



The Science of Making...



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TECHNICAL ACHIVEMENTS

»»» ULTRA-PRECISION AIR BEARING ROTARY SPINDLE FOR MICRO-MACHINING APPLICATIONS

CMTI, pioneering in the Precision Engineering domain, is involved in the development of Precision Machine tools and aggregates for Machine Tool & Metrology OEMs. CMTI scientists have developed an Ultra-Precision Aerostatic Bearing Rotary Table/Spindle, setting new standards in accuracy and performance. These advanced air bearing rotary systems serve as core components in a variety of high-accuracy applications,

including diamond turning machines, rotary tables for CMM as a 4th axis, roundness & form testers for the measurement of roundness and form error, optical alignment, inspection, and calibration systems, and special-purpose rotary inspection systems.

The developed product is tested for various static (load carrying capacity = 100kg; Axial Stiffness = 300N/μm; Radial Stiffness = 150N/μm) & dynamic characteristics (spindle running accuracy < 0.4 μm). The product is also tested and validated for ultra-precise positioning accuracy of ±0.5 arc.sec, step resolution of 0.25 arc.sec, and an excellent repeatability of <0.3 arc.sec.

Machining trials have been conducted to validate the performance of the rotary table for ultra-precision machining, by mounting the developed air bearing rotary table on a vertical machining centre. The air



Air bearing spindle in VMC machine bed

Milling & Grooving

Finished component

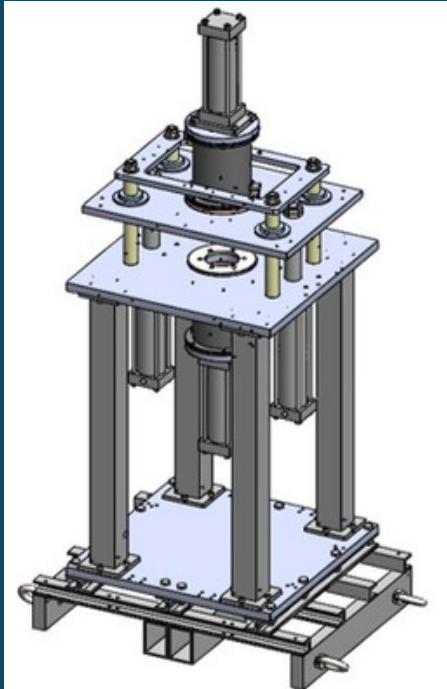
Machining trials for NANAOSPIN ABR 150-M in Vertical machining center.

Milling	Grooving
Depth of Cut : 0.1mm VMC Spindle Speed : 6000 rpm Feed : 500 mm/min (X&Y Movement)	Depth of cut : 0.1mm VMC Spindle speed : 6000 rpm Air bearing spindle feed : 345 mm/min (C-axis)

bearing rotary table was used as a 4th-axis rotary table attachment in a 3-axis VMC machine. The milling was carried out successfully with a 0.1mm depth of cut using a 2mm diameter end mill tool. This qualifies the air bearing rotary table for light-duty ultra-precision micro-machining applications.

CMTI is now offering its advanced air bearing spindle technology to industries for large-scale commercialization. In addition, the institute can develop and supply ultra-precision spindles customized to meet both standard and specialized requirements.

»»» INDUSTRIAL DESIGN PATENT GRANTED FOR MICRO ABRASIVE FLOW FINISHING MACHINE



An Industrial Design Patent for the Micro Abrasive Flow Finishing Machine was officially granted on 3 April, 2025 by the Patent Office, Government of India, with Design No. 440928-001. CMTI congratulates the Inventors-Mr. Manjunath M A, Mr. Girish Kumar M, Mr. Narendra Reddy T, Mr. Prakash Vinod, and Dr. Nagahanumaiah for this significant accomplishment and their outstanding contribution to innovation in precision manufacturing.

»»» VISITS/NEW INITIATIVES

»»» VISIT BY C-SPM SCIENTISTS TO NECBDC, GUWAHATI



Mr. Arun Kumar J G, Joint Director; Mr. Vijaykumar Nidagalkar, Scientist-D; and Mr. Ankur Bhardwaj, Scientist-B from C-SPM visited the North East Cane and Bamboo Development Council (NECBDC), Guwahati, from April 1–4, 2025. The objective of the visit was to study and understand the specific requirements and operational challenges of bamboo processing units in the region. The team sought to gain on-ground insights into the existing units to support discussions on customized technological interventions tailored to regional needs.

MOUS/NDA

MOU EXECUTED BETWEEN CMTI AND RAMAIAH INSTITUTE OF TECHNOLOGY

CMTI and M/s. Ramaiah Institute of Technology, Bengaluru, have executed an MoU on 1 April 2025. This MoU establishes a strategic partnership aimed at collaborative Research & Development (R&D) in the domain of Advanced Manufacturing, fostering innovation, knowledge exchange, and technological advancement in key industrial sectors.



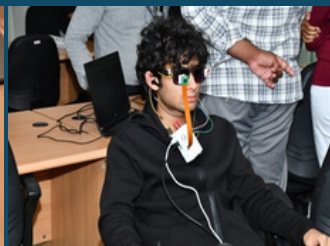
EVENTS/ WORKSHOPS

DESIGN & INNOVATION CLINIC (DIC)-2025

The Central Manufacturing Technology Institute (CMTI) successfully hosted the fifth edition of the Design & Innovation Clinic (DIC-2025) from 7-9 April, 2025, with exceptional grandeur and tremendous success. This year, we received an impressive total of 195 registrations from eager teams hoping to participate in the event. Following a thorough selection process, 105 teams were chosen to participate in



the first round. From these, 32 outstanding teams were selected for the final phase, where they worked tirelessly day and night during an intense 36-hour hackathon to design and demonstrate fully functional prototypes, showcasing their innovative solutions. A dynamic group of aspiring engineers — Godugu Bharani Vishnu, Bathula Trinadh, and Boyapati Srinivasulu from Rayapati Venkata Ranga & Jagarlamudi Chandramouli College of Engineering (RVR & JC), Guntur, Andhra Pradesh - clinched the first-place prize. Their project, "VISHESH HAST", captivated the judges and stood out among the numerous entries. The team was guided by their mentor, Mr. Ankur Bhardwaj (Scientist-B, CMTI), whose expert guidance played a crucial role in their success.





EVENTS/ WORKSHOPS ATTENDED

»»» PARTICIPATION IN IRINS TRAINING PROGRAMME

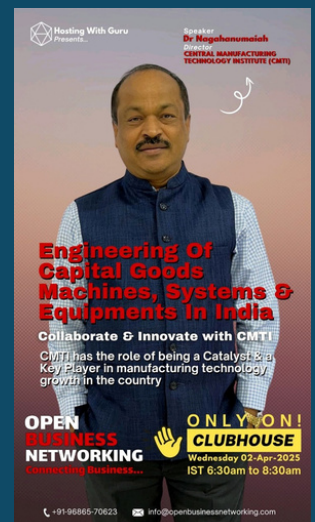
Mr. Raghu B., Librarian, participated in a three-day training programme on “Research Information Management System (RIMS) – Indian Research Information Network System (IRINS)” held from 19-21 March, 2025, at the INFLIBNET Centre, Infocity, Gandhinagar, Gujarat. The training focused on enhancing institutional research visibility and managing scholarly information efficiently using the IRINS platform. The programme offered interactive learning aimed at strengthening research information management across academic and research institutions.



CONTRIBUTORY TALKS

»»» CMTI DIRECTOR DISCUSSES “ENGINEERING OF CAPITAL GOODS MACHINES, SYSTEMS, AND EQUIPMENT IN INDIA” AT OPEN BUSINESS NETWORKING EVENT

On April 2, 2025, Dr. Nagahanumaiah, Director of the Central Manufacturing Technology Institute (CMTI), delivered an insightful lecture on “Engineering of Capital Goods Machines, Systems, and Equipment in India” during the Open Business Networking event hosted by Hosting With Guru on Clubhouse. Dr. Nagahanumaiah highlighted CMTI’s pivotal role in designing and developing advanced machines, showcasing select technologies currently available for technology transfer. He emphasised the importance of self-reliance in the capital goods sector and outlined collaborative strategies for fostering the development of indigenous technologies.



➤➤➤ CMTI DIRECTOR SPEAKS ON “PRODUCT INNOVATION, REQUIREMENTS, GAPS, AND CHALLENGES” AT IIT DHARWAD



Dr. Nagahanumaiah, Director of CMTI, delivered an expert lecture on “Product Innovation, Requirements, Gaps, and Challenges” as part of a distinguished lecture series organized by the Department of Mechanical, Materials, & Aerospace Engineering

at IIT Dharwad from 4-5 April, 2025. Drawing from his extensive experience, Dr. Nagahanumaiah provided valuable insights into the evolving landscape of product innovation in India, highlighting critical industry requirements, existing technological gaps, and the challenges that need to be addressed to drive innovation forward.

➤➤➤ TECHNICAL TALK ON “PROCESS OF INNOVATION DEVELOPMENT & TECHNOLOGY READINESS LEVEL (TRL) AND COMMERCIALISATION OF LAB-TECHNOLOGIES AND TECH-TRANSFER”

On 15 March, 2025, Mr. Anil Kumar K, Scientist-D and GH-AEAMT, C-ASMP delivered an insightful technical talk on the “Process of Innovation Development & Technology Readiness Level (TRL) and Commercialization of Lab-technologies and Tech-Transfer” at the at MVJ Engineering College. The session provided a comprehensive overview of the innovation pipeline—from conceptualization and development to commercialization—highlighting key strategies for enhancing the market readiness and adoption of research outcomes.



TRAINING INITIATIVES

➤➤➤ ONSITE TRAINING PROGRAMME ON LABORATORY MANAGEMENT & INTERNAL AUDIT

An onsite training programme on “Laboratory Management & Internal Audit as per ISO/IEC 17025:2017” was organized by CMTI, Bangalore, from 1-4 April 2025, at Seminar BNPL, Mysore. Coordinated by Mrs. Khushboo, Scientist-D, the programme covered a wide range of topics essential for laboratory accreditation and internal auditing. The sessions began with an overview of laboratory accreditation and



internal auditing. The sessions began with an overview of laboratory accreditation and the ISO/IEC 17025:2017 standard, followed by detailed discussions on general and structural requirements, including impartiality, confidentiality, and resource management. The later sessions delved into process requirements, such as method validation, sampling, and measurement uncertainty, supplemented with

practical exercises. The final day focused on internal auditing practices, corrective actions, audit findings, and the route to NABL accreditation. Faculty members, including Mr. K. Niranjan Reddy, Mr. Vijet Bhandiwad, Mr. Chetan H. S., Mr. Shashikumar, and guest faculty Mr. Avadhani S.S. facilitated the sessions, concluding the programme with an evaluation test and a Q&A session.

UPCOMING TRAINING PROGRAMS

1. "Level 2- Laboratory Training on Semiconductor Packaging", from 12-16 May, 2025
2. "Single Point Diamond Turning (Machine Technology & Characterization Techniques)", Course Code: 2101, from 29–30 May 2025, at CMTI Bengaluru
3. "Non-Destructive Testing", Course Code: 1303, from 29–30 May 2025, at CMTI Bengaluru
4. "Nano Material Characterization, SEM, XRD, SPM, Nanoindenter, etc.", Course Code: 2301, from 13–16 May 2025, at CMTI Bengaluru
5. "Precision Measurements & Metrology", Course Code: 4102, from 12–16 May 2025, at CMTI Bengaluru

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