

# gear

## TECHNOLOGY INDIA

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### **MPMA UPDATE**

*MPMA Announces Leadership Transition as Matthew Croson Retires; Jennifer Blackford Becomes 8th MPMA President*

### **E-MOBILITY**

*From Precision to Performance: Poggenamp Nagarsheth Powertronics Drives the Future of E-Mobility Laminations*

### **INDUSTRY VISIT**

*Redefining Gear Finishing: A Shop Floor Perspective from Mii Robotics*

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**Anitha Raghunath**  
**Director / Publisher**  
**Virgo Communications and Exhibitions Pvt.Ltd**

Dear Readers,

The transformation of the gear industry is gaining momentum as electrification and intelligent manufacturing continue to redefine traditional boundaries. In this edition of Gear Technology India, we bring you a focused exploration of E-mobility and Smart Manufacturing, two pivotal forces shaping the future of motion, power transmission, and industrial efficiency.

This quarter also marked the successful conclusion of IPTEX GRINDEX 2026, a landmark event that brought together the best of the gear and grinding ecosystem under one roof. Adding further value to the exhibition were Gear Technology India's concurrent initiatives, the GTI Summit and Awards 2026, now in its second edition, both of which witnessed outstanding industry participation and response.

A proud milestone for us was the launch and distribution of the first print edition of Gear Technology India magazine during the three-day IPTEX GRINDEX 2026 exhibition. The response from the industry was truly encouraging, with copies reaching a wide audience of professionals, decision-makers, and technology providers across the exhibition floor.

The GTI Summit emerged as a vibrant knowledge-sharing platform, featuring eminent speakers and experts from across the gear industry. What stood out was the highly engaging format, where discussions evolved into meaningful conversations, with delegates actively interacting with panel members. This exchange of ideas and experiences highlighted the collaborative spirit that is essential for navigating today's rapidly evolving manufacturing landscape.

The Awards and Felicitation segment was equally memorable, recognising excellence, innovation, and leadership across the industry. Celebrating these achievements not only honours individual and organisational success but also sets new benchmarks for the entire sector.

As the industry moves forward, embracing new technologies and opportunities, we remain committed to bringing you insights that matter and stories that inspire.

We hope you find this issue both informative and engaging.

Warm regards,

A handwritten signature in black ink, appearing to read 'Anitha', with a horizontal line underneath.



**Sushmita Das**  
**Associate Editor**  
**Gear Technology India**

The gear industry is undergoing a significant transformation driven by electrification, advanced materials, and digital integration. In this edition, focused on E-mobility and Smart Manufacturing, we present a concise yet comprehensive view of the technologies and trends redefining gear design, production, and performance.

This issue opens with an important industry update on the leadership transition at the Motion + Power Manufacturers Alliance, reflecting broader strategic shifts within the global power transmission ecosystem. Our cover story captures key highlights from IPTEx GRINDEX 2026, along with the successful GTI Summit and Awards 2026, where innovations, knowledge exchange, and industry excellence came together under one platform.

From a technical perspective, we examine the role of tribology in optimizing gear efficiency, alongside advancements in AI-driven inspection for improved torque management. Our E-mobility feature explores how electric powertrains are influencing gear architectures, while the aerospace segment highlights high-precision manufacturing through the Bharat Forge and Liebherr collaboration.

Further, we address productivity enhancements through wiper CBN inserts, sustainable approaches to gear design, and real-world implementation through our industry visit to Mii Robotics. The issue is rounded off with a product update from KAPP NILES and an insightful interview with Quaker Houghton on fluid engineering innovations.

Together, these insights reflect an industry that is rapidly evolving towards higher efficiency, intelligence, and sustainability.

We hope this edition adds value to your understanding of the technologies shaping the future of gear manufacturing.

Thank you

# gear

TECHNOLOGY INDIA

Gear Technology India is a bimonthly publication created in collaboration between the American Gear Manufacturers Association (AGMA) and Virgo Communications & Exhibitions. It serves as the premier platform in the industry, offering latest innovations, information, interviews and technical articles related to gears.

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Michael Goldstein founded Gear Technology in 1984 and served as Publisher and Editor-in-Chief from 1984 through 2019. Thanks to his efforts, the Michael Goldstein Gear Technology Library, the largest collection of gear knowledge available anywhere will remain a free and open resources for the gear industry. More than 38 years' worth of technical articles can be found online at [geartechnology.com](http://geartechnology.com). Michael continues working with the magazine in a consulting role and can be reached via e-mail at [michael@geartechnology.com](mailto:michael@geartechnology.com).

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# MPMA Announces Leadership Transition as Matthew Croson Retires; Jennifer Blackford Becomes 8th MPMA President

- By Gear Technology India

The Motion + Power Manufacturers Alliance (MPMA) announced the retirement of its President, Matthew Croson, effective April 1. Jennifer Blackford assumed the role of President immediately thereafter.



Jenny Blackford, President, MPMA



Matthew Croson, Outgoing MPMA President

*"Matt Croson joined AGMA in its 100th year, and has, for the past ten years, provided the leadership and energy required to move the industry forward," noted Sara Zimmerman, MPMA Chair and Vice President, Customer Experience and Product at Sumitomo Drive Technologies USA. "He has been a change agent that was needed to re-energize and focus the traditions of AGMA and ABMA."*

The collaboration focuses on validating standards for gear and bearing design and manufacturing—Croson has been an association executive for 29 years, with leadership stints at the Packaging Machinery Manufacturers Institute (PMMI), Adhesive and Sealant Council (ASC) and AGMA, including 16 years as President for ASC and AGMA, combined.

During his ten years at AGMA, then MPMA, working closely with the Executive Committee and Board, the organisation:

- Merged with the American Bearings Manufacturers Association (ABMA), two 100-year-old organizations with a 20-year history of program collaboration
- Adjusted Gear Expo to MPT Expo, to respond to the long-term trend of suppliers providing total power transmission solutions
- Launched the National Training Center, which has doubled the number of classes and capacity in support of its workforce development efforts
- Purchased the Intellectual Property of 90% of its classes while positioning the organization as a leader in technical education
- Acquired the assets of Randall Publications, including Gear Technology and Power Transmission Engineering
- Evolved its standards development process from a committee structure to a working group approach, modelling ISO production formats
- Created Alliances with leading organisations supporting the power transmission industry, including Federtec (Italy) for educational programming, Eurotrans (EU) for advocacy collaboration and Virgo Communications (India) for Gear Technology India.

- Navigated through COVID, while transforming the staff structure to a remote workforce that now includes 20 team members in 10 different states.

"On behalf of the Board of Directors, we want to thank Matt for his service to the industry," added Steve Janke, MPMA Board Treasurer and President of Brelie Gear. "We wish him the very best in retirement and look forward to working with Jenny Blackford as our next President."

Blackford joined AGMA in 2000 as Director of Marketing & Communications. Over the past 25 years at AGMA, she managed all aspects of communications and its tradeshow for 15 years, and led its business division. As AGMA Vice President, Business Division, she was named President of ABMA, serving in that position for five years, until the ABMA merger with AGMA in 2025.

In 2024, she was named Chief Operating Officer and oversaw contracts, operations and human resources. In 2025, she began overseeing strategy and in 2026, finances, as part of the succession plan developed by the Executive Committee.

**As Chief Operating Officer, she:**

- Steered the post-merger integration of AGMA and ABMA, bringing together 400 members across the gear and bearing industries under a unified organisation
- Built MPMA's Advocacy program from the ground up, leading its first DC Fly-In and securing meetings with Executive and Legislative Branch officials on trade, tariffs, and manufacturing competitiveness
- Transformed ABMA's financial position from \$100K in reserves to more than \$500K within four years, while driving member value and positioning the organization for its successful merger with AGMA
- Drove an enterprise-wide operational transformation – from financial systems to member engagement platforms – building the infrastructure needed to execute MPMA's long-term strategy
- Led MPT Expo (formerly Gear Expo) for 14 years, executing the strategic rebranding to reflect the industry's evolution toward power transmission solutions
- Cultivated partnerships that expanded association reach and member value – including co-locating with ASM's Heat Treat show beginning in 2009 and joint programming collaborations with NFPA, PTDA, and STLE
- Serves as Secretariat for one of the three standing

committees of the World Bearing Association (WBA), leading global anti-counterfeiting efforts to protect the integrity of the bearing industry worldwide

"The Board stands firmly behind Jenny Blackford. She knows our members, she knows this industry, and she has a track record of getting things done. She steps into this role with deep institutional knowledge and a clear vision for where MPMA needs to go as we lead our members through a period of change," noted Janke. Croson transitioned to serve as Special Assistant to the President, supporting the leadership change while finalizing strategic programs through February 2027.

"It's been a privilege to serve this wonderful community who cares so much for the organization" said Croson, Special Assistant to the President. "And it's been an absolute blessing to work side by side with the devoted staff team as we challenged ourselves to develop new programs, adjust during COVID, and have a fun time working on behalf of industry."

"Bringing AGMA and ABMA together was just the beginning. As we build one unified organisation, I'm committed to making sure MPMA is the indispensable partner our members turn to – whether they're navigating trade, developing talent, or preparing for what's next in manufacturing," said Blackford, President, MPMA. "I look forward to working with MPMA's Board of Directors, our volunteers, and our MPMA team to ensure value for our members in the years to come."

**About MPMA**

The Motion + Power Manufacturers Alliance (MPMA) is a merger of the American Gear Manufacturers Association and the American Bearing Manufacturers Association. MPMA is a voluntary association of companies, consultants and academicians with a direct interest in the design, manufacture and application of gears, couplings, bearings and related power transmission components and equipment. The members include gear and bearing manufacturers from the United States, as well as gearing interests from more than 30 countries around the world. MPMA is accredited by the American National Standards Institute to write U.S. standards on gears and bearings.

# IPTEx GRINDEX 2026 Post Show Report



Industry stakeholders inaugurating IPTEx GRINDEX 2026, Auto Cluster Exhibition Centre, Pune, India

## A Resounding Success for the Gear & Allied Industries

IPTEx – GRINDEX Expo 2026 concluded on a highly successful note, reinforcing its position as India's most focused and result-driven exhibition for gear manufacturing and grinding technologies.

Held in Pune – the heart of India's automotive and engineering ecosystem – the exhibition brought together global technology leaders, industry innovators, and serious buyers under one roof.

The 2026 edition stood out for its quality of visitors, strong exhibitor ROI, and high-value business interactions, making it one of the most impactful editions to date.

## SHOW HIGHLIGHTS AT A GLANCE(USE ICONS TO HIGHLIGHT THE BELOW)

- 90+ Exhibitors showcasing cutting-edge technologies
- 15+ Participating Countries
- 5000+ Business Visitors & Industry Professionals
- Strong presence of OEMs, Tier 1 & Tier 2 suppliers
- Focus on precision engineering, automation & advanced manufacturing
- High-quality decision-makers & procurement heads

## GLOBAL PARTICIPATION

The expo witnessed participation from over 15+ countries, including:

### - By Sushmita Das

Germany, Japan, USA, Italy, Switzerland, Austria, China, South Korea, Taiwan, United Kingdom, Spain, Netherlands, Denmark, Poland and more.

International exhibitors showcased next-generation gear cutting, grinding, metrology, automation, and Industry 4.0 solutions, positioning IPTEx–GRINDEX as a global sourcing hub.

## STRONG INDUSTRY VISITOR PROFILE

IPTEx–GRINDEX 2026 attracted a highly targeted audience from across India and overseas, including key decision-makers from leading automotive and engineering companies.

Key Visitors Included:

- Tata Motors
- Bharat Forge
- Mercedes-Benz India
- Bajaj Auto Ltd
- Mahindra & Mahindra
- CIE Automotive India

## Other Prominent Automotive & Engineering Giants from Maharashtra:

- Force Motors
- Kirloskar Group Companies
- Skoda Auto Volkswagen India
- Cummins India
- Endurance Technologies
- JBM Auto
- Varroc Engineering
- Sandvik Asia
- ZF India
- Greaves Cotton
- Premium Transmission

These companies represent the core of India's automotive manufacturing ecosystem, especially concentrated in the Pune–Nashik–Aurangabad belt, ensuring high business relevance for exhibitors.

## VISITOR PROFILE BREAKDOWN (Share the Bi chart or diagram)

The exhibition attracted a diverse and high-quality audience:

- OEMs & Automotive Manufacturers
- Gear Manufacturers

- Grinding & Machine Tool Companies
- Tier 1 & Tier 2 Suppliers
- Plant Heads & Production Managers
- R&D and Design Engineers
- Procurement & Purchase Heads

The strong presence of decision-makers and technical experts ensured meaningful business discussions and faster conversion cycles.

## BUSINESS & NETWORKING IMPACT

IPTEX–GRINDEX 2026 successfully delivered:

- High-value B2B meetings and partnerships
- Strong lead generation for exhibitors
- Immediate and future order pipelines
- Opportunities for technology collaborations

Exhibitors reported consistent footfall, serious inquiries, and strong conversion potential, making the event a high-ROI platform.

## KNOWLEDGE & INDUSTRY ENGAGEMENT

The concurrent Gear Technology Summit & Industry interactions provided a platform for:

- Industry leaders and experts
- Discussions on future-ready manufacturing
- Insights into automation, EV transition, and precision engineering

These sessions added significant value by combining a technology showcase with knowledge exchange.

## WHY IPTEX–GRINDEX STANDS OUT

- India's only dedicated platform for gear & grinding technology
- Hosted in Pune – India's Auto Hub
- Highly focused audience = better business outcomes
- Strong domestic + international participation
- Proven track record of exhibitor satisfaction and repeat participation

## EXHIBITOR & VISITOR SENTIMENT

- Strong satisfaction levels from exhibitors
- High intent to rebook for next edition
- Visitors rated the event as highly relevant for sourcing and networking

## Launch of Gear Technology India – Volume 4, Issue 1 (2026)

A special highlight of the event was the official launch of the print edition of Gear Technology India

– Volume 4, Issue 1 (2026). The edition was unveiled by prominent gear industry dignitaries, symbolising the continued growth of the publication as a dedicated platform for industry insights, technology developments, and knowledge sharing within the gear manufacturing community.



## GTI Summit 2026: Exploring Global Opportunities

Running alongside the exhibition, the Gear Technology India Summit 2026 commenced with a warm welcome address by Ms Anitha Raghunath, Director of Virgo Communications and Exhibitions Pvt. Ltd. and Publisher of Gear Technology India Magazine. In her opening note, she greeted esteemed delegates, speakers, and industry leaders, setting the tone for the second edition of the summit themed “Global Opportunities in Gear & Powertrain Manufacturing: Defence, EV & Beyond.”



The summit brought together industry experts, technologists, and manufacturing leaders to discuss emerging opportunities in defence manufacturing, electric mobility, advanced gear engineering, and global supply chains.

## Day 1 Highlights – 26 February 2026

The summit began with a powerful panel discussion on "Atma Nirbhar Bharat: Driving Self-Reliance in Aerospace & Defence through Indigenous Gear & Transmission Manufacturing."

Moderated by Waseem Ahmed Khan of Fortune Business Insights, the session featured speakers including Sqn Ldr Shailesh Pol (Retd), a former officer of the Indian Air Force, Mohit Khanna, AVP - Advisory Fortune Business Insights and Rahul Pardeshi of Walchandnagar Industries Ltd. The discussion highlighted the importance of strengthening domestic manufacturing capabilities to support India's growing aerospace and defence sectors.



The panel discussion focused on India's ongoing transformation in the aerospace and defence sector under the Atma Nirbhar Bharat initiative, with a strong emphasis on indigenous gear and transmission manufacturing. From an operator's perspective, the sector is witnessing a significant shift toward higher reliability, performance, and mission readiness, where precision-engineered gear and transmission systems play a critical role in ensuring operational safety across fighter aircraft, helicopters, and drones.

The discussion highlighted that under the Make in India initiative, several defence segments—particularly aerospace platforms, naval systems, and unmanned aerial vehicles—are showing notable progress in local manufacturing. However, certain high-precision and advanced gear drive segments still rely on imports, indicating gaps in technology, materials, and manufacturing capabilities.

Drones were identified as a rapidly growing and strategically important area in modern warfare, where compact, lightweight, and highly reliable gear systems are essential for performance and endurance.

Looking ahead, the panel emphasised the need to strengthen domestic manufacturing through technology upgrades, skill development, and deeper industry collaboration. Reducing import dependency in critical gear systems remains a priority, alongside building capabilities for global competitiveness.

The discussion also underscored the importance of international collaborations in accelerating indigenous development. Strategic partnerships with global players are enabling knowledge transfer, advanced manufacturing practices, and access to new markets. These collaborations are expected to play a key role in positioning India as a future export hub for defence gear and transmission systems, particularly in emerging markets across Asia, Africa, and Latin America.

Overall, the panel conveyed cautious optimism—India is on a clear path toward self-reliance, but sustained efforts in innovation, partnerships, and ecosystem development will be crucial to achieving long-term success.



This was followed by a technical presentation by experts from SECO/WARWICK, including Marcin Przygoński, Jędrzej Malinowski, and Mayur Rao, who discussed Case Hardening of Gears Using LPC and

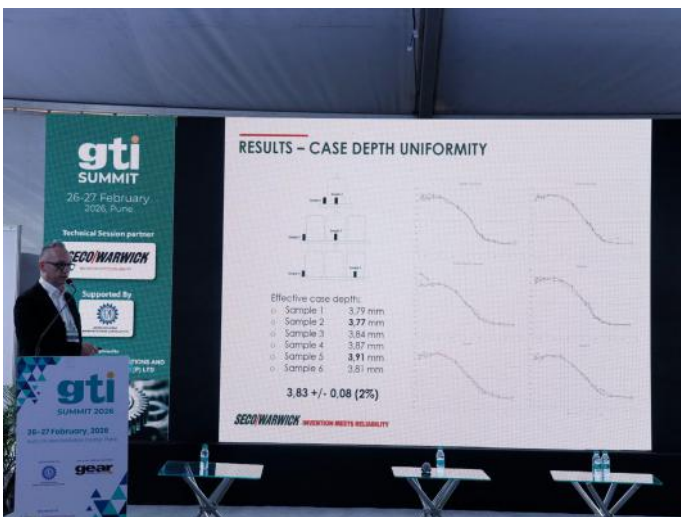




ZeroFlow® Nitriding.

The presentation highlighted the shift from conventional heat treatment methods to advanced technologies to meet the growing performance demands of modern gearboxes. Traditional carburizing and nitriding processes face limitations in cycle time, energy efficiency, and consistency, prompting the adoption of more controlled and sustainable solutions.

SECO/WARWICK's Low Pressure Carburizing (LPC) enables oxidation-free processing with precise control, resulting in uniform case depth, reduced distortion, shorter cycle times, and improved surface quality. Digital tools like SimVac® further enhance process accuracy, reduce trial runs, and support efficient production.



Advanced quenching solutions, including high-pressure gas quenching and 4D Quench® technology, ensure uniform cooling and minimal distortion, delivering performance comparable to oil quenching while maintaining a cleaner process.

ZeroFlow® nitriding significantly improves

efficiency by optimising ammonia usage, reducing consumption and emissions while maintaining precise layer control and compliance with global standards.

Overall, the integration of LPC, advanced quenching, and ZeroFlow® nitriding offers higher productivity, superior gear quality, lower operational costs, and a reduced environmental footprint, making it a future-ready solution for modern gear manufacturing.



Ms Anitha Raghunath, Director, Virgo Communication and Exhibition Pvt Ltd., along with the team SECO/WARWICK

Another engaging session focused on "Local to Global – Emerging Opportunities for MSMEs in Gear Manufacturing." Moderated by Shriyal Sethumadhavan of Panoptic Solutions, the panel brought together industry leaders, including Nitish Mahajan of Ratna Gears, Prakash Kadam of Pragati Transmission, Rajiv Kulkarni of Bharat Gears Limited, and Arunachalam A from IGW Technologies India Pvt Ltd. The session explored how MSMEs can leverage technology, quality standards, and export opportunities to strengthen their presence in global supply chains.



The panel discussion explored how Indian MSME gear manufacturers can strengthen their position in global markets amid evolving industry dynamics. The discussion highlighted that India's gear manufacturing ecosystem is at a significant inflexion point, driven by supply chain diversification, increasing precision requirements, and the growing role of advanced manufacturing technologies.

Panelists discussed technology readiness and global competitiveness, emphasising that global markets today demand more than cost advantage. Precision capability, process discipline, quality consistency, and advanced metrology are becoming critical for MSMEs aiming to move from domestic supply to export-driven growth. While investments in automation and advanced machinery are essential, participants also acknowledged concerns around capital expenditure, utilisation, and skilled manpower.

The conversation also addressed EV disruption and rising precision expectations. Although electrification may change gear demand, it is simultaneously increasing requirements around tolerances, noise reduction, and performance, creating niche opportunities for MSMEs willing to specialise and invest in capability development. Discussions on smart investments and operational risks highlighted the importance of strategic technology adoption, scaling capacity responsibly, and maintaining quality standards during growth. The panel also emphasised building global credibility, where long-term partnerships, supplier ecosystems, and process reliability are key to gaining trust with global OEMs.

The session concluded that Indian MSMEs have strong global growth potential, provided they focus on technology adoption, precision engineering, and evolving from component suppliers to trusted engineering partners.



## Day 2 Highlights – 27 February 2026

Day two began with a presentation titled “NexGen Gears Engineering: Integrating R&D with AI, Advanced Materials, and Smart Manufacturing,” delivered by Mahendran Muthu the proprietor of NexGen Gears. The presentation emphasised the importance of combining research, advanced materials, and digital technologies to improve gear performance and manufacturing efficiency.

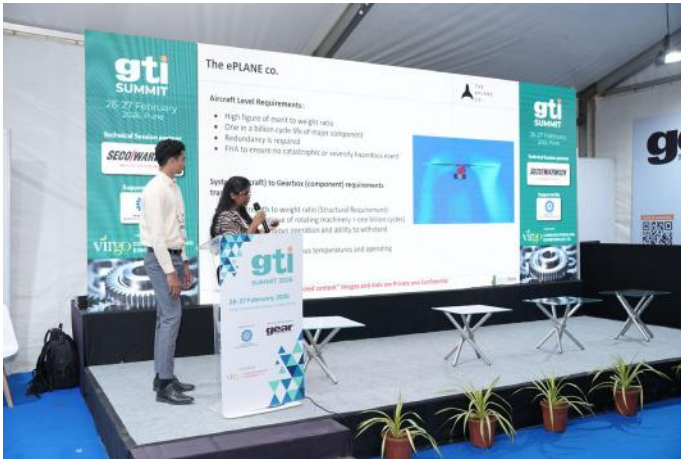
The session highlighted the transformation of gear engineering through the integration of AI, advanced materials, and smart manufacturing, positioning gears not just as power transmission components but as intelligent, data-driven systems.

A key focus was the shift in R&D from traditional component-level design to system-level, multi-disciplinary optimisation. This approach integrates gears with bearings, shafts, lubrication, and thermal systems to enhance performance parameters such as torque density, efficiency, NVH, durability, and weight reduction. The speaker emphasised the growing role of AI in enabling “first-time-right” designs, reducing trial-and-error, and accelerating development cycles. Advanced digital tools—such as AI-driven load prediction, real-time torque modelling, LTCA for NVH optimisation, and data-driven stress analysis—are significantly improving design accuracy and efficiency.

The session also underlined the importance of advanced materials, precise heat treatment, lubrication analysis, and modern manufacturing practices, including closed-loop inspection, GD&T metrology, and smart quality systems. The adoption of IoT-enabled sensors, SCADA-based monitoring, and Digital Twin technology is further enabling real-time performance tracking, predictive maintenance, and lifecycle optimisation.

A practical case was presented through an eVTOL aircraft developed by The ePlane Company, demonstrating how an integrated gearbox and powertrain design, combined with high-efficiency motors, is enabling innovation in urban air mobility.

The session reinforced that gear engineering is evolving into an intelligent ecosystem where AI-driven R&D, digital tools, and smart manufacturing collectively drive superior performance, efficiency, and reliability in next-generation gear systems.



The panel discussion focused on the urgent need to build a future-ready workforce in the gear industry, addressing challenges across hiring, training, retention, and evolving skill requirements. A key consensus was that the industry is facing not just a skill shortage, but a skill transformation challenge, driven by rapid technological advancements and changing industry needs.

One of the major concerns highlighted was the gap in core technical fundamentals, even among engineering professionals, which directly impacts higher-level design and global competitiveness. This is further compounded by a significant academic gap, as gear engineering is not adequately covered in mainstream curricula, creating a disconnect between industry expectations and workforce readiness.

The discussion emphasised the importance of developing deep technical competencies, particularly in areas such as gear design, manufacturing processes, and metrology. Advanced gear metrology and GD&T were identified as critical capabilities, essential for meeting global precision standards.

Panelists also addressed the need for structured, role-based training instead of generic training approaches. Challenges such as a floating workforce, lack of trainers, and limited adoption of training institutes were discussed, highlighting the need for more practical, scalable, and industry-aligned training models. Digital tools, including audio-visual learning and engineering-focused digital platforms, were seen as effective enablers for faster and more consistent skill development.

With the rise of EVs, Industry 4.0, and automation, new roles and skill requirements are emerging, making continuous learning and upskilling critical. The panel stressed the importance of building strong industry-academia collaboration, investing in dedicated training infrastructure, and fostering a culture of continuous learning within organisations.



Another important discussion focused on building a future-ready workforce for the gear industry. Moderated by NC Gosavi of Coplaced Consultants, the panel featured industry leaders including Vishwajit Kothari of Cyber Gears, Santosh Kulkarni of Sanjeev Auto Parts Manufacturers, Milind Kulkarni of American Axle & Manufacturing, and Durga Das of RSB Transmissions India Ltd.

The session concluded with a strong message: skill development should not be viewed as a cost, but as a strategic investment in competitiveness. Without timely action, skill gaps could significantly impact productivity, quality, and the global positioning of the Indian gear industry in the coming years.



The summit concluded with a forward-looking panel on "India's Manufacturing Future: Scaling Up for the Next Decade to Meet International Demands." Moderated by Amol Natu of Cummins India, the discussion featured leaders such as Mushtaq Jamal of Bevel Gears India, Ashish Nemade of Nemade Engineers, Parag Apte of SKF India Limited, and Rakesh Vaidya of Kalyani Technoforge Limited.



The panel discussed how India's gear industry can scale to meet global demand by integrating AI, real-time data, and advanced manufacturing technologies. Emphasis was placed on building a skilled workforce while adapting to automation-driven shifts in job roles.

Gender diversity and inclusion were highlighted as key to expanding the talent pool and fostering innovation. Overall, the session stressed that global competitiveness will depend on a balanced approach

combining technology adoption, workforce development, and inclusive growth.



Additional presentations included "The EV Shift: Opportunities for Gear Manufacturers in India's New Mobility Ecosystem," delivered by Karthik Sheshagiri of Hitork Gears.



Karthik Sheshagiri Director Hitork Gears



The Summit concluded with an engaging and insightful technical session titled "Efficient Gear Manufacturing," delivered by Vishwajeet Kothari, Director at Cyber Gears.



The summit witnessed strong engagement from delegates across the industry, reflecting the relevance and depth of the discussions. Participants actively contributed through insightful questions, bringing in diverse perspectives from manufacturing, design, R&D, and end-user segments.

The Q&A sessions evolved into meaningful knowledge exchanges, where delegates not only sought clarity but also challenged viewpoints, shared practical experiences, and highlighted real-world challenges. This interactive environment added significant value to the sessions, making them more dynamic and solution-oriented.

Such active participation underscored the industry's keen interest in addressing current challenges and exploring future opportunities, ultimately enhancing the overall impact and success of the summit.



### GTI Awards 2026: Honouring Industry Excellence

The GTI Awards 2026 celebrated outstanding achievements across the gear manufacturing sector.

Key winners included Bonfiglioli Technology Space, Bharat Gears Limited, ESGI Tools Pvt Ltd, Premium Transmission Limited, UCAM Pvt Ltd, RAEL Geartech Limited, Grind Master Machines Private Limited, Shelar Automation, and Tata Motors.

Special recognition was given to industry veterans Chandrakant Nemade, Director at Nemade Engineers Pvt Ltd and K P Soundararajan, former Managing Director of Gleason Works India, for their lifetime contributions to the gear industry.

### Driving the Future of Gear Manufacturing

With strong participation, insightful discussions, and recognition of industry achievements, IPTEX GRINDEX 2026 once again demonstrated its role as a vital

platform for technology exchange, industry collaboration, and innovation in the gear manufacturing sector.

knowledge-driven summit sessions, and the celebration of industry excellence through the GTI Awards highlighted the continued growth and global potential of India's gear manufacturing sector.

The combination of a dynamic exhibition,

### Award Winners 2026



*Excellence in Design & Development - Bonfiglioli Technology Space*



*Excellence in Gear Manufacturing - Bharat Gears Limited*



*Cutting Tool Innovation - ESGI Tools Pvt Ltd*



*Excellence in Heat Treatment - Premium Transmission Limited*



*Excellence in Indigenisation - Make in India - UCAM Pvt Ltd*



*Outstanding Social Responsibility - RACL Geartech Limited*



*She Leads the Gear - Mohini Kelkar Grind Master Machines Private Limited*



*Innovator of the Year - Shelar Automation*



*Gear Production Leadership - Tata Motors Ltd*



*Gear Industry Lifetime Contributor - Chandrakant Nemade*



*Gear Industry Lifetime Contributor - K P Soundararajan*



*American Gear Manufacturers Association Distinguished Service Award  
PRAKASH KADAM, Managing Director of Pragati Transmission Pvt Ltd - India*

# From Precision to Performance: Poggenamp Nagarsheth Powertronics Drives the Future of E-Mobility Laminations

Established in 1982, Poggenamp Nagarsheth Powertronics Pvt. Ltd. has steadily evolved into a trusted name in the manufacturing of electrical stampings and laminations. With decades of engineering expertise and a strong commitment to innovation, the company has positioned itself at the forefront of delivering high-performance solutions for a wide spectrum of applications, ranging from conventional industrial motors to next-generation e-mobility systems.

At the core of the company's offerings lies a comprehensive portfolio of standard IEC range laminations alongside fully customised solutions tailored to meet specific customer requirements. This flexibility enables Poggenamp Nagarsheth Powertronics to cater to diverse industries with precision-engineered products that align with global standards, including DIN specifications for strips and EI laminations.

A key highlight of the company's capabilities is its focus on self-bonding laminations, which are increasingly critical in modern electric mobility and high-efficiency applications. These advanced laminations eliminate the need for traditional interlocking or welding, thereby reducing core losses, minimising noise, and enhancing overall motor performance—making them ideal for electric vehicles and energy-efficient systems.

In line with the global push toward sustainability and energy optimisation, the company places significant emphasis on processing higher-grade electrical steels. Its expertise extends to producing laminations for premium efficiency classes, including IE5 motors, with thicknesses ranging from 0.2 mm to 0.5 mm. This capability ensures reduced energy losses and improved performance in

- **By Poggenamp Nagarsheth Group**  
demanding applications.

The company's robust manufacturing infrastructure is another pillar of its success. Spread across a built-up area of over 10,000 square meters, the state-of-the-art facility is equipped with advanced machinery designed for precision and scale. This includes high-speed and gang punching presses up to 400 tons, vertical die casting machines of similar capacity, and specialised processes such as broaching for rotor inner diameters. Additionally, the facility supports notching and indexing operations for diameters up to 1150 mm, along with automated cleating and welding systems that ensure consistency and efficiency.

Reinforcing its commitment to excellence, the company holds multiple internationally recognised certifications, including ISO 9001:2015, IATF 16949, ISO 14001:2015, and ISO 45001:2018. These certifications reflect adherence to global standards in quality management, automotive requirements, environmental responsibility, and occupational health and safety.

With a production capacity of up to 2000 metric tons of finished laminations per month, Poggenamp Nagarsheth Powertronics Pvt. Ltd. is well-equipped to meet high-volume demands without compromising on precision or quality.

As industries continue to shift toward electrification, efficiency, and sustainability, Poggenamp Nagarsheth Powertronics stands as a reliable partner, delivering advanced lamination solutions that power the technologies of tomorrow.



## Built for Load Engineered for Uptime

#Gears Driving Performance Across Core Sectors



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# Less Friction, More Progress: Why Industry Must Rethink Friction, Wear and Surface Interactions

At a time when India is striving to move higher in the global manufacturing index - currently ranked sixth in Asia according to Dezan Shira & Associates' Asia Manufacturing Index 2026- the conversation around competitiveness often revolves around scale, automation and digitalisation. Yet some of the most significant efficiency gains lie hidden in plain sight: in the science of friction, wear and lubrication.

In an increasingly competitive regional landscape - with countries like Malaysia, Vietnam and Singapore advancing rapidly and China continuing to lead - the real differentiator for manufacturing excellence will not simply be producing more. It will be producing smarter. The question is no longer about scale alone, but whether we can do more with less - less energy, less material loss, less downtime.

This is precisely where tribology becomes critical.

## The Invisible Force Shaping Industrial Performance

In industrial operations, friction and wear are often treated as inevitable. Machinery components move against one another for hours every day, and gradual degradation is accepted as part of the lifecycle. However, what is frequently overlooked is how cumulative friction directly impacts energy consumption, reliability and equipment lifespan.

Across power, mobility, manufacturing and heavy engineering sectors, incremental inefficiencies can escalate into significant energy losses, unexpected downtime and premature equipment failure. What appears to be a minor technical variable can quietly become a structural drag on productivity and sustainability.

Going back to its origins in Greek- tribos (rubbing) and logos (study)- addresses these very interactions. As the science of friction, wear and lubrication, it sits at the intersection of materials science, mechanical engineering and surface physics. By understanding and optimising surface interactions, tribology enhances safety, reliability and service life - delivering tangible economic value.

From seals, gears, brakes and roller bearings, tribological principles prevent wear, surface deformation and stress concentration. Consider this- the carbon graphite seal used in rotary joints in the paper industry

- **By Sanoj Somasundaran**

to avoid any steam leakage fails when adhesive wear reduces the mechanical contact zones. A smaller contact area increases stress, raising the probability of failure under the same load. Tribology engineering can help mitigate such risks through material design, lubrication strategy, and surface optimisation.

This knowledge underpins industries ranging from cement, oil and steel to aviation and marine engineering. It is no coincidence that the field is often referred to as "industrial tribology".

## The Rise of Nano Tribology

As industries adopt nanotechnology, tribology faces new frontiers. In devices such as smart wearables, semiconductor components, precision instruments, friction wear and tear occur at micro and atomic scales. Dealing with these goods can be more challenging since the nanostructure strongly influences their material strength, scratch hardness, friction and wear.

Nano tribology addresses these interactions at the atomic level. It examines how lubricants, environmental media and surface structures behave under extreme precision conditions. As micro- and nano-electromechanical systems become more prevalent, tribology research must evolve to address high-friction and severe-wear challenges at increasingly smaller scales.

## Engineering for Longevity and Efficiency

Whether at the macro or nano scale, proprietary surface engineering processes and lubrication technologies play a transformative role. Advanced materials, optimised mechanical design, and intelligent lubrication strategies significantly extend component life while improving performance.

Lubrication monitoring and condition-based maintenance have become essential. Metallurgical alloys used in gears and bearings are engineered for precise speeds and temperatures. When exposed to elevated operating conditions, unpredictable deformation may occur - reducing lubrication clearances and triggering heat build-up, vibration and eventual failure.

Addressing these phenomena requires not just better components, but deeper tribological

insight embedded into design, operation, followed by maintenance.

### Why Tribology is Strategic for India's Growth

In a fast-emerging economy like India, industrial competitiveness will increasingly hinge on efficiency rather than expansion alone. As infrastructure investments accelerate and manufacturing capacity expands, minimising frictional losses can unlock significant gains in energy savings, reliability and asset longevity.

As India aims to strengthen its position in global manufacturing value chains, foundational engineering sciences such as tribology will quietly shape the outcome. Improving productivity is no longer just about automation or digital transformation, but mastering the fundamentals that determine how machines behave under stress, over time and at scale.

Tribology may not always command headlines. But it is one of the most powerful, and often underexplored levers for industrial efficiency, sustainability and long-term competitiveness.

In a country like India with strong manufacturing momentum, a vast domestic market and deeper integration into global trade pathways, such advantages compound rapidly. Where design will no longer be an accessory to business but its core driver, enabling dynamic industrial ecosystems and advancing in lockstep.



**Sanoj Somasundaran**

Chief Technology Officer, SKF India (Industrial), and Director, Technology Development, ISEAM (India, SE Asia, Middle East)

Sanoj Somasundaran is the Chief Technology Officer of SKF India, where he leads the company's technology, innovation and engineering agenda across India, Southeast Asia, Middle East (ISEAM) for customer-centric solutions & products

As the CTO of SKF India (Industrial), he crafts the technological roadmap for the industrial entity, aligning local innovation priorities with SKF Group's global technological vision, and advancing clean, intelligent solutions for industry and the planet.

With over 28+ years of experience, he brings deep expertise across product development, connected technologies, IoT, electronics, and advanced engineering for industrial and automotive applications. He has successfully built and scaled global technical centres, managed large multidisciplinary engineering teams, led multiple functions and driven innovation across hardware, software, electronics, and digital platforms.

Prior to SKF, Sanoj held senior leadership roles at Bosch and Valeo, where he led end-to-end engineering operations, P&L responsibilities, product development, Cost projects and global technology centre strategy, overseeing teams of over 1,500 engineers.

Sanoj heads SKF's Global Technical Centre in Bengaluru, a key node in the company's global R&D network, where teams develop Products for ISEAM as well as for global markets in the areas of bearings, predictive maintenance, connected technologies, and next-gen materials, shaping future-ready industrial solutions from India.

Known for driving Innovation, change management and strong execution focus, Sanoj champions clean, intelligent technologies that translate innovation into sustainable performance- strengthening customer outcomes and shaping SKF's future-ready industrial leadership.



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# AI Inspection for Smarter Torque Management in Gears

- By Neha Bausdkar Ghate

Torque management is central to how gear systems function and how efficiently they transmit power in industrial machinery, automobiles, robotics, and rail traction units. At its core, torque is the rotational force that drives components such as shafts, gears, and wheels to perform work; in geared systems, the gearbox converts motor or engine speed into usable torque via gear ratios. Industrial gearboxes, for example, deliberately use high gear ratios to multiply torque for heavy-duty applications such as mining conveyors, cranes, and extruders, while low-ratio setups favour speed over torque for light, high-speed operations. Without proper torque management—right ratios, robust materials, and accurate gear geometry—gearboxes quickly suffer overheating, premature wear, and mechanical failure, directly impacting reliability and productivity.

In the gear industry, torque management is not just about sizing and selecting gears; it is about ensuring that every manufactured gear tooth can reliably transmit the designed torque over millions of cycles without fatigue, pitting, or scuffing. This is why precise gear geometry, surface finish, and hardness uniformity are critical: even small defects in a tooth profile can locally spike contact stress, creating micro-cracks that eventually propagate into macro-scale failures under high torque. As industries push for higher-efficiency, high-speed, and compact gearboxes, torque management effectively becomes a quality-and-reliability challenge—where every micrometre-level deviation in inspection can translate into torque-transmission risk.

## AI-driven inspection on the shop floor

To meet these tightening quality demands, the gear industry is increasingly turning to AI-driven inspection systems that replace or augment manual gauging and sample-based checks with real-time, full-100% coverage of gear parameters. Modern AI-driven gear inspection platforms typically combine high-resolution cameras, structured lighting, and often 3D laser or hyperspectral sensors on a conveyor-based line, capturing detailed images and profiles of each gear as it passes through the inspection station. Deep-learning and computer-vision algorithms then compare these real-time measurements against a digital master (CAD-based reference) to detect dimensional deviations, tooth-profile errors, chamfer inconsistencies, and surface defects far more consistently than human operators.

Beyond pass-fail classification, advanced AI inspection systems classify defect types (chipping,

burrs, nicks, micro-pitting precursor regions) and rank their severity using trained models. This capability is particularly relevant for torque-management applications, because certain defect patterns—such as edge-exposed or micro-cracked teeth—are more likely to cause early fatigue under high-torque loading. By tagging not just “defect” but “defect-type-under-torque-risk,” AI systems allow manufacturers to route borderline gears away from high-load duty cycles or to flag process parameters that repeatedly generate torque-sensitive flaws.

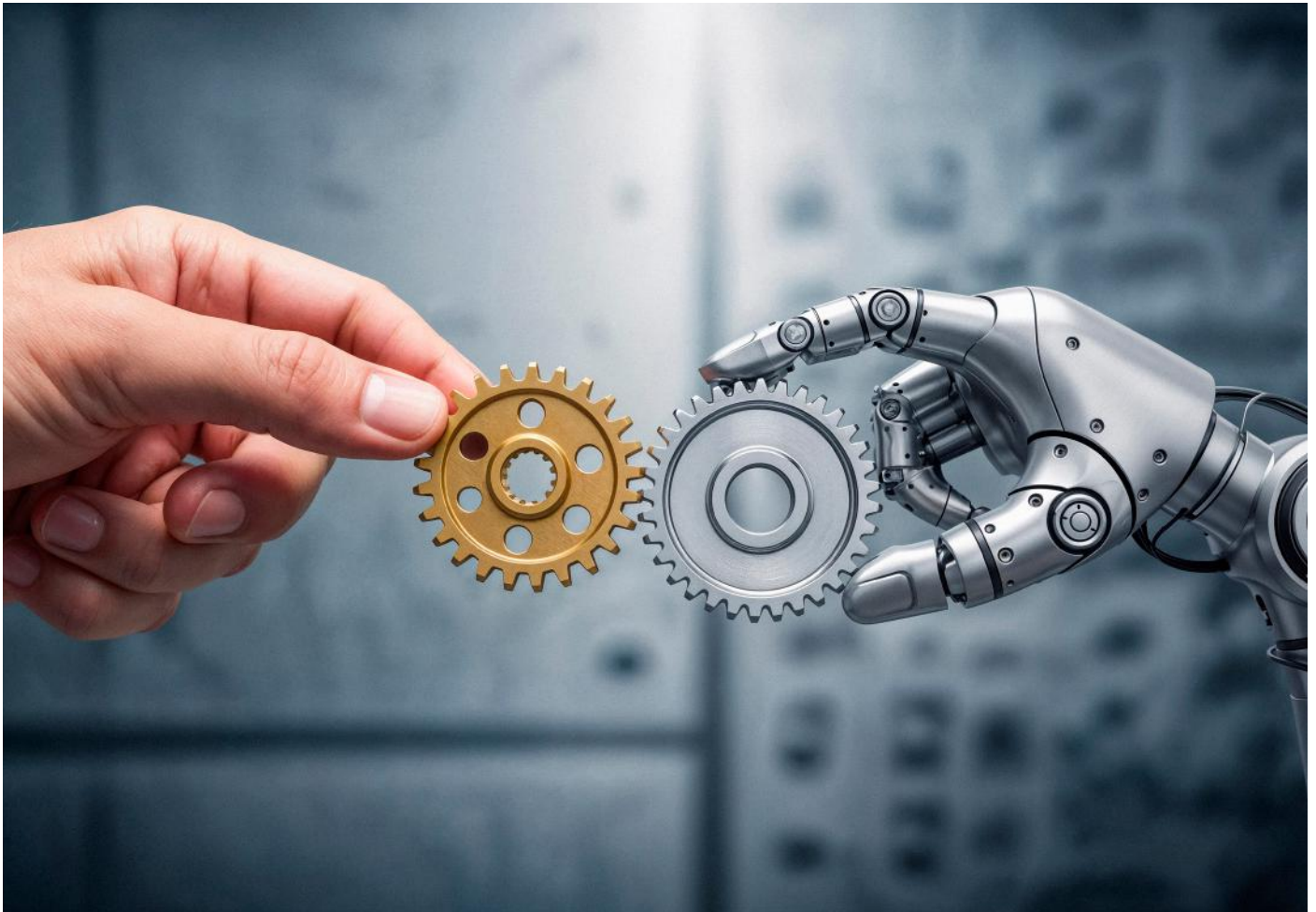
## How torque performance benefits from AI inspection

AI-driven inspection directly raises the bar for torque management in two key ways: predictive-quality assurance and process-control feedback. First, by inspecting every gear and logging detailed defect and dimensional data, manufacturers can correlate specific inspection signatures—such as tooth-tip roughness, micro-profile deviations, or hardness-map non-uniformity—with torque-endurance test results. Over time, AI models can predict the likely torque-life of a gear batch from inspection images alone, enabling proactive selection of only high-confidence gears for high-torque applications such as wind-turbine gearboxes or EV drivetrains.

Second, AI inspection systems integrate with Manufacturing Execution Systems (MES) and process databases to build a “digital fingerprint” of each gear and its production recipe. When a torque-related failure appears in field service, this database allows engineers to trace back to the exact machine settings, tooling condition, and inspection flags, rather than relying on anecdotal reports. This feedback loop can reveal subtle patterns—such as a specific hobbing cutter-wear band or a heat-treatment chamber-zone that correlates with torque-fatigue cracks—enabling manufacturers to fine-tune their torque-management strategies at the design and process level.

## Real-world examples and benefits

Several AI-driven gear-inspection solutions already demonstrate tangible benefits for torque-sensitive applications. For instance, a computer-vision-based AI inspection system reported in recent research can measure gear profiles, detect defects, and execute pneumatic rejection—all in real time on a high-speed conveyor line—achieving near-zero defect escape rates



in industrial gear manufacturing. Another industrial-scale implementation at an automotive-gear manufacturer uses AI-enhanced vision systems to inspect complex gear geometries with 100% accuracy, ensuring that only gears matching precise torque-transmission criteria proceed to assembly.

Such systems also support predictive maintenance for gear-cutting equipment, such as hobs, shaving tools, and grinding wheels. By continuously monitoring inspection data, AI can detect the onset of tool wear or machine-tool drift that would gradually degrade torque-handling capability even if nominal tolerances are still within specification. Early intervention—retipping a hob, re-dressing a grinding wheel, or re-calibrating the machine—reduces the risk of torque-sensitive defects entering the production stream, thereby improving both product reliability and equipment-utilisation rates.

### **Torque management and the gear industry's future**

For the gear industry, AI-driven inspection is not just a quality-control gadget; it is becoming a core enabler of advanced torque management across sectors ranging from electric mobility and industrial

automation to aerospace and renewable energy. As gearbox designs grow more compact and efficient, with higher torque-densities and longer service intervals, the margin for manufacturing defects shrinks, making AI-powered inspection a strategic asset rather than a nice-to-have. At the same time, integrating AI-inspection data into digital-twin and life-cycle-cost models allows gear manufacturers and end-users to optimise torque-management policies—such as duty-cycle selection, lubrication strategies, and overhaul schedules—with data-driven confidence.

In India's gear-manufacturing ecosystem, where many shops still rely on manual or semi-automated inspection, adopting AI-driven torque-aware inspection can be a differentiator for entering global EV, wind-turbine, and high-precision automation supply chains. Training engineers to interpret AI-inspection outputs in torque-performance terms—linking profile errors, surface defects, and metallurgical flags to real-world torque-handling capability—will be as important as deploying the hardware itself. By fusing AI-driven inspection with a deeper understanding of torque management, the gear industry can move from reactive defect control to proactive torque-reliability engineering, ensuring that every gear delivers not only precision but also predictable, high-torque performance over its entire life.

# Shifting Gears: How Electric Powertrains Are Rewiring the Gear Industry

- By Vivek Singh

Electric powertrains are no longer a niche curiosity; they are rapidly becoming the dominant force reshaping the design, materials, and manufacturing practices of the gear industry worldwide. Unlike traditional internal-combustion drivetrains, which rely on multi-ratio gearboxes to manage torque and speed, electric powertrains push gear engineers toward compact, high-speed, high-efficiency single- or two-stage gear systems that operate under very different thermal and loading conditions. For India's gear-design and manufacturing ecosystem, this shift is not just a product change—it's a transformation of the entire value chain, from R&D and materials to metrology and lubrication.

## New design demands for e-gearboxes

Electric motors deliver peak torque from standstill and can spin at 15,000 rpm or higher, which forces gearbox designers to rethink gear-ratio strategies, tooth geometry, and micro-geometry. Instead of wide-range, multi-clutch gearboxes, many EVs now use single- or two-speed gear units with specially optimised helical or spur gears to minimise noise and vibration while maximising efficiency. This means higher pitch-line velocities, thinner oil films, and more demanding NVH targets, pushing gear designers toward advanced simulation-driven workflows that model gear-tooth contact, load distribution, and thermal growth simultaneously.

Lubrication and cooling strategies also differ significantly in electric powertrains. In many EVs, the same oil or coolant must serve both the gearbox and the motor or power electronics, calling for lubricants with excellent electrical insulation properties and low particle content to avoid arcing and contamination. At the same time, higher rotational speeds and continuous high-load operation increase the importance of managing friction, micro-pitting, and surface fatigue—making tribology a central pillar of the next-generation e-gearbox.

## Materials, manufacturing, and integration

To meet the weight and efficiency targets of electric vehicles, gearbox casings and gear components are increasingly fabricated from lightweight alloys, hollow shafts, and sometimes hybrid structures that combine metal gears with polymer or composite elements. Advanced heat-treatment processes, surface-hardening techniques, and precision grinding are being applied more rigorously to ensure that high-speed gears can withstand prolonged high-torque operation without compromising

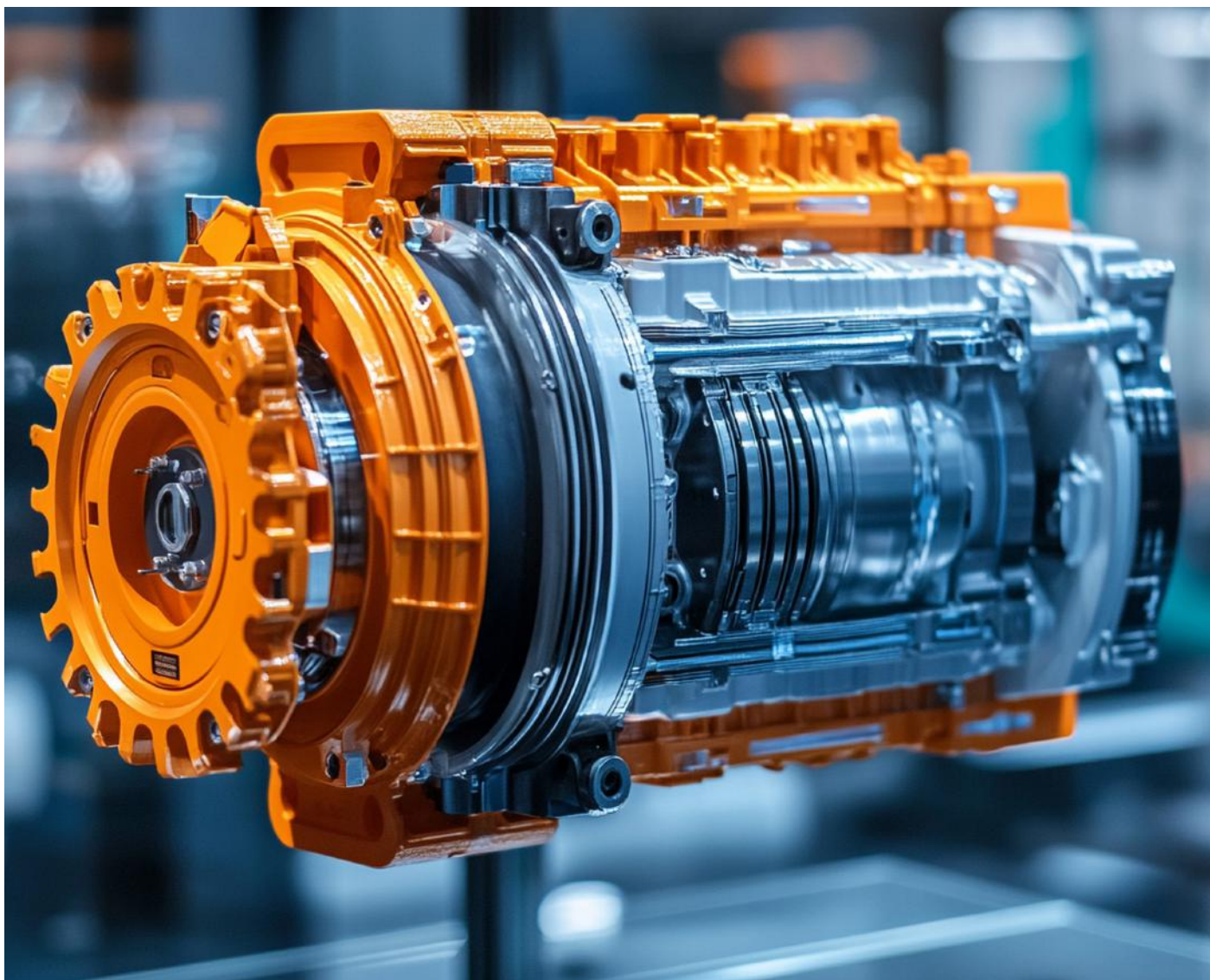
reliability. Metrology practices are also tightening, with tighter run-out tolerances, crown and tip-relief control, and more frequent functional inspection of gear-meshing quality to guarantee smooth NVH performance.

Integration is another key theme in the electric-powertrain era. Many OEMs now adopt "e-axle" or "e-drive" architectures, where the motor, inverter, gearbox, and sometimes even the differential are packaged into a single compact unit. For gear manufacturers, this demands a systems-thinking mindset: gears must be designed not in isolation, but in intimate coordination with electromagnetic and thermal models of the motor and power electronics. Such integrated units place a premium on thermal management, structural stiffness, and sealing integrity, all of which influence gear-tooth loads, bearing life, and overall drivetrain longevity.

## A snapshot of key changes in e-powertrain gears

The table below highlights some of the key technical and operational differences between conventional ICE-based gear systems and modern electric-powertrain gearboxes.

Aspect	Conventional ICE gearbox	Electric-powertrain e-gearbox
Typical speed range	Lower motor speeds, stepped ratios	Very high motor speeds, often 10,000–18,000 rpm
Number of ratios	4–10 speeds common	Often 1–2 speeds; some 3-speed concepts emerging
Lubrication focus	Load-carrying, wear protection	Efficiency, electrical insulation, and motor cooling
NVH requirements	Moderate noise targets	Extremely low noise/vibration for cabin comfort
Integration level	Separate gearbox, engine, clutch	Integrated e-axle or e-drive units with motor and gearbox
Thermal loads	Transient, combustion-cycle-driven heating	Continuous high-speed, high-torque operation
Key design driver	Torque-range coverage and fuel economy	Overall efficiency, weight, and packaging compactness



## Implications for the Indian gear industry

For India's gear manufacturers, electric powertrains open a window to move beyond cost-driven, commodity-type production and into higher-value engineering roles. Companies that invest early in e-gearbox design competence, advanced simulation tools, and lightweight-manufacturing capabilities can become strategic partners to global EV OEMs and Tier-1 suppliers rather than just gear-cutting vendors. Collaborations with research institutes, universities, and regional EV clusters can accelerate the development of indigenous know-how in e-axle design, lubricant selection, and durability-validation protocols.

Upskilling is also critical, as electric powertrain gears demand a workforce fluent in multiphysics simulation, digital twins, and advanced metrology. Engineers need to understand not only gear-geometry fundamentals but also electromagnetic losses, thermal-stress interactions, and the impact of manufacturing

variations on NVH and efficiency. Training programmes, in-plant academies, and partnerships with gear-technology institutes can help Indian firms accumulate the deep, cross-disciplinary expertise that electric powertrains require.

## The road ahead

As the automotive and off-highway sectors accelerate their transition to electric and hybrid powertrains, the gear industry must evolve from a support player to a core enabler of efficiency, range, and driving experience. Electric powertrains do not diminish the role of gears; they redefine it, demanding smaller, faster, quieter, and more integrated gear systems that operate at the very edge of material and tribological limits. For Indian gear manufacturers willing to embrace this shift, the electrified future offers not just a change in product lines but a once-in-a-generation opportunity to become technology leaders in the global mobility ecosystem.

# Bharat Forge and Liebherr-Aerospace Launch Advanced Landing Gear Machining Facility in Pune



Bharat Forge Limited has inaugurated a state-of-the-art landing gear components machining facility in Mundhwa, Pune, developed in collaboration with Liebherr-Aerospace & Transportation SAS. The new facility marks a major step in strengthening India's aerospace manufacturing capabilities and expanding the country's role in the global aerospace supply chain.

The facility integrates advanced machining centres dedicated to the production of high-precision landing gear components. With this development, Bharat Forge becomes one of the first companies in India to operate OEM-approved landing gear component machining capabilities at scale.

The inauguration ceremony was attended by senior leaders from Liebherr-Aerospace, including Martin Wandel, Managing Director and Chief Operating Officer at Liebherr-Aerospace & Transportation SAS; Philipp Walter, Managing Director at Liebherr-Aerospace Lindenberg GmbH; Bernd Schacherl, Director Procurement at Liebherr-Aerospace & Transportation SAS; and Sanjay Prasad and Sunil Kalra, Managing Directors at Liebherr India Private Limited. Representing Bharat Forge were Amit Kalyani, Vice Chairman and Joint Managing Director, and Guru Biswal, CEO of the Bharat Forge Aerospace Division.

Speaking at the inauguration, Amit Kalyani said the facility represents a significant milestone in the company's aerospace journey. "This state-of-the-art facility, planned in partnership with Liebherr-Aerospace, is a very significant milestone in Bharat Forge's journey in the aerospace sector and a testament to our ability to add value to customer relationships. We thank Liebherr-Aerospace for the faith reposed in the BFL Aerospace

## - By Gear Technology India

division to deliver critical components and products for its global requirements," he said.

He further noted that the partnership reflects Bharat Forge's commitment to scaling up its aerospace operations and enhancing value addition through strategic collaborations, thereby strengthening the long-term growth of the Indian manufacturing sector.

Martin Wandel, Managing Director and Chief Operating Officer at Liebherr-Aerospace & Transportation SAS, highlighted the importance of the collaboration. "We are proud and pleased to embark on this partnership with Bharat Forge, a strong and highly technological industry leader. Together we are building a state-of-the-art facility tailored precisely to the requirements of the global aerospace industry," he said, adding that the collaboration represents a major step toward advancing innovation and excellence for global aerospace customers.

With the addition of this facility, Bharat Forge has further strengthened its aerospace manufacturing portfolio, which already includes aero-engine components, airframe structures, and landing gear sub-systems for civil and military aviation. The company currently manufactures turbine and compressor components, forged rings, shafts, and discs, along with structural and landing gear elements.

The Pune-based company is also in the process of establishing an advanced aerospace ring mill in India to produce high-value forged rings for aero-engine programs. The collaboration between Bharat Forge and Liebherr-Aerospace is expected to further reinforce the position of Bharat Forge Aerospace in the global supply chain while underscoring India's growing capabilities in high-precision aerospace manufacturing.





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# Boosting Gear Turning Productivity with Wiper CBN Inserts

- By Dinesh Kumar Acharya

## Abstract

In the competitive landscape of gear manufacturing, the transition from traditional grinding to Hard Part Turning (HPT) offers significant cycle time reductions. This article explores how coupling Cubic Boron Nitride (CBN) with Wiper geometry can exponentially increase feed rates while maintaining surface finishes rivaling grinding operations.

## Introduction: The Evolution of Gear Finishing

We can all agree that gear manufacturing is an exacting discipline. It is an engineered product involving critical manufacturing processes where quality demands are unforgiving at every stage. If you are in gear manufacturing, you know the challenges well. In this competitive era, it is essential to be productive, reduce cycle times, and improve quality simultaneously.

Traditionally, the finishing of hardened gears (48–60 HRC) has been the domain of grinding. While grinding is a proven solution used since the 19th century for achieving high quality, it often acts as a bottleneck due to low Material Removal Rates (MRR). This is where smart manufacturing techniques come into the picture: introducing Hard Part Turning (HPT) with Wiper CBN inserts.

## The Need for Higher Productivity

High productivity and superior product quality are the need of the hour. Improving productivity means increasing the production rate within the same setup, which is where manufacturing costs are drastically reduced.

Likewise, the advantages of improved quality are self-evident—better product quality naturally leads to fewer rejections and longer tool life. The objective is to elevate the process from simple “machining” to delivering true “engineered solutions.”

## Hard Part Machining in Gear Manufacturing

Gear production involves multiple stages, but one of the most critical and time-consuming operations is hard part machining. After heat treatment, gear hardness often exceeds 48 HRC. At this stage, machining is typically done by grinding or Hard Part Turning (HPT)

using Ceramics or CBN.

While many industry experts use hard part turning to eliminate grinding, many smart engineers employ HPT as an intermediate operation. By removing the bulk of the material with CBN, they reduce the grinding allowance to as little as 50 microns. This drastically reduces the grinding cycle time—a classic “win-win” situation where the high MRR of turning supports the precision of grinding.

## The Role of CBN: A Game Changer

Most gears are machined after heat treatment, whether through-hardened or case-hardened. The resulting surface hardness (48–60 HRC) degrades machinability by 15–30%. Standard Carbide and HSS tools cannot withstand the cutting zone temperatures (>800°C), and Ceramics, while useful, often suffer from thermal shock in interrupted cuts.

This is where Cubic Boron Nitride (CBN) excels. With a hardness of approx. 4000 HV (second only to diamond) and hot hardness stability up to 1400°C, CBN provides the thermal resilience required for hard turning. Selecting the Right Grade Composition

Success in hard turning depends heavily on matching the grade composition and coating to the application.

- **Continuous Cuts:** For gears requiring high-speed, continuous finishing, wear-resistant CBN grades are ideal. These grades typically feature a optimized binder structure that resists crater wear, allowing for extended tool life at elevated cutting speeds.
- **Interrupted Cuts:** When facing interruptions—such as oil holes, splines, or gear teeth—toughness is paramount. Here, tougher, coated CBN grades are the preferred choice. These are engineered to withstand the mechanical shock of interrupted cuts without chipping, providing process security where ceramics would likely fail.

## Decoding Wiper Technology

To truly boost productivity, we must look at the geometry. A “Wiper” is a specially designed insert edge geometry that decouples surface finish from feed rate.

In standard inserts, higher feeds leave larger

“scallop” marks. Wiper geometry features a multi-radius section that “wipes” the surface smooth. Leading tool manufacturers have refined this into specific application-based geometries:

**1. Finishing Wipers (FW):** Designed for applications where surface finish is the primary KPI. These geometries allow for superior surface quality (often < 0.2 Ra) while maintaining moderate productivity gains.

**2. General Purpose Wipers (GW):** The workhorse for productivity. These geometries allow manufacturers to double or triple their feed rates compared to standard ISO inserts while maintaining acceptable finish standards suitable for most gear applications.



### The Productivity Equation

The results are quantifiable. At Kennametal, we have conducted several test cases where the finish achieved by a standard insert at feed “X” mm/rev was achieved by Wiper geometry at 2X to 4X that feed. In short: Wiper CBN inserts = High Productivity + Superior Surface Finish.

### Economic Efficiency: Multipoint CBN

Historically, CBN was seen as a high-cost consumable. However, the industry is shifting towards Multipoint CBN inserts. Unlike traditional “tipped” inserts with only one cutting corner, Multipoint inserts feature multiple brazed tips (often 2, 3, or even 4 corners per insert).

This innovation drastically reduces the cost per cutting edge. When combined with the high feed rates of modern wiper geometries and the durability of advanced coated grades, the total cost per component drops significantly compared to grinding.

### The Criticality of Edge Preparation

Product quality is paramount. While Wiper geometry looks simple conceptually, its manufacturing is highly complex. Imagine expecting a component tolerance below 30 microns and a finish below 0.4 Ra—this is impossible without a pristine cutting edge.

This is where Laser Ablation technology comes into play. Although more costly than other edge prep methods, laser cutting provides a highly accurate and precise cutting edge. This precision is what allows the Wiper CBN to deliver consistent, high-quality results on the shop floor.

### Conclusion: The Untapped Potential

Surprisingly, available public data shows that today, nearly 80% of gears (with surface hardness >48 HRC) are still finished using only grinding, while only 20% utilize Hard Part Turning.

By integrating advanced solutions—like tough grades for interrupted cuts, optimised Wiper geometries for speed, and Multipoint inserts for economy—manufacturers can gain a massive competitive edge.



**Dinesh Kumar Acharya**

Head - Kennametal Knowledge Center, Kennametal India Limited

*Dinesh Kumar Acharya is the Head of the Kennametal Knowledge Center at Kennametal India. With over two decades of experience in the machining and metal cutting industry, he specialises in technical education, process optimisation, and advanced machining strategies.*

# Sustainable Gear Design: Cleaner, Lighter, Longer-Lasting

By Sudhanshu Nayak



Sustainable design in the gear industry means creating gears and gearboxes that do less harm to the environment while delivering equal or better performance, reliability, and efficiency. Instead of just focusing on strength and cost, designers now think about the full life cycle—material extraction, manufacturing, energy use in service, and end-of-life recyclability. In practical terms, this leads to lighter gears, longer-lasting surfaces, smarter lubrication, and more efficient power transmission that reduces fuel or electricity consumption across many industries.

## What “sustainable gear design” means

Sustainable gear design starts with three core ideas: lightweighting, durability, and resource efficiency. Lightweight gears reduce rotating mass, which cuts energy demand for acceleration and reduces dynamic loads on bearings and housings. Durable designs—through better micro-geometry, surface treatments, and material selection—extend service life, cutting the need for frequent replacements and repairs. Resource-efficient design, meanwhile, minimises excess material, machining energy, and lubricant volume, lowering both operating cost and environmental footprint.

For the gear industry, sustainable design is not a one-time change; it is a mindset shift from “design to survive” to “design to last, reuse, and recycle.” This shift is increasingly driven by regulations, customer expectations, and the need to cut energy costs across sectors such as automotive, mining, railways, aerospace, and renewables. As manufacturers adopt digital tools like simulation, digital twins, and data-driven maintenance, they can quantify how each design choice affects efficiency, emissions,

and lifecycle costs—making sustainability a measurable engineering parameter rather than a marketing slogan.

## Automotive: lighter gears, longer-lasting drivetrains

In the automotive sector, sustainable gear design is closely tied to fuel efficiency and, increasingly, electric-vehicle range. Gears for ICE and EV transmissions are being made lighter through thin-web designs, hollow shafts, and high-strength alloys, which directly reduce vehicle weight and energy consumption. At the same time, advanced surface treatments and precision-ground tooth profiles help gears run more quietly and efficiently, extending oil-change intervals and reducing parasitic losses.

For electric powertrains, gearboxes must handle continuous high-speed operation while minimising noise and vibration, all to improve passenger comfort and perceived quality. Sustainable design in this context means gear systems that stay efficient over long mileage, require fewer lubricant changes, and can be integrated into compact e-axle or e-drive units without adding unnecessary mass. By combining lightweight gearing, smart lubrication, and predictive-maintenance schemes, automotive gear manufacturers help OEMs meet both fuel-economy targets and environmental-impact standards.

## Mining and heavy industry: durability over disposability

In mining and other heavy-industry applications, sustainability is less about weight and more about durability and reduced downtime. Gears for excavators, conveyors, crushers, and draglines often operate under extreme loads, shock loading, and dusty or abrasive environments, which rapidly degrade conventional designs. Sustainable gear design here focuses on robust materials, advanced heat-treatment, and protective coatings that resist wear, pitting, and micro-cracking, enabling longer service intervals and fewer unplanned stoppages.

Another aspect is modular and repairable design: instead of replacing entire gearboxes, engineers design gear shafts and pinions that can be disassembled, reconditioned, or refinished and reinstalled. This approach reduces the need for new raw materials and

lowers the environmental and economic cost of gear-replacement campaigns in mines and processing plants. When combined with condition-monitoring and AI-driven inspection, sustainable gear design also helps operators schedule maintenance based on actual wear rather than fixed time intervals, further cutting waste and downtime.

### **Railways and aerospace: efficiency and reliability**

In railways, sustainable gear design supports the broader goal of shifting freight and passengers from road to rail, which is inherently more energy-efficient per ton-kilometre. Lightweight gearboxes and drivetrains reduce the mass of rolling stock, cutting energy consumption and rail-infrastructure wear while improving acceleration and braking response. At the same time, high-reliability gear designs with advanced lubrication and condition-monitoring systems extend overhaul intervals and reduce the need for frequent maintenance on busy networks.

In aerospace, gears sit at the heart of engines, transmissions, and actuation systems, where reliability and safety are paramount. Sustainable aerospace gear design, therefore, emphasises lightweight, high-strength alloys and precision-manufactured components that can withstand years of high-cycle operation without fatigue failure. Oil-conserving lubrication strategies and closed-loop, long-life lubricant systems further reduce the environmental burden of aircraft operations, aligning with the industry's push for lower emissions and noise.

### **Emerging sectors: renewables, robotics, and beyond**

New and emerging industries such as wind-turbine drivetrains, robotics, and industrial automation are also driving demand for sustainable gear designs. In wind turbines, gearboxes must transmit huge torque

over decades of operation, often in remote locations where maintenance is costly and logistically challenging. Sustainable approaches here rely on advanced materials, surface treatments, and AI-driven health monitoring to maximise gear life and minimise unplanned service trips.

In robotics and precision automation, compact, lightweight gearboxes that reduce energy consumption and heat generation are essential for efficiency and compact form factors. Sustainable design in these segments favours integrated gear-motor units, advanced lubricants, and low-friction tooth geometries that lower operating temperatures and extend service life without frequent re-lubrication. As more industries move toward digital-twin-based design and predictive-maintenance platforms, sustainable gear design will increasingly be validated in silico before metal is cut, further cutting material waste and trial-and-error development.

For the global gear industry, sustainable design is no longer a niche trend; it is becoming a core requirement for market access, especially in regulated sectors such as automotive, rail, and aerospace. Companies that invest early in lightweight materials, durability-driven design, and smart maintenance-ready gear architectures will be better positioned to supply high-value, low-environmental-impact drivetrains across a wide spectrum of applications. In India and other emerging-market ecosystems, this shift offers a chance to move beyond commodity-gear manufacturing and toward higher-engineering, sustainability-conscious gear solutions that align with global decarbonisation goals.

By embedding sustainability into every stage—from material selection and manufacturing to service life and recyclability—the gear industry can help entire mobility and industrial systems run cleaner, quieter, and more efficiently for decades to come

# Built for Torque, Engineered for speed

#Gears Driving Performance Across Core Sectors



# Redefining Gear Finishing: A Shop Floor Perspective from Mii Robotics

- By Gear Technology India

The manufacturing world is undergoing a significant transformation, driven by the blend of conventional engineering expertise and advanced automation technologies. This change is clearly visible on the shop floor, where precision, productivity, and performance are now deeply interconnected rather than separate priorities.

Against this backdrop, Sushmita Das, Associate Editor of Gear Technology India, recently had the opportunity to undertake an industrial visit to Mii Robotics Pvt. Ltd., a subsidiary of Patil Automation Ltd. The visit offered a comprehensive look into how specialised automation solutions are enhancing gear finishing processes, an often underappreciated yet critical stage in gear manufacturing.



*Patil Automation Ltd.*

## A Firsthand Experience of Automation in Action

The visit commenced with an immersive walkthrough of the facility, offering a close look at how automation seamlessly integrates with precision engineering on the shop floor. From the very first glance, the environment reflected a strong commitment to structured workflows, safety, and technological sophistication. Advanced machines, neatly organised workstations, and clearly defined operational zones highlighted a production ecosystem designed for efficiency and consistency. The presence of safety systems, intuitive control panels, and operator-friendly interfaces further underscored the company's focus on both performance and usability.



*Rupesh Wagh, Assistant Manager, Mii Robotics, along with the team*

Accompanying the visit was Rupesh Wagh, along with members of the technical and business development teams, who provided valuable insights at every stage. Their detailed explanations went beyond surface-level descriptions, offering a deeper understanding of machine functionalities, process flows, and the engineering considerations behind each solution. This interaction transformed the walkthrough into a highly engaging and informative experience, bridging the gap between technical specifications and real-world application.



*Insights from the shop floor: Rupesh Wagh detailing the functionality of a deburring machine to Sushmita Das at Mii Robotics.*

What stood out most was how each machine on the shop floor represented more than just a standalone piece of equipment—it reflected a specific industrial challenge and its corresponding solution. Whether it was compact systems engineered for smaller, high-precision gears or robust, customised setups designed for large and complex components, every solution demonstrated a clear purpose. The facility as a whole conveyed a thoughtful and application-driven approach, where innovation is not just about technology, but about addressing the evolving needs of modern manufacturing.

### Engineering the Edge in Deburring

Mii Robotics positions its solutions around a powerful idea: as legacy converges with innovation, precision and performance take the lead. This philosophy is embodied in their Gear Teeth Expert Machine Series, a lineup designed specifically to address the complexities of gear deburring and finishing.

Gear deburring, though often considered a secondary process, plays a vital role in ensuring performance, durability, and safety. Improperly finished gears can lead to noise, wear, inefficiency, and even system failure. Recognising this, Mii Robotics has developed solutions that combine automation, consistency, and adaptability.

### Exploring the GTX Series: Scalable Solutions for Every Need

One of the highlights of the visit was the detailed exploration of the GTX series, a range of machines engineered to handle varying gear sizes and requirements.



*Gear Deburring Machine*

### GTX100: Compact Precision for Small Gears

The GTX100 is designed for smaller gears, with a diameter range of 20 mm to 100 mm and supported modules from 0.5 to 2. Its compact tabletop design makes it particularly suitable for facilities where space is limited but precision cannot be compromised.

Despite its size, the machine delivers consistent deburring performance, ensuring uniform finishing across components. It is especially relevant for applications where smaller gears play a critical role in larger assemblies, such as in precision instruments or compact mechanical systems.



### GTX300: Versatility Meets Productivity

Moving up the range, the GTX300 caters to gears with diameters between 50 mm and 300 mm and modules ranging from 2 to 8. Available in both 1H and 2H configurations, and in standard and advanced variants, this machine offers flexibility to suit diverse production requirements.

During the demonstration, several features stood out:

- Automatic deburring cycles, which reduce operator dependency
- Uniform brushing and deburring, ensuring consistency
- Options for carbide pencil deburring, enabling precision finishing

These capabilities translate into improved productivity and quality—two parameters that are often difficult to balance in manufacturing environments.



### GTX500: Built for Heavy-Duty Applications

For larger gears, the GTX500 provides a robust solution. With a gear diameter capacity of 200 mm to 500 mm and support for modules ranging from 2 to 8, this machine is designed for demanding industrial

applications.

The configurations available within the GTX500 range allow manufacturers to tailor the machine to their specific needs. Industries dealing with heavy-duty machinery, such as wind energy, railways, and defence, can particularly benefit from its capabilities.

What stood out during the visit was the emphasis on maintaining uniformity even at larger scales. As gear size increases, maintaining consistent finishing becomes more challenging, and the GTX500 addresses this with precision-focused engineering.



### GTNX Series: Customisation for Complex Requirements

Beyond the standard GTX lineup, Mii Robotics offers the GTNX series—engineered for gears with diameters exceeding 500 mm. This series represents a shift towards customised automation, where solutions are tailored to specific components and production environments.

The GTNX machines incorporate several advanced features:

- Robot compatibility, enabling seamless integration into automated production lines
- Automatic job loading and unloading, reducing manual intervention
- Coolant systems, enhancing process efficiency
- Dust extraction systems ensure a cleaner and safer working environment

The emphasis here is not just on performance but on creating a holistic solution that integrates with the broader manufacturing ecosystem.

## Technology That Enhances Usability

A notable aspect across all machine variants is the focus on operator convenience. Ease of operation, intuitive controls, and automated cycles reflect an understanding that technology must be accessible to deliver its full value.

Rather than replacing human expertise, these machines are designed to augment it, minimising errors, reducing fatigue, and enabling operators to focus on higher-value tasks.

## Applications Across Industries

The versatility of Mii Robotics' solutions is evident in their wide range of applications. The machines cater to industries such as:

- Automotive
- Aerospace
- Industrial machinery
- Agricultural equipment
- Wind energy
- Railways
- Defense
- Robotics and automation

This broad applicability highlights the universal importance of gear finishing. Regardless of the sector, the quality of gears directly impacts system performance, efficiency, and longevity.

## Insights from the Shop Floor

What made the visit particularly enriching was the opportunity to connect technical features with practical applications. The explanations provided by the team helped bridge the gap between machine specifications and real-world use cases.

It became clear that the focus is not just on building machines, but on solving manufacturing challenges, whether it is improving consistency, reducing cycle times, or adapting to unique component geometries.

The shop floor itself reflected a balance of structure and flexibility. While processes were clearly defined, there was also room for customisation and innovation, an essential combination in today's dynamic industrial environment.

## The Bigger Picture: Redefining Gear Finishing

As the manufacturing industry moves towards higher precision, tighter tolerances, and increased automation, processes like deburring are gaining greater

importance. No longer viewed as a finishing touch, they are now integral to overall product quality.

Mii Robotics' approach underscores this shift. By focusing on automation, consistency, and customisation, the company is contributing to a broader transformation in how gears are manufactured and finished.

## Concluding the Visit

The industrial visit to Mii Robotics provided valuable insights into the evolving role of automation in the gear finishing process. From compact tabletop machines to large-scale customised solutions, the Gear Teeth Expert Machine Series reflects a deep understanding of industry needs.

For Gear Technology India, such visits are an opportunity to go beyond surface-level observations and engage with the technologies shaping the future of manufacturing.

Ultimately, the experience reinforced a key takeaway: In modern manufacturing, precision does not end with machining—it is perfected through finishing. And as companies like Mii Robotics continue to innovate, the future of gear production looks not just efficient, but exceptionally refined.



*Sushmita Das, Associate Editor with Rupesh Wagh  
Assistant Manager, Business Development, Mii Robotics*

# KAPP NILES Elevates Aerospace Gear Quality with Advanced VX Series Machines

- By Gear Technology India

Aircraft and helicopters transport passengers and freight around the world quickly and reliably. The components used in these vehicles must therefore meet the highest standards of safety, efficiency, and sustainability. KAPP NILES offers tailor-made solutions for the precision grinding, measuring, and documentation of gears and profiles – presented as part of its Trust in Technology campaign.

“We have been focusing intensively on gears for the aerospace industry for over 40 years. Thanks to this extensive experience, we understand the specific challenges of this sector,” emphasises Matthias Kapp, Managing Director at KAPP NILES. “As a market leader, we are proud to work closely with our customers to develop machines and technologies that precisely meet their requirements and enable first-class quality.”

Whether for drives or planetary gears in engines, for flap actuators, helicopter main drive gearboxes, or for drive and adjustment mechanisms used in Mars rovers, KAPP NILES solutions enable the high-precision grinding and measurement of essential, flight safety-critical components for aircraft, helicopters, and spacecraft.

## Meeting the highest quality standards

The aerospace industry's stringent, safety-driven production standards encompass both the final quality of manufactured gears and complete process documentation. Machines in the VX series are specifically designed to meet these demanding requirements. High-quality guide systems with scraped guides ensure maximum precision and consistent quality for decades of operation.

Using the integrated measurement system (AMS), workpieces are measured before and after the grinding process and evaluated in terms of quality. All results are comprehensively documented, ensuring full traceability of part quality even many years later.

VX machines can be equipped with one or two interchangeable grinding spindles, allowing up to six grinding wheels to be used simultaneously. This makes it possible, for example, to grind multiple gears in a single set-up. Additional carriers for grinding arms can also be mounted on the same interfaces to machine internal gears. Both dressable and non-dressable CBN roughing and finishing tools from KAPP NILES can be used.

Equipping the optional zero-point clamping system, set-up times for grinding spindles and additional grinding heads can be reduced by 85 per cent.

VX machines have been used worldwide for decades and consistently deliver the highest workpiece quality – even for a batch size of one. Approximately half of all grinding machines supplied by KAPP NILES to aerospace customers over the past 40 years have been VX machines or their predecessor models. In addition, machines from the KNG master, ZE and KX series are also used in the aerospace sector, for example, by customers machining workpieces with tip diameters greater than 630 millimetres or requiring generating grinding capabilities.

## Tools for special requirements

The new CBN pro tools from KAPP NILES are particularly well-suited to aerospace applications. While standard CBN tools previously achieved surface qualities of  $Ra < 0.4 \mu\text{m}$ , these new grinding wheels enable surface qualities of  $Ra < 0.2 \mu\text{m}$  on the workpiece. In addition, an optimised profile shape with  $ffa < 1.0 \mu\text{m}$  can be achieved on the tool. Improved reproducibility of surface finish and profile geometry reduces adjustment effort during tool set-up and significantly increases process reliability for customers.

KAPP NILES also offers comprehensive solutions for gear measurement in the aerospace industry. The KNM 2X, 4X, 6X, and 9X measuring machines cover a wide range of measuring tasks. Thanks to a flexible tailstock, even very long workpieces – such as main and auxiliary shafts – can be measured with high precision. A special quick-clamping system allows secure mounting of special geometries as well as standard components, while minimising set-up and non-productive times.

“From tools and grinding machines to measuring technology, we offer complete precision solutions for the aerospace industry,” summarises Matthias Kapp. “Our many years of experience and tailor-made technologies enable our customers to achieve outstanding gear quality.”

## About KAPP NILES

KAPP NILES is a globally operating group of companies with high-quality and economical solutions

for finishing gears and profiles, and is a partner for companies from numerous industrial sectors in the mobility, automation and energy segments.

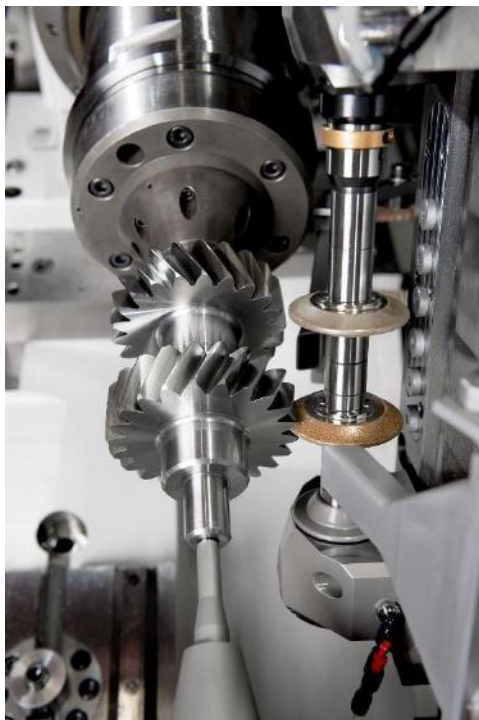
The perfect interaction between machine, tool, technology and metrology enables extremely precise machining to a thousandth millimetre.



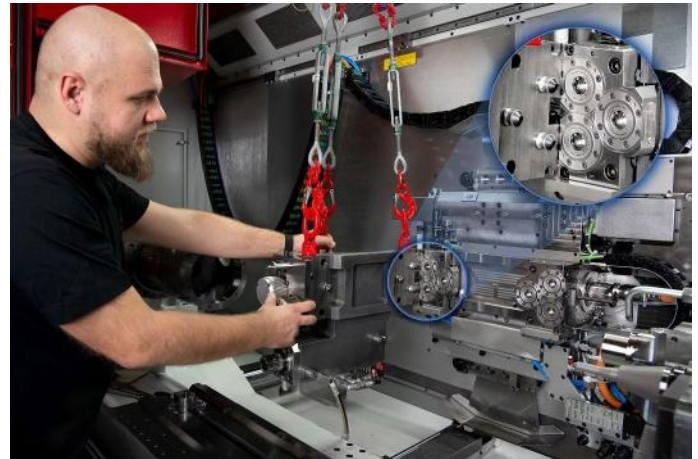
Matthias Kapp, Managing Partner at KAPP NILES.



Picture 1: Profile grinding machines from the VX series by KAPP NILES deliver the highest workpiece quality even for a batch size of one.



Picture 2: Several grinding wheels can be used simultaneously on the grinding spindles of the VX machines.



Picture 3: Thanks to the zero-point clamping system, set-up times can be reduced by 85 per cent.



Picture 4: With CBN pro, the new tools from KAPP NILES, surface qualities of  $Ra < 0.2 \mu m$  can be achieved on the workpiece.



Picture 5: All relevant components for aerospace can be analysed on KAPP NILES measuring machines.

# Quaker Houghton: How Advanced Fluid Engineering Is Shaping Modern Industry

- By Sushmita Das

## 1. How do you see Quaker Houghton's strategy evolving over the next few years as global manufacturing requirements change?

Quaker Houghton's strategy is expected to undergo significant evolution over the next few years, driven by shifting global manufacturing requirements. The company is focusing on Globalisation and Expansion, particularly in high-growth regions in Asia-Pacific, India and Southeast Asia, to capitalise on emerging market opportunities.

Quaker Houghton's core technology extends beyond commodity lubricants into high-performance formulations that add value to our customers.

Key areas of focus include:

- **Advanced Solutions Portfolio:** Expanding our portfolio to cater to growing demand in metal plating, impregnation and coatings.
- **Digitalisation and Innovation:** Investing in digital solution FLUID INTELLIGENCE to enhance customer experience and operational efficiency.
- **Sustainability:** Prioritising sustainability and environmental responsibility, aiming to be carbon neutral by 2030 and achieve net zero emissions by 2050.
- **Cost Optimisation:** Continuing to optimise costs and improve operational efficiency through strategic acquisitions and restructuring.

These initiatives are expected to drive growth, improve profitability, and enhance Quaker Houghton's competitive position in the global industrial process fluids market.

## 2. What role do innovation and advanced process-fluid technologies play in strengthening your value proposition for customers?

Innovation and advanced process-fluid technologies are crucial to Quaker Houghton's value proposition. They enable the company to:

- **Enhance Customer Productivity:** Develop customised solutions that improve process efficiency, reduce costs, and increase productivity.
- **Address Evolving Needs:** Cater to emerging trends like lightweighting, electrification, etc., in industries like automotive and aerospace.
- **Differentiate Offerings:** Provide unique, patented technologies that set Quaker Houghton apart from competitors.
- **Improve Sustainability:** Develop eco-friendly products and processes that help customers reduce environmental impact.

Another important aspect is that Quaker Houghton's products have garnered approvals and recommendations from a majority of Machine Tool Manufacturers (MTMs), evidence of their commitment to providing end-to-end solutions. Through collaborative efforts, Quaker Houghton develops and customises solutions in partnership with MTMs, ultimately enhancing value for end customers.

By investing in R&D and collaborating with customers, Quaker Houghton delivers cutting-edge solutions that drive value and strengthen partnerships.

## 3. How is digitalisation—such as data-driven fluid management - reshaping the way you support customer operations?

Digitalisation, particularly data-driven fluid management, is transforming Quaker Houghton's customer support. Tools like FLUID INTELLIGENCE enable:

- **Real-time Monitoring:** Track fluid condition and performance remotely.
- **Predictive Maintenance:** Anticipate issues before they impact operations.
- **Data-Driven Insights:** Optimize fluid usage and processes for efficiency.
- **Proactive Support:** Quaker Houghton experts can intervene early to prevent issues.

This digital approach enables customers to monitor, control and optimise the use of our process fluids, increasing uptime, reducing costs and strengthening partnerships

**4.Sustainability is a growing priority for manufacturers;how is Quaker Houghton aligning product development with environmental goals?**

Quaker Houghton is aligning product development with environmental goals by:

- Eco-friendly Formulations: Developing products with reduced environmental impact.
- Sustainable Packaging: Exploring biodegradable and recyclable packaging options.
- Resource Efficiency: Creating solutions that help customers reduce waste and energy consumption.
- Carbon Footprint Reduction: Targeting carbon neutrality by 2030 and net zero emissions by 2050.

This focus on sustainability enhances Quaker Houghton's value proposition for environmentally conscious manufacturers

**5.Which end-use sectors are currently driving the strongest demand for your solutions, and why?**

Quaker Houghton's solutions are in high demand across various sectors, including:

- Automotive: With the growing focus on electric vehicles (EVs) and sustainability, Quaker Houghton's specialised fluids are meeting the evolving needs of the automotive industry.
- Aerospace: The company's high-performance fluids are supporting the aerospace sector's demand for efficient and reliable solutions. Major Aircraft manufacturers recommend or approve Quaker Houghton products.
- Steel and Aluminium: Quaker Houghton's industrial process fluids are driving productivity and sustainability in these industries.

**6.In an uncertain global environment, how are you ensuring supply-chain reliability and operational continuity?**

The biggest solution is to have our own state-of-the-art manufacturing plant in India. Quaker Houghton India has implemented a robust strategy to ensure supply-

chain reliability and operational continuity, prioritising the production continuity of our esteemed customers.

A state-of-the-art manufacturing plant in Dahej, Gujarat, caters to the requirements of India, complemented by strategically located warehouses in North, South, and East India, thereby enabling swift response to our customers' needs. Additionally, an exclusive toll blending plant in Kolkata supports our major steel customers in east India.

Apart from these facilities, the operations team proactively diversifies the supply chain, mitigating risks through multiple sourcing options. Meanwhile, R&D collaborates closely with procurement to introduce local suppliers of raw materials, ensuring quality and availability standards are met.

**7.What differentiates Quaker Houghton most clearly from competitors in the industrial fluids market?**

Quaker Houghton's differentiators in the industrial fluids market include:

- Comprehensive Portfolio: Broad range of process fluids and services under one roof.
- Application Expertise: Deep industry knowledge and R&D capabilities.
- Global Reach, Local Support: Presence in key regions with tailored solutions.
- Innovation Focus: Cutting-edge technologies like FLUID INTELLIGENCE.
- Sustainability Leadership: Commitment to eco-friendly products and practices.

Most importantly, our strength lies in our people—their diverse and rich experience in India, reinforced by our global expertise.

This combination sets Quaker Houghton apart, offering customers value beyond just products

**Tridib Majumder**  
 Managing Director & Sr. Director  
 Commercial APAC -Quaker Houghton



**gear**  
TECHNOLOGY INDIA



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