



MONITOR

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Flash News !!

Andhra University and CMSI jointly decided to launch a new PG Diploma Course on

'Condition Monitoring of Machinery'

The aim of the course is to provide an understanding of Condition Monitoring and its relevance in Industry.

Duration : One Year

Mode : Distance Education

For Further details please keep browsing our website
www.comsoi.org

and next News Letter 'MONITOR'...

From President's Desk...



Condition-Based Maintenance is growing in demand and popularity. US Navy has in fact published their CBM policy as early as 6th May 1998 which states "The purpose of CBM strategy is to perform maintenance only when there is objective evidence of need, while ensuring safety, equipment reliability and reduction of total ownership cost." One of the reasons for increase in CBM applications is due to increase in preventive maintenance cost which has been in vogue for decades. With the fighting combatants becoming aged the importance of CBM is being felt all the more essential. To keep the facts open, 75% of US Air force Aircrafts are old by greater than 20 years and will be in the field for at least 10 more years. The average age of US Naval aircraft is 17 years and service life of submarine fleet in US Navy is between 33-43 years. Ground fighting vehicles have been in the field for more than 20 years. Same is the case with other countries fighting combats. University of South Carolina has established CBM Research Centre dedicated to maintenance of aircraft maintenance. Similarly Singapore Research and Technology Centre has started a state of art diagnostic and prognostic maintenance system to take up CBM of military hardware. So is the Canadian, UK, India's military establishments. So, this is time to strengthen our CMSI activities to take care of this growing demand.

It is high time for implementation of CONDITION MONITORING...



Mechanical failures are common. There will always be a reason for a mechanical failure. Human factor is one of them. This human failure is highly relevant factor in situation like accidents. We shall not intended to cover human ineptitude or material insufficiency. Studies reveal that increasing attention by way of condition monitoring should be given priority while efforts should be made to take into account the effects of group interaction, lack of instruction, incorrect motivation, ill-defined areas of responsibility, poor control, group-interaction hostilities, poor communications and many similar causes of irrational human behavior. Therefore, it is high time for implementation of condition monitoring with best human face for best results.

Prof. Dr. M. Ananda Rao
General Secretary

Enroll as a member of our society & Advertise your products in News Letter 'MONITOR' and Website www.comsoi.org Check Website for details..

VIBRATION ANALYSIS TO DETECT GEAR DAMAGE

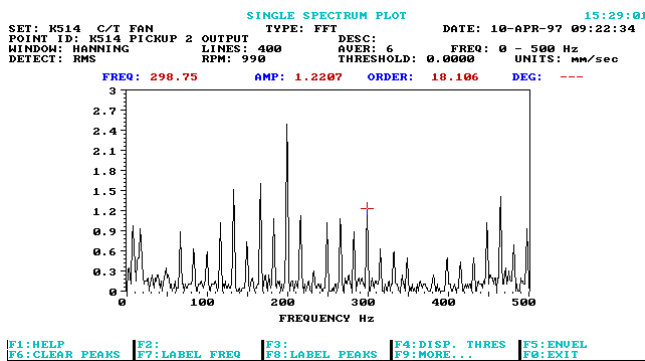
Gear mesh vibration frequencies are easy to recognise, but not easy to interpret. This is due to two reasons:

- 1) It is not normally possible to place the transducer close to the problem gears.
- 2) The number of vibration sources in a multi-gear drive unit result in a complex array of gear mesh, modulation and running speed frequencies.

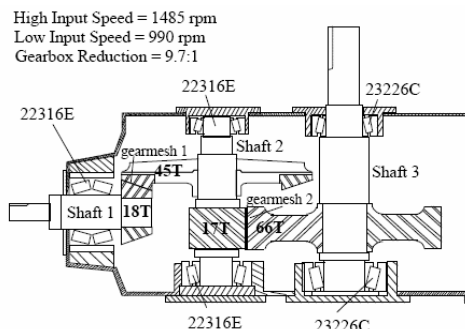
For the analysis of gear problems a high resolution spectrum analyser is required to enable a high frequency range spectrum to be taken without loss of sideband data. Sidebands are very important and in most cases enable the analyst to determine which of the two meshing gears is at fault. The following case history shows how spectral analysis proved invaluable in helping identify a problem gear in a cooling tower fan gearbox.

Vibration data is collected from the electric motor by means of a vibration spectrum analyser and a magnetically mounted accelerometer. Due to the inaccessibility of the fan gearbox, permanently mounted accelerometers are fitted to the input and output shaft bearing housings and cabled out to a safe location.

Figure below shows the spectrum collected from the gearbox output shaft.



From the above spectrum, and knowing the fan was running at low speed, we could identify the input bevel gear meshing frequency. Harmonic activity at the input shaft frequency of 16.5 Hz are evident at either side of the input gear mesh frequency. From this information, and technical data from the gearbox shown below it was concluded that the input bevel gear had sustained some degree of gear tooth damage.



Damaged input bevel gear teeth.

It is estimated that a saving of **£4500** was made due to early fault detection, however, had this unit catastrophically failed then secondary damage could have run into *many THOUSANDS* of pounds more as the potential for damage to blades and structure is high.

Web source: www.vibanalysis.co.uk

PRODUCT NEWS

IQ200 Continuous On-line Laser Particle Counter



Parker's IQ200 particle counter is specifically designed to provide continuous, on-line monitoring of the particulate contamination level of hydraulic and lubrication fluids.

This compact, affordable particle counter can connect to virtually any system to give the user real-time data at the specified interval. Other features include:

- Remote and multiple system monitoring
- Laser accuracy and repeatability
- Programmable test intervals from 3 sec to 24 hrs
- Adjustable contamination level alarms
- Integral flow and calibration check
- ISO 4406-1999 reporting correlation to NAS 1638
- User friendly Windows-based software
- Data displayed instantly in graphic form

Further Details : www.parker.com

DID YOU KNOW !!

Trace metal analysis in used oil indicates depletion of additives and wear metals concentration. Analysis of wear metals can be used to determine which equipment components are wearing and if the levels of the wear becoming critical.

M/s. Structural Solution (Emerging NVH Solutions)

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FIVE - CARDINAL SIGNS OF A HEALTHY MACHINE

The five cardinal signs of a healthy machine are as given below. They may not be applicable to every machine, but the strategic premise is clear. Most of these cardinal signs are highly developed with wide-ranging modalities in the field of in condition-based maintenance.

1. Healthy, Uncontaminated Lubricant: Over time, lubricants age and lose their wear and corrosion protective properties. With rare exception, these conditions cannot be restored without adding new lubricant to the compartment. Usually, but not always, the aged lubricant will need to be first removed (drained, purged or flushed). Even healthy lubricants can become periodically contaminated, which can sharply impair lubrication performance as well.

2. Volume and Level Control: Just like an automobile engine, many machines require a relatively precise level of lubricant volume. Too much or too little lubricant can rob our machines of years of reliable service. This relates to both oil level and grease volume. Sudden changes can denote both failure cause and symptom. Don't underestimate the importance of this machine-health condition.

3. Mechanical Stability: Machines become mechanically instable for a host of reasons. Many of these reasons recur throughout the machine's life. Maintaining mechanical stability is essential to achieve machine reliability. Numerous causes contribute to mechanical instability including excess bearing clearance/preload, misalignment, unbalance, soft foot and others. Use technologies such as vibration, acoustic emission, proximity sensors and load cells to detect mechanical problems early.

4. Thermal Stability: Normal mechanical and fluid movement during machine operation creates friction and heat. Heat also is generated, transmitted or concentrated from combustion, radiation, compression, heaters, etc. Temperature changes can serve as an important indicator of an abnormal operating condition. Some heat sources are specific (hot spots) and demand immediate attention. In other cases, a system may experience gradual thermal excursions that can be more difficult to diagnose.

5. Leakage Control: Certain equipment types are prone to leakage such as fluid power systems and machines that circulate lubricants to multiple frictional zones. The root causes of leakage can vary considerably. Some leakage is internal (say, across a piston or valve); in other cases, it may be out-leakage (fluid loss) or in-leakage (contaminant ingress). Leakage can rapidly destabilize the system and must be brought under control.

Reference:

Jim Fitch, Noria Corporation, "The Five Cardinal Signs of a Healthy Machine". *Practicing Oil Analysis Magazine*. September 2008

ECOPOWER ENGINE WASH SYSTEM

This system is used for overhauling and repairing the engines for military jets. The EcoPower will reduce fuel by up to 1.2% & decrease their exhaust gas temperatures up to 15 degree Fahrenheit enhancing on wing performance. The system is closed loop and uses high pressure water Nozzles that spray through the engines hot and cold sections. The water is captured in drip collectors and recycled preventing ground contamination.

ISO 10816 Vibration Severity Chart

ISO 10816 establishes the general conditions and procedures for measurement and evaluation of vibrations using measurements made on the non-rotating parts of machines. It also provides general evaluation criteria related to both operational monitoring and acceptance testing established primarily with regard to securing reliable long term operation of the machine.

ISO 10816-3 separates the working conditions into four zones:

- Zone A Green: Vibration values from machines just put into operation.
- Zone B Yellow: continuous operation without any restrictions.
- Zone C Orange: condition is acceptable only for a limited period of time.
- Zone D Red: Dangerous vibration values - damage could occur at any time.

It also defines four groups of machines, according to their size, base and purpose.

Vibration Velocity IPS (RMS)	Group 4 Integrated Driver		Group 3 External Driver		Group 2 Motors 160 ≤ H < 315 mm		Group 1 Motors H ≥ 315 mm	
	Rigid	Flexible	Rigid	Flexible	Rigid	Flexible	Rigid	Flexible
0.71	Red	Red	Red	Red	Red	Red	Red	Red
0.43	Red	Red	Red	Yellow	Red	Red	Red	Yellow
0.28	Red	Yellow	Yellow	Yellow	Red	Yellow	Yellow	Yellow
0.18	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
0.14	Yellow	Yellow	Yellow	Green	Yellow	Yellow	Yellow	Green
0.11	Yellow	Yellow	Yellow	Green	Yellow	Yellow	Yellow	Green
0.09	Yellow	Green	Yellow	Green	Yellow	Green	Yellow	Green
0.06	Green	Green	Yellow	Green	Yellow	Green	Yellow	Green
0.03	Green	Green	Yellow	Green	Yellow	Green	Yellow	Green

PARETO DIAGRAMS

Pareto diagram is an important quality tool used in prioritizing & deciding the course of action in maintenance management. Of all the problems that occur, only a few are quite frequent/ costly. The others seldom occur/cost less. The problems are grouped and labeled as *vital few and trivial many*. Pareto diagrams help in quickly identifying the critical areas for management's attention.

Refer <http://web.soccerlab.polymtl.ca> for more details.

SPM Instrument India Pvt. Ltd.

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Condition Monitoring Society of India (C M S I)

CMSI Member in News



CMSI Life Member
Sri. **DTV Vara Prasad, Technical Officer 'C'** has received Commendation

from **Padmasri M.Natarajan, SA to RM** in recognition of his valuable services in the field of **Vibration measurements, analysis and fault diagnosis**. CMSI congratulates him for the achievement.

CMSI Welcomes it's New Members!!

Institutional Members:

M/s SPM Instrument India Pvt. Ltd., Hyderabad

Life Members:

Dr. Ch. Srinivasa Rao
Sri Jaiprakash
Prof. P. Srinivasa Rao
Prof. R. Bala Bhaskar
Prof. M. Kedar Mallik
Sri Edwin Vijaykumar

Annual Members:

Sri Ravindra B. Magi

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Sri K.V.V.S.S. Murty
Sri T. Venkata Ratnam

CONDITION MONITORING AROUND THE GLOBE...

Courses, Conferences, Workshops

- i) Short Term Training Programme on
CONDITION MONITORING OF MECHANICAL SYSTEMS
Date : 16-21 March 2009
Venue: GITAM UNIVERSITY, Visakhapatnam
Email: cmms09@gitam.in or bk_1381@yahoo.co.in
- ii) The Sixth International Conference on
Condition Monitoring and Machinery Failure Prevention Technologies (CM 2009 / MFPT 2009)
Date: 23-25 June, 2009
Venue: Stillorgan Park Hotel, Dublin, Ireland
E-mail: cm2009_mfpt2009@bindt.org
Web: www.cm2009-mfpt2009.org

Reference Books

CONDITION MONITORING AND CONTROL FOR INTELLIGENT MANUFACTURING, *By Lihui Wang, Robert X. Gao,*

Condition Monitoring and Control for Intelligent Manufacturing brings together the worlds authorities on condition-based monitoring to provide a broad treatment of the subject accessible to researchers and practitioners in manufacturing industry. The book presents a wide and comprehensive review of the key areas of research in machine condition monitoring and control, before focusing on an in-depth treatment of each important technique, from multi-domain signal processing for defect diagnosis to web-based information delivery for real-time control.

ISBN 1846282683, 9781846282683

CONDITION MONITORING OF ROTATING ELECTRICAL MACHINES

By Peter J. Tavner

The book is aimed at professional engineers in the energy, process engineering and manufacturing industries, plus research workers and students.

ISBN 0863417418, 9780863417412

BOOK POST

If undelivered please return to:

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President, Condition Monitoring Society of India,
Naval Science & Technological Laboratory,
Visakhapatnam - 530 027, INDIA, Phone: 0891-2586100

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

- Editor