



Condition Monitoring
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PREDICT • PROTECT • PERFORM

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CONDITION MONITORING PLUS (CM+) FOR VIKSIT BHARAT 2047

- Intelligent Monitoring
- Predictive Insight
- Reliable Assets
- Sustainable Future



SMART
SENSORS



AI &
ANALYTICS



CLOUD &
IOT



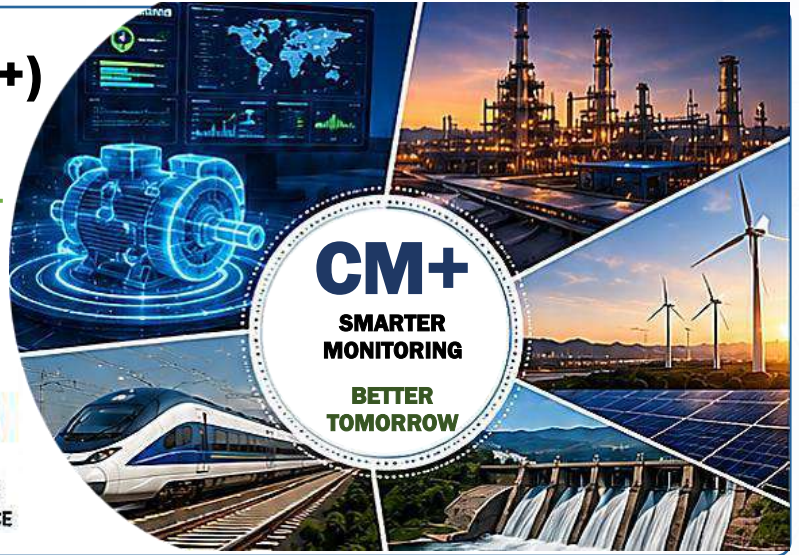
DIGITAL
TWINs



RELIABILITY
& SAFETY



PREDICTIVE
MAINTENANCE



Main features of this Issue...

- ❖ **Message from the Founder President:** Condition Monitoring Plus (CM+) for Viksit Bharat 2047!!
- ❖ **Industry Snapshot:** CM+ Driving Reliability Across Critical Industries
- ❖ **CM+ Beyond Industry:** Safeguarding Infrastructure & Heritage
- ❖ **Future of CM+:** AI, Digital Twins & Smart Asset Intelligence
- ❖ **12th Dr. V. Bhujanga Rao Endowment Lecture** – Highlights & Key Takeaways
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From the Founder President



CONDITION MONITORING PLUS (CM+) FOR VIKSIT BHARAT 2047 !!

India is entering a transformative era of industrial growth, infrastructure expansion, digitalisation, and technological self-reliance. As we build steel plants, railways, refineries, highways, tunnels, dams, metros, renewable energy systems, and smart manufacturing ecosystems, the nation must also ensure that these assets operate reliably, efficiently, safely, and continuously throughout their life cycle.

Condition Monitoring Plus (CM+) is becoming an essential technology for this transition. CM+ combines engineering, Artificial Intelligence, IoT sensors, predictive analytics, digital twins, AR/ VR and intelligent diagnostics to detect failures before they occur, improve operational efficiency, reduce downtime, conserve energy, and extend asset life.

As part of Viksit Bharat, India is building huge infrastructure. We will depend not only on how much infrastructure we create, but also on how intelligently we operate and sustain it. CM+ can significantly contribute towards national productivity, industrial competitiveness, infrastructure reliability, safety, energy conservation, and sustainability.

The Condition Monitoring Society of India (CMSI) has consistently worked to promote awareness, research, training, and industrial applications of Condition Monitoring technologies across the country for the last 25 years. This newsletter presents the growing role of CM+ in industry, transportation, infrastructure, civil engineering, and national economic growth.

I hope this issue encourages wider adoption of CM+ technologies and inspires young engineers, industries, institutions, and policymakers to view reliability and predictive maintenance as strategic national priorities for Viksit Bharat @2047.

— Dr. V. Bhujanga Rao
Founder President, CMSI

Announcement:

13th Dr V. Bhujanga Rao Endowment Lecture



13th Dr. V. Bhujanga Rao Endowment Lecture will be delivered by Padmashri Awardee **Dr. Prahlada Rama Rao**, Former Distinguished Scientist and Director General, DRDO & Former Vice Chancellor, DIAT, Pune on **21st July 2026** at **GITAM University**, Visakhapatnam in association with the **Condition Monitoring Society of India (CMSI)**.



Industry Snapshot

CM+ Driving Reliability Across Critical Industries

Condition Monitoring Plus (CM+) has become an essential technology for modern industrial operations. Industries today operate highly complex equipment under demanding conditions, making reliability, safety, and productivity critical to business success. By combining traditional condition monitoring techniques with Artificial Intelligence (AI), IoT-enabled sensors, Digital Twins, and predictive analytics, CM+ helps organizations move from reactive maintenance to intelligent asset management.

CM+ IN STEEL PLANTS

Driving Reliability and Productivity

Steel plants are among the largest users of Condition Monitoring technologies worldwide. Modern steel manufacturing facilities operate a wide range of critical equipment, including rolling mills, turbines, gearboxes, heavy-duty motors, cranes, conveyors, pumps, compressors, and continuous casting systems. The reliable operation of these assets is essential for maintaining production continuity and operational efficiency.

Condition Monitoring Plus (CM+) enables steel plants to continuously assess equipment health through vibration analysis, temperature monitoring, lubrication assessment, electrical diagnostics, and process parameter evaluation. By identifying early signs of deterioration, CM+ helps maintenance teams intervene before faults develop into costly failures.

The benefits are substantial. CM+ reduces unplanned downtime, improves machine availability, enhances production efficiency, lowers maintenance costs, conserves energy, and extends equipment life. Large integrated steel plants achieve significant economic gains through predictive maintenance and intelligent asset management strategies.

The same approach is increasingly adopted in cement plants, fertilizer industries, petrochemical complexes, oil refineries, power generation facilities, and advanced manufacturing industries, where equipment reliability directly influences operational performance and profitability.

AVIATION AND AEROSPACE

Ensuring Safety Through Intelligent Monitoring

The aviation industry is one of the most demanding sectors for reliability and safety. Aircraft engines, landing gear systems, turbines, hydraulic systems, and avionics must operate flawlessly under extreme conditions. Even minor equipment failures can have significant operational and safety implications.

Condition Monitoring Plus (CM+) helps aviation organizations continuously monitor critical parameters such as vibration, temperature, pressure, acoustic emissions, and structural integrity. Advanced analytics and predictive maintenance techniques enable early fault detection, helping maintenance teams address issues

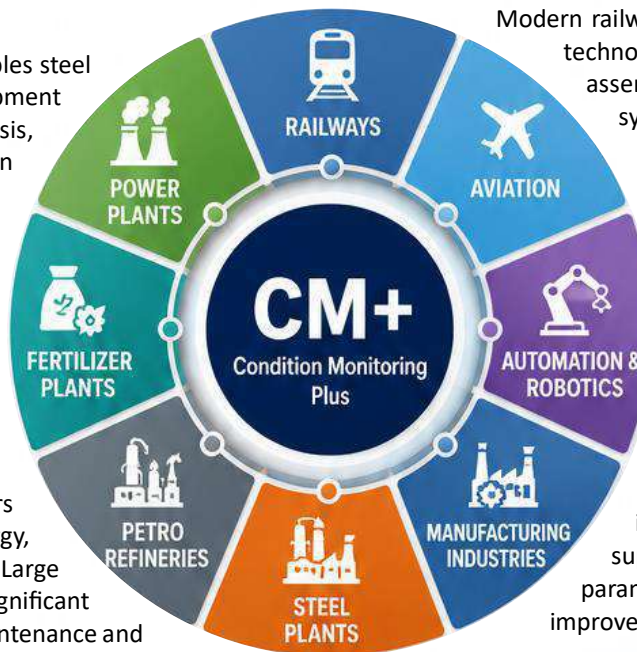
RAILWAYS AND KAVACH

Intelligent Infrastructure Monitoring in Action

Condition Monitoring has expanded beyond industrial machinery and is now playing a vital role in transportation infrastructure. Indian Railways is increasingly adopting advanced monitoring technologies to improve reliability, operational efficiency, and passenger safety.

Modern railway systems utilize Condition Monitoring technologies for traction motors, wheel assemblies, axle bearings, gearboxes, braking systems, railway tracks, signaling equipment, and overhead electrification infrastructure. Continuous monitoring helps identify developing faults before they affect train operations or compromise safety.

One of India's most significant achievements in this field is **KAVACH**, the indigenous Automatic Train Protection (ATP) system designed to enhance railway safety through real-time monitoring and intelligent intervention. KAVACH continuously supervises train movement and operational parameters, helping prevent accidents and improve network reliability.



Industry Insight

"From steel plants to railway networks, Condition Monitoring is transforming reliability, safety, and operational excellence through intelligent monitoring and predictive decision-making."

before they impact aircraft performance or safety.

Modern airlines and aerospace organizations increasingly rely on sensor-based monitoring, Digital Twins, and AI-driven diagnostics to improve aircraft availability, reduce maintenance costs, and enhance passenger safety. CM+ plays a vital role in ensuring reliable operations while supporting the industry's commitment to safety and efficiency.

"In aviation, reliability is not a target—it is a necessity."



Condition Monitoring Plus (CM+) has evolved far beyond its traditional industrial roots and is now playing a critical role in protecting the infrastructure that supports modern society. Today, CM+ technologies are increasingly deployed in dams, tunnels, bridges, roads, flyovers, metro systems, pipelines, buildings, and heritage structures, helping asset owners improve safety, reliability, and long-term performance.

surface deterioration, and pavement fatigue with greater speed, accuracy, and cost-effectiveness.

Even the vast network of underwater communication cables that carry global internet traffic increasingly relies on condition monitoring technologies to ensure reliability and uninterrupted connectivity.

CM+ BEYOND INDUSTRY

Safeguarding Infrastructure and Preserving Heritage

Large infrastructure assets are constantly exposed to stress, vibration, thermal variations, environmental effects, ageing, and operational loads. Advanced CM+ systems continuously monitor structural movement, leakage, cracks, deformation, pressure changes, and other indicators of asset health. By combining sensors with Artificial Intelligence and predictive analytics, these systems can distinguish between normal operational behaviour and potential structural risks, enabling timely intervention before serious problems develop.

Modern infrastructure monitoring relies on vibration sensors, strain gauges, imaging technologies, drones, LiDAR systems, and AI-assisted diagnostics. These technologies help identify fatigue, corrosion, abnormal vibration, pavement deterioration, structural instability, and other early warning signs that may affect safety and serviceability.

Tunnel monitoring systems provide continuous assessment of deformation, water ingress, stress accumulation, and seismic effects, while automated road monitoring solutions can detect potholes,

Monitoring Heritage Structures

Historical monuments and heritage structures represent invaluable cultural assets that require continuous protection from vibration, tilt, environmental degradation, moisture intrusion, and nearby construction activities. CM+ systems provide non-invasive monitoring solutions that help preserve these structures while maintaining their historical integrity for future generations.

Research and Development in India

India is actively advancing Condition Monitoring and CM+ technologies through research conducted at IITs, IISc, CSIR laboratories, DRDO establishments, railway research organizations, and leading engineering institutions. Current areas of innovation include AI-driven diagnostics, Digital Twins, wireless sensor networks, predictive analytics, edge AI, drone-assisted inspection, and Structural Health Monitoring (SHM).

As infrastructure becomes increasingly intelligent and interconnected, India is well positioned to emerge as a global leader in developing affordable, scalable, and sustainable CM+ solutions for the future.



ENABLING THE FUTURE WITH CM+ TECHNOLOGIES



“ From bridges and tunnels to heritage monuments and smart cities, CM+ is the invisible guardian that keeps our infrastructure safe, reliable and future-ready. ”

FUTURE OF CM+

Emerging Technologies Shaping the Next Generation of Asset Intelligence

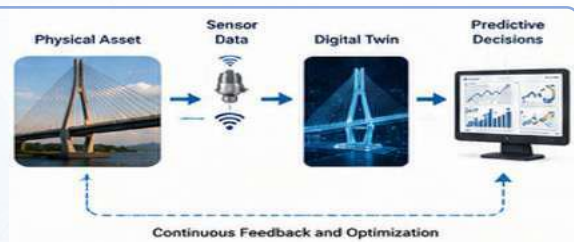
Condition Monitoring Plus (CM+) is entering a new era driven by digital transformation, intelligent systems, and data-driven decision-making. As infrastructure becomes more complex and interconnected, CM+ technologies will play a critical role in building a resilient, sustainable, and future-ready world. The integration of Artificial Intelligence, Digital Twins, smart sensors, and predictive analytics is transforming condition monitoring from a maintenance tool into a strategic asset management framework.

DIGITAL TWINS

The Virtual Mirror of Physical Assets

Digital Twin technology is transforming the way engineers monitor and manage assets. By creating a dynamic virtual replica of a physical system, Digital Twins enable continuous synchronization with real-time sensor data. This allows engineers to visualize asset behaviour, simulate operating conditions, predict failures, and evaluate maintenance strategies before issues occur in the real world.

For complex infrastructure such as bridges, tunnels, dams, metro systems, power plants, and industrial facilities, Digital Twins provide a holistic view of asset health throughout the lifecycle. By combining monitoring data with advanced simulations, organizations can reduce downtime, extend service life, and optimize performance with greater confidence.



AI AND EDGE INTELLIGENCE

From Data to Intelligent Decisions

Artificial Intelligence is elevating CM+ from condition assessment to intelligent decision-making. Machine learning algorithms can analyze large volumes of operational data to identify anomalies, detect subtle degradation patterns, predict remaining useful life, and recommend optimal maintenance actions.

"The future of Condition Monitoring lies not only in detecting failures, but in creating intelligent, connected, and self-aware assets that support a safer, smarter, and more sustainable world."



Edge AI complements this capability by processing data closer to the source. This reduces latency, minimizes communication requirements, enhances cybersecurity, and enables real-time responses in critical applications such as railways, aviation, energy systems, and manufacturing facilities. Together, AI and Edge Intelligence are helping organizations move from reactive maintenance to predictive and prescriptive maintenance strategies.

SMART SENSORS AND WIRELESS MONITORING

Advances in wireless sensors and IoT technologies are making continuous monitoring easier and more cost-effective. These systems can track vibration, temperature, pressure, acoustics, and other critical parameters across large and geographically distributed assets. The result is improved visibility, higher data quality, and earlier detection of potential issues.

CM+ AND VIKSIT BHARAT 2047

Building a Developed India Through Intelligent Infrastructure

India's vision of Viksit Bharat 2047 calls for world-class infrastructure, industrial growth, and improved quality of life. CM+ technologies will serve as important enablers of this transformation by improving the reliability, safety, and sustainability of critical national assets.



From smart cities and high-speed rail networks to renewable energy systems, ports, airports, highways, and advanced manufacturing facilities, intelligent monitoring will become a cornerstone of future infrastructure management. By adopting Digital Twins, Artificial Intelligence, IoT, drone-assisted inspection, LiDAR technologies, and predictive analytics, India can enhance safety, reduce lifecycle costs, improve energy efficiency, and ensure long-term asset sustainability.

"Viksit Bharat will not be built merely by constructing assets, but by ensuring that those assets continue to operate safely, efficiently, intelligently, and reliably throughout their life cycle."



12th Dr. V. Bhujanga Rao Endowment Lecture at GITAM, attracting students, researchers, academicians, scientists, and industry professionals.

12th Dr. V. Bhujanga Rao Endowment Lecture Inspires Future Generations

The Department of Mechanical Engineering, GITAM (Deemed to be University), Visakhapatnam Campus, in association with the Condition Monitoring Society of India (CMSI), organized the **12th Dr. V. Bhujanga Rao Endowment Lecture** on 29th July 2025. The event brought together scientists, academicians, industry professionals, researchers, and students to explore emerging technologies and their role in shaping the future.

The keynote address was delivered by **Dr. A. Sivathanu Pillai, PhD, D.Sc., Founder CEO & Managing Director of BrahMos Aerospace and Former Chief Controller (R&D), DRDO**, on the theme **“Building a Sustainable Future Integrated with National Vision.”** Dr. Pillai shared inspiring insights on the growing influence of Artificial Intelligence, robotics, aerospace technologies, renewable energy, and intelligent manufacturing in transforming industries and society. He highlighted how these technologies are expected to drive progress in agriculture, healthcare, transportation, infrastructure, and advanced manufacturing. Drawing from the success of the **BrahMos Supersonic Cruise Missile Programme**, he emphasized the importance of indigenous innovation, technological excellence, and international collaboration. He also encouraged

students and young researchers to embrace innovation, continuously upgrade their skills, and actively contribute to nation-building.

In his special address, **Dr. V. Bhujanga Rao, Chairman of KIMS Foundation and former Director General of DRDO**, spoke about the growing importance of Condition Monitoring technologies and the role of Artificial Intelligence, Machine Learning, and advanced analytics in predictive maintenance and reliability improvement. **Er. P. V. S. Ganesh Kumar, President of CMSI and Scientist at NSTL**, shared the vision of CMSI in promoting reliability engineering and condition monitoring practices across industries. The event was successfully coordinated by **Dr. T. Venkata Ratnam** from CMSI, along with **Dr. K. V. S. Seshendra Kumar** and **A. Ravindra** from GITAM (Deemed to be University), whose efforts contributed significantly to the success of the programme.

Key Takeaways

- ✓ *Artificial Intelligence and robotics will significantly influence future industries and society.*
- ✓ *Innovation, sustainability, and technological self-reliance are essential for national growth.*
- ✓ *The BrahMos programme stands as a model of indigenous innovation and engineering excellence.*
- ✓ *Condition Monitoring and predictive technologies are transforming modern maintenance practices.*
- ✓ *India's youth can drive future progress through innovation, skills, and research.*



NCCM-2025 Successfully Brings Together Experts in Integrated Vehicle Health Management

The National Conference on Condition Monitoring (NCCM-2025) was successfully organized by the Condition Monitoring Society of India (CMSI) in association with Gas Turbine Research Establishment (GTRE), DRDO, Bengaluru, during 27–28 November 2025. The conference focused on the theme **"Integrated Vehicle Health Management"**, highlighting emerging technologies and innovative approaches for improving reliability, safety, and operational performance of critical engineering systems. The conference attracted enthusiastic participation from scientists, engineers, researchers, academicians, industry professionals, and students from across the country. A major highlight of the

event was the presentation of around 60 technical papers, covering diverse areas such as Artificial Intelligence and Machine Learning in Condition Monitoring, Digital Twins, Gas Turbine Health Management, Aircraft Health Monitoring, Structural Health Monitoring, Vibration Analysis, Thermography, Oil Analysis, Ultrasonics, and Predictive Maintenance. The technical sessions provided an excellent platform for sharing research findings, industrial case studies, innovative monitoring methodologies, and practical experiences related to machinery and structural health monitoring. Participants actively engaged in discussions on intelligent diagnostics, advanced sensor technologies, data analytics, and next-generation maintenance strategies. The conference also showcased the significant contributions of GTRE and DRDO in advancing aero-engine technologies and health management systems for strategic applications. The deliberations emphasized the importance of interdisciplinary collaboration among industry, academia, and R&D organizations in addressing future challenges in reliability engineering and asset management. NCCM-2025 successfully strengthened knowledge exchange, professional networking, and technological awareness while reaffirming CMSI's commitment to promoting Condition Monitoring technologies for industrial excellence, national development, and the vision of a technologically self-reliant India.



The Voice of Participants

"NCCM-2025 provided an excellent platform to interact with experts from industry, academia, and R&D organizations. The technical sessions were highly relevant and offered practical insights into emerging Condition Monitoring technologies."

— Industry Professional

"The conference successfully showcased the growing role of Artificial Intelligence, Digital Twins, and predictive analytics in modern Condition Monitoring. The discussions were informative and inspiring for researchers and practicing engineers alike."

— Research Scientist

"NCCM-2025 served as a significant forum for advancing knowledge exchange, fostering technical collaboration, and strengthening academia–industry partnerships to enhance the safety, reliability, and sustainability of engineering systems."

— Academia Expert

CMSI ACTIVITIES AND AWARDS (2024 – '25)

Promoting Excellence and Strengthening the Condition Monitoring Community Across India

The **Condition Monitoring Society of India (CMSI)** continued to strengthen the Condition Monitoring community during **2024–25** through conferences, Faculty Development Programmes, technical workshops, industrial collaborations, and professional recognition. These initiatives provided valuable opportunities for engineers, researchers, academicians, scientists, and industry professionals to exchange knowledge, explore emerging technologies, and promote best practices in Reliability Engineering and Predictive Maintenance.

SKF–CMSI Technical Meet

The **CMSI Jamshedpur Chapter**, in association with **SKF**, organized an exclusive technical event on **29 August 2025** at the **Radisson Hotel, Bistupur, Jamshedpur**. The programme focused on **Advanced Condition Monitoring Solutions, Transformative Technologies, and the Future of Predictive Maintenance**.

More than **60 participants** from industry and academia attended the event, which showcased practical industrial applications, innovative monitoring technologies, and emerging trends in predictive maintenance. The programme provided an excellent platform for professional networking and technical knowledge sharing among Condition Monitoring professionals.

Faculty Development Programme (FDP)

A **Faculty Development Programme (FDP)** on "**Artificial Intelligence for Condition Monitoring**" was organized by **Prof. M. R. S. Satyanarayana** during **16–20 December 2024** at the Department of Mechanical Engineering, **GITAM (Deemed to be University), Visakhapatnam**.

The programme was inaugurated by **Sh. P. V. S. Ganesh Kumar, President, CMSI**, who delivered the keynote lecture on **AI-Based Condition Monitoring**. Several distinguished experts from academia, industry, and research organizations shared their knowledge and practical experience on Artificial Intelligence, Machine Learning, Digital Twins, intelligent diagnostics, and predictive maintenance technologies.

CMSI Awards – Recognizing Excellence

To honour outstanding contributions in **Condition Monitoring, Reliability Engineering, research, and professional service**, the CMSI Awards Committee, chaired by **Prof. K. Ramji**, evaluated nominations received from the members.

The following prestigious awards were presented:

- **Dr. M. Ananda Rao Memorial Lecture**
Dr. Edwin Vijay Kumar, Professor & HoD (Asset Management), GVP College of Engineering, Visakhapatnam.
- **Dr. V. Ramamurti Award (2022–2025)**
Dr. Rajiv Tiwari, Professor, IIT Guwahati.
- **Outstanding Services Award (2022–2025)**
Dr. M. R. S. Satyanarayana, Professor, GITAM (Deemed to be University), Visakhapatnam.

NMAMIT-Student Chapter Activity:

Condition Monitoring Society of India (CMSI-Vishakhapatnam) NMAMIT Chapter organized a talk on "**Corrosion challenges for a sustainable society**" by **Dr. Shashi Bhushan Arya**, Associate Professor, Dept. of Metallurgy and materials Engineering NITK, Surathkal, on **26th October 2024**, in the Phalguna Seminar Hall. The resource person Dr. Shashi Bhushan Arya, delivered talk on the effect of corrosion on materials specifically metals, leading to failure if neglected. He explained factors affecting corrosion and also the types of corrosion and discussed the effect of corrosion on Cu, Fe, and Ag. Finally, he discussed methods to prevent corrosion. Also, he pointed out trending areas in corrosion so that our faculties can also do research work on those topics. Dr. I Ramesh Mithanthaya, Dean (Academic), Dr. Narasimha Marakala, I/C HOD, NMAMIT Nitte, Research scholars and Faculty from the Mechanical Engineering Department and about 35 UG students and 2 PG student members were present. Mr. Devesh Hegde was the master of ceremony and CMSI staff coordinator Dr. HS Kumar, welcomed the audience and highlighted the importance of CMSI. The chief guest also highlighted the need of condition monitoring in industries. The Vice principal gave presidential remark and the vote of thanks was proposed by Mr. Devesh Hegde.



CMSI Awards – Recognizing Excellence (Contd.,)

Dr. Baldev Raj Best Paper Awards from NCCM-2023 & NCCM-2024 Proceedings.

NCCM-2023: *Data-Driven Solution for Condition Monitoring of Continuous Galvanizing Line Motors Using Time Series Data*, by Gaurav Lal, Namrata, DN Sharma, Priya Ranjan Mahapatra, Arghya Deb and Sanjeev Kumar.

NCCM-2024: *Intelligent Fault Detection in Wind Turbines Using Spectra Estimation Methods*, by Mantaza Mudassir, Sidra Khanam, and Mohd. Atif Jamil.



NEW CM BOOKS

Latest Publications Advancing Condition Monitoring, Structural Health Monitoring and Asset Management



Condition Monitoring and Structural Health Monitoring of Infrastructure Systems (1st Edition)

by Vistasp M. Karbhari and Farhad Ansari

A comprehensive reference covering modern Condition Monitoring and Structural Health Monitoring techniques for bridges, buildings, pipelines, power infrastructure, and other critical civil engineering assets.

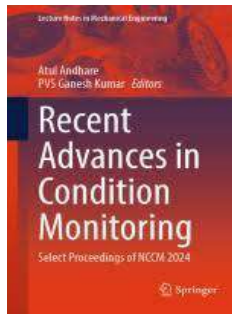
ISBN: 978-044-33-8316-8

Recent Advances in Condition Monitoring – Selected Proceedings of NCCM 2024

by Atul B. Andhare and P. V. S. Ganesh Kumar

A collection of peer-reviewed papers presenting recent developments in Artificial Intelligence, vibration analysis, predictive maintenance, oil analysis, thermography, digital diagnostics, and industrial applications discussed during NCCM-2024.

ISBN: 978-981-96-5791-9



CMSI AT A GLANCE

	NATIONAL CONFERENCES	Organizes national conferences that bring together experts from industry, academia, R&D organizations, and government institutions.
	TECHNICAL PAPERS	Promoting high-quality technical paper presentations on emerging Condition Monitoring and Reliability Engineering technologies.
	SCOPUS-INDEXED PUBLICATIONS	Supporting publication of selected conference papers in internationally recognized Scopus-indexed proceedings and journals.
	KNOWLEDGE SHARING	Conducting endowment lectures, faculty development programmes, workshops, webinars, and expert technical talks.
	INDUSTRY-ACADEMIA COLLABORATION	Strengthening collaboration among industries, academia, research laboratories, and professional organizations.
	CMSI AWARDS & FELLOWSHIPS	Honouring outstanding contributions and recognizing excellence in Condition Monitoring, Reliability Engineering, and Asset Management.
	STUDENT ENGAGEMENT	Encouraging student chapters, technical competitions, awareness programmes, and professional development activities.
	AI & DIGITAL TRANSFORMATION	Promoting Artificial Intelligence, Digital Twins, Industrial IoT, predictive maintenance, and intelligent asset management technologies.
	GROWING PROFESSIONAL NETWORK	Expanding the CMSI community by connecting engineers, researchers, academicians, students, and industry professionals across India.
	LOOKING AHEAD	Advancing future initiatives, conferences, training programmes, collaborative research, and innovation in Condition Monitoring and Asset Management.

Advancing Reliability * Enabling Predictive Maintenance * Building a Smarter Future

ACHIEVEMENTS OF CMSI MEMBERS

Celebrating Excellence in Research, Innovation, Professional Leadership and Industrial Contributions

CMSI proudly recognizes the achievements and professional contributions of its members in the areas of Condition Monitoring, Reliability Engineering, Asset Management, research, training, and innovation.

Technical Programmes & Training

Er. Ganti Subba Rao organized an **Advanced Turbomachinery Vibration Analysis Course** during **13–15 November 2025** at Hyderabad in hybrid mode. The programme benefited industry professionals by providing advanced exposure to vibration analysis and turbomachinery diagnostics.

Er. Hemant Bari conducted a **four-day online training session on Condition-Based Maintenance (CBM)** for the **L&T Defence team** in April 2026. He was also invited as a speaker for the **Summer School organized by RGIPT Institute and TSI Society** on 15 July 2026.

Awards & Recognitions

Dr. V. Sankar received the **Lifetime Achievement Award for Best Engineering Educator 2026** from the **ISTE Andhra Pradesh Section** on 10 April 2026, recognizing his outstanding contributions to engineering education and academic leadership.

Er. Hemant Bari received an **Excellence Award at NCQC 2025**, held at Greater Noida in December 2025, for his case study presentation.

Patents Granted and Publications

CMSI Members as inventors and collaborators achieved notable national and international milestones in innovation and research.

- **USA and Indian Patents: “A System for Transporting a Temperature-Controlled Biological Specimen”** by Dr. Bhaskar Rao Bollineni, Dr. Hemanth K. Vepakomma, Dr. Sandeep Attawar, and Dr. V. Bhujanga Rao.
- **South Korean Patent No. 10-2773899** (24 Feb 2025): **“A Marine Propeller”** granted to Dr. V. Ramakrishna (Scientist-F, NSTL & CMSI EC Member) with co-inventors (CMSI Members) Er. P. V. S. Ganesh Kumar, Ch. Sankara Rao, and Dr. Ch. Suryanarayana.
- **Russian Patent No. 2810150** (25 April 2025) and **Japanese Patent No. 7858638** (01 May 2026): **“An Article Handling System”** granted to Dr. V. Ramakrishna, with co-inventors (CMSI Members) Dr. O. R. Nandagopan and U. Urban Kumar.
- **Indian Patent No. 587298** granted to Dr. D. Ramesh Babu, Professor, SR University, Warangal, titled **“Agricultural Products Peeling and Cleaning Device”**.
- **Dr. Sidra Khannum’s** research presented at the **WCEAM 2024 – 18th World Congress on Engineering Asset Management** was published in May 2026, further strengthening CMSI’s contribution to international research in asset management and reliability engineering.

These achievements reflect CMSI’s growing impact in research, innovation, and intellectual property development at both national and international levels.



Engineering Decision Intelligence:

The Next Evolution of Condition Monitoring

From Data Acquisition to Intelligent Engineering Decisions

by **Er. Ravindra Andukuri**

Life Member, Condition Monitoring Society of India (CMSI).

*Department of Mechanical Engineering,
GITAM (Deemed to be University), Visakhapatnam*

Dr. M.R.S. Satyanarayana

Sr. Vice-President, Condition Monitoring Society of India (CMSI).

*Professor, Department of Mechanical Engineering,
GITAM (Deemed to be University), Visakhapatnam*

Industrial Condition Monitoring has undergone remarkable transformation over the past three decades. Modern industries continuously collect information from vibration analysis, thermography, oil analysis, acoustic monitoring, electrical signature analysis, process instrumentation, and advanced sensors. These technologies have significantly improved the ability to detect equipment abnormalities at an early stage. However, successful maintenance depends not only on identifying faults but also on making the right engineering decision at the right time.

Today's maintenance engineers face increasingly complex decisions making challenges. A detected fault may require immediate shutdown, scheduled maintenance, continued operation under close supervision, or detailed investigation. Selecting the most appropriate action involves balancing equipment health, operational risk, production requirements, maintenance cost, safety, environmental impact, and remaining asset life. These decisions cannot be based on a single parameter alone and often depend on both engineering expertise and data-driven analysis.

This emerging challenge has given rise to the concept of Engineering Decision Intelligence (EDI). EDI extends traditional Condition Monitoring by integrating monitoring data with reliability engineering, risk assessment, asset lifecycle information, Artificial Intelligence, and expert knowledge to support informed engineering decisions. Instead of simply answering "What is the fault?", EDI focuses on "What is the best engineering action?".

Artificial Intelligence is expected to play an increasingly important role in this transformation. Rather than replacing experienced engineers, AI can analyse large volumes of monitoring data, identify hidden relationships, compare historical failure patterns, evaluate multiple maintenance alternatives, and provide transparent decision support. Human expertise remains central to the final decision, while AI enhances consistency, speed, and confidence.

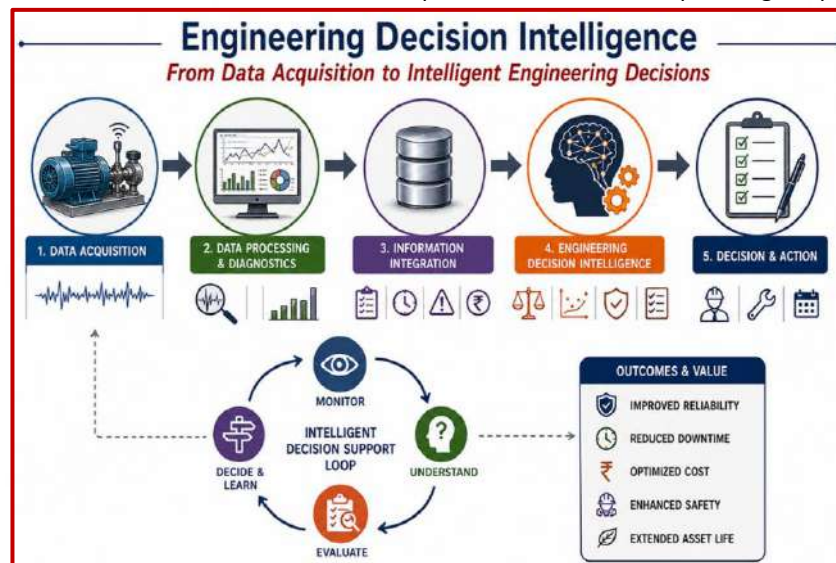
One practical example of this method is the development of Adaptive Neuro-Fuzzy Multi-Criteria Decision-Making (ANF-MCDM) frameworks. Such intelligent decision-support approaches combine engineering knowledge with multiple technical and operational criteria to prioritize maintenance actions and recommend suitable alternatives. These frameworks demonstrate how Condition Monitoring information can be transformed into structured engineering decisions that support reliability, safety, and asset performance.

The future of Asset Management will depend on the ability to convert monitoring information into actionable engineering knowledge. Technologies such as Digital Twins, explainable Artificial Intelligence, physics-informed models, and advanced decision-support systems will further strengthen engineering practice. Organizations that successfully integrate these technologies with human expertise will achieve higher reliability, optimized maintenance planning, improved sustainability, and

better lifecycle performance.

Engineering Decision Intelligence is therefore not another monitoring technology — it is a new way of thinking. By connecting Condition Monitoring with engineering judgement and intelligent decision support, industries can move beyond fault detection towards proactive,

transparent, and value-driven Asset Management.



“Engineering Decision Intelligence is where monitoring ends and engineering begins”.

MEMBER'S PERSPECTIVE

The Future of Condition Monitoring

By **Dr. T. Venkata Ratnam,**

*Associate Professor of Practice, SRM University-AP
Former Technical Officer-D, DRDO-NSTL
General Secretary, CMSI*

Condition Monitoring is entering a new era driven by intelligent sensing, Artificial Intelligence, Digital Twins, and advanced analytics. The focus is no longer limited to fault detection but extends to improving reliability, optimizing maintenance strategies, and maximizing asset performance throughout the lifecycle. As industries move toward smarter and more connected operations, engineering knowledge and practical experience will remain essential for interpreting data and making sound decisions. The future of Condition Monitoring lies in integrating advanced technologies with human expertise to build safer, more reliable, and sustainable industrial systems. Continuous learning, innovation, and collaboration will shape the next generation of maintenance excellence.

Engineering Chabot's for Machinery Condition Monitoring

The Next Digital Assistant for Maintenance Engineers

by Dr. T. Venkata Ratnam

*General Secretary, Condition Monitoring Society of India (CMSI).
Associate Professor of Practice, Dept of CSE, SRM University- AP*

Er. P.V.S. Ganesh Kumar

*President, Condition Monitoring Society of India (CMSI)
& DRDO Fellow, NSTL, Visakhapatnam*

Artificial Intelligence is rapidly transforming the way industries monitor, diagnose, and maintain critical engineering assets. Modern Condition Monitoring systems continuously collect enormous volumes of information through vibration analysis, thermography, oil analysis, ultrasonics, electrical signature analysis, and process monitoring. These technologies have significantly improved our ability to detect abnormal machine behaviour at an early stage. However, identifying a fault is only the beginning of the maintenance process. The real challenge lies in interpreting the available information, understanding its engineering significance, evaluating the associated risk, and selecting the most appropriate maintenance action. This decision-making process often depends on the knowledge and experience of skilled engineers.

Engineering chatbots are emerging as an intelligent solution to bridge this knowledge gap. Unlike conventional chatbots developed for customer service or general-purpose conversations, engineering chatbots are designed specifically for industrial applications. They are trained using equipment manuals, maintenance procedures, international standards, reliability engineering principles, historical fault cases, and domain-specific Condition Monitoring knowledge. As a result, they function as intelligent engineering assistants capable of supporting maintenance personnel during troubleshooting and decision-making.

One of the greatest advantages of engineering chatbots is their ability to communicate with users through natural language. Instead of searching through technical manuals or maintenance records, an engineer can simply ask questions such as, "Why has the vibration level increased?", "What are the possible causes of bearing overheating?", or "Which inspection should be performed before replacing the component?" Within seconds, the chatbot can interpret the available monitoring information, explain possible fault mechanisms, recommend inspection procedures, retrieve relevant engineering standards, and suggest practical maintenance actions based on established best practices.

Beyond fault diagnosis, engineering chatbots can also support maintenance planning and asset management. By integrating information from Condition Monitoring systems, Computerized Maintenance Management Systems (CMMS), Digital Twins,



Industrial Internet of Things (IIoT) platforms, and predictive analytics tools, these intelligent assistants can help prioritize maintenance activities, estimate operational risk, recommend spare parts, review maintenance history, and even generate inspection checklists. Such capabilities reduce troubleshooting time, improve consistency in engineering decisions, and enhance knowledge sharing across maintenance teams.

Another important contribution of engineering chatbots is preserving organizational expertise. Many industries are facing the challenge of retaining valuable engineering knowledge as experienced professionals retire. By capturing expert knowledge, maintenance procedures, and historical case studies within an AI-driven conversational system, organizations can ensure that critical technical expertise remains available to future generations of engineers. This approach also supports the training of young professionals by providing instant access to reliable engineering guidance whenever required.

The future of Condition Monitoring is moving beyond simple fault detection toward intelligent engineering decision support. Engineering chatbots are expected to become an integral part of next-generation maintenance systems by combining Artificial Intelligence with human expertise to deliver timely, reliable, and actionable recommendations. Rather than replacing engineers, they will empower them to make faster, more consistent, and better-informed decisions that improve equipment reliability, reduce unplanned downtime, optimize maintenance costs, and enhance operational safety.

As industries continue their digital transformation journey, engineering chatbots have the potential to become trusted companions for reliability engineers, maintenance professionals, and Condition Monitoring specialists. By converting complex technical data into meaningful engineering knowledge, these intelligent assistants will play a vital role in building smarter, more connected, and more sustainable industrial maintenance systems for the future.

"The future of Condition Monitoring lies not only in detecting faults, but in empowering engineers to make faster, smarter, and more informed decisions."

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NATIONAL CONFERENCE ON CONDITION MONITORING (NCCM 2026)

Advancing Reliability with Intelligence
Driving Industry 4.0 and Beyond



CONFERENCE THEME

Advance condition monitoring
with AI and industry 4.0

KEY TOPICS



Advances in Condition
Monitoring Technologies



AI & Machine Learning
for Predictive Insights



Industry 4.0 & IIoT
Integration



Data Analytics &
Digital Twins



Reliability, Safety &
Asset Performance



Sustainability through
Proactive Maintenance

About the Conference:

NCCM-2026 aims to provide a platform for knowledge sharing among experts, engineers, and academicians on advancements in condition monitoring. It emphasizes the role of AI and Industry 4.0 in improving predictive maintenance and reliability, promotes adoption of advanced techniques to enhance efficiency and reduce downtime, and encourages innovation and collaboration between industry and academia. The expected outcomes include enhanced technical knowledge of participants, increased adoption of modern condition monitoring practices, strengthened industry-academia partnerships, and identification of future research and application areas in smart maintenance systems.

Call for Papers:

NCCM-2026 invites paper submissions across disciplines related to Condition Monitoring of Machines and Structural Health Monitoring for presentation at the conference and inclusion in its proceedings. Submissions that include relevant case studies are particularly encouraged, as they offer greater practical value to participants. All papers will undergo peer review prior to acceptance.

DATE:



11-12 December 2026

VENUE:



Shavak Nanavati Technical
Institute, N-Road,
Jamshedpur - 831001

HIGHLIGHTS

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CMSI announced **Honorary Fellows** and **Life Fellows** to the following eminent persons who made excellent contributions to the field of Condition Monitoring during **NCCM-2025** held during **27-28 Nov 2025** at **GTRE, DRDO, Bengaluru**.

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Upcoming CM Events & Programmes (2026-27)

- 19th World Congress on Engineering Asset Management (WCEAM 2026) | 14-16 October 2026 | Braga, Portugal** – The flagship global event on Engineering Asset Management, Reliability, and Lifecycle Management.
[Vibration Analysis Training Courses \(VCAT I-IV\) | RMS Ltd](#)
- International Conference on Gears 2027 (VDI-FZG) 8-10 September 2027 | Garching, Munich, Germany**
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Knowledge grows when professionals share their expertise, inspire innovation, and collaborate to advance Condition Monitoring, building safer, smarter, and more reliable industries for the future.

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