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From President's Desk..



Digital Twin concept opens new horizons in Predictive Maintenance!!

Digital Twin is an exact replica of a product with all its operational features generated using its physical system's real time information collected via several smart sensors. IOT, AI, Data Analytics, increased data storage capabilities, simulation and visualization techniques, etc. are making this unique innovation possible. Maintenance teams can leverage this animated visual representation for performance monitoring and process optimization.

Dr. Michael Grieves from University of Michigan was the first to put forth this model in 2002. So to say, today, we can make a digital 3D copy of an inflight aero gas Turbine, a physical twin, based on physical data of the turbine (3D model, performance data, environment data, external conditions etc.) and visually see on the computer on the ground how it is working real time. This technology is adaptable to any scale, and highly flexible without dimensional constraint. Any malfunction in the operational turbine can be easily identified and corrected in real time in this large data driven process using suitable neural networks. Extending this new Digital twin concept, one can test, design, and improve a new product in a virtual environment before its launch at much less product development cost. In addition, maintenance professionals will have a better understanding of the product life cycle and can even prepare better maintenance schedules as part of their predictive maintenance strategy for extending equipment life and reducing down time. NASA has started using Digital twin in their space craft design. US air force first time used in the analysis of F-15 airframe and other equipment. GE, the manufacturer of Jet engines, Siemens, another industrial giant are offering expertise in this field. IBM is marketing digital twins as part of its IoT technology, and Microsoft is offering its own digital-twin platform. India should not lag behind and CMSI members should start working in this innovative field.

---- **Dr. V. Bhujanga Rao**

Main Features of this Issue...

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Announcements

National Conference on Condition Monitoring (NCCM-2019) is being Conducted at **K. L. University (Deemed), Vijayawada** under the aegis of **Condition Monitoring Society of India (CMSI)** during **20-21 Sep 2019**. Prof K V Ramana, Dept of Mech Engg is the convener.

For Further information please see: **Website:** www.comsoi.org

COMADEM - 2019 is being hosted by **University of Huddersfield, UK**, during **03- 05 Sep 2019**.

For Further information please see:

Website: <http://www.comadem2019.com/>

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Single channel vibration analyzer and field balancer by Mr. Karan M. Banthia Founder & CEO - Signasis Technologies Pvt. Ltd.

The principal object of this invention is to provide improved method for locating the absolute point of imbalance of a rotating body with respect to vibration sensor, such as an accelerometer, without using any external speed synchronization input for RPM measurement and phase synchronization. The electrical vibration signal is digitized and processed using a micro processor to derive phase compensated and synchronized trigger signal for synchronizing the light flashing speed of an external flashing device with the speed of rotating body for visually locating the point of imbalance, apparently freezing the point i.e. the said body will make precisely one revolution for each flash of the said flashing device and the said point will appear in precisely the same position during each flash, in the direction parallel to the mounted vibration sensor on the same plane and in line of the tip of vibration sensor on the peripheral of the rotating body.

This invention is based on the concept that vibration signal due to imbalance in rotating body is a sine waveform at 1 x rotating speed of the body under maintenance and the peak of the said sine waveform represents the amplitude and location of point of imbalance on the body when using a vibration accelerometer for converting mechanical vibrations into electrical signal. When using velocity or displacement sensor for measuring vibrations, the shape of electrical vibration signal will still be a sine waveform with an added phase shift. So the peak of sine waveform in this case won't represent the point of imbalance but compensating the added phase shift will give the location of point of imbalance in the electrical vibration signal.

Market News

The machine condition-monitoring market is expected to grow from \$2.38 billion this year to \$3.5 billion by 2024, according to the Markets and Markets, mainly due to the increased availability of condition monitoring sensors and the growing number organizations looking to implement advanced maintenance strategies like Condition-Based Maintenance (CBM) and Predictive Maintenance. Bryan Christiansen | Dec 12, 2018.

Condition Monitoring of Railway Track Using a Drone

Researchers from Indian Institute of Technology (IIT) Roorkee have developed computer vision approach for monitoring of railway track using a drone. The technology is a fusion of drone and satellite data.

The aim of the project is to provide some automated techniques for track inspection. Railway track health monitoring is one of the major tasks in railway inspection and monitoring system which is performed in order to maintain safety and security.

More about the track-monitoring task

The track-monitoring task involves inspection of various railroad components such as loose rail fasteners, defect in clips and switches, broken and misplaced crossings, cracks in various components of track and gauge measurement between the rails.

Due to the course of time, rail track component come across various defects like: loose rail fasteners, rail cracks, rail burns, misplaced crossties, broken crossties, a problem with the joints, and defect at switches as well as less visually evident defects like shifting from the mathematical model of track geometry over time. In particular, a common problem in the railroad industry is the tendency of rails to deviate from their proper gauge.

The existing system is expensive, time-consuming, involves human inspection, and automated vehicle-based system that needs proper track engagement for inspection. Researchers from IIT Roorkee is using computer vision for railroad component analysis to improve efficiency, objectivity and accuracy in the inspection system. This system helps to achieve cost-effective solutions with a higher level of performance, which is often unattainable through human inspection.

The inspection of rail track is done by applying Image processing, Computer Vision techniques on the images sent by drone. Images and generated data obtained from the drone is analyzed which gives useful information about the health of the rail tracks.

Ref: <https://www.thehindu.com/news/national/iit-roorkee-develops-technology-for-railway-track-health-monitoring-using-drones/article24329026.ece>.

CBM = Cost Savings + Higher system reliability

Source: <https://www.fiixsoftware.com/condition-based-maintenance/>

Condition Monitoring Activity

CMSI Member **Er. Hemant Bari** conducted 03 Day Condition Monitoring workshop for 75 engineers of Parichha Power Plant, Jhansi, UP during 24-26 July 2018.



Er. Hemant Bari also conducted a Two Day Condition Monitoring workshop for 210 students with Basics & Hands on Practice for Vibration Measurement at Amrutvahini Engg. College, Sangamner, Shirdi during 15 & 16 September 2018.

During the workshop total 21 students enrolled for CMSI yearly membership.



Global Condition Monitoring Services market: \$ 2.3 Billion worth of growth Oppourtunities from 2017 to 2014. Ref: Frost & sullivan

Worth \$1.92 Billion in 2017, the Condition Monitoring market revenues are expected to reach \$4.8 billion by 2025 at a CGAR of 12.4%, although revenue trajectory varies among different service segments. Improved customer appreciation of the benefits of condition monitoring, wider leverage of standards and certifications, reduced condition monitoring equipment prices, and demand for analytics will underpin growth. Customers are looking to derive actionable insights from their condition monitoring data and require assistance with integrating disparate data and leveraging analytics. The industrial Internet of Things (IIoT) or industry 4.0 and changing customer requirements will lea to the adoption of new business models.

There is increased demand for integration of condition monitoring with other operational and business systems (e.g. CMMS) so that condition monitoring is not look at in isolation (for example, viewing vibration data alongside pump data).



Conditon Monitoring Benefits Calculator

Glad to know Bruel & Kjaer developed a handy calculator titled "**Benefits Calculator**" for condition monitoring of wind turbines. B&K Condition monitoring solution provides early fault detection techniques and expert diagnostic services that avoid costly catastrophic failures. This net savings can offset the cost of investment for the monitoring system faster than you think. It is easy to use and to enter data about your wind park to see what your payback will be and the total savings over the lifetime of your wind turbines.

Ref. E-Mail: info@bkvibro.com



CMSI Welcomes New Members!!

LIFE MEMBERS:

Mr. KARAN MAHAVIR BANTHIA
Mr. AMTI RAMESH BHENDE
Dr. V. PARTHASARATHI NAIDU
Dr. M. V. CHILUKURI
Dr. R. SARAVANA KUMAR
Dr. VIJAYA PRIYA

STUDENT MEMBERS:

- 14 Student Members from NMAM, Karnataka
- 22 Student Members from Amrutvahini College of Engineering, Maharashtra
- 02 Student Members from Vellore Institute of Technology, Vellore.



M/s. UE Systems IMENA Pvt. Ltd

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CMSI Members in News



Prof. A SESA RAO, CMSI Life Member has been Awarded **Ph.D** degree in **Computer Science & Systems Engg.** by **Andhra University, Visakhapatnam**. He is currently working as Director at Vignan Institute of Engineering for Women, Visakhapatnam.



Dr. Ch. Suryanarayana, CMSI Life member appointed as Director, Indian Maritime University, Kochi.

CMSI congratulates him on his new appointment and wish him all success in his tennure!!



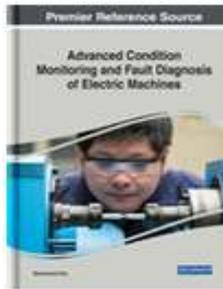
Prof. MRS Satyanarayana, CMSI Secretary, has been appointed as Director, Consultancy Projects Collaboration, GITAM University (Deemed), Visakhapatnam.

CMSI congratulates him all successful tenure in the new post.

Reference Book

Advanced Condition Monitoring and Fault Diagnosis of Electric Machines
By **Muhammad Irfan** (Najran University, Saudi Arabia)

Description: The reliability of induction motors is a major requirement in many industrial applications. It is especially important where an unexpected breakdown might result in the interruption of critical services such as military operations, transportation, aviation, and medical applications.



Advanced Condition Monitoring and Fault Diagnosis of Electric Machines is a collection of innovative research on various issues related to machinery condition monitoring, signal processing and conditioning, instrumentation and measurements, and new trends in condition monitoring. It also pays special attention to the fault identification process. While highlighting

topics including spectral analysis, electrical engineering, and bearing faults, this book is an ideal reference source for electrical engineers, mechanical engineers, researchers, and graduate-level students seeking current research on various methods of maintaining machinery.

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On- Line CBM Course:

OSIsoft: Enabling Condition Based Maintenance (CBM) Online Course

<https://www.youtube.com/watch?v=LU5ZYT7la1U>

Any information on Technical Articles, Latest CM Products/ Courses/ Conferences, significant Achievements/Awards/Honours by our CMSI members may please be intimated through our CMSI e-mail: cmsi.hq@gmail.com. **--Editor**