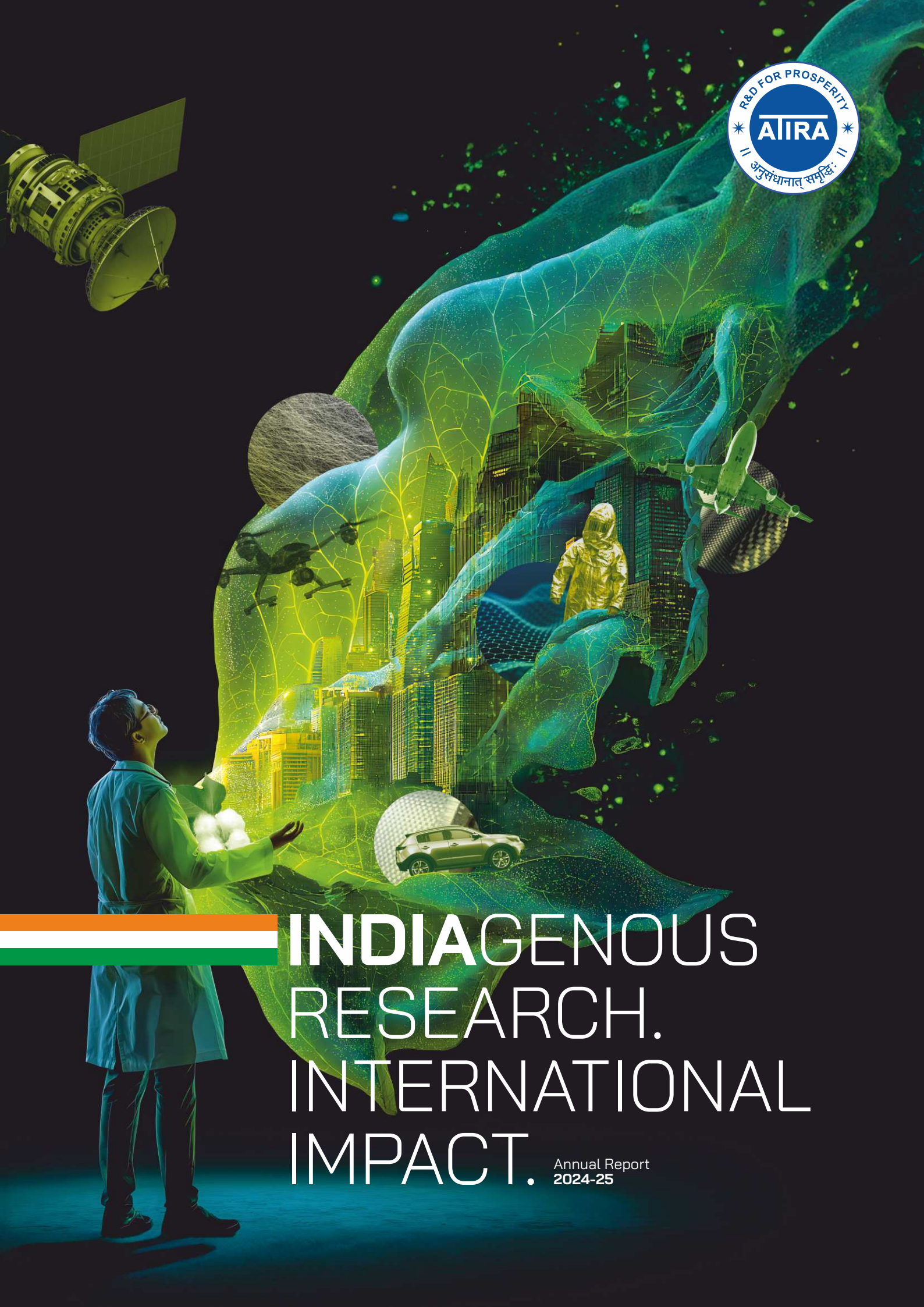


INDIAGENOUS RESEARCH. INTERNATIONAL IMPACT.

Annual Report
2024-25

INDIAGENOUS RESEARCH. INTERNATIONAL IMPACT.

Indigenous Solutions.
Universal Applications.

At ATIRA, innovation begins at home but travels far beyond borders. Rooted in India's spirit of ingenuity, our research transforms local insight into global influence – thereby advancing industries, empowering enterprises, and enriching lives worldwide.

Our commitment to 'India'genous Research stems from a belief that solutions designed in India can redefine possibilities everywhere.

Whether in space-grade composites, defence-grade textiles, or sustainable materials for everyday applications, ATIRA's breakthroughs are proving that Indian research can set international benchmarks.

This journey from lab to life is powered by a culture of collaborative innovation. By partnering with startups, industry leaders, research institutions, and national missions, ATIRA strengthens the industry fabric through shared intelligence and co-created solutions.

Each invention, each material, each idea carries the imprint of our dual commitment: to elevate Indian capability and deliver universal applicability. The goal is to make textiles not just functional but foundational to global progress and in the process position India as a leading force shaping the future of textiles and the future through textiles.

CONTENT INDEX

CHAIRMAN'S MESSAGE

The Indian textile industry is entering a new era; one defined by technology and sustainability. With the National Technical Textiles Mission (NTTM) and the Production Linked Incentive (PLI) Scheme, the Government has set the stage for self-reliant growth driven by homegrown innovation. India's shift from conventional textiles towards technical textiles, smart materials, and functional solutions is central to its competitiveness in global value chains.

In this transformative landscape, ATIRA's role is more strategic than ever.

As a bridge between science and enterprise, we transform research into industry-ready technologies that serve national priorities like space, defence, infrastructure, healthcare and more.

Our work in composites, electrospinning, filtration, and nanomaterials positions India to meet both domestic and international demand.

Globally, the momentum is clear: the sustainable textiles market is projected to grow from USD 3.6 billion in 2024 to USD 9.4 billion by 2034, underscoring how innovation and green solutions will define competitive leadership.

In India, we are helping build the ecosystem for sustained leadership in technical textiles. As one of the Associate Incubators under NTTM's GREAT Scheme which promotes start-ups and innovation-driven enterprises in the sector, ATIRA is nurturing early-stage ideas into scalable ventures. Complementing this, our partnership with Ahmedabad University for the M.Tech in Composites programme is strengthening the academic–industry connect by giving students direct access to our research facilities.

Going forward, we will integrate R&D, testing, and incubation with enhanced infrastructure and digital systems to speed the journey from idea to market. Sustainability will guide every step; from renewable energy adoption to circular design practices.

As India advances toward Viksit Bharat 2047, ATIRA remains committed to enabling industry, nurturing talent, and driving globally relevant innovation. The future belongs to those who research boldly, act locally, and impact universally. In the years ahead, we aim to position ATIRA as a global centre for material innovation; where Indian research shapes solutions for a sustainable, technology-driven world.

SANJAY LALBHAI
Chairman, COA, ATIRA

DIRECTOR'S MESSAGE

FY 2024–25 has been a year of consolidation, capability-building, and purposeful growth for ATIRA.

Anchored to national priorities of innovation, sustainability, and self-reliance, we have strengthened our role as a transformation engine translating indigenous research into global applications.

In the domain of **R&D & Innovation**, we advanced key missions under NTTM, including the Conductive Composite Development for Space Applications and HEPA Filter Media projects. We inducted new engineers and researchers and initiated major infrastructure upgrades such as the autoclave and cleanroom, to be operational soon. Additionally, our composite and braiding technology projects gained stronger traction, enabling structural materials innovation.

Testing & Quality Services saw major upgrades across labs in technical textiles, composites, and protective materials, along with growth in geotextile testing, further reinforcing our reputation in textile validation.

On **Training and Capacity Building**, we strengthened industry-aligned programmes and relaunched the NTTM–GIST Internship initiative, delivering mentorship and exposure to top student talent. The first batch of the M.Tech in Composites programme, launched this year in collaboration with Ahmedabad University, will gain hands-on experience in ATIRA's advanced laboratories.

Under the **NTTM's GREAT Scheme**, we mentored start-ups in prototype development, scale-up, and grant alignment, enabling approval of four projects.

On infrastructure and sustainability, the commissioning of a rooftop solar system meeting over half of our energy needs is a concrete step toward operational self-reliance.

Simultaneously, civil upgrades, fire safety improvements, and lab modernisation have laid the foundation for future expansion.

In summary, FY 2024–25 reinforced ATIRA's trajectory: deeper collaborations, stronger technical capacity, and sharper alignment with national missions in composites, technical textiles, and clean innovation. Our next phase will focus on accelerating technology translation, scaling impact, and cultivating India's place in the global materials landscape.

PRAGNESH SHAH
Director, ATIRA

INDIA'S TEXTILE INNOVATION CATALYST

ABOUT ATIRA

For over 75 years, ATIRA has been shaping the future of textiles and allied industries with India-born innovations that meet global benchmarks. Established under the vision of pioneers like Dr. Vikram Sarabhai, Shri Kasturbhai Lalbhai, and Shri Shanti Swaroop Bhatnagar, ATIRA today is recognised as a leading independent, non-profit R&D institution driving research that moves markets and strengthens economies.

As India's textile sector advances into high-value segments, particularly technical textiles, ATIRA stands at the centre of this transformation.

VISION

To make Indian textile manufacturing competitive and sustainable in all possible ways.

MISSION

To service the textile industry efficiently and to provide innovative and sustainable solutions that enable the betterment of the industry, economy, and society.

FOCUS AREAS

RESEARCH & DEVELOPMENT

Advancing nano and composite materials for applications across space, aerospace, defence, filtration, and healthcare.

IDEA INCUBATION

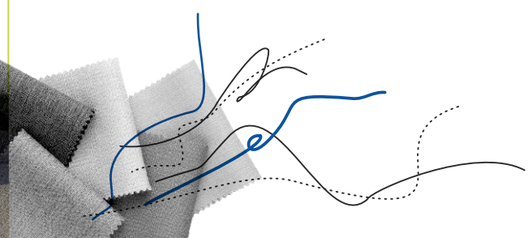
Nurturing India's start-ups with labs, expertise and industry linkages to translate textile ideas into scalable businesses.

TESTING

Delivering specialised testing for textiles, protective textiles, geotextiles, composites and ecology across critical industries such as infrastructure, construction, defence and many more.

TRAINING AND SKILL DEVELOPMENT

Building future-ready talent with advanced programmes in textiles, technical textiles and allied technologies.



BUILDING ON NATIONAL PRIORITIES

ALIGNED WITH INDIA'S VISION

It is our continuing endeavour to align our initiatives with the National Technical Textiles Mission and the vision of Viksit Bharat 2047. By fostering knowledge, nurturing talent, and advancing indigenous technology, we are building the economic, intellectual and industrial foundation of a sustainable, self-reliant India.

Defence Projects

Empowering India's frontline with indigenous innovation.

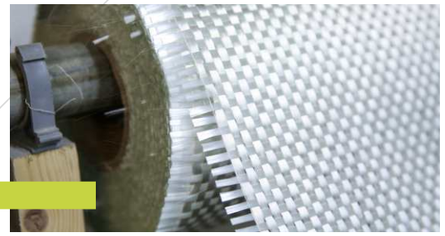
ATIRA's cutting-edge research in advanced fibres and composites is enhancing the nation's defence preparedness. From lightweight composite structures to next-gen gas filters, we are creating materials that combine resilience with agility.

By collaborating with the defence sector, we contribute to India's goal of Aatmanirbhar Suraksha and advancing self-reliance in critical technologies.

Renewable & Infrastructure

Engineering strength for a sustainable tomorrow.

ATIRA's composite technologies are helping build the physical backbone of a greener India. Our glass fibre-reinforced polymer systems and structural profiles are finding applications in renewable energy, construction, and mobility, delivering high strength-to-weight ratios, corrosion resistance, and long-term durability. These innovations support national missions for infrastructure resilience, energy transition, and sustainable urban development.



Healthcare & Social Impact

Science that safeguards lives.

From nanofibre-based cosmetic masks to research in antimicrobial and filtration technologies, ATIRA's expertise lies in innovations that promote human well-being. Our collaborations across government and industry have delivered scalable, affordable solutions in healthcare textiles that reinforces India's leadership in health-tech manufacturing and export. Beyond products, ATIRA's work touches lives, combining science with social purpose.

Make In India

Strengthening India's materials independence.

ATIRA's R&D has consistently supported India's manufacturing competitiveness by developing indigenous alternatives to imported materials.

Whether it's aerospace-grade composites or machinery components, our applied research converts dependence into domestic capability. Our industry collaborations exemplify the Make in India spirit — innovation that's conceived, developed, and produced on Indian soil.

RESEARCH LEADERSHIP & IMPACT

RESEARCHED IN INDIA. DEVELOPED FOR THE WORLD.

Our research is rooted in INDIAGENOUS innovation with universal relevance. Through our Centre of Excellence for Composites, strategic partnerships, and deep understanding of market requirements, we are furthering materials science while reinforcing India's leadership in technical textiles.

Shaping the Future with Advanced Composites

Centre of Excellence – Composites

Established in 2011 in Ahmedabad under a national mission, ATIRA's CoE–Composites has grown into a leading hub for R&D, collaborative development, and application-driven composite engineering.

Key Highlights

National-level facility for research and industrial applications of fibre-reinforced polymers (FRPs) and natural fibre composites (NFCs).

Driving innovation in sustainable, lightweight, high-performance composite solutions.

Focused on sectors including aerospace, defence, infrastructure, transport, and renewable energy.

A Legacy of Collaboration - from Earth to Space

Our partnership with SAC-ISRO stands as a testament to our strength in high-end indigenous R&D that meets global standards.

Building on this legacy, we are now extending similar collaborative models to Defence PSUs and developing critical composite components such as precision radomes, reflectors, and waveguide antenna systems.

These innovations are vital to India's strategic communication and defence capabilities. Through the growing Centre of Excellence for Composites, we continue to advance materials science and strengthen national preparedness, fuelled by collaboration, self-reliance, and a shared commitment to nation building.

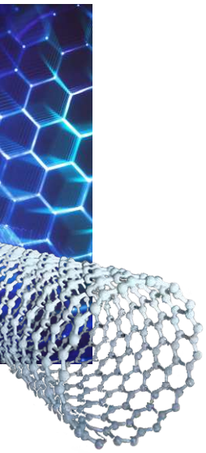
Pioneering Sustainable Innovations - Proven and Patented

In 2024, ATIRA's CoE–Composites filed a breakthrough patent titled "A Composite and a Process for its Preparation" **(Application No. 202421028299).**

Potential Applications:

- Modular housing panels
- Smart structural elements
- Industrial enclosures
- Lightweight transport solutions

By combining performance with eco-conscious design, this patent addresses the rising global demand for high-strength, sustainable materials. It stands as a cornerstone in our intellectual property portfolio and reinforces ATIRA's role as a leader in indigenous, environmentally responsible composite innovations.



Giving Rise to Next-gen Composites

In 2024, we pivoted our research attention towards nanomaterials to enhance composite performance. Under the flagship NTTM (MoT) project, we are at the forefront of nano-enabled composite research focusing on Graphene, Carbon nanotubes, Conductive Carbon Black Nanoparticles, and Metallic Nanomaterials.

The research topics include:

- Enhanced mechanical performance of Fibre-Reinforced Composites (FRCs)
- Enhanced electrical conductivity of FRCs
- Graphene-based E-Textile Sensors
- Improving mechanical properties of natural fibres-based composites for sustainable growth

Demonstrating Thought Leadership

Knowledge creation and dissemination remain central to ATIRA's mission. Our research spans advanced material innovation, smart functionality, and sustainability in FRPs.

Through high-impact publications and technical presentations, we continue to share these insights with the global community, reinforcing India's voice and influence in composites and technical textiles worldwide.

FROM CONCEPT TO COMMERCIALISATION

TRANSLATING RESEARCH INTO REAL-WORLD APPLICATIONS

From biomedical devices and defence-grade systems to sustainable housing and space applications, our innovations deliver practical impact and global relevance.

Making Mobility Affordable & Sustainable

We have developed jute composite prosthetic legs, delivering cost-effective and sustainable limb solutions. This project improves accessibility in healthcare and also demonstrates how natural fibres can support biomedical innovation with global resonance.

Reimagining Shelters

Our hybrid jute composite porta cabins provide modular, thermally stable, and environmentally resilient shelters. Designed for disaster relief, defence, and infrastructure, these cabins embody India's capacity to create scalable solutions for urgent humanitarian and industrial needs.

Taking India into the Space Age

In collaboration with SAC–ISRO under NTTM (MoT), we have developed WR90 modules and CFRP Slotted Waveguide Antennas with improved mechanical and electrical properties. These lightweight, high-strength systems deliver superior signal fidelity for radar and satellite communications, showcasing indigenous capability in aerospace-grade innovation.

Filtering A Healthier Future

ATIRA's R&D in nanofibre-enabled HEPA filters ensures superior filtration efficiency, low pressure drop, and long service life. Applications span healthcare, cleanrooms, and critical industries. By reducing import dependency, these filters reinforce India's self-reliance in advanced filtration systems.

Moulding Excellence with Engineering Precision

Our design cell delivered over 10 precision mould systems supporting defence, energy, and space programmes. Highlights include:

- Radome moulds (1.5 m & 3.5 m) for stealth and strength
- Moulds for 28 BLDC motor components
- Ripple spring moulds for electrical insulation upgrades
- Mould design for 1-meter Ku-band Single Piece Reflector, ensuring high dimensional accuracy in defence and satellite communication applications.

Defence-grade Gas Filter Masks

ATIRA's Nano Spinning Division is advancing electrospinning technology for chemical defence. Early trials show strong potential for developing protective masks capable of shielding individuals from toxic chemical agents.

BRIDGING THE TECH GAP BETWEEN RESEARCH AND IMPACT

At ATIRA, technology plays a key role in the transformation of material science into scalable solutions.

Our technology endeavours focus on delivering products and processes that strengthen industries, enable sustainability, and drive national self-reliance.

Structural Profiles for Buildtech

Developed Z-section and hollow tubes for the construction sector using Glass Fibre Reinforced Polymer (GFRP) systems. These export-quality structural profiles offer high strength-to-weight ratios, corrosion resistance, and dimensional stability, making them a viable alternative to conventional materials.

Defence-Grade Composite Enclosures

Developed radomes (1.5 m and 3.5 m) and 0.75 m reflectors using E-glass/epoxy laminates. These precision-moulded components provide RF transparency, mechanical impact resistance, and thermal endurance, ensuring reliable signal transmission and protection of sensitive antenna systems in mission-critical defence applications.

Dielectric Machine Covers

Created GFRP profile covers for high-speed textile coating machinery. They are designed for chemical resistance, dielectric strength, and mechanical robustness. These locally engineered components replace imports, reduce downtime, and support the 'Make in India' initiative.

Sustainable Laminates from Post-Industrial Textile Waste

We have engineered eco-composites from shredded and nonwoven textile waste combined with thermoset resin systems. These laminates offer excellent formability, dimensional consistency, and sound-dampening properties, making them ideal for modular furniture, interior panels, and eco-friendly construction, while advancing circular economy practices.

Collagen-based Cosmetic Face Masks

ATIRA's Nano-web Technology Division developed and commercialised nanofibre-based cosmetic masks using electrospinning technology. Over 75,000 finished products were packaged and dispatched for export through our commercial partner.

ENABLING THE ECOSYSTEM

EMPOWERING ENTERPRISE BY ACCELERATING INNOVATION

ATIRA continues to play a central role in nurturing India's textile innovation ecosystem — bridging the gap between research, industry, and entrepreneurship.

From nurturing high-potential start-ups to building strategic collaborations, strengthening testing infrastructure, and supporting industry with technical expertise, ATIRA is enabling Indian ideas to fuel global progress.

Building the Next Generation of Textile Entrepreneurs - GREAT Scheme

Under the Guidelines for Research and Entrepreneurship Assistance for Textiles (GREAT) Scheme of the National Technical Textiles Mission (NTTM), ATIRA has emerged as one of India's most successful incubators for technical textile innovation.

As an Associate Incubator, our comprehensive support includes:

Access to state-of-the-art facilities for research, development, and testing.	Mentorship from industry experts and seasoned researchers.	Networking and collaboration opportunities with leading researchers and industry professionals.	Workshops and training programmes on the latest trends and technologies.	Market access and commercialisation support with market analysis, business planning, and go-to-market strategies.

वस्त्र मंत्रालय
MINISTRY OF
TEXTILES

In FY 2024–25, four start-ups incubated at ATIRA secured project approvals and grants from the Ministry of Textiles.

Tetrel Innovations LLP

Braidtech Composites

Momentux Systems Pvt. Ltd.

Guerintech Systems

This collective achievement underscores ATIRA's differentiated approach to incubation. One that is anchored in scientific rigour, cross-disciplinary collaboration, and industry integration.

By helping these ventures validate technologies, optimise processes, and align with national missions, we are nurturing India's next generation of textile innovators and entrepreneurs to turn indigenous research into globally relevant impact.

From Ideas to Industry: ATIRA's Prototype Successes

ATIRA's Incubation Centre continues to drive innovation from concept to commercialisation, fostering industry-oriented research and product development in technical textiles.

During the year, several breakthrough prototypes were successfully developed and commercially produced — including glass fibre fabrics ranging from 100 GSM to 750 GSM, and Leno Mesh variants made from PP Tape, Glass Fibre, Carbon Fibre, and Basalt.

Advanced material capabilities were demonstrated through the production of biaxial carbon fabrics (200–450 GSM) and monofilament warp beams (400d–800d). We also developed airbag fabrics for the automotive sector and trim fabrics for rope manufacturing.

A key highlight was the commercial operation of the robotic 3D radial braiding machine, enabling the development of tri-axial sleeves for defence and space applications. Additionally, the Meta Aramid yarn with a glass core, produced on the DREF machine, achieved export-scale success with over 1 tonne shipped to the USA by the industry partner.

Partnering for Progress - Collaborations & MoUs

ATIRA continues to expand its network through strategic collaborations with leading academic institutions and industry players.

In FY 2024–25, 9 new MoUs were signed to advance composite research, product development, and knowledge exchange.

Preparing Next-Gen Composite Professionals

India's growing composites industry is at an inflection point. While it is advancing rapidly across defence, aerospace, mobility, and infrastructure, the sector continues to face a critical talent gap of engineers and technicians with specialised composite expertise.

Stepping up to bridge this gap, ATIRA, in partnership with Ahmedabad University, launched one of India's first M.Tech programmes in Composites in October 2024.

The programme blends academic rigour with industry immersion, giving students hands-on training at ATIRA's Centre of Excellence – Composites.

By integrating education with live R&D, ATIRA is shaping a new generation of professionals skilled in both materials science and manufacturing. This pioneering initiative reflects our commitment to strengthening India's composite ecosystem.

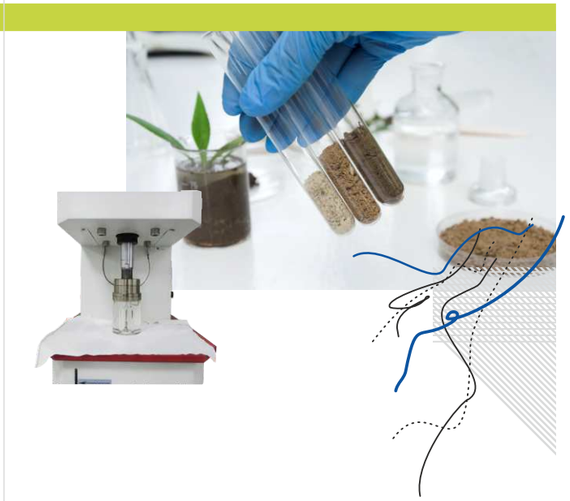
Pursuit of Quality that Reinforces Confidence

Testing & Calibration Services

A strong testing backbone remains essential for industrial growth and compliance.

In FY 2024–25, ATIRA expanded its capabilities by adding 265 new test parameters across Textile, Technical Textile, Composites, and Ecology Labs as part of NABL accreditation renewal.

Additionally, the Calibration Lab calibrated 1,269 instruments during the year, ensuring measurement accuracy and reliability for industry clients.



Driving Process Efficiency through Science

Chemical Technology Department

ATIRA's Chemical Technology Department continues to provide hands-on expertise to the textile processing industry.

In FY 2024–25, the team offered consultation to 15 processing units and analysed 728 fabric samples for defect identification and process optimisation, reinforcing ATIRA's role as a trusted knowledge partner for India's textile value chain.

Advisory Excellence that Strengthens Industry Capabilities

Consultation Services

Our environment engineering department continued to empower the textile industry through expert consultancy, delivering 109 environmental audit and feasibility reports and supporting 15 textile units through its Indore Centre. These initiatives strengthened industry capabilities in sustainability, compliance, and process optimisation, translating ATIRA's technical expertise into tangible impact.

KNOWLEDGE DISSEMINATION & HUMAN CAPITAL DEVELOPMENT

Powering Progress Sustainably

In October 2024, ATIRA commissioned a 330 kWp rooftop solar power system that now meets over half of our total electricity requirement.

By significantly reducing grid dependency and energy costs, this initiative advances our commitment to sustainability and operational self-reliance. It also reflects our broader vision of integrating green energy practices into research and industrial ecosystems, setting a benchmark for responsible institutional growth.

BUILDING THE MINDS AND MOMENTUM FOR MAKE IN INDIA

ATIRA continues to play a pivotal role in shaping India's textile ecosystem, not only through pioneering research, but also by actively sharing knowledge, nurturing partnerships, and developing the next generation of textile professionals. FY 2024-25 was particularly significant as ATIRA led several high-impact initiatives that aligned with national missions such as Make in India, NTTM, and Viksit Bharat 2047, positioning itself as a key thought leader and enabler of ecosystem transformation.

Driving Dialogue, Collaboration and Change

High-Impact Conferences 2024

ATIRA emerged as a key bridge between academia, industry, and policymakers driving conversations that translate innovation into impact. Through three flagship symposiums, ATIRA fostered collaboration, capability, and competitiveness.

Composites Symposium

May 2024 | New Delhi

Centred on the theme 'Unleashing Growth through Indigenisation', we gathered policymakers, scientists, and industry leaders from NITI Aayog, MoT and beyond to explore composites for aerospace, defence, EVs, and infrastructure.

Jute Symposium

September 2024 | Ahmedabad

Co-hosted with the National Jute Board, this event repositioned jute as a sustainability enabler, with dialogues on circular economy, green infrastructure, and livelihoods.

INTEXCON 2024

October 2024 | Ahmedabad

An international platform that brought together experts from DRDO, INDA, AATCC, and Texas State University to explore applications of technical textiles in defence, aquaculture, packaging, and sustainability.

Collectively, these events strengthened ATIRA's reputation as a convener of ideas and a catalyst for industry action.

Enabling Excellence through Skill Development

Technical Training Programmes

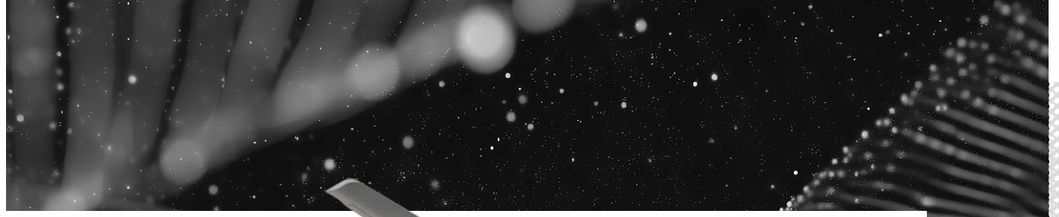
Recognising that innovation thrives on skill, ATIRA conducted structured technical training programmes to enhance industry competence in failure prediction, root cause diagnostics, and advanced composite manufacturing.

In FY 2024-25, 36 participants attended an FMEA training and 35 joined an RCA session, alongside focused modules on weaving, cotton quality, textile processing, and pultrusion technology.

Empowering Tomorrow's Researchers

Student Internships

To cultivate future-ready talent, ATIRA hosted 43 student interns from leading institutions across Punjab, Delhi, Gujarat, and Telangana, offering them hands-on exposure to cutting-edge textile research and innovation.



FUTURE FOCUS

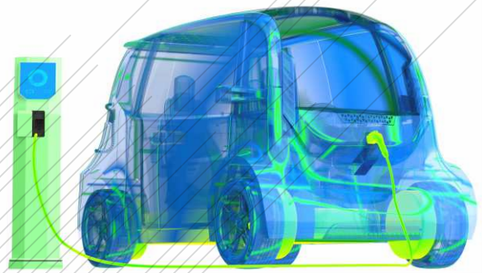
PIONEERING TOMORROW'S TEXTILE FRONTIER, TODAY

ATIRA's journey forward is defined by one word: Acceleration.
With composites at the core, our research is now geared towards next-generation materials that will shape the future of aerospace, mobility, and defence.

Our new and advanced Autoclave and Cleanroom facilities enable precision manufacturing and testing of carbon, glass, and aramid fibre composites, expanding capabilities in lightweight, high-strength applications.

From aerospace-grade structures and UAV components to sustainable composite alternatives for infrastructure and mobility, ATIRA is engineering materials that balance performance with responsibility.

As India's industries move towards self-reliance and decarbonisation, ATIRA will continue to ensure that the future of advanced materials is made in India.

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AHMEDABAD TEXTILE INDUSTRY'S RESEARCH ASSOCIATION (ATIRA)

P.O. Ambawadi Vistar
Ahmedabad - 380 015
Gujarat, India

www.atira.in

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