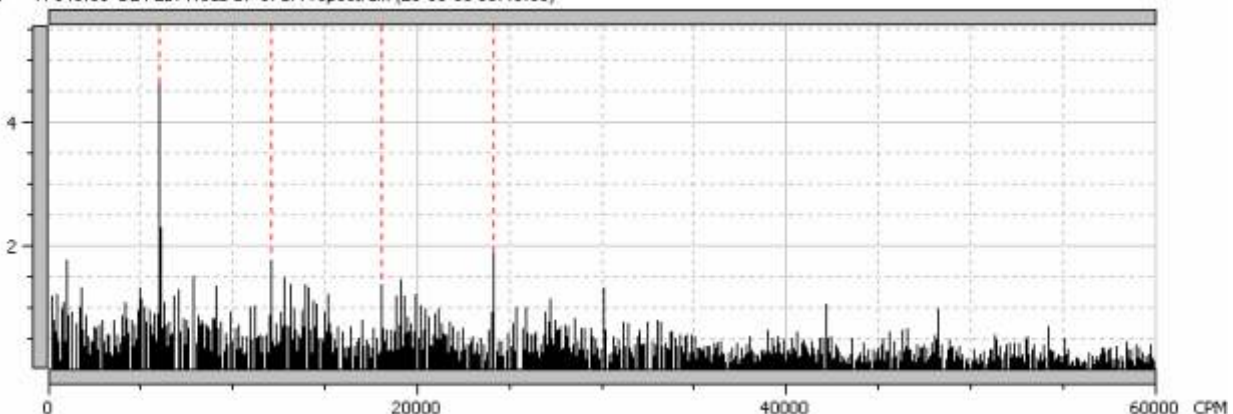
- Evaluates data automatically
- Display result in Green-Yellow-Red band.
- A crack in an Inner Race of a bearing is hard to find in the spectrum because the energy involved is so low compared to the total vibration energy due to unbalance forces.
- Enveloping is a technique which allows us to transform the shock signal in to a spectrum and compare the time interval between the shocks with the bearing frequencies to identify the faults.

## The Core Solution of Shock Pulse Method

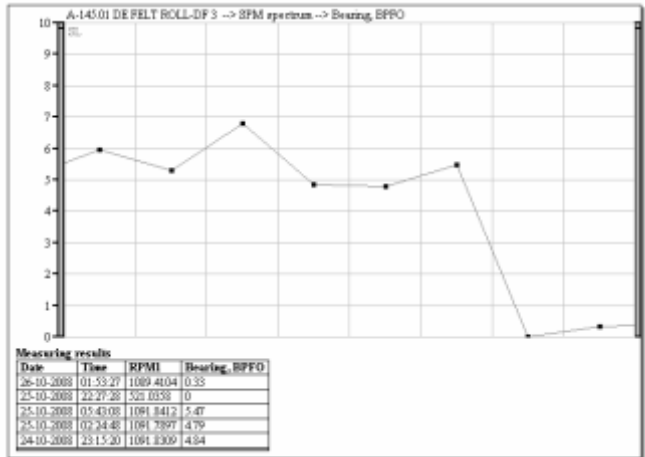
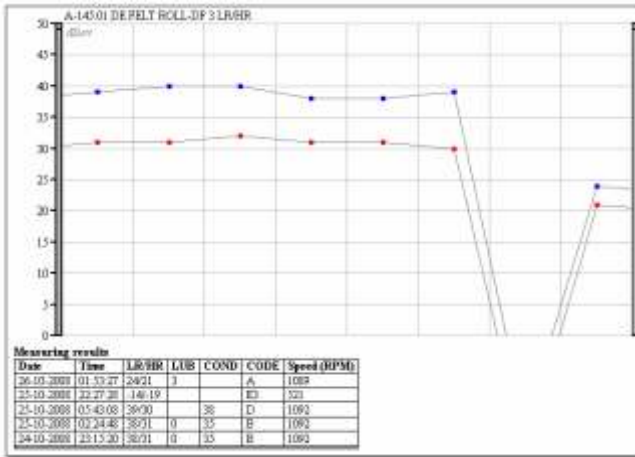
## Trend

Before replacing the bearing.

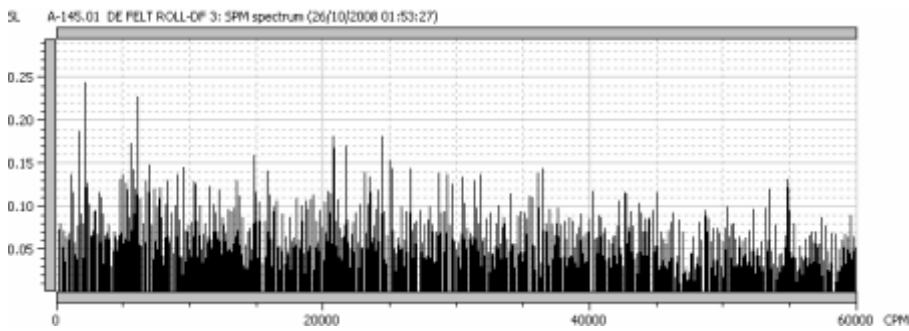
SL A-145,01 DE FELT ROLL-DF 3: SPM spectrum (25-10-08 05:43:08)



Emami Paper Mills Ltd.  
Kolkata.

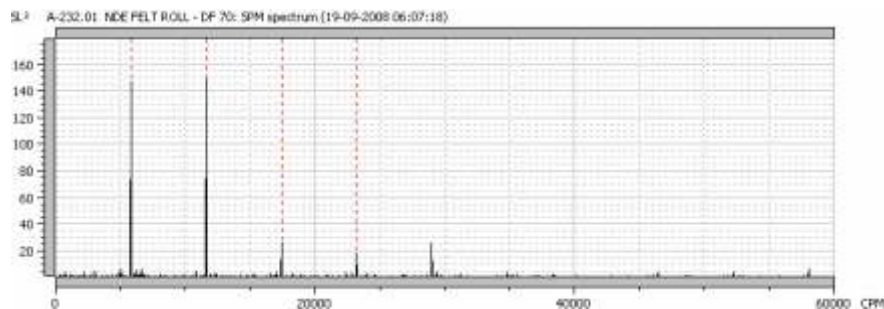


**BPFO Values Reduced after correction**



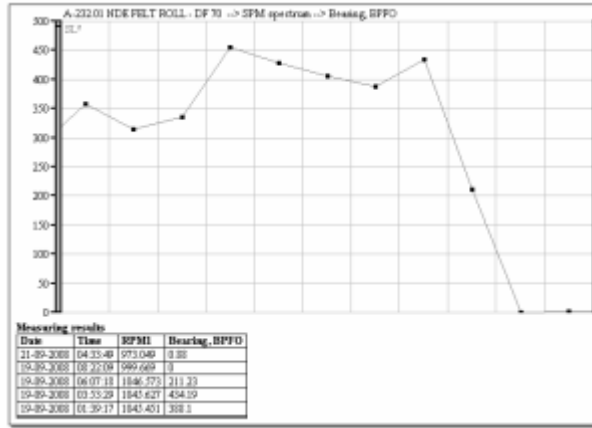
**Inspection**

- LR/HR values reduces to 22/18
- Bearing when inspected , it was found pitting marks on the outer race .

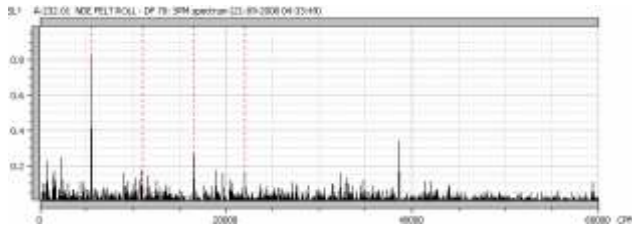


**Dryer felt roll 70 (NDE) Trend...**

Before changing the bearing

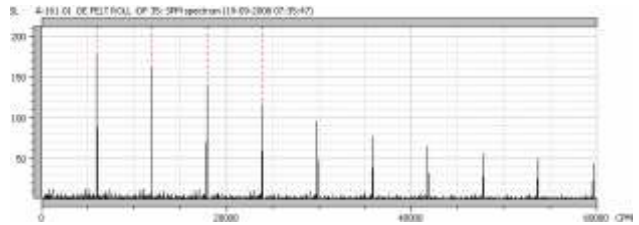


After changing the bearing..



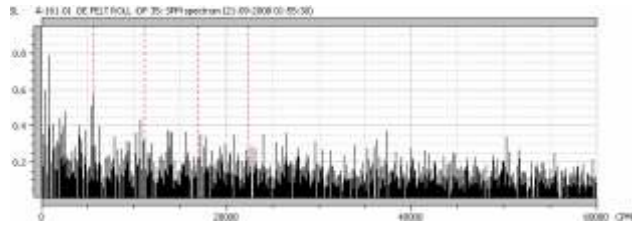
SPECTRUM AFTER CHANGING THE BEARING

**Dryer felt roll 35 (DE)**  
SPECTRUM BEFORE CHANGING THE BEARING

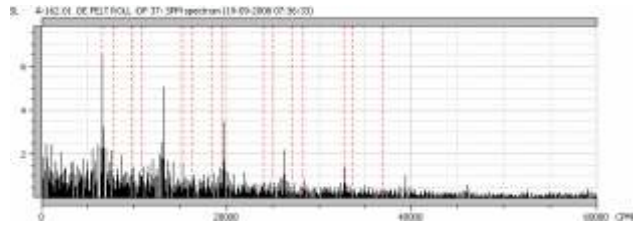


**Dryer felt roll 37 (DE)**

SPECTRUM BEFORE CHANGING THE BEARING

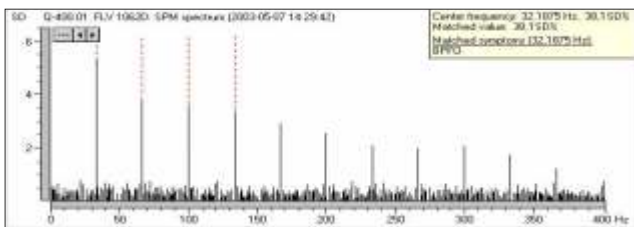


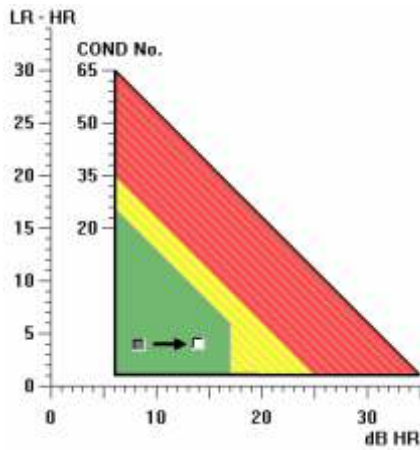
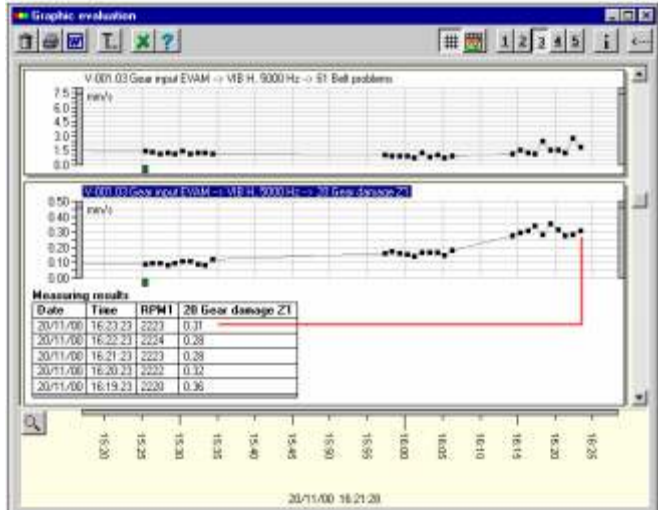
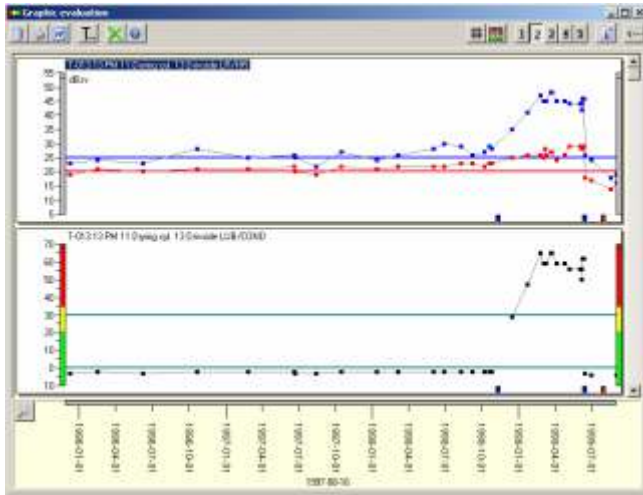
AFTER CHANGING THE BEARING



**DAMAGED BEARING**

Found pitting marks in the inner race of the bearing





- VCM provides specific information on bearing conditions using SPM technique - Lubrication and Mechanical Condition of the equipments.
- The SPM Spectrum verifies source of shocks generated from bearings, gears, loose parts and other mechanical inaccuracies like unbalance mass and misalignment etc,
- Based on time record of enveloped shock signal
- Range 0 to 100, 200, 500, 1000, 2000, 5000, 10000, 20000 Hz
- Lines 400, 800, 1600, 3200, 6400
- Display toggled Hz, cpm, orders
- Windows Rectangle, Hanning, Hamming, Flat 4
- FFT type linear, power
- True zoom

**RESULTS AND DISCUSSION:**

- EMAMI PAPER MILLS LTD.

- Machine speed : 1100 MPM
- DRYER FELT ROLL-03
- Bearing No : 22316 C3

**Observation:**

- Sudden increase in SPM readings from 24/20 to 40/30
- Greasing did not help
- Vibration readings normal at 2.3mm/sec

**OTHER CASE STUDIES...**

- Similar to the above case, few of other cases where in effectively detected the faults, in rolling element bearings are listed.
- In dryer felt roll 70 (NDE), 35 (DE), 37 (DE) the bearing faults are detected with the help of this online condition monitoring system.

**ECONOMICAL BENIFITS**

- Machine stoppage costs Rs.2.00 Lacks per Hour
- Dryer Felt Roll Bearing damage will result in 3 hours Machine Down Time. A loss of Rs.6.00 Lacks for each bearing damage.
- With the help of ON LINE SYSTEM we could avoid 19 potential bearing damages, resulting in Rs.114.00 Lacks as savings.

**CONCLUSIONS**

- Around the clock surveillance of the Machine.
- Close to zero breakdowns.
- Control over Inventory
- As a result high rate of returns on Investment.
- ON LINE BEARING CONDITION MONITORING SYSTEM is easy to understand, very effective & user friendly