MONITOR

A Publication of Condition Monitoring Society of India

Regd. No. 45061/2003 | Volume 5, No. 3 | October 2008

From President's Desk

It is time for Indian Railway to take on CBM...

Railways especially those operating mainline passengers and high speed services need to be run safely, reliabily and efficiently. Sametime, one needs to adopt competitive and cost effective solutions. Today's CBM techniques offer such flexibility. This trend is seen in many countries like Russia, Germany, Austria etc. India having one of the largest railway networks stands to gain lot by going the CBM way. One can use internet technologies to ever monitor railway equipment remotely. It will be a major step forward in achieving the goals of better reliability, safety and lower-life cycle costs.

In Service Monitoring of turbine blades

Condition monitoring is more highly regarded, indeed insisted upon, as a technique for protecting the mechanical drive trains of in-service wind turbines. The need for it becomes more critical as turbine size steps up from 2.5 MW to 5MW and higher ranges. Given the increased size of modern turbine blades and their growing fabrication sophistication and cost, blade monitoring is becoming important to operators and insurers alike. The consequences of any structural failure, especially offshore where replacing a damaged blade weighing a dozen or more tonnes is a major undertaking, are increasingly expensive. Condition monitoring offers the chance to avoid such failures and to keep a degraded rotor turning until the next scheduled maintenance period.

A study conducted by the Wind Energy Department at Denmark's Risoe National Laboratory concluded that remote surveillance of rotor blades of large offshore wind turbines has clear economic benefit. Several monitoring techniques relying on fibres and sensors that can be embedded within reinforced plastic blade structures found that all worked satisfactorily and could complement each other.

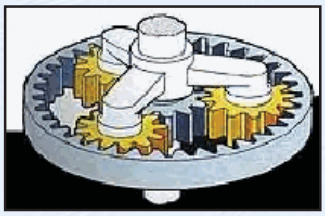
The characterized acoustic emission is best able to detect and locate small laminate flaws, and fibre optic displacement transducers are especially effective in detecting adhesion failures. Accelerometers sense vibration along with changes and trends that can indicate incipient damage.

Rotor blade condition monitoring is attracting growing interest from cost-conscious wind farm operators to minimize operation and maintenance expenses, to mitigate risk for insurers and to enhance turbine yield. **Condition monitoring** can make a major contribution to enabling these crucial wind turbine components last their full design life of 20 years.

Source: ***Reinforcedplastics, Volume 52, No.5, May 2008***

PLANETARY GEAR DEFECT CALCULATIONS

Many times we require the calculations of the frequencies for checking planetary drives. The third harmonic of the planetary fundamental gear mesh frequency is the best indicator of a problem, and exhibits the best side bands. It can locate ring gear problems from the ring gear defect frequency with velocity; and enveloped Gs is a good way to find any defect change that is at a higher frequency. Sun gear side bands around the fundamental planetary gear mesh frequency will indicate a serious problem. It is convenient to calculate the values and their harmonics with different numbers of teeth and different input speeds with a basic excel program. Always one must take in to account whether the ring gear is rotating or stationary. The prominent gear mesh component can be found as follows:



N_s = Sun gear rotational speed.
N_p = Planet gear rotational speed.
N_o = Out put shaft rotational speed.
T_s = Number of teeth on sun gear.
T_p = Number of teeth on planet gears.
T_r = Number of teeth on ring gear.
n_p = Number of planet gears.
F_m = Planetary fundamental gear mesh frequency

$N_o = N_s/((T_r/T_s)+1)$
$N_p = N_o(T_r/T_p)$
$F_m = \underline{T_s(N_s-N_o)} = T_r \text{ X } N_o = T_p \text{ X } N_p$
Prominent gear mesh component = n_p X F_m

Defects are sidebands of the gear mesh frequency and the mesh harmonics.

NOTE: These sideband frequencies can also be separate frequencies and have harmonics. They are easily seen with Enveloped Gs Spectrums, and on standard spectrums if gear problems are present.

F_s = Sun gear sideband defects.
F_p = Planet gear sideband defects.
F_r = Ring gear sideband defects.

$F_s = \pm n_p(N_s-N_o)$ = Sun gear sideband defects.
$F_p = \pm$ (2 X N_p) = Planet gear sideband defects.
$F_r = \pm$ (n_p X N_o) = Ring gear sideband defects.

HOW SHOULD THE CABLE SHIELD BE GROUNDED?

When using coaxial cables, the shield carries common and therefore, is grounded at the monitoring system. The shield must be isolated from the sensor housing to prevent ground loops.

When using two conductor shielded cable, two methods are available.

a. If the sensor housing is **electrically connected** to the machine (i.e., stud mount), the cable shield is typically connected to the sensor housing and thereby tied to machine ground. In this type of installation, the shield should not be tied to the monitoring system or ground loops may develop between the monitor ground and the machine ground.

b. If the sensor housing is **electrically isolated** from the machine (i.e., many cement mounting installations), then the shield should be tied to monitor ground. It is recommended that the shield be isolated from the sensor housing in this type of installation to prevent ground loops in the event that the isolation between the sensor housing and the machine is lost.

TERMINOLOGY

Electronic amplifier noise

All electronic components produce some electrical noise. At high frequencies, amplifier noise is governed by circuit resistors in the form of white noise. Low frequency noise is governed by transistors and other active components in the form of 1/f noise. This is why the noise is higher at very low frequencies, slopes down and becomes flat at high frequencies.

Bias voltage

The bias voltage, sometimes referred to as the rest voltage, is required to measure AC signals using two wire single ended amplifiers. The DC bias voltage provides a carrier on which the AC signal is superimposed. It is generally chosen at a point half way between the power supply and ground.

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PRODUCT NEWS

SKF Multilog On-line system TMU-CMMA 7720

The Multilog on-line system TMU is a compact three-channel surveillance device designed to monitor critical production assets ranging from machine tool spindles to pulp refiners. It can warn of developing machine problems (e.g. bearing damage, imbalance, lubrication, etc.) and provide diagnostic information for improving reliability and quality. In addition, it has a special feature which rapidly detects shocks (e.g. crashes) and helps prevent severe damage to machine components.

SKF MicroVibe P CMVL 3850-ML

The MicroVibe P provides extensive automatic setup and evaluation of vibration results. Simply collect the data and MicroVibe P does the rest - comparing readings to pre-programmed velocity and enveloped acceleration severity criteria for a reliable and accurate evaluation of vibration severity. This allows even novice users to easily determine abnormal conditions and take appropriate action. This economical vibration meter expansion module fits in a PocketPC's compact flash card slot (CF Type II) and features the user-friendly Windows® Mobile Operating System. Identify problems and assess machine condition quickly and easily with this versatile and easy-to-use pocket tool.

Source : www.skf.com

Do U Know ?! It's Very Interesting !!

In general, the sensor cable should not be routed alongside or parallel to high current carrying wires. If the installation requires that the low signal carrying sensor cable be routed alongside the high current carrying wire, they should be ***separated by a minimum distance of six inches*** and preferably installed in a separate and grounded conduit or tray. High current carrying wires should be crossed at right angles only.

REFERENCE BOOKS

The Bearing Analysis Handbook - by James I. Taylor & D. Wyndell Kirkland, P.E.

This is the first book dedicated solely to accurate diagnosis of defects in antifriction bearings using vibration analysis. It contains analytical descriptions of how bearings generate frequencies, and how to determine the kind of defect, defect size, and the cause of failure. Each theory is supported by calculations and case histories. The format guides the reader through the process of data collection to advanced analysis. Review questions are located at the end of each chapter.

ISBN 0-9640517-3-7

The Gear Analysis Handbook - by James I. Taylor

This book includes the latest technology for diagnosing a wide variety of gear problems including how each cycle of gear mesh frequency is generated, how to distinguish between pitch-line run out and tooth transition problems, and how to identify phase modulation. Review questions can be found at the end of each chapter.

ISBN 0-9640517-1-0

CM – Around the Globe
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- **Machinery Vibration and Condition Monitoring for Non-Vibration Engineering, Maintenance and Operations Professionals**
  Date: **07-11 Jun 2009**
  Venue: **DUBAI**
  For Further Details : www.glomacs.com
- **Condition Monitoring and Diagnostic Engineering Management (COMADEM 2009),** 22nd International Congress
  Date: **JUNE 9 – 11, 2009**
  Venue: **Miracle Palace, San Sebastian, Spain**
  Important Dates
  Abstract Submission: **Nov 30, 2008**
  Notification of paper acceptance: **Feb 1, 2009**
  Paper Submission: **Mar 30, 2009**
  For Further Details : www.comadem2009.org

CMSI NEWS

CMSI Welcomes It's New Institutional Members!!!

- **Machinery Trials Unit, C/o Fleet Mail Office, Mumbai - 400 001**
- **Technical Division, Western Naval Command, Shahid Bhagath Singh Marg, Mumbai-400023**
- **Diesel Testing & Tuning Team , Western Naval Command, Shahid Bhagath Singh Marg, Mumbai-400023**

Member in the News !!

Dr. V.Bhujanga Rao, FNAE, Founder and President of CMSI and Director, NSTL, Visakhapatnam, has been promoted to the grade of Scientist 'H' (Outstanding Scientist). CMSI Congratulates and wishes him all the best.

CMSI Welcomes It's New Members!!

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Condition Based Maintenance Strategy

Most equipment failures have no relationship to length of time in-service. Most failures are unpredictable. But if you detect a future failure early, you can handle it most cost effectively before it becomes a breakdown.

All feed back, comments and contribution to the news letter are most Welcome.

- Editor

If undelivered please return to:

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