

Monitor

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**CMSI Wishes all its members
A Happy & Prosperous
Christmas, New Year and Pongal
2005**

Editorial

Let us Commit !!

It is a fact that different companies in a wide variety of industries from Steel plant to Refinery, or from Fertilizer plant to heavy industry have similar obstacles and issues which are to be faced when undertaking maintenance planning. While the underlying technology or processes in each industry may be completely different, the maintenance and reliability issues are surprisingly same. And more importantly, human nature is the same wherever we go. Never say in a country like India, "We don't have people", "We don't have time", "We don't have the money". We have every thing, but commitment. Let us strive to commit. We need committed men! We have to learn how little extra cost is involved to go for the few extra balancing runs, few extra moves in alignment, little extra care for base preparation, and try to do, things for the first time. Analysis and correction is NOT machinery improvement. Redesign of a machine should be termed machinery improvement. Then there will be truly great returns. Oh! my maintenance folks, let us commit, let us keep our dreams high!.

* * *

Condition Monitoring of Hydro Electric Machinery

A large number of hydro electric units are functioning in various parts of our country. Condition monitoring of these machinery are expected to give better mechanical and electrical performance.

A properly engineered condition monitoring system will help the hydro operator avoid operating the machine in load zones where vibration or cavitation can cause premature damage.

They typically operate at low rotational speeds, usually from 60 to 600 rpm, and are physically very large, often with generator rotors that may be more than 50 feet in diameter and weigh more than 500 tons. Their physical mass and slow rotational speeds give rise to large vibration amplitudes and low vibration frequencies. This requires a monitoring system with special low frequency response capabilities. In addition many of the vibration behaviors typical to these machines require specialized filtering and signal conditioning.

Large vertical hydro units can weigh over 500 tons, with the unit's entire weight carried by the thrust bearing. An absence or reduction in oil film thickness at the thrust pads results in rapid breakdown of the bearing babbitt and can result in rotor/bearing damage if not corrected.

Certain operating conditions can give rise to cavitation, an implosion of vapor cavities in the liquid. Cavitation can damage the turbine, eroding metal, affecting efficiency, and eventually forcing a shutdown and dewatering for repair of affected parts. Cavitation is measured with an accelerometer mounted on the draft tube or the turbine head cover.

Temperature sensors are installed in locations such as in stator slots, air cooler inlet and outlet, water inlet and outlet, etc., providing important information on stator condition.

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Partial discharges are the small electrical sparks that occur within the voids of high-voltage insulation systems. By monitoring these partial discharges, a variety of winding-related problems can be detected.

□ CMSI News

Vehicle Health Monitoring System

Vehicle Health Monitoring Systems uses sensors to monitor the actual operating condition of the vehicles. Sensor development in support of vehicle health and performs monitoring includes the monitoring of aerodynamic, structural, propulsion, electrical, pneumatic, hydraulic, navigation, control, and communication subsystems. Sensor development in support of vehicle environmental monitoring includes the following:

- Non-intrusive air data parameters (air speed, air temperature, ambient and stagnation pressures, Mach number, air density, and flow angles)
- Off surface flow field measurement and/or visualization (laminar, vertical, and separated flow, turbulence) zero to 50 meters from aircraft.

World-class condition monitoring capabilities in aerospace and defence have been developed and are now available to the road and rail industry. Road and Railway demand – for both passenger and freight traffic – is set to increase dramatically over the coming years. Meeting that demand depends on fully efficient asset management using resources cost-effectively. The important parameters, which can monitor vehicle condition including wheel compliance, axle box condition, vibration and acoustic compliance and engine and gearbox characteristics. And because reliable services and efficient operations depend critically on a safe and well-maintained infrastructure, one can specialize in condition monitoring across permanent way characteristics such as: rail crack propagation, ballast condition, point machine performance, civil structures.

□ Dr. K. Ramji

Institutional Member:

CMSI takes pleasure in announcing that ...

**Rashtriya Ispat Nigam Limited,
Visakhapatnam has become First
Institutional Member (No. IM 01)**

CMSI appreciates the RIN Ltd., management for their initiative in CMSI activities.

**To the optimist the glass is half full,
To the pessimist the glass is half empty,
To the Maintenance Engineer,
The glass is twice as big as it needs to be.**

Shock, Noise & Vibration Centre, NSTL

Shock, Noise & Vibration Centre which came into existence in Nov, 1988 at NSTL, Visakhapatnam has grown into a premier research centre offering specialized expertise and modern technological resources. It has a complement of 30 Scientists and support staff drawn from various disciplines like Mechanical, Materials, Instrumentation & Ocean engineering, Physics and computer science. The centre has unique R&D facilities in the field of Shock, Vibration and Noise. Besides the in-house expertise, the centre maintains excellent rapport with premier academic/research institutes in its pursuit of technical excellence.

The activities of this centre

- Shock & Vibration Isolator Design
- Shock measurement & Analysis
- Underwater explosion and its effects on structures
- Underwater Noise measurements
- Vibration and structure borne noise measurement
- Propeller Noise Studies
- Shock & vibration Testing
- Expert based condition monitoring and diagnostics
- Computational acoustics using in house developed F.E.M. codes
- Experimental modal analysis
- Specialised Technical programmes

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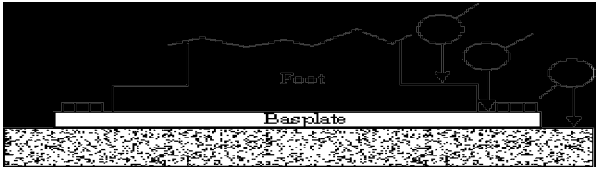
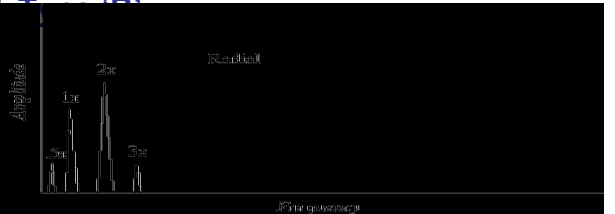
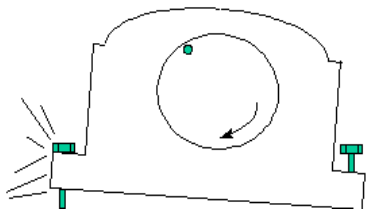
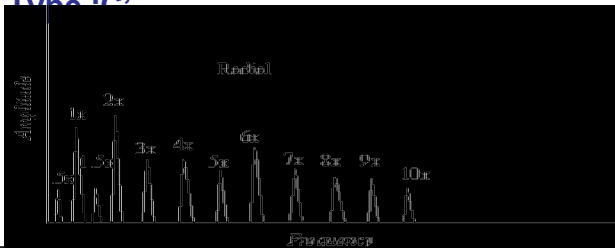
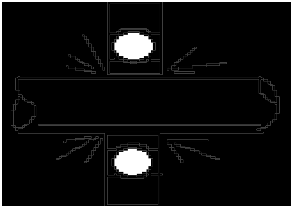
Mechanical Looseness: A common machinery fault

Mechanical Looseness is indicated by either type A, B or C spectra. Type 'A' is caused by structural looseness/weakness of machine feet, baseplate or foundation, also by deteriorated grouting, loose hold-down bolts at the base and distortion of the frame or base (i.e. Soft Foot).

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Typical Spectrum	Phase Relationship
Type 'A' 	
Type 'B' 	
Type 'C' 	

Phase analysis may reveal approx. 180° phase difference between vertical measurements on the machine foot, baseplate and base itself. Type 'B' is generally caused by loose pillow block bolts, cracks in the frame structure or bearing pedestal. Type 'C' is normally generated by improper fit between component parts which will cause many harmonics due to non-linear response of loose parts to dynamic forces from the rotor. Causes a truncation of time waveform. Type 'C' is often caused by a bearing liner loose in its cap, excessive clearance in either a sleeve or rolling element bearing or a loose impeller on a shaft. Type 'C' phase is often unstable and may vary widely from one measurement to the next, particularly if the rotor shifts position on the shaft from one start-up to the next. Mechanical looseness is often highly directional and may cause noticeably different readings if you compare levels at 30° increments in the radial direction

Machinery musings ...
Nobody Ever Gets Credit for fixing
problems that never happened.

Total Productive Maintenance (TPM)

TPM is the acronym of 'Total Productive Maintenance', a concept pioneered by the Japan Institute of Plant Maintenance, Tokyo for operational excellence. What TPM does is help companies achieve high levels of productivity by developing self managing abilities in workers and managers, which in turn improves skills, and work practices. In the process, companies can benefit by cutting costs and raising production simultaneously. These teams are empowered and supported by suitable training and other inputs. They handle to entire process of problem identification, suggestion for improvement and implementation of the solution in a collaborative fashion.. On the average, Hindustan lever has more than doubled productivity through TPM. With TPM, Each factory and each machine started producing more goods due to complete change in employee mind set.

HLL's TPM costs and benefits

Mfg site	Investment (Rs. Crores)	Benefits (Rs. Crores)
Silvassa (PP)	1.50	21.00
Chhindwara	0.80	2.40
Yavatmal	0.60	6.00
Orai	0.45	6.00
Rajpura	0.42	6.20
Mangalore	0.62	11.10
Daman	1.00	13.90
Sumerpur	0.20	2.30

M/s. Jost's Engineering Company Limited

96 year old company in the business of material handling, import and export of industrial engineered products
Email : sales@hvd.josts.com, URL : www.josts.com, Phone : 040 - 27900300

CMSI NEWS

CMSI Celebrates its First Anniversary on 05 Sep 2004 at Hotel Dasapalla Executive Court in Style.

Dr. K. Satyanarayana, Director, NSTL, Visakhapatnam was the Chief Guest.



Chief Guest addressing the CMSI members



Delegates at the Function



Chief Guest awarding certificates to the members



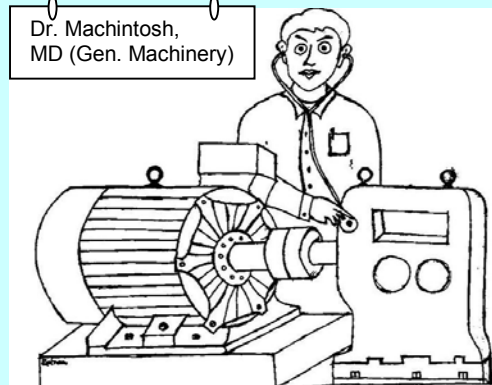
Dr. V. Bhujanga Rao, President, CMSI delivering a lecture

A little effort can make the difference ...

- *Always precision balance the rotors.*
- *Overhung rotors need balancing in two planes.*
- *Create company standards for balancing and alignment.*
- *Bearings, shafts or bores need careful assembly.*
- *Practice periodic alignment checks for all machinery.*
- *Identify resonating items like pipes, attached parts at initial stages.*
- *Precise shimming necessary to eliminate soft foot.*

Books Recommended:

- *Reliability – Centred Maintenance – John Moubray*
- *Uptime : Strategies for Excellence in Maintenance Management – John Campbell*



Hey ! Mac !

UR ROTOR is humming Carnatic Tune.

No More Pop or Disco Noise.

U R Safe !.. No ECG ! No TMT Required

TAKE CARE OK! OK!

Published by Prof. M. Ananda Rao, General Secretary, CMSI

If undelivered please return to :

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Naval Science & Technological Laboratory,
Visakhapatnam – 530 027, INDIA

To,