MONITOR

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EDITORIAL

Today the focus of maintenance approach has shifted from 'reactive' to 'proactive'. In an ideal world, we have to make use of the latest technology for enhancing machine reliability. Basic instruments are available to plant engineers for low cost Condition Monitoring programme. These can assesses and report on vibration, temperature and other specific parameters relating to the health of the equipment. Today we have advanced tools for on-line surveillance monitoring systems. We also have excellent software which delivers fully automated machinery monitoring. New type of wireless MEMs sensors which will be able to remotely monitor the machinery are expected to be in the market by 2010. The aim is to produce a sensor which can be seamlessly fitted inside gearboxes, motors, diesel engines, wheel bearings etc. in which faults can occur and monitor these sensors remotely by computers. Distance and cost limitations associated with wired links will be overcome. This development is likely to bring a dramatic reduction in cost of Condition Monitoring programme. Maintenance management system for scheduling, inventory and work orders management is going to be simpler than ever before.

- Editor

Five Reasons why you need oil analysis?!

Today truck and heavy duty machinery operators demand more output from their vehicles/machinery. A well 'oiled' machine experiences very little down time. An oil analysis program can help to accomplish this by maximizing equipment efficiency and engine durability. Five reasons for adopting oil analysis are:

i) Assists owners and operators in making decision based on the equipment condition using oil analysis.

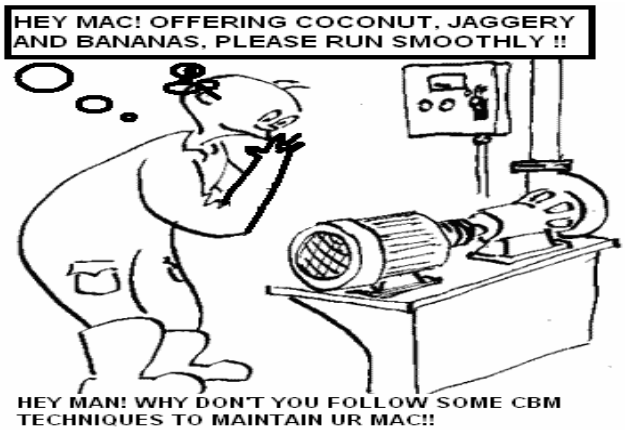
ii) Like maintaining a clean house, oil analysis program help you maintain a clean engine by identifying trouble spots such as fuel dilution of lubrication, dirt contamination of the oil, antifreeze in the oil, excessive bearing wear and impeding vehicle problems.

iii) A thorough oil analysis can easily identify at risk situations and will offer helpful advice like "check for fuel leak", or " extend service", remind you to prevent problems before they arise.

iv) In conjunction with regular maintenance, oil analyses keep your equipment out of the ICU. Full equipment failures can be sidestepped because individual parts are getting some personal attention and major tragedies can be bypassed.

v). High quality oil analysis can forecast potential problems; maintenance decisions are easier and more accurate than ever before.

This can result in extended drain intervals and keeping your vehicles/machinery in running condition.



Maintenance tips on using Vibration Sensor

1. Improving Vibration Sensor Performance:

Keep your magnets for magnetically mounted accelerometers, clean and free from metallic chips with the use of the sticky side of packaging tape. Rub your sensor magnet on 400 to 600 - grit sandpaper to remove any high spots; this will maximize the contact area, thus improving the sensor performance.

2. Selecting a Vibration Sensor:

When purchasing a new vibration sensor there are many factors to take into consideration. Make sure the desired machinery measurement parameters fit within the sensor fmin & fmax capabilities.

If you're trying to capture 3X gear mesh frequency information, you will need a sensor with a frequency response that is greater than this value.

- Ensure the sensor is suitable for the environmental conditions. If it will be used in an electrically noisy area, an electrically isolated sensor may be necessary. Check the sensor meets the temperature requirements.
- One aspect that is overlooked is the physical size of the sensor. If there are limited clearances due to piping or protective covers, check the sensor fit. Remember, cost isn't the only consideration when choosing a sensor.

3. Mounting a Sensor:

When mounting a sensor, for non-permanent applications use silicon grease or petroleum jelly between contact surfaces and for permanent applications use an approved adhesive. This will fill any voids in the contact area and improve the sensor performance.

Frequencies related to bearing defects

In vibration analysis bearing defect frequencies are calculated using simple mathematical formulae. If you find that you have a frequency that you believe is a defective bearing but you just can not get the frequencies to line up with your fault frequency overlays here are some things you need to consider.

- Check the true running speed of the machine. You may have the machine identified as an 1800-rpm machine that is actually running at 1780 rpm.
- Ensure the bearing characteristics match those in your bearing database. You may find your bearing number in that database; however the actual bearing may be slightly different. The bearing may have one more or one less ball than the selected bearing.
- Determine if axial loading is occurring. High axial loading will change the roller path and thus effect the frequency calculations. As the axial load increases, the rollers have less distance to travel because they are being forced on the raceway shoulder.
- Determine if wear is an issue. As a bearing wears over time, the distance the rollers have to travel will increase as a result. The rollers will actually decrease in diameter as wear occurs.
- Determine if you have identified the right bearing. Occasionally when equipment is rebuilt, its original bearings are replaced with a similar bearing of a different brand. This can lead to differences in bearing defect frequencies.
- Ensure you have enough resolution to separate defect frequencies from running speed harmonics.

If you follow these simple guidelines for determining the proper bearing defect frequencies, you will find that your fault overlay will match your suspected bearing defect frequencies a much higher percentage of the time.

An online monitoring system for Railways

MasCon16R – on – line mechanical condition monitoring is designed for,

- early fault detection and prevention.
- Automatic advice for correcting existing or impending conditions.
- Condition based maintenance.

MasCon16R offers the railway industry increased vehicles availability through an increase in the operational reliability. Also after a new installation, refurbishment, or maintenance, the final result can always be easily checked using MasCon16R mechanical condition monitoring system.

MasCon16R monitors:

- wheel/axle bearing conditions and temperature,
- wheel flats and shape,
- grease life,
- bogie stability/hunting sensor,

- rail track conditions,
- propulsion system condition, (motor, gearbox, etc.),
- unbalance and resonance problems,
- any rotating machine parts of the train,
- cardan shafts

MasCon16R provides automatically, load and speed dependent warning and alarm, which initiates:

- on-board and remote communication (information to driver, transfer of data to train care centres, control room based server, etc.).
- data processing for automated diagnostics, root cause analysis, etc.,
- link to maintenance management system for scheduling, spare parts – and work order management

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

- Concentration of minute particles of contamination cause havoc in critical equipment, resulting in downtime can cost thousands of rupees in lost production.
- Equipment performance depends on the cleanliness of the oil and fluids that are the lifeblood of hydraulic systems, turbines and other pieces of machinery that are sensitive to particulate contamination.

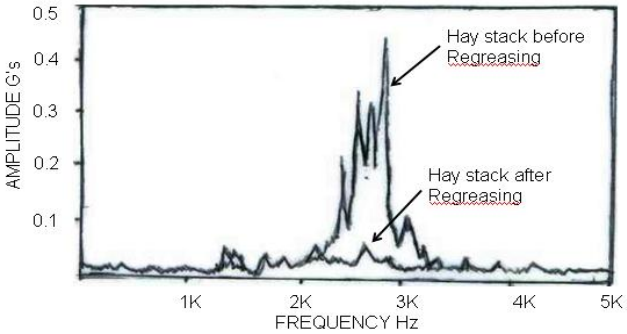
Vibration analysis Detects Inadequate Lubrication in Fan Bearing: A Case Study

It is possible to detect the effect of inadequate lubrication within a rolling element bearing by utilizing vibration analysis as a predictive maintenance tool. This ability to detect lubrication deficiencies with vibration analysis was proven at one facility when a noise was heard in an electric fan motor.

Six fan motors were installed on a cooling tower at a large refinery in England. All six are lubricated with Shell Nerita Grease HV semi synthetic high-speed bearing grease, and are included in the production unit lubrication program.

During the routine scheduled vibration monitoring activity, one electric motor was observed by the condition monitoring operator to be emitting intermittent high –pitched noise from the non drive end (NDE) bearing location, albeit very low in amplitude. Routine overall vibration readings taken throughout the motor exhibited readings below 1mm/sec rms and were consistent with previous values.

This prompted further "in-field" investigation to determine the location and/or cause of this noise. This investigation was carried out by setting the portable vibration data collector into "analyzer" mode. With the required collection set and frequency max selected, real time data was obtained from both the NDE and drive-end (DE) motor bearing locations while the motor was at full speed; this data was taken in all three axes (where access permitted).



Vibration Spectra before and after regreasing

Examination of the vibration spectrum from the NDE bearing revealed, in the vertical direction, a "haystack" effect in a frequency band between 2 kHz and 3.5 kHz.

This type of spectrum is normally attributed to a reduction in lubrication quality or lubrication effectiveness, resulting in some degree of metal to metal contact within the rolling element bearing. If this condition is not resolved, accelerated bearing wear occurs, leading to an increase in operating temperature and ultimately bearing failure.

Once the condition was determined, a given amount of lubricating grease was applied to this bearing. With the vibration data collector still set in analyzer mode, the analysts were able to visually monitor the immediate effect the lubricating grease had on the vibration and this haystack effect.

After the grease was added and had been distributed within the bearing, the live spectra indicated a very slight recurrence of the haystack. It was then decided that a few shots of grease should be applied. The effect was immediately noticeable with a considerable reduction in the vibration haystack, which, after some time, did not return.

The reason this particular motor showed this symptom is unknown, and the actual severity of the bearing wear/damage is also unknown. Maintenance records show, however, that this motor continued in full service for another five years without the need for bearing replacement. Therefore, it is clear that by locating and correcting this lubrication deficiency, a motor bearing failure due to this condition was prevented.

CMSI NEWS

Dr. V. Bhujanga Rao, CMSI Founder President has been appointed Director, Naval Science and Technological Laboratory, Visakhapatnam wef. 1st April, 2006. CMSI congratulates him on his appointment and wishes him all the best in new assignment.

INAE Summer Fellowship:

Our life member & treasurer Dr. MRS Satyanaryana, Associate Professor of GITAM Engg. College was selected for prestigious Indian National Academy of Engg. (INAE) summer fellowship – 2006 under the guidance of our founder President Dr. V. Bhujanga Rao.

CMSI wishes Dr. MRS Satyanarayana all the best in this endeavor.

Overall Equipment Effectiveness:

In an ideal factory, equipment would operate 100 percent of the time at 100 percent capacity, with an output of 100 percent good quality. In real life, however, this situation is rare. The difference between the ideal and the actual situation is due to losses. Calculating the overall equipment effectiveness is a crucial element of serious commitment to reduce these losses. OEE is calculated by combining three factors,

$$\text{Availability rate} = \frac{\text{Operating Time} - \text{Downtime}}{\text{Total Operating Time}}$$

$$\text{Performance rate} = \frac{\text{Total output}}{\text{Potential Output at Rated Speed}}$$

$$\text{Quality Rate} = \frac{\text{Good Output}}{\text{Total Output}}$$

OEE = Availability rate x Performance rate x Quality rate

Feedback, comments and contribution to the news letter are most Welcome.

- Editor

CMSI Welcomes New Members!!

Life Members

Mr. B. Narsimloo
Mr.P.Veerabhadra Rao
Mr. P.Venkata Narayana
Mr. G.U. Narasimhulu

Annual Members

Mr. K.G.S. Vinay
Mr. M.Janardhana Babu
Ms. I. Deepthi Ganesh
Mr. M. Srinivasa Rao
Mr. M.Siva Satyananrayana
Mr. K.K.K. Sanyasi Raju
Mr. S.C. Prabhakar
Mr. S.K. Anand
Mr. N.S. Naidu
Mr. K. Seshagiri Rao
Ms. T. Saraswati
Mr. Munesh Kumar
Mr. S. Narasimhappa Rao
Mr. Vishnuvardhan B

National Symposium on 'Condition Monitoring'

CMSI proposes a National Symposium on 'Condition Monitoring' in the month of December 2006. Further details will be announced in the next issue of ' MONITOR'.

CMSI website is being modified. Inconvenience is deeply regretted.

If undelivered please return to:

Dr. V. Bhujanga Rao,
President, Condition Monitoring Society of India,
Naval Science & Technological Laboratory,
Visakhapatnam – 530 027, INDIA
Phone: 0891-2586100

To,