

RAM

INSIDER

MAINTENANCE, RELIABILITY & ASSET MANAGEMENT INSIDER

STRATEGIC INSIGHTS	FUTURE PERSPECTIVES	INDUSTRY INTELLIGENCE
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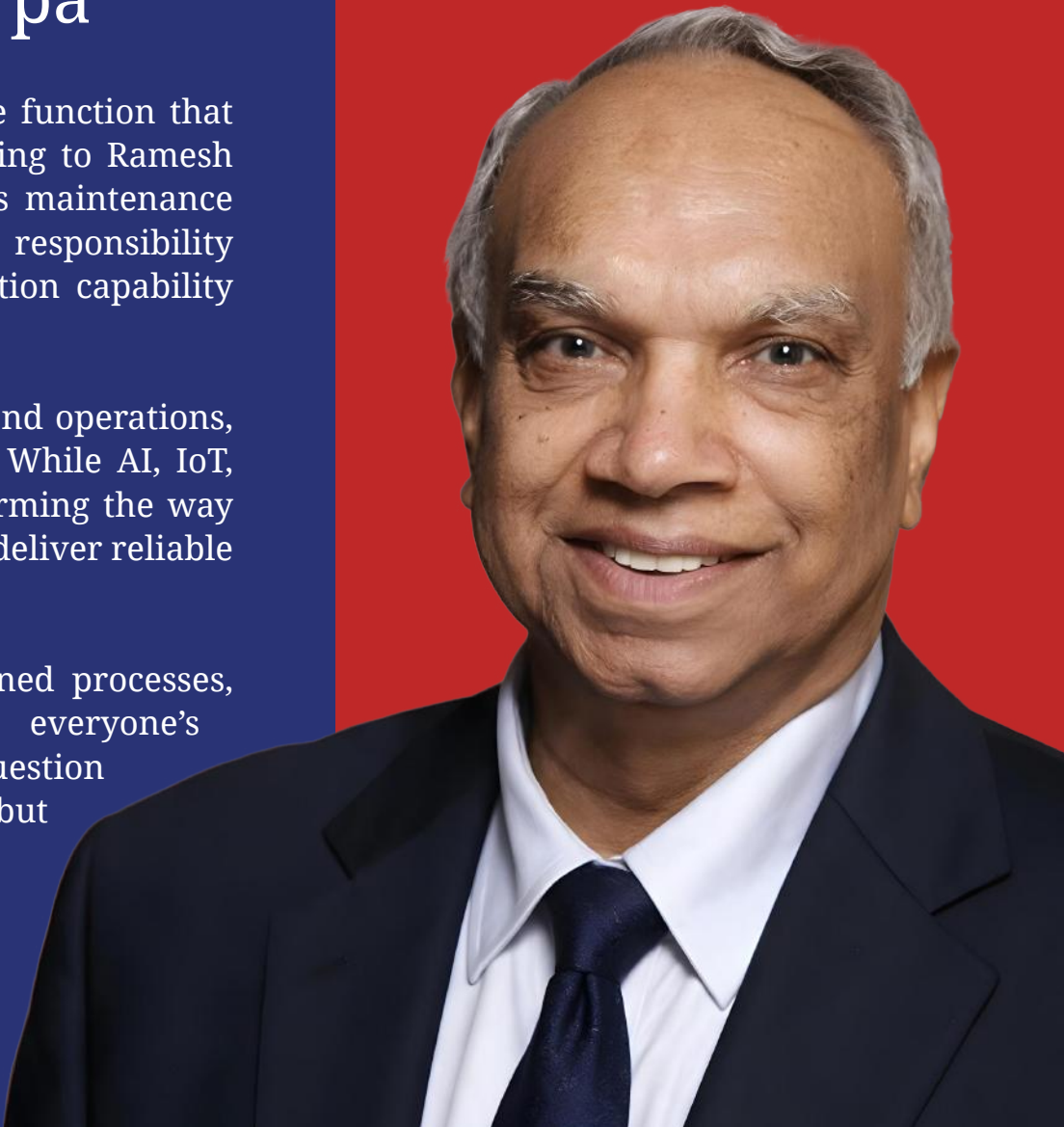
A Walkthrough Of The Industry With The Reliability Sherpa

For decades, maintenance has been viewed as the function that steps in when something goes wrong. But according to Ramesh Gulati, that mindset needs to change. He believes maintenance must evolve into Capacity Assurance: a broader responsibility focused on sustaining an asset’s intended production capability throughout its lifecycle.

From design and procurement to commissioning and operations, reliability is shaped long before a failure occurs. While AI, IoT, Digital Twins and predictive analytics are transforming the way industries manage assets, technology alone cannot deliver reliable operations.

The real shift lies in trained people, disciplined processes, leadership and a culture where reliability is everyone’s responsibility. As Industry 5.0 takes shape, the question is no longer how smart our machines can become, but how smart our organisations can be.

Ramesh Gulati



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MRAM Exhibition 2026

India’s first-of-its-kind expo bringing the entire Maintenance, Reliability & Asset Management ecosystem under one roof, connecting solution providers, industry professionals, technology innovators and decision-makers to advance asset performance.



MRAM Conference 2026

Expert-led conversations addressing emerging trends, industry challenges and strategic approaches shaping the future of maintenance, reliability and asset management.



MRAM Workshop 2026

Hands-on, expert-led workshops designed to tackle real-world challenges and equip professionals with practical tools, techniques and strategies across maintenance, reliability and asset management.



From The Publisher's Desk

Dear Reader,

For over two decades, Virgo Communications & Exhibitions Pvt Ltd has built platforms that bring industries together, not only to do business, but to exchange ideas, share expertise, and inspire progress. While exhibitions create powerful moments of connection, the conversations that truly shape an industry deserve to continue long after the exhibition floor has closed.

It is with that vision that we introduce MRAM Insider.

As industries embrace digital transformation, predictive maintenance, asset intelligence, and operational excellence, Maintenance, Reliability, and Asset Management have evolved into strategic business priorities. Yet, the industry has lacked a dedicated platform that consistently captures the ideas, innovations, and leadership driving this transformation.

MRAM Insider has been created to bridge that gap. More than a newsletter, it is a knowledge platform designed for professionals committed to improving asset performance, operational resilience, and industrial excellence. Through expert insights, industry perspectives, technology trends, case studies, and thought leadership, we aim to foster meaningful conversations that create value throughout the year.

As publishers, we see this as a natural extension of our commitment to the industries we serve. While MRAM Expo will bring the community together this October, MRAM Insider will keep that community connected beyond the exhibition: encouraging continuous learning, collaboration, and the exchange of ideas that move the industry forward.

This inaugural edition marks the beginning of a long-term journey. We invite industry leaders, practitioners, solution providers, and innovators to contribute their expertise, challenge conventional thinking, and become active participants in this growing knowledge community.

Our aspiration is simple: to make MRAM Insider the publication professionals trust for credible insights, meaningful conversations, and the future of Maintenance, Reliability, and Asset Management.

Because this publication belongs to the industry.

Welcome to the inaugural edition of MRAM Insider.

virgo COMMUNICATIONS AND
EXHIBITIONS (P) LTD

About MRAM Insider

Welcome to the inaugural edition of MRAM Insider: The dedicated editorial platform focused exclusively on Maintenance, Reliability and Asset Management (MRAM).

The MRAM industry has always been driven by innovation, engineering excellence and the collective expertise of professionals working behind the scenes to keep industries running safely and efficiently. Yet, despite its critical role, the knowledge that shapes this industry is often scattered, siloed within organisations, or confined to conversations during exhibitions and conferences.

MRAM Insider has been created to change that. More than a digital newsletter, it is a knowledge-sharing platform designed to bring together industry leaders, plant professionals, reliability engineers, researchers, solution providers and technology innovators under one roof. Our goal is to capture the ideas, experiences and breakthroughs that deserve a wider audience and make them accessible throughout the year.

Every edition will feature expert insights, industry trends, practical

maintenance concepts, case studies, technology spotlights, interviews and operational best practices, content that informs, educates and sparks meaningful conversations across the industrial ecosystem.

Our philosophy is simple: For the Industry. By the Industry. Of the Industry.

As the industry evolves through digital transformation, predictive maintenance and smarter asset management, the need for a credible, community-led knowledge platform has never been greater. MRAM Insider aims to bridge that gap by fostering continuous learning, encouraging collaboration and documenting the progress of an industry that powers manufacturing and infrastructure every day.

This publication marks the beginning of a larger vision: to build an informed, connected and future-ready MRAM community that extends far beyond the exhibition floor, and brings the industry's most important conversations to the forefront.

Welcome to the conversation.

Vietnam's MRO Market Forecast to Reach USD 347.6 Million by 2030

Vietnam's MRO market is projected to grow from USD 193 million in 2024 to USD 347.6 million by 2030, according to Ken Research. Service volume is expected to reach 8.68 million man-hours, driven by aviation, manufacturing and energy

investments. Opportunities are expanding across condition monitoring, preventive and predictive maintenance, reliability contracts and shutdown support, while domestic MRO capability is expected to reach 38%.



COUNCIL OF VIBRATION SPECIALISTS



Council Of Vibration Specialists (CVS) On Why Reliability Engineering Is Becoming A Strategic Business Function

For decades, maintenance was largely viewed as a support function, focused on fixing equipment after failures occurred or following predetermined maintenance schedules. Today, that mindset is rapidly changing. Across manufacturing, power, petrochemicals and infrastructure, reliability engineering is emerging as a strategic discipline that directly influences operational resilience, sustainability, productivity and business competitiveness.

The industry's journey reflects a clear evolution: from reactive maintenance to preventive strategies, followed by condition-based maintenance, Reliability-Centred Maintenance (RCM) and enterprise-wide asset management. Modern reliability programmes now integrate methodologies such as FMECA, RCFA, RBI, HAZOP and SIL with Industrial IoT, predictive analytics, machine learning and digital twins. The focus has shifted beyond maintenance metrics to business outcomes, including lifecycle cost, asset availability, energy efficiency, safety and environmental performance.

Yet, despite the rapid advancement of predictive technologies and condition monitoring systems, many organisations continue to face recurring reliability challenges. The gap often lies not in the technology itself, but in how it is implemented and supported across the organisations. As industry expert Dr. Tarapada Pyne, Founder Secretary and Director General, Council of Vibration Specialists (CVS), Chief Knowledge Officer and Director, Centre for Reliability & Diagnostics (CRD), explains, "Technology must be treated as an enabler rather than a solution in itself." Investments in AI, IIoT and predictive maintenance cannot deliver lasting results without quality asset data, structured reliability-oriented processes, cross-functional collaboration and a culture that prioritises long-term asset performance over short-term production targets.

This transformation is also redefining the skills required of tomorrow's reliability professionals. Engineering expertise is no longer limited to understanding equipment behaviour; it increasingly demands proficiency in data analytics, AI, machine learning, digital twins, systems engineering and cybersecurity. At the same time, human judgement remains central to interpreting digital insights and making informed engineering decisions. As Dr. Harvindar Singh Gambhir, Founder President, Council of Vibration Specialists notes, "The business benefits in future will not belong to those who simply possess the most advanced technology but to enterprises that combine advanced digital tools with highly skilled interdisciplinary professional engineers who can ask the right questions, interpret data intelligently, understand engineering principles, and make timely, evidence-based informed decisions."

Building that capability will require stronger collaboration between academia, industry and professional bodies. Integrating reliability engineering into mainstream engineering education, expanding specialised certification programmes and developing dedicated centres of excellence will be essential to prepare a workforce capable of managing increasingly intelligent and interconnected industrial assets.

Looking ahead, reliability engineering is expected to move beyond predictive maintenance towards prescriptive and autonomous asset management, where AI, digital twins and advanced diagnostics continuously optimise asset performance throughout the lifecycle. However, the industry's competitive advantage will continue to depend on engineering expertise as much as technological innovation.

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Reliability engineering will evolve from a technical discipline into a cornerstone of sustainable industrial development and a key enabler of the factories, infrastructure, & intelligent systems of the future.

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Dr. Tarapada Pyne is Founder Secretary and Director General, Council of Vibration Specialists (CVS), Chief Knowledge Officer and Director, Centre for Reliability & Diagnostics (CRD). With over 40 years of experience across defence, process industries, petrochemicals, refineries and metals, he specialises in reliability management, asset management, predictive maintenance, machinery diagnostics and operational excellence.



“

Think long term. Think about the long-term demand. Think about the long-term performance that is required and think about the whole lifecycle cost and whole lifecycle carbon as well

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Dr. Navil Shetty is President of the Institute of Asset Management (IAM) India and Strategy Adviser to the MSME Ministry, Government of Karnataka. A Fellow of IAM, he has over 25 years of experience in strategic infrastructure asset and risk management. He has played a key role in developing the ISO 55000 asset management standards.

“India Needs To Think Beyond Building Assets To Realising Value Over Their Whole Life,”

Says Dr. Navil Shetty, President, Institute Of Asset Management India, In An Exclusive Interview

India is entering a period of unprecedented infrastructure and industrial asset creation. From transport networks and energy systems to manufacturing facilities and public infrastructure, trillions of dollars are being committed to assets that are expected to support economic growth and enhance quality of life for decades. But as the scale of investment increases, a critical gap is emerging: how these assets will perform once the construction phase is over?

Dr. Navil Shetty, President, Institute of Asset Management India, believes India needs to bring lifecycle and value-based thinking into infrastructure and industrial investment much earlier, rather than treating asset performance as an issue that begins once an asset is operational. Shetty points to the scale of India's infrastructure programme, estimating that around \$1.5 trillion is being invested through government infrastructure projects over a five-year period. Yet, he notes, many large projects continue to be conceived around traditional design-and-build models, with insufficient attention to long-term demand, operating performance, resilience and total cost of ownership.

For asset-intensive industries, this means changing when and where asset management decisions are made. The greatest influence over an asset's future cost, performance and resilience comes during planning, concept development, design and construction. Once an asset is in operation, the room to fundamentally change its characteristics is considerably smaller.

A lifecycle approach can also help organisations balance competing priorities around cost, risk and performance. Rather than reducing maintenance expenditure in isolation, asset owners can evaluate how investment decisions affect reliability, operational risk and the value ultimately delivered to customers, businesses, wider stakeholders, and the environment.

This shift is also changing the role of maintenance. While maintenance remains essential to sustaining asset performance, Shetty argues that it should sit within a broader asset management framework that connects asset decisions with business objectives. “Asset management actually goes much beyond maintenance.” The focus, he explains, is on understanding what the organisation is trying to achieve, what value stakeholders expect, and how its assets contribute to delivering that value.

Technology could accelerate this transition. AI, digital twins, connected assets, IoT sensors and advanced analytics can provide real-time visibility into asset usage, asset condition, degradation and emerging failure modes. But Shetty cautions against treating digitalisation as a collection of isolated maintenance solutions. Its greater value lies in connecting stakeholder engagement, customer sentiment analysis, long-term planning, asset investment decisions, operations and performance across the organisations, i.e. digital transformation of asset management as part of the organisational digital transformation.

However, technology alone will not deliver the shift. Leadership, organisational culture, competencies and collaboration across functions remain fundamental. Asset management requires engineering, maintenance, finance, procurement, IT and leadership to work towards common organisational outcomes rather than operate in functional silos.

For organisations beginning this asset management journey, the approach need not be well-planned and well-phased. Shetty recommends identifying the assets that are critical to value delivery, understanding their condition and risks, and then building a progressive roadmap around investment, maintenance, capability and technology. “Asset management should be seen as a continual improvement journey. It's not a project that you do for two, three years and then stop.”

For India, the opportunity is therefore not simply to build more assets, but to ensure that the assets being built today remain reliable, resilient and valuable throughout their intended lives. As investment continues to scale, embedding that thinking at the start of the asset lifecycle could have as much impact as the infrastructure itself. There are many important lessons, both good and bad, that can be learnt from other countries and the extensive body of knowledge available on Asset Management can be leveraged by Indian industries and infrastructure authorities – public, private, and regulated. The Institute of Asset Management India, a not-for-profit Section 8 company registered with the Ministry of Corporate Affairs, Government of India, will seek to be an enabler in this transition, supporting organisational and individual learning journeys.

From Prediction To Prevention: The Association Of Corrosion Professionals On Corrosion Management

For decades, corrosion has been accepted as an unavoidable consequence of operating industrial assets. Whether in pipelines, refineries, power plants or marine infrastructure, the industry’s response has traditionally been reactive: repairing damage after it appears and replacing assets once degradation becomes severe. However, this mindset is rapidly changing. Across sectors, corrosion management is evolving into a discipline focused on prediction, prevention and long-term asset integrity rather than failure response.

The challenge is no longer the lack of protective technologies. Today’s industries have access to advanced coatings, cathodic protection systems, corrosion-resistant alloys, inhibitors and sophisticated monitoring solutions. Yet premature asset degradation continues to occur. The real gap lies in execution. Poor quality control during design and construction, inadequate maintenance practices, limited workforce training and weak collaboration between research institutions and industry often prevent these technologies from delivering their full potential.

As Mr. J. N. Agrawal, President of the Association of Corrosion Professionals (AOCP) points out, “Applying coatings and cathodic protection is not enough, they must be applied effectively and maintained throughout the asset’s lifecycle.”

Equally important is recognising that corrosion cannot be managed through universal solutions. Every operating environment presents unique challenges. Petrochemical plants contend with aggressive chemicals and high temperatures, marine assets battle chloride-rich environments, while power plants face entirely different degradation mechanisms. Material selection, protective coatings, monitoring techniques and cathodic protection systems must therefore be tailored to each application rather than following a one-size-fits-all approach.

The economic argument for proactive corrosion management is becoming impossible to ignore. While investments in better materials, protective systems and continuous monitoring may increase initial project costs, they significantly reduce lifecycle expenditure. Asset failures result in production losses, expensive repairs, environmental incidents, safety risks and reputational damage, costs that far exceed

the investment required for prevention. Studies estimate that corrosion accounts for nearly 4.2% of India’s GDP, with almost 30% of these losses considered preventable through better corrosion management practices.

“The total cost of corrosion in India is estimated at nearly 4.2% of the GDP, around US\$102 billion. Nearly 30% of that, approximately US\$30.6 billion, can be saved through effective corrosion prevention and control.” — J N Agrawal

The next phase of the industry’s evolution will be driven by digital technologies. Real-time IoT sensors, AI-powered predictive analytics, digital twins, graphene-based coatings, self-healing materials and high-performance alloys are transforming corrosion management from periodic inspections to continuous asset intelligence. Instead of identifying damage after it occurs, organisations are increasingly able to predict degradation patterns, schedule maintenance proactively and optimise asset life with data-driven decisions.

However, technology alone is not enough. Organisations must strengthen professional training, adopt risk-based inspection strategies and establish dedicated asset integrity programmes that connect project teams with operations and maintenance. Long-term reliability depends as much on organisational culture as it does on engineering innovation.

The value of this long-term approach is already visible across India’s energy infrastructure. As Agrawal observes, “Pipelines designed for a 30-year life are operating safely even after 60 years because corrosion management and maintenance have been carried out effectively.” This demonstrates that with the right combination of design, monitoring and preventive maintenance, asset life can be extended well beyond original expectations while avoiding costly failures.

The future of corrosion management will not be defined by how effectively industries repair damaged assets, but by how successfully they prevent damage from occurring in the first place. In an era where operational excellence is measured by reliability, resilience and lifecycle performance, proactive integrity management is no longer a competitive advantage, it is rapidly becoming the industry standard.



“The total cost of corrosion in India is estimated at nearly 4.2% of the GDP, around US\$102 billion. Nearly 30% of that, approximately US\$30.6 billion, can be saved through effective corrosion prevention and control”



J. N. Agrawal is President of the Association of Corrosion Professionals (AOCP) and CEO of Corrsol Tech. With over 40 years of experience in oil and gas, he specialises in pipeline integrity, corrosion management and cathodic protection. A certified ICorr specialist and author, he has contributed extensively to industry training, standards and technical knowledge.





“Maintenance Is The Foundation For Operational Capacity,” Says Mr. Ramesh Gulati In An Exclusive Interview

For decades, maintenance has been viewed as the team that fixes equipment after something goes wrong. According to global reliability expert Ramesh Gulati, that mindset is precisely what the industry must leave behind.

With more than six decades of experience across heavy engineering, aerospace, asset management, and global reliability leadership, Gulati believes maintenance is not a cost centre, it is the foundation of operational capacity. In fact, he proposes replacing the term maintenance altogether with Capacity Assurance, reflecting its true purpose: ensuring that an organisations consistently delivers its intended production capability.

One of the industry's biggest misconceptions, he argues, is that equipment reliability begins once an asset is commissioned. Reality tells a different story. Studies indicate that nearly 40% of equipment problems originate during the design, procurement, installation, and commissioning stages, long before operations begin. When these early decisions are compromised due to poor design reviews, inadequate commissioning, or budget constraints, organisations pay the price throughout the asset's lifecycle. This broader perspective explains why reliability has evolved beyond preventive maintenance into Asset Management. Instead of focusing solely on repairing failures, modern reliability professionals must influence every stage of an asset's life: from concept and design to operation, maintenance, sustainability, and eventual retirement.

While technologies such as AI, IoT, Digital Twins, and predictive analytics are transforming maintenance practices, Gulati

offers an important caution. Technology alone cannot create reliable operations.

Whether it was CMMS in the 1980s or Artificial Intelligence today, every technological breakthrough has arrived with enormous expectations. Yet, without trained people, disciplined and standardised processes, executive commitment, and organisational readiness, these tools become little more than expensive dashboards.

Culture, not technology, remains the defining factor.

Gulati believes a genuine reliability culture exists only when there are no silos; every department, from design engineers and procurement teams to operators, finance, HR, and maintenance, shares responsibility for asset performance. Reliability cannot remain confined to the maintenance department; it must become an organisational philosophy. His advice for industry leaders is refreshingly simple: invest in preventive and predictive condition-based maintenance, continuously educate the workforce, involve maintenance teams during asset design, and remain patient when implementing change.

Reliability is not built overnight. It is built through persistence, learning, and collaboration.

As industries move towards Industry 5.0, where sustainability, resilience, and human-centric operations take centre stage, the future of reliability will depend less on smarter machines and more on smarter organisations. The companies that succeed will not simply adopt new technologies; they will create cultures where every decision contributes to long-term asset performance.



Ramesh Gulati, known as the “Reliability Sherpa,” is a globally recognised leader in maintenance, reliability and asset management. With over six decades of industry experience, he is an author, educator and thought leader, and currently works with ReliabilityX. He has authored several acclaimed books and contributed extensively to ISO 55000 standards and professional development.

“The biggest mistake organisations make is expecting new technology to solve all our problems on the plant floor, including cultural issues”

Engineering Excellence In The Digital Era: Why Technology Alone Cannot Deliver Reliability: Insights By Dr. Kartik Fojdar

Industrial organisations are investing heavily in digital transformation. Artificial intelligence, digital twins, Industrial Internet of Things (IIoT), smart instrumentation, and autonomous operations are rapidly becoming part of modern manufacturing. Yet, despite these technological advancements, many organisations continue to face unplanned downtime, operational failures, and inconsistent reliability.

The question is no longer whether industries should adopt advanced technologies, but whether they have built the engineering foundation needed to make those technologies successful.

Speaking with MRAM Insider, Dr. Kartik Fojdar, Sr. V P, Head – Centre of Excellence (CoE) - Engg (Inst.), at Reliance Industries Limited., explains that instrumentation has undergone one of the biggest transformations in modern industry. “Earlier, instrumentation was seen merely as a measurement and control function. Today, it has become a strategic enabler of operational excellence, process safety, energy efficiency, sustainability, and business transformation.”

However, digital capability alone is not enough. As organisations modernise their plants, success increasingly depends on engineering discipline rather than technology itself. Standardised engineering practices, lifecycle asset management, maintenance strategies, robust documentation, cybersecurity, and cross-functional collaboration collectively determine whether digital investments generate long-term value.

The industry’s biggest differentiator today is not the sophistication of its automation systems, but the capability of its people. Organisations that consistently invest in competency development, structured

training, mentoring, and knowledge management are better equipped to identify risks early, optimise maintenance strategies, and sustain reliable operations throughout an asset’s lifecycle. In contrast, treating digitalisation as merely an IT upgrade often results in fragmented implementation and unrealised returns. Looking ahead, the convergence of AI, digital twins, predictive analytics, and autonomous operations will continue to reshape industrial enterprises. But these technologies will deliver meaningful outcomes only when supported by rigorous engineering governance and a culture of continuous improvement. As Fojdar aptly summarizes, “The future belongs to organisations that combine technological innovation with engineering discipline and operational resilience.”

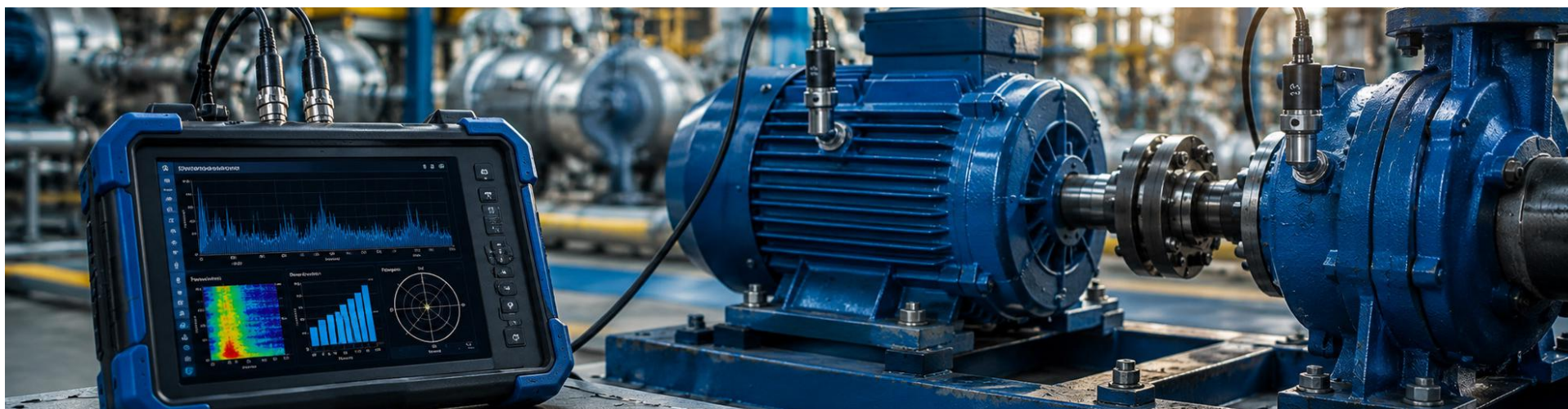
For industries pursuing operational excellence, the message is clear: engineering fundamentals remain the bedrock upon which every successful digital transformation is built.



Dr. Kartik Fojdar is the Sr. V P, Head – Centre of Excellence (CoE) - Engg (Inst.), at Reliance Industries Limited. With over 39 years of experience, he has worked across project execution, plant maintenance, engineering and reliability. An instrumentation specialist, author and industry expert, he focuses on instrumentation reliability, process safety, engineering excellence and operational performance.

“Technology alone cannot create engineering excellence, it must be supported by engineering standards, lifecycle asset management, competency development, and cross-functional collaboration.”





N. P. Sundar, Member - GC, CVS And Independent Consultant On The Evolution Of Maintenance And Asset Management

N. P. Sundar, Member - GC, CVS and Independent Consultant, brings over 43 years of cross-functional industry experience, including 36 years with leading asset-intensive manufacturing organisations and subsequent consulting expertise. A Mechanical Engineer, Chartered Engineer and CMRP, he specialises in maintenance, reliability, asset integrity, process safety and digital transformation. He contributes to SMRP, IAM, BIS and ISO asset management standards. In an exclusive interview with Team MRAM, Mr. Sundar spoke about the evolution of maintenance and asset management, the role of digitalisation and predictive maintenance, the importance of integrated asset lifecycle management, and the capabilities that will shape the next generation of high-performing industrial organisations.

Q: Over the past four decades, maintenance has evolved from a reactive function to a strategic driver of business performance. In your experience, what have been the most significant shifts in the way organisations approach asset performance and operational excellence?

Let me use the GFMAM maintenance maturity levels as a reference that explains the evolution of maintenance from both a maturity of management strategy and technological viewpoints. Maintenance has evolved over decades from a reactive domain to a strategic domain today. The reactive domain (reacting to failure) is focused on “failure response”. The next level is planned domain (preventing failure, planning and scheduling etc.) is focused on the “availability and maintenance costs”. Then the next state of evolution in the proactive domain (predicting failure, learning from failure etc.) is focused on “reliability and operational value”. Today we see organisations that have reached the next level of “strategic domain” (adoption of asset management, organisational alignment) that is focused on “life cycle value” and many others are striving to reach that level.

The most significant shifts that I see in the way organisations’ approach to asset performance and operational excellence are the adoption of established frameworks for maintenance management, asset management, focused on life cycle value delivery from assets. Apart from this, technology is being leveraged

for asset condition monitoring (closer-to-real-time), asset condition and performance management. Technology has evolved over decades, from manual detection to automatic detection, prediction and then prescription. Today, we see a number of predictive maintenance solutions, some even with prescriptive capabilities, that are being implemented by organisations aligned to their contexts. We are moving towards risk-based maintenance and asset performance that delivers value to an organisations.

Q: You’ve worked across industry, consulting, standards development and professional institutions. How can organisations bridge the gap between global best practices and their day-to-day operational realities to create meaningful and lasting change?

In my 43 years of work experience, bridging the gap between global best practices and their daily operations for any organisations is not a one-time event or an activity but an ongoing one. Also it is important that organisations

adapt global best practices to their specific contexts, needs, maturity, culture etc. and customize the implementation in a way that works best for them.

Taking maintenance management or asset management as examples, continual improvement of the maintenance and asset management system, based on the established P-D-C-A cycle, makes the difference. This development and implementation of the management system need to be based on the right understanding of the relevant organisational contexts, relevant stakeholder needs and expectations etc. and I am not going into their details or the other aspects here. Organisations’ asset management policy, strategy, objectives and detailed plans etc. need to be developed aligned to the organisational plans and objectives. Global best practices need to be considered in the planning at all levels, operations and asset life cycle management and improved ongoingly. Day-to-day operations, including asset life cycle activities, need to be aligned to the organisation’s planning and objectives at the strategic, tactical and operational levels.

Most importantly, a strong performance evaluation, founded on effective performance monitoring to evaluation audits, here both system audits and focused technical audits, are important followed by regular management review. Here I am reminded of one quote something like “People don’t do what you expect, but what you inspect or monitor”. In addition, openness for periodic external benchmarks and peer comparisons matters here. I would consider that organisations’ quest for excellence, its people at all levels and a strong culture of continual improvement and innovation matter most. Needless to say here, organisational leadership makes all what we discussed possible. Here I can think of statements like “safety for all, reliability is also for all”.

In summary, I could say that connecting the assets in shopfloor or field, the employees in various roles and positions and their activities to organisational strategic, tactical and operational plans and objectives is the key. Meaningful and lasting change comes from a strong change in leadership and change management with the collective will of the organisations to do what it takes for that.



N. P. Sundar has 43 years of cross-functional experience, including 36 years with leading asset-intensive manufacturing organisations in India, followed by consulting. A Mechanical and Chartered Engineer, CMRP and business consultant, his expertise spans asset lifecycle management, maintenance, reliability, asset integrity, process safety, digitalisation and enterprise transformation. He is a member of SMRP and IAM, a Life Fellow of CVS and IEI, and a Life Member of AIMA and ISTD. He also serves on BIS MSD-12 and ISO Technical Committee 251 groups working on the development and adoption of international asset management standards.

“Tomorrow, if the tools become very good, compile data seamlessly & suggest something, then the reliability engineer will be doing actual engineering work”



Biswabhusan Mohanty is Head – Mechanical at Haldia Petrochemicals Limited, with over two decades of experience across project execution, commissioning, maintenance and reliability. A Mechanical Engineering graduate, he has worked across petrochemicals and steel, with expertise in reliability engineering, predictive maintenance, asset performance, maintenance digitalisation and cross-functional operational excellence, including greenfield projects.

Reliability Begins Long Before Maintenance: Why The Industry Must Rethink Asset Management: Perspectives By Biswabhusan Mohanty

For decades, industries have treated reliability as a maintenance objective: something to improve after a plant begins operating. But as industrial assets become more complex and downtime more expensive, that mindset is proving increasingly inadequate. Reliability is no longer something that maintenance teams deliver; it is something that organisations must design, build and sustain throughout an asset’s lifecycle.

That shift begins long before the first machine starts running. As reliability expert Biswabhusan Mohanty explains, “If you want to improve reliability, it is actually better to design it in the first place.” Just as a building depends on the strength of its foundation, an asset’s long-term performance is largely determined during engineering, equipment selection and commissioning. Maintenance can preserve reliability, but it cannot fully compensate for poor design decisions.

Yet even well-designed assets fail to achieve their potential when organisations view reliability as the responsibility of a single department. In reality, operations, maintenance, inspection, instrumentation, safety and engineering all influence equipment performance. When these functions work in isolation, valuable information remains fragmented and decision-making slows down. The result is familiar across industries, repeated failures, reactive maintenance and preventable downtime.

Digital technologies promise to solve many of these challenges, but only if they evolve beyond standalone solutions. Today, organisations invest heavily in AI, predictive analytics, vibration monitoring and digital twins. However, these systems often operate independently, forcing engineers to spend more time gathering data than interpreting it. Technology, in other words, should eliminate administrative effort and elevate engineering judgement.

The same principle applies to operational decision-making. Production targets will always matter, but postponing essential maintenance to maximise short-term output often leads to greater losses later. Organisations that embrace planned interventions instead of reacting to failures consistently build more resilient operations. As Mohanty puts it, “When you spend a penny to save the equipment life today, that will actually give you a dollar tomorrow.” The greatest returns come not from avoiding maintenance, but from preventing failure before it occurs.

The future of reliability will therefore depend on more than smarter software or advanced diagnostics. It will require connected systems, seamless sharing of information across platforms & departments and leaders willing to make decisions that favour long-term asset health over short-term convenience. Reliability is ultimately not defined by the tools an organisations owns, but by the philosophy with which it operates, and that philosophy must begin long before maintenance ever starts.

Reliability by the Numbers

The financial case for proactive maintenance is increasingly measurable. A manufacturing case study in Northern India found that a mobile maintenance/TPM programme reduced breakdown time by 23.14%, increased production by 15.63% and improved OEE by 17.08%. At another manufacturing plant, a preventive-maintenance and TPM programme cut downtime by 24% and reduced conveyor-related incidents by 48%. Over a longer five-year motor-diagnostics programme, annual motor repairs fell by more than 33% and emergency work orders by over 66%; when the programme was discontinued, the previous failure and downtime patterns returned within 18 months. In documented field trials, predictive diagnostics also prevented 12 hours of compressor downtime worth an estimated \$90,000 and 10 hours of pump downtime worth \$72,000 by shifting interventions into scheduled maintenance windows.



Beyond Maintenance: The Shift Towards Intelligent Asset Management

For decades, industrial maintenance was largely built around responding to equipment behaviour, listening for unusual sounds, identifying changes in performance and intervening when something appeared to be going wrong. Today, asset-intensive industries are moving towards a fundamentally different model, where technology, predictive intelligence and asset integrity are becoming central to operational decision-making.

This shift reflects a broader transformation across sectors such as oil and gas, power and other high-risk industries. As industrial assets become more complex and the consequences of failure become more severe, organisations are increasingly looking beyond maintenance to manage the complete lifecycle and performance of their assets.

Pramod Kumar Sapra, President, Shapoorji Pallonji Armada and a member of the National Advisory Committee of MRAM 2026, describes this as a transition from maintenance-led operations to asset management as a business function. Having witnessed the industry's technological evolution over four decades, he notes that the journey has moved from technicians relying on their senses to preventive maintenance, predictive maintenance and now AI-enabled systems, IoT and digital twins.

The significance of this transformation goes beyond improving equipment uptime. In high-risk environments, a small asset integrity issue can develop into a major operational or safety event if warning signs are missed. This has made early identification and intervention a critical part of modern industrial asset management.

Digital technologies are increasingly helping organisations detect these early indicators and reduce dependence on manual observation alone. Sensors, connected systems, AI-driven tools and digital twins can provide greater visibility into asset health, enabling organisations to identify emerging problems and act before they result in breakdowns, downtime or safety incidents.

For industries operating complex assets, however, technology is only one part of the equation. Effective asset management requires organisations to bring together operational performance, safety, environmental responsibility and commercial objectives. Sapra views these as interconnected pillars, arguing that decisions must be evaluated from a long-term, lifecycle perspective rather than through short-term gains.

This is also reshaping the role of process safety and asset integrity management. International experience has demonstrated the importance of identifying weaknesses in safety barriers before they contribute to major incidents. For Indian industry, adopting established practices alongside Industry 4.0 technologies could strengthen resilience and operational continuity.

The next stage of industrial reliability is therefore likely to be defined by the convergence of technology, systems and human commitment. Digital tools can identify risks and provide timely alerts, but organisations still need strong processes and leadership to act on that information. "Leadership commitment & technological transformation" are, according to Sapra, the combination needed to deliver reliable uptime, incident-free operations and environmental sustainability.

As industries move towards increasingly connected and technology-driven operations, the objective is no longer simply to keep machines running. It is to build systems capable of anticipating failure, protecting people and the environment, and delivering sustained asset performance across the lifecycle.



Pramod Kumar Sapra is President, Shapoorji Pallonji Armada, with nearly four decades of global experience across the oil and gas industry. His expertise spans upstream and downstream operations, asset development, project execution, asset integrity, operational excellence and HSE leadership. He has held leadership roles across India, Brazil, Sudan, Egypt, Iraq and Kurdistan.

“We were maintenance-oriented earlier and now we are becoming asset management as a business department”



ImageGrafix On Digitalisation To Smarter Asset Management

Industrial assets today generate more data than ever before. Yet, for many organisations, the challenge is no longer collecting information: it's transforming that information into decisions that improve reliability, optimise maintenance and extend asset life. As industries accelerate their digital transformation journeys, technologies such as Digital Twins, Asset Performance Management (APM), IIoT and engineering data integration are redefining how plants are designed, operated and maintained.

For nearly three decades, ImageGrafix Software Solutions has been enabling this transition by helping organisations digitise the entire lifecycle of industrial and infrastructure assets. Established in 1996, the company has evolved from an engineering software specialist into a comprehensive digitalisation partner, delivering solutions that span plant design, engineering, project execution, operations and maintenance. Today, ImageGrafix supports more than 6,000 customers across India and the Middle East through a portfolio that combines Digital Twin technologies, engineering simulation, Asset Performance Management, digital engineering services and intelligent project delivery.

What distinguishes ImageGrafix is its ability to bridge engineering with operations. By integrating globally recognised technologies from partners such as Hexagon, Oracle, AWS, PTC, Bricsys and Cenosco with implementation expertise, managed services and engineering consulting, the company helps organisations create connected digital ecosystems rather than isolated software deployments. These capabilities are increasingly becoming indispensable as industries pursue predictive maintenance, lifecycle asset management and data-driven decision-making.

With an expanding presence across India and a client base that includes Fortune 500 organisations in energy, EPC, manufacturing and infrastructure, ImageGrafix is helping reshape how industrial enterprises think about reliability. In an environment where operational excellence depends as much on digital intelligence as engineering expertise, the company's work reflects a broader industry shift, from managing assets to managing them intelligently throughout their lifecycle.

Quadruped Robots Support Digital Maintenance At Swiss Nuclear Plant

Leibstadt Nuclear Power Plant in Switzerland has deployed quadruped robots from DEEP Robotics to support routine inspection and condition-monitoring activities. The robots use thermal-imaging and acoustic cameras to identify temperature anomalies, unusual equipment sounds and other early indicators of asset deterioration. Designed to navigate stairs, slopes, narrow passages and other difficult areas, they can perform frequent checks while

reducing personnel exposure to physically demanding environments. Inspection data is transferred to an on-premises digital management system within the plant's secure network, enabling automated alerts and faster analysis of detected irregularities. The deployment demonstrates how mobile robotics and multimodal sensing can complement human expertise while helping nuclear facilities move from periodic manual inspection towards more proactive, data-driven maintenance.



Tribotech India's Role In India's Reliability Evolution

When a refinery shuts down unexpectedly or a critical rotating asset goes offline, the cost is measured not just in repairs but in lost production, delayed operations and compromised reliability. For over three decades, TRIBOTECH India has worked behind the scenes to help industries prevent exactly that.

Long before predictive maintenance became an industry buzzword, the company was introducing precision laser alignment, vibration diagnostics and condition monitoring technologies to Indian manufacturing. Today, TRIBOTECH India has evolved into one of the country's established reliability partners, enabling maintenance teams to detect faults before they become failures and helping plants transition from reactive maintenance to data-driven asset management.

Its strength lies not only in representing globally recognised technology leaders such as Easy-Laser, VMI, JOSAM, Prisma Teknik and Simatec, but also in providing the technical expertise required to maximise the value of these solutions. Through its dedicated service division, the company delivers field diagnostics, laser alignment, vibration analysis, thermography, calibration, repairs and specialised training, ensuring customers receive support well beyond equipment installation.

This combination of technology and engineering expertise has earned the confidence of some of India's largest industrial organisations, including BPCL, IOCL, HPCL, ONGC, GAIL, MRPL, Reliance Industries and Essar Oil. With applications spanning refineries, power plants, steel mills, cement facilities, pharmaceuticals and heavy manufacturing, TRIBOTECH India continues to play a pivotal role in improving equipment reliability, extending asset life and driving maintenance excellence across India's industrial landscape.

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