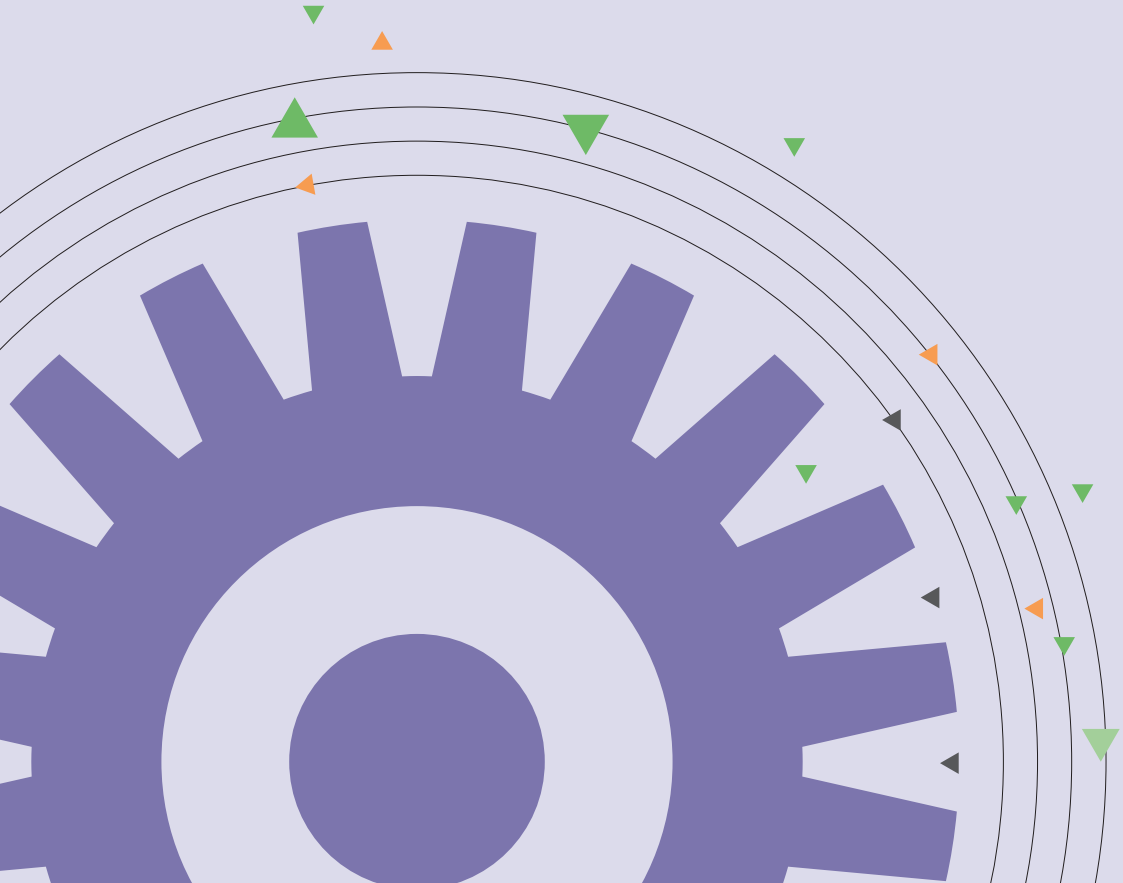
Confederation of Indian Industry

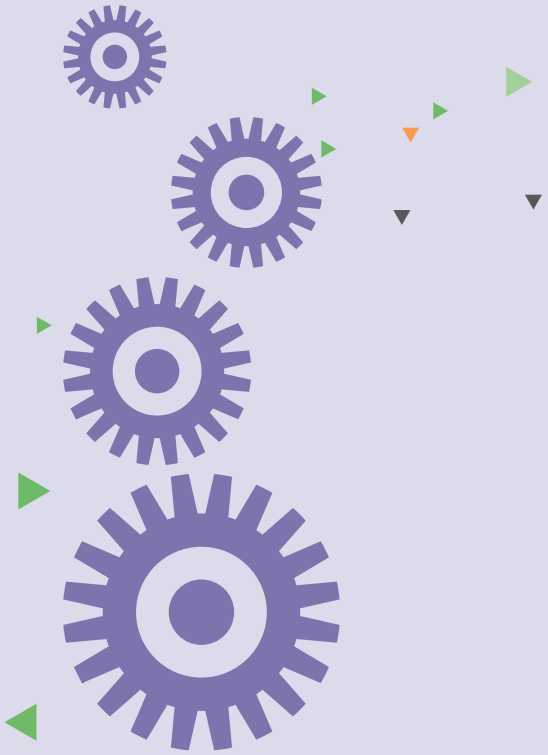
INDUSTRIAL INNOVATION AWARDS 2021

Top innovative companies and institutions



INDUSTRIAL INNOVATION AWARDS 2021

Top innovative companies and institutions



Published by:
Confederation of Indian Industry
249-F, Udyog Vihar
Phase-IV, Sector-18
Gurgaon-122 015 (Haryana)
E-mail: ciiinnovation@cii.in
Web: www.innovationawards.ciiinnovation.in

FOREWORD

S Gopalakrishnan
Past President, CII &
Chairman, CII Industrial
Innovation Awards

Innovation has been the key driver for the sustenance, growth and prosperity of a nation's economy and has been instrumental for the measurable value-enhancement in any activity. The present pandemic has further reinforced the importance of innovation and is accelerating the pace at which the companies are bringing ideas to market.

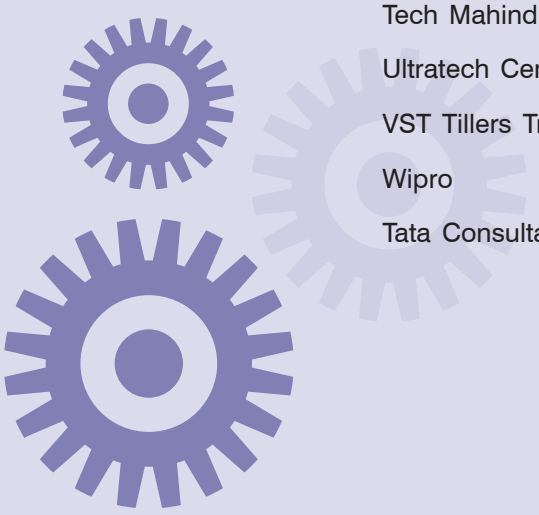
As India paves the way for economic development and is starting to unlock the post-crisis growth, the country needs to uplift its large population into much higher pedestal of prosperity in the quickest possible time. Such rapid economic progress can only be possible by innovation driven actions and businesses by all the stakeholders. India's young demographic fabric, robust demand, and a large digitally enabled middle class are some of the rare advantages that has enabled the country to thrive in an era of disruptive technologies. Towards this direction, India is redefining innovation in a larger perspective, putting social values as well as economic benefits at the centre stage.

The much-coveted Industrial Innovation Awards instituted by CII celebrates innovation excellence in Indian ecosystem. Since its inception, the awards have evaluated and recognized many world class innovations in organizations of all sizes. The top 25 award winners are selected after a rigorous assessment based on the innovation framework for firms developed by CII. A jury comprising of eminent experts in the country selected the category award winners. In this year's edition of awards, the quality of applications has been an indicator of India's rising performance with enhanced industrial innovation capacity and outputs. While this compendium is only a small bouquet of case-studies of top 25 companies and the top research institutions, which are recognized for their innovation and best practices in 2021, India is teeming with a large array of young innovators with enviable entrepreneurial spirits.

I am confident that the compendium provides interesting insights into India's innovation trajectory and provides a rich source of information for all the stakeholders in understanding the role and impact of innovation for the growth of business, academia and overall country's innovation ecosystem and its sustenance.

CONTENTS

Top 25 Innovative Companies 2021



Category Award Winners

- Grand Award

  Dr Reddy's Laboratories Ltd.

- Top Manufacturing- Large

  a) Tata Steel (Joint Winner)

  b) Reliance Industries (Joint Winner)

- Top Manufacturing - Medium

  Saankhya Labs Pvt Ltd

- Top Service - Large

  Afcons Infrastructure

- Special Award (Services - Large)

  Wipro

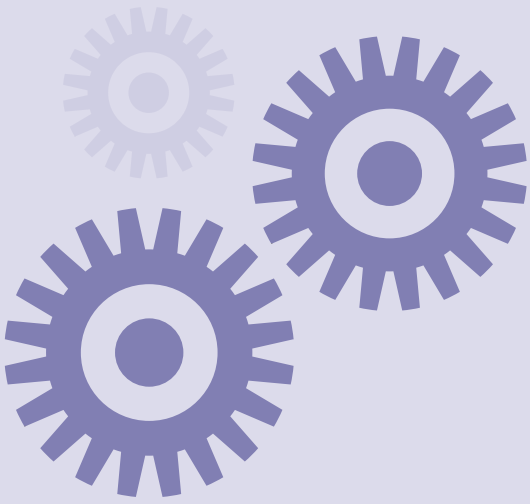
- Service - Medium

  MBRDI

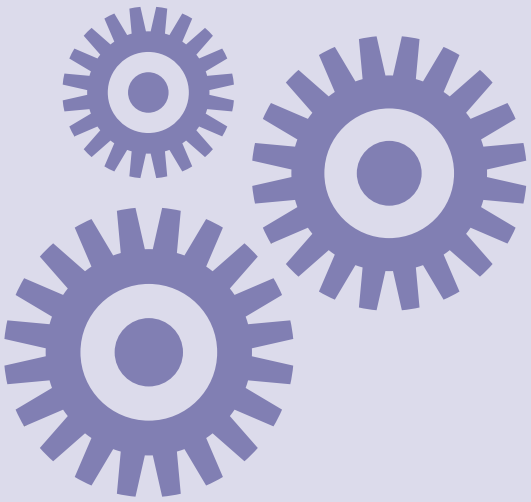
Special Award

- Driving Innovations through Industry-Academia Collaborations

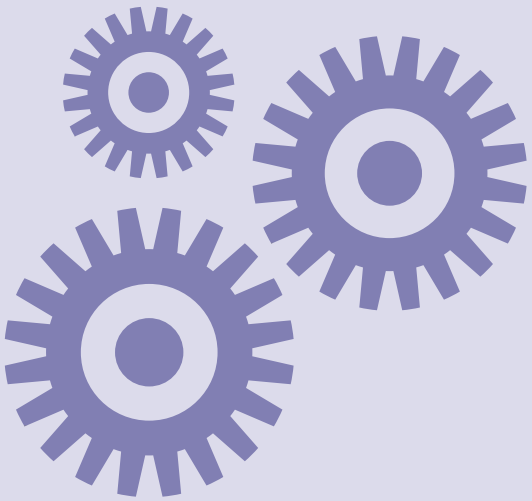
  Tata Consultancy Services



Most Innovative Research institutions



Top 25 Innovative Companies 2021



Afcons

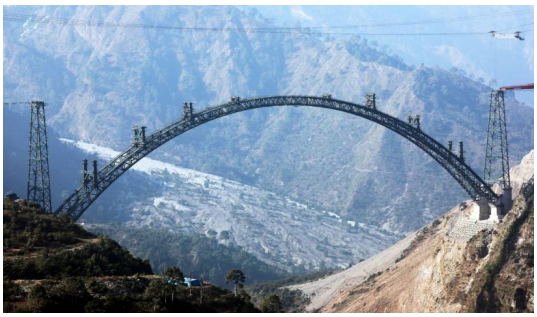
Afcons Infrastructure Limited is part of the $7bn Shapoorji Pallonji Group. Afcons, with a turnover of $1.25bn, has a diverse experience of on-time execution of over 350 infrastructure projects in more than 22 countries. The company has successfully executed landmark infrastructure projects in areas of Rail, Metro, Highways, Bridges, Tunnels, Ports, Industrial projects, LNG, Hydropower & Water Works, and Oil & Gas. Overseas, Afcons has delivered over 50 infrastructure projects across Africa, Asia, and the Middle East. Afcons is ranked 7th globally in Marine & Port Facilities, and 13th globally in the Bridges sector, as per latest Engineering News-Record (ENR), USA. Afcons was awarded the Best Contractor of the Year 2020 for Major Projects by RTA, Dubai.

A two-time winner of the Most Admired Knowledge Enterprise (MAKE) Award in 2016 and 2017, Afcons is the first infrastructure company globally to win the Most Innovative Knowledge Enterprise (MIKE) Award at the Global, Asia Pacific, and India levels in 2018, 2019, and in 2020.

The Innovation

The 9.2 Km. Atal Tunnel is the longest tunnel in the world over the elevation of 3000m. At one stage however, it appeared that tunnel would have to be abandoned and a new Tunnel with a different alignment constructed. There was heavy ingress of slurry and riverbed material at the Seri Nalla Fault Zone which threatened to derail the project altogether. The rock condition encountered at the Seri Nalla Fault Zone was of such adverse geological condition that it could not be considered in the standard Rock Mass Classification. Further, the existing 'Codal' provisions were not dealing with such poor strata. The first action by Afcons was to complete the Tunnelling from the North portal so that the breach could be tackled from both ends simultaneously. After careful consideration, Afcons opted to 'combine' proven techniques. The P5 System of Excavation was adopted, combined with three different Excavation sequences: Central Pilot Drift Method, Side Drift Method and Double Layer - Pipe Roofing. At time of Plugging, vertical struts made from wood and Horizonal struts of steel channels and I-beams were welded to the lattice girders at springing level to prevent deformation. Shotcrete was sprayed at the heading. For prediction of the strata ahead, Tunnel Seismic Profiling (TSP) at various locations were done. Drainage holes with directing steel pipes were installed at the crown for actual pressure release. Dual Level Pipe Roof were then carefully put in place. Special techniques were adopted so that hole collapse was avoided. Finally, the supported area was excavated slowly, and lattice girders at close spacing were installed before advancing. Face bolting with self-drilling rock bolts and grouting them with Micro Fine Cement (MFC) instead of normal OPC cement also facilitated in supporting the face and enabled the steady progress until the Seri Nalla breach was overcome

The taming of the Seri Nalla Zone



Worlds Tallest Railway Arch Bridge, Chenab

MG Setu Bridge, Patna

The Approach

The culture to execute projects 'ahead of schedule', 'within budget' and 'with highest customer satisfaction' ensures that Innovative thinking is ingrained in the very fabric of the organization. The other triggers – a Customer Challenge, an Intractable Problem or Challenging Industry Benchmarks act as a prompt to think differently. We harness the deep knowledge of our people, draw from the vast Knowledge Repository, and connect with Internal and External Experts to create solutions that are developed at point of deployment and implemented expeditiously. The unique Afcons Innovation Culture - IMPROVATION™ has been trademarked and along with the 4-Way Test, the Improvation™ Framework has been copyrighted.

The culture of Improvation™ was amply demonstrated while tackling the Seri Nalla Fault Zone.

The Benefits

TIME AND COST: The alternative was to abandon the tunnel and start afresh in another area. Roughly, this saved around a decade of effort and time and cost of a new tunnel.

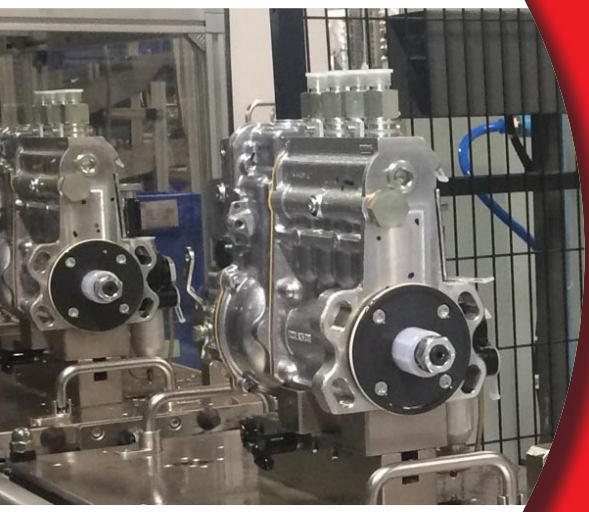
ENVIRONMENT & SOCIAL DEVELOPMENT: The Atal tunnel ends the social isolation of people in Lahaul-Spiti. For 6-7 months, during the bitter winter, locals were cut off: no earnings, dependent on meagre savings & stocked up local produce, lost lives because of no access to medical facilities, while children missed out on exams. The Atal Tunnel provides all year access to medical facilities and traders now sell in markets as far away as Delhi.

CONTRIBUTION TO NATIONAL SECURITY & NATION BUILDING: With year-round access, Atal Tunnel will encourage more investment leading to increased employment. Importantly, it allows for faster movement of supplies and artillery for the Army to the forward areas.

The Future

Globally, Industries & Governments are evolving since the COVID-19 outbreak. At Afcons, we are constantly assessing what needs to change, what will stay, and what will be left behind in the post pandemic economy. In all this, one thing is constant: Afcons will continue to generate benchmarks in Innovation and will be known as an organization that Creates New Knowledge for the benefit of the Sector and Society!

BOSCH Limited



"In India, Bosch is a leading supplier of technology and services in the areas of Mobility Solutions, Industrial Technology, Consumer Goods, Energy, and Building Technology. Additionally, Bosch has in India the largest development center outside Germany, for end-to-end engineering and technology solutions. The Bosch Group operates in India through fourteen companies: Bosch Limited – the flagship company of the Bosch Group in India : Bosch Chassis Systems India Private Limited, Bosch Rexroth (India) Private Limited, Robert Bosch Engineering and Business Solutions Private Limited, Bosch Automotive Electronics India Private Limited, Bosch Electrical Drives India Private Limited, BSH Home Appliances Private Limited, ETAS Automotive India Private Limited, Robert Bosch Automotive Steering Private Limited, Automobility Services and Solutions Private Limited, Newtech Filter India Private Limited, Mivin Engg. Technologies Private Limited, PreBo Automotive Private Limited, and Precision Seals. In India, Bosch set up its manufacturing operations in 1951, which has grown over the years to include 16 manufacturing sites, and seven development and application centers. The Bosch Group in India employs over 31,500 associates and generated consolidated sales of about INR 19,996 crores* (2.54 billion euros) in the fiscal year 2020 of which INR 14,011 crores* (1.78 billion euros) are from consolidated sales to third parties. The Bosch Group in India has close to 15,650 research and development associates"

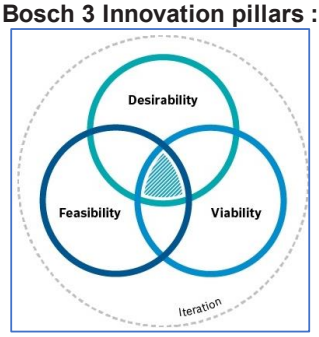
The Innovation

The Bosch Innovation Framework (BIF) provides logical steps how to transform an idea into a successful product in the market. The BIF helps to align with strategic search fields, to discover the problem space and to generate holistic business models based on the 3 innovation pillars Desirability, Viability & Feasibility.

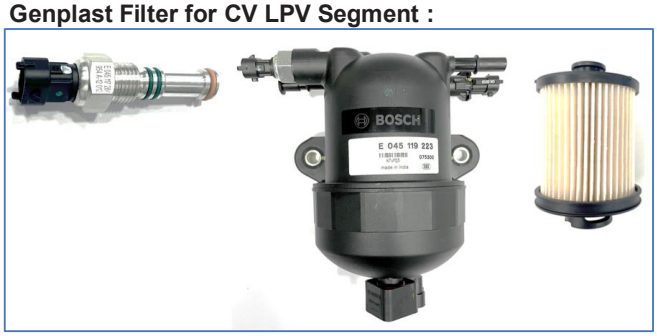
Innovation in Plastic Single Filter which is developed for Indian Commercial Vehicle (LPV Segment).

- Single compact Plastic Filter (Referred as Genplast Filter) is with Vertical mounting having Increased Robustness.
- Genplast Diesel Filter is designed with 3-Stage fuel filter element which Combines the Performance of Two Separate Filters by meeting High Water separation efficiency at the end of life & Higher particle separation efficiency.
- Genplast Filter also accommodates a Differential pressure switch for real time indication of 3-Stage Element clogging & on-time replacement of element.
- Higher service internal of the 3 Stage element to reduce the Total cost of ownership.
- Passive Water sensor without electronics, with less Components and negligible failures in field.
- Temperature sensor with Aluminum body for better Response time on the vehicle.
- Two Patents have been Filed for 3 Stage Element and Delta Pressure Switch.

Bosch 3 Innovation pillars :



Genplast Filter for CV LPV Segment :

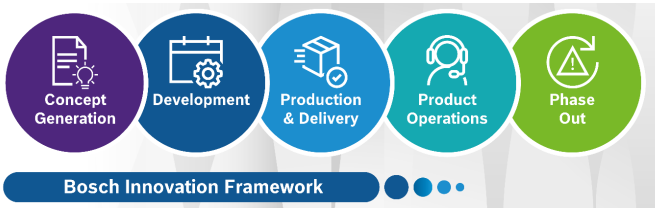


The Approach

Bosch has developed a modern Innovation process, which provides appropriate methods, tools, and criteria considering the innovation context.

The Bosch Innovation Framework (BIF) provides the platform for such processes. It is founded on the understanding of an innovative product's end-to-end lifecycle. The BIF emphasizes the early stages of innovation where ideas are refined into validated concepts fast and efficiently in order to focus our efforts on those businesses that demonstrate the most promise to scale profitably.

How the BIF fits into an end-to-end product lifecycle is depicted below:



The Benefits

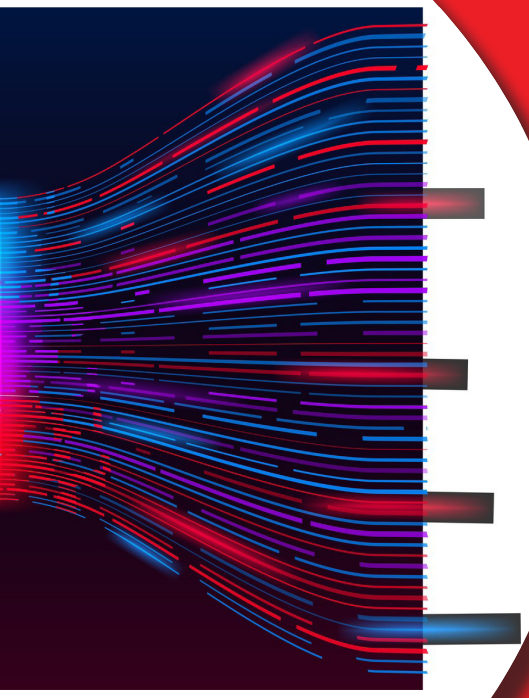
Innovations is Bosch Genplast Compact Plastic Diesel Filter resulted in Successful Launch of the Product in the Market for Commercial Vehicle LPV Segment in India with following benefits,

- Low cost of ownership by combining performance of Two Separate Filters into One Single Filter
- High Efficiency Product Protects Fuel Injection Equipment Components & benefiting End Customer
- Delta P switch, Element Clogging Indicator: Saves Cost by eliminating early replacement of element
- Passive Water & Temperature sensor No Electronics failures

The Future

Launching of this Innovative Product in Indian Market since 2020 has created following Opportunities for Future,

- Potential to acquire similar applications in India as well in EU Market.
- Recurring Business Opportunity in terms of Aftermarket sales of 3 Stage replaceable element in field.
- Innovation in Delta Pressure switch has the potential to be applicated for other Industrial usage.



Cummins India

Cummins in India, a power leader, is a group of complementary business units that design, manufacture, distribute and service engines and related technologies, including fuel systems, air handling, filtration, emission solutions and electrical power generation systems. Its technology and pioneering initiatives are bringing innovative solutions and dependable services at the best possible value to users across the country. Its high-performance outlook is based on customer focus, integrity, and capability of its people. Part of the US $19.8 billion Cummins Inc., Cummins in India is a group of eight legal entities across 200 locations in the country with a combined turnover of over Rs. 11,000 Crores in 2020 and employing more than 10,000 individuals. Collectively, the Group operates 21 manufacturing facilities across India.

The Innovation

1. New To Market – Diesel Particulate Filter Cleaning Machine

Diesel Particulate Filter (DPF) is a critical component fitted in the engine exhaust system to control "Particulate Matter" (PM) within the limits of BS-VI emission norms. Cummins globally adopted "factory cleaned DPF" as a solution for customers. True to our brand promise of powering our customers through innovation and dependability, Cummins India supported customers with lower-cost solutions. Cummins India developed an innovative and efficient "field cleaning" machine that enables customers to clean and re-use DPFs filled-up with soot and dust. This machine technology has been patented and provides cleaning efficiency equivalent to factory cleaning.

2. New To Firm – KTAA19-G12 (600KVA Prime) and KTAA19-G13 (625KVA Prime)

This path-breaking innovative product was released by Cummins India on the reliable 6-cylinder inline 19-liter engine platform with a higher power density. Product met stringent CPCB-II emission norms for Engine and Genset with Cummins heady-duty PT mechanical in-house fuel system by keeping Make in India vision in mind.

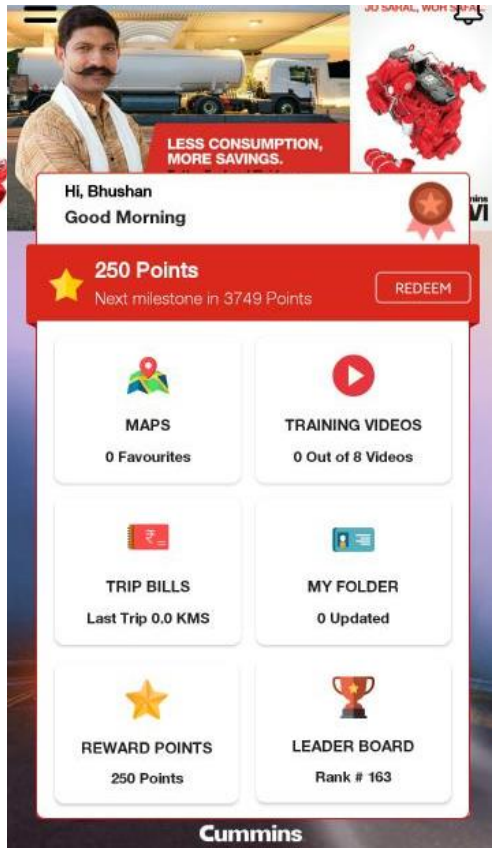
The technology innovations include a clean combustion recipe, cylinder to cylinder fuel control mechanism, robust & reliable steel power cylinders for enviro-friendly and high durability.

The product launch was with a patent and one trade secret.

3. New To Firm – BS-VI

True to our belief in innovation and dependability, we at Cummins designed and developed an outstanding series of engines for BS-VI enhanced by Cummins SCR technology. Cummins in India successfully developed and launched first 'SCR only' architecture for meeting BS VI emissions against EGR+SCR architectures used by competitors and Cummins globally for meeting emission regulations. 'SCR only' architecture resulted in high efficiency NOx conversion across variety of duty cycles and applications meeting stringent fuel economy targets. Cummins partners with OEMs for fleet management and service support.

Cummins has designed mobile training vans for educating/training drivers on BS VI technology and engine-vehicle features. Cummins also has launched 'SAATHI' app for supporting drivers in their daily vehicle operations.



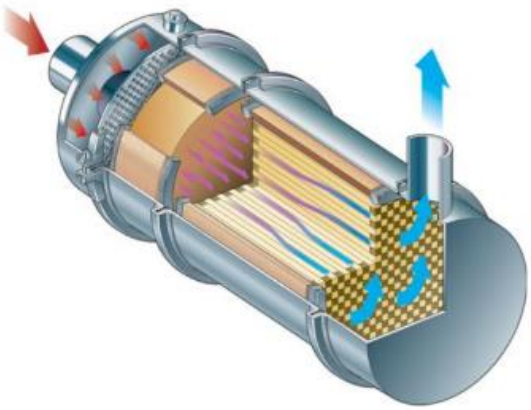
4. New To Firm – Process Development Of Cummins Components Care Center (CCC)

Cummins India built the CCC infrastructure to help OEMs and end-users. The objective was to navigate through the challenges posed by the change in the technology of emission norms of BS-IV and BS-VI. CCC helped reduce the total cost of ownership and ensured easy and faster availability of service and spare parts. During the “Infant Care” period, Cummins India executives and the CCC channel partners supported customers to understand the technology and the need of genuine consumables spare parts. Further, Cummins India introduced a “Fit for Market” repair. or service solution to ensure vehicular emissions norms are met every time. CCC infrastructure with more than 200 centres across India with Cummins trained technicians ensures easy and faster availability of spare parts and service.

CCC can be found in all major cities and automotive hubs across India. The branding, standard layout, cleanliness, repair quality, and Cummins trained technicians differentiate CCC from the non-genuine offers which are there in the market.

The Benefits

- Cummins India has been able to reduce the replacement cost for the customers by about 60% to 70%.
- This product has a lucrative total cost of ownership, including minimum service cost & maximized up-time to benefit customers.
- Experts with advanced technical training
- Latest support technologies
- Unmatched network of aftermarket support
- Unparalleled service quality across the country
- A comprehensive solution for all component related services for BSIV and BSVI emission norms



The Future

Cummins is committed to making people's lives better by powering a more prosperous world. While creating financial stability and wealth for our stakeholders is essential to our future, doing so sustainably is equally important. Ultimately, we will only fulfill our mission and make people's lives better if we create more wealth with less impact on the planet. A more prosperous world requires a healthy, vibrant planet.

Cummins mission, vision and values recognize that the company's prosperity is linked both to strong communities and a healthy planet. Prosperity includes both business and environmental sustainability.

PLANET 2050 – aspirational targets

COMMUNITIES ARE BETTER BECAUSE WE ARE THERE

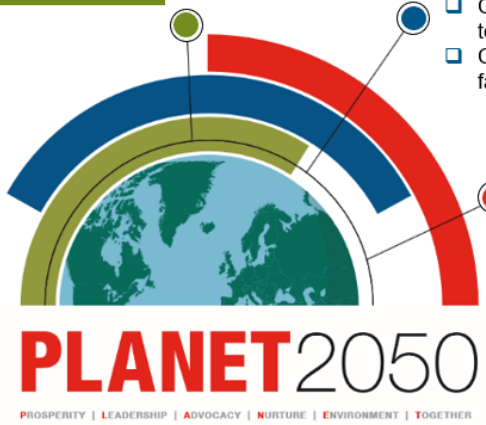
2050 Targets

- Net positive impact in every community in which we operate
  = sum of environmental good > local environment footprint
- Near zero local environmental impact

DOING OUR PART TO ADDRESS CLIMATE CHANGE AND AIR EMISSIONS

2050 Targets

- Customer success powered by carbon neutral technologies that address air quality
- Carbon neutrality and near zero pollution in Cummins' facilities and operations



USING NATURAL RESOURCES IN THE MOST SUSTAINABLE WAY

2050 Targets

- Nothing wasted
  - Design out waste in products and processes
  - Use materials again for next life
  - Reuse water and return clean to the community

- ***At Cummins, we are adopting a wholistic approach towards carbon neutrality & sustainability***
- ***We follow a Well To Wheel (WTW) approach while selecting technologies and developing products***
- ***We are deploying innovation across Supply Chain, Manufacturing, and End Product Usage.***

Dr Reddy's Laboratories Limited

Our Purpose:

We accelerate access to affordable and innovative medicines because Good Health Can't Wait

Our Promises:

- Bringing expensive medicines within reach
- Addressing unmet patient meets
- Helping patients manage disease better
- Working with partners to help them succeed
- Enabling and helping our partners ensure that our medicines are available where needed

Our Principles:

- Empathy: We understand the needs of our patients and partners better than others
- Dynamism: We solve challenges that only a few can, and do this with agility

Global Presence: 48 Nationalities, 56 Countries

Revenues: ₹ 189.7 billion

New Products Launched: 273 across USA, Canada, Europe, China, LATAM, ASEAN and all Emerging Markets

Source: Dr Reddy's Annual Report 2021

Integrated Product Development Organization (IPDO)

- 4 locations globally: Hyderabad - India, Cambridge - UK, Leiden - Netherlands, Shreveport-US
- 1600+ Scientists and Functional Experts
- End to end capabilities in API, Formulations, Biology / Clinical Development, Intellectual Property and Regulatory Affairs
- R&D spend as % of revenue amongst highest in peers
- Innovative and Generic Product Range: Active pharmaceutical ingredients (API), Oral formulations, Parenteral (Injectables, Opthalmics) & other dosages

The Innovation

Our Innovations

1) Innovation for Market Leadership

- Innovative clinico regulatory strategies
- Patent non-infringing generics
- Complex products in global markets

2) Patient Centric Product Innovation:

- Differentiated products for unmet needs
- COVID portfolio
- Novel formulation processes for physician and caregiver needs

3) Operational Excellence & Continuous Improvement

- Advanced manufacturing to reduce cost and achieve scale efficiency
- Novel analytical methods
- In silico modelling
- Digitization across the value chain

Approach

Developing lowest cost and robust products through our in house digital initiatives for every step in the product life cycle for First Time Right Execution

- API development: Predictive analytics to develop lowest cost APIs
- Formulation development: Rapid formula finalization
- Analytical methods: Advanced characterization techniques
- Clinical: Modelling and Simulation for Bio Study success
- Tech Transfer to plant: Virtual method transfers, innovative technologies which result in paperless shop floors and labs
- Regulatory: Digital insights from past data, for lower errors and faster cycle time
- IP: Real time IP search
- Advanced Manufacturing technologies: For faster, safer more efficient manufacturing- with smaller footprint

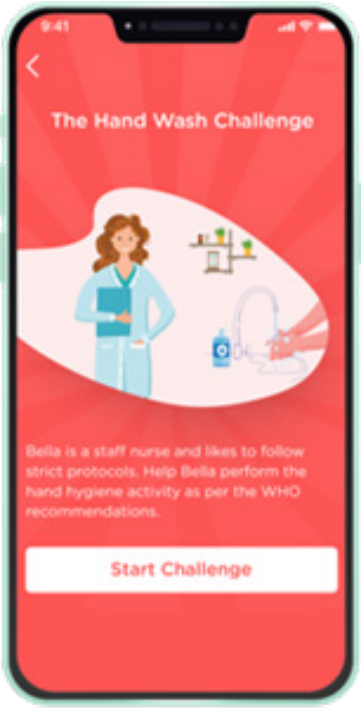
The Benefits

- First to market in complex generics for multiple markets
- Serving unmet needs through our COVID portfolio & differentiated generics
- Doubled product pipeline and output over 3 years - by using innovative R&D, manufacturing technologies and digital & analytics adoption
- North America Market: 9% growth in FY21
- Europe: 32% in FY21; India: 15% in FY21
- Emerging markets: Overall 7% growth in FY21
- CIS countries: 15% growth over the previous year. Rest of the World markets (which includes Brazil, China, South Africa, and certain other markets) representing 25% growth.

The Future

As we go onwards and upwards, we know our people are the wind beneath our wings. We are committed to empowering them using the latest technologies and scientific know-how. We continue to be future-ready, by learning from other industries and innovating to deliver on our purpose of Good Health Can't Wait.

Ethosh



Ethosh

We at Ethosh are deeply rooted in solving communication complexities of science and engineering. We are passionate about applying our domain knowledge, our creative geniuses, and our deep digital expertise in helping transform complex sets of information and knowledge to a simpler, visual and engaging form, so the users get educated, enabled and excited about scientific information.

Educate - Our immerging-tech solutions using gamification and VR-based education platforms have helped health care organizations transform skill and learning development.

Enable - Our AR-based solutions are enabling users to be confident about their decisions from buying a product to solving a complex issue.

Excite - Our digital and content marketing solutions are helping our customers excite and delight their customers across the buying journey.

The Innovation

The Innovation at Ethosh is about helping solve the challenge of universal availability of standardised health care. With the help of the VR based gamified Medical Training Platform, we offer a standardised, scalable, and feedback-oriented training opportunity for health care teams, so that there is confidence in their actions, consistency in their responses, and clarity in their communication while working on the field.

We understand the scale of the need for such pieces of training and hence a thought process has also gone in thinking, how we could create multiple experiences quickly. Hence, we have adopted a platform approach fortified by libraries of digital interactions, which can be quickly assembled to create curated learning experiences.

On the user experience front, we have considered 3 main elements of digital experiences as the key to creating a good learning engagement and better learning retention. These are interaction, immersion, and gamification. While an advanced level of interaction helps in active engagement, behavioural mapping, and instant feedback; adding immersion to it helps in mining the complete attention of the user. This, along with emotional memory and an added repeatability without the fear of causing harm. Gamification helps in purposeful goal-oriented learning with added emotions of fear of losing and the joy of winning.

Overall, the Immersive Virtual Medical Training Platform helps health care professionals in caring for lives in a standardized, consistent, and reassuring way.

The Approach

The thought of the innovation was seeded from our observation of patients in emergency rooms of hospitals. What are they looking for? More than a quick fix to the health issue, they look for an assurance that they are being treated well. This led to our interviews with patients, nurses, and doctors on the field. Empathizing with the health care teams gave us a key insight that exposure to clinical scenarios frequently makes a health care professional confident due to better recall of learnings. Trying our bit through our domain of work, we asked ourselves, how could we provide a scalable opportunity to each HCP for experiencing clinical scenarios which are easily accessible, repeatable and feedback oriented. With structured brainstorming, we decided to prototype the virtual platform for scalable learning.

The Benefits

When health care teams regularly rehearse protocols of care, as if in a real-life scenario, multiple numbers of times, without the fear of harm, but with an instant standardised feedback, we believe, it would enhance their confidence in treating patients as per the global standards. These standardized real to life training can reach all the pockets of the country, where training is deficient. Without the person needing to travel distances, clinical experiences are readily made available through portable VR devices. We believe good health care means standardized health care based on global recommendations. We wish to see it reach every corner of the world.

The Future

With VR devices becoming more accessible and affordable, Virtual Reality is going to change the way stories are told and training is delivered. We can see a future where, just like smartphones, VR devices become a must-have possession of individuals and the need to create experiences would rise exponentially. We see ourselves as a key enabler of such meaningful healthcare training experiences.

Fluid Controls Pvt. Ltd.

Started way back in 1974, Fluid Controls' offerings go in Primary 5 business verticals to Indian and Global markets i.e. Railways (Metro, Coaches, Locomotives), Oil and Gas, Power(Nuclear, Thermal), Defence and Aerospace Industries.

Fluid Controls' Design, Engineering, Manufacturing and Test-Lab are at Chakan, Pune where we have a state-of-the-art R&D centre which offers clients customized solutions based on analytical formulations, 3D Modelling and Finite Element Analysis. Fluid Controls® R&D is recognised by the Government of India(DSIR) as an "In House R&D Unit". Fluid Controls Test Lab is NABL (ISO17025) certified which gives us edge in our offerings.

The Innovation

Innovation 1: Case Hardening Process for Carbon Steel made Ferrule

To impart the spring back action, this Single Ferrule needs to be case hardened.

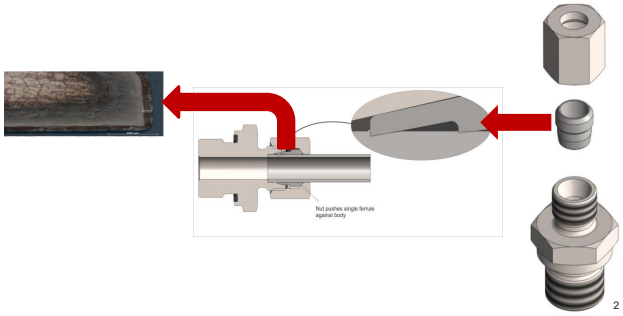
This invention focuses on Ferrules manufactured from Low Carbon Steel (LCS) or EN1A grade.

Approach

Underground Salt bath furnace is maintained at a temperature between 500 to 600degC. Nitriding bath consists of solution containing carbonate of 17-25% and Cyanite of 36-40%. Air flow passed in this bath is of 400 to 500 Litters per hour.

Above ferrules are then exposed to this salt bath for 4 to 6 hours.

Then the same ferrules shall be dipped in water bath maintained between 40 to 60degC for 2 to 4 hours



Benefits

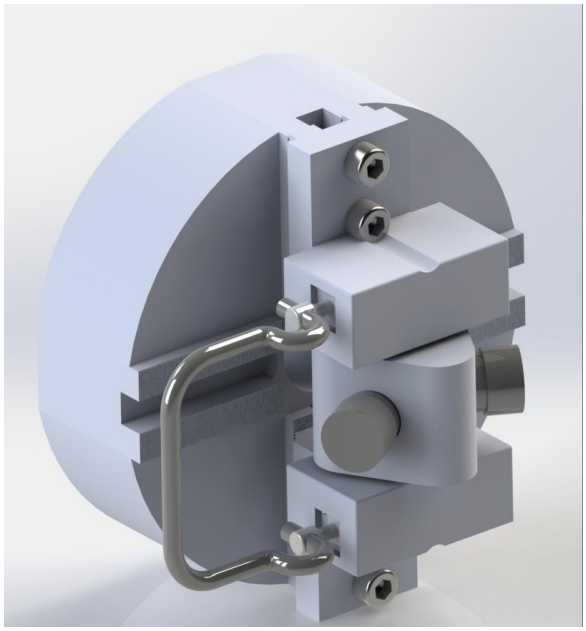
Globally such processes costs a lot of time and money.

The Future

Reduce the hardening process cycle time.

Innovation 2: Universal Locking Mechanism for CNC Fixture

It is a Rotating jaw fixture designed for the CNC machine to reduce the number of steps involved in the operation of various workpieces/forgings. The current working procedure for the machining process of a workpiece requires continuous mounting and unmounting of the workpiece to change the machining face. The Designed fixture enables rotation of the mould with an innovative locking mechanism to machine all the faces of the workpiece, after mounting the workpiece only once, thus eliminating a lot of machining time.



Approach

To perform multiple machining operations with reduced mounting and unmounting steps of the workpiece in a CNC machine.

Benefits

This will reduce the machining time, which in return will improve the overall productivity.

The Future

Mechatronics can be leveraged to Automate the holding of the Fixture and the component in it.

Havells India Limited

Havells India Limited is a Fast-Moving Electrical Goods (FMEG) Company with a powerful global presence, thanks to our philosophy of Make in India, extensive distribution network, and world-class quality.

We own many prestigious brands like Havells, Lloyd, Crabtree, Standard, and Reo.

Our vision: To be a globally recognized corporation known for excellence, governance, consumer delight, and fairness to each stakeholder, including the society and environment in which we operate.

Key facts and figures that define Havells are as below:

- Strong performance YOY, 2020-21 turnover at 10,428 Cr.
- Our products are available in 60+ countries.
- 21 product categories and 39 branches with a strong network of 14,000+ dealers.
- With 14 state-of-art-manufacturing plants, we are proud to make 90%+ of products in India.
- Diverse intellectual capital of 5,000+ employees and 500+ patent & design registrations (since 2016).
- Focused sustainability programs, during 2020-21, 6,578 MWh of green energy generated.

The Innovation

Distinguished Innovations from Havells in recent times:

Havells' Innovation vision is to go deeper into customer homes in safe, intelligent & healthy ways. Innovations mentioned in the following section represent outcomes of the vision translated to customer-centric products.

Havells Delite alkaline high recovery water purifier

- Water is one of the most critical and scarce natural resources, accessibility of clean drinking water is even more difficult.
- Havells patented high recovery technology saves more than 50% of input water (vis-à-vis ~ 25% by RO purifiers in general).
- It also sets the benchmark of alkalinity for output water quality.

Crabtree Anti-microbial (bacteria & fungi) switches:

- Humanity is facing one of its biggest challenges in COVID 19 pandemic.
- Havells "Safe touch" technology introduced in the switch range protects from various microbes with 99.9% efficacy.
- A material innovation based on nano-metal oxide; the technology responds to the call of keeping us safe.

Silencio: Low noise Mixer grinder

- High noise levels in kitchen appliances like mixer-grinder is a well-known pain consumer pain area.
- To address this problem, Havells Silencio presents a new industry benchmark for low noise levels.
- With innovative and premium design and 6 technology patents, it is an engineering masterpiece.

Carnesia-i: Smart Fan with self-regulation features

- IoT enabled smart fan that can be operated through Havells sync app and various voice-activated devices like Alexa or Google Home.
- With its sensors, it can self-regulate based on ambient temperature and humidity to provide a personalized user experience.
- For the above reason, it's commonly called the "feeling fan".

iHTT Magnetron: India's first induction water heater

- Based on induction heat transfer technology using EM waves to heat the water.
- Hence, eliminating the need for the physical heating element.
- This delivers higher energy efficiency, ease of maintenance and saves cost over the operational life.

The Approach

Our mission is to democratize ubiquitous technology and make it seamless for customers through Innovations.

Havells Center for Research & Innovation plays a pivotal role here by percolating Innovation mindset across the organization through various frameworks and processes.

Everything starts with customer-centricity derived by Insights programs like "Customer research and focus group interactions" and leading design thinking methods.

To solve customer problems, we perpetually evolve product roadmaps, technology platforms, and external collaborations.

With a state-of-art Customer experience and design studio, future technology-oriented Center of Excellences and advanced R&D center, Havells leads the benchmark among FMEGs in India.

The Benefits

Our Innovations exemplifies the motto of "Making a difference" with Industry-leading and customer-centric features:

- High recovery water purification system leads the way for drastically reducing and even eliminating water wastage.
- Switches are transmission hotspots for microbes, Havells "Safe touch" technology makes our office and homes safer.

- With Silencio mixer grinder Havells is leading the industry to solve the loud noise issue of home appliances stylishly.
- Carnesia-i smart fan presents a glimpse of future homes with intelligent devices.
- Induction heat transfer water heater delivers the benefits of long-term energy efficiency and reduced service costs.

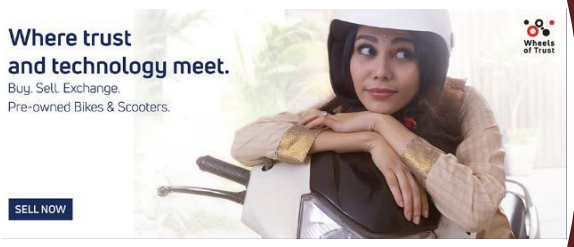
The Future

Havells aspires to be a leading global FMEG with strong Indian roots powering the world with state-of-the-art innovations and energy-efficient solutions.

Our focus continues to be on customer centricity, ownership of critical technologies and leadership in innovations. Havells Center for Research and Innovation will continue to lead atmanirbharta here by evolving in-house capabilities and external collaborations.

Hero MotoCorp

Collaborate! Co-Create!



With innovation at the core of its philosophy, the New Delhi (India) headquartered Hero MotoCorp is at the forefront of designing and developing technologically advanced motorcycles and scooters for customers around the world. It is the world's largest two-wheeler manufacturer since 2001 and has held the coveted title for the past 20 consecutive years.

With over 100 million satisfied customers across the globe, it continues to champion socio-economic progress and empowerment through its range of products and services.

Led by Dr Pawan Munjal, Chairman, Hero MotoCorp, has expanded its presence to over 40 countries across Asia, Africa, and Latin America. Hero MotoCorp is a truly global enterprise with a workforce from over 10 nationalities, manufacturing plants in three countries and R&D facilities in India and Germany.

Hero MotoCorp is the dominant market leader in India with over 50% share in the domestic motorcycle market.

The Innovation

HeroCoLabs

HeroCoLabs is an exciting crowd-sourcing platform, which allows individual to interact with the community and showcase their skills. This initiative is based on our mission – create collaborate and inspire, where we put customer's design into reality. This platform is always active, youth centric and aspirational. So far 4 challenges have been successfully completed on this platform generating over 21+ potential customer engagements

Xpulse Rally Kit

XPulse Rally Kit is an industry-first product that allows customers to transform the XPulse 200 motorcycle into a rally ready machine. It is Homologated for the road use (India) and also FMSCI homologated. It allows users to participate with their regular Xpulse 200 fitted with rally kit the competitive motor sports rallies and test their mettle. It is a unique package which inspires users to improve and hone their off-roading skills and empowers them for participating in competitive

Wheels of Trust

Wheels of Trust is a one-stop solution for all needs related to "pre-owned" 2Ws. The technical platform provides service in 2 steps: First is to certify the vehicle through a health report based on 100+ check points, which is also the rationale behind price prediction. Second is matching of buyer and seller. Certification details are flashed on a bidding app where verified professional buyers bid their prices based on Health report and WOT valuation. Sellers don't need to wander multiple places for best price and Buyers get assured transparent deals. The entire marketplace runs on one single screen. It has been a hit in the market and is actively used by 900+ dealerships across India in less than a year

The Approach

The company's innovation agenda is driven from top management and is regularly updated, improved and adapted with dynamic scenarios. Projects such as Open Innovation also see external advisor including Harvard and Wharton Professors. Monthly progress reviews and implementation plans foster a culture of innovation.

The Benefits

HeroCoLabs:

1. Third highest Revenue contribution in Accessories in first year of Launch
2. 50% reduction achieved in Development duration for Digital Interface solution with Customers
3. Achieved fastest (<6mo) Time to Market with additional revenue and cost savings
4. Youth-centric, Aspirational and Futuristic Dealer Interface Ideas for Premium Products

Xpulse Rally Kit

1. Affordable price - Makes Competitive rally sports accessible and within everyone's reach
2. 10X revenue growth achieved in FY21 vs previous year
3. Achieved 50% higher take rate compared to budgeted target

Wheels of Trust:

1. It is being actively used by 900+ dealerships across India in less than a year, we have already certified close to 1.5L vehicles. The app has an active network of around 3000 brokers on its' network who have collectively bid for vehicles more than 2.2L times.
2. Our pricing algorithm has a hit rate of 96% and is on its way to become 100% accurate - when WoT price will become the standard in pre-owned 2W transactions.

The Future

Over the next decade the company aims to create the next generation of mobility solutions for customers across the world. To this end, it has earmarked investments that will be utilised towards R&D of alternative mobility solutions and sustainable manufacturing facilities. Hero MotoCorp will launch its EV by March 2022.

Keetronics (India) Pvt. Ltd.

Keetronics (India) Pvt. Ltd. is a pioneer company engaged in manufacturing Advance Input Devices, Functional Printed Electronics and Touch Electrical Switches. Established in 1994, in Pune, Maharashtra, Keetronics has grown to presently boast of a workforce of 150 employees and a turnover of ₹ 27 crores.

Keetronics aims at being an innovative company that offers the best solutions for developing the finest products with functional as well as aesthetic superiority at a competitive price range.

We are focused on customer satisfaction and developing our infrastructure by adapting advanced technologies. As a company imbibed with innovative culture, we always strive for opportunities to drive new methods and product development.

Leading the team is Mr. Rajesh Kulkarni, a young and experienced entrepreneur who believes in the national interest and supports the “MAKE IN INDIA” vision. His ideas and sharing of experiences plays an indispensible role in the creation and developments of our products.

The Innovation

Keetronics introduces its Advance Input devices & Switches with the new upgraded “Epoxy Foam Surface Technology”, the Epoxy-Foam technology is a modular concept which gives the liberty of choice of flexible layers with more application benefits on surface like concave & convex types. Reaching far ahead to meet the ideas and expectations, we offer the freedom to choose the switches of any shape, surface structure, color & back light and switching feedback.

Additively our capacitive switching solutions are also available, combined with this technology.

Keetronics (India) Pvt.Ltd. has been catering to the Global Medical Healthcare sectors since the last 25 years, GE Healthcare, Phillips ,Siemens are a few to name them. Serving the field of medical electronics calls for the highest levels of accuracy. The 3D Epoxy foam keyboards has enhanced the aesthetics as well functional operations of the keyboards that are widely used for the x-ray machine ,ventilators and many medical user interface devices. By initiating this product offering we have strived to change the Indian perception towards the Indian products. Our team has taken seamless efforts to upgrade the product technology to meet the global standards. The product is a true “Import Substitute “delivered to the local as well as the global Market.

The 3D Epoxy technology innovation has enhanced the Excellency and technical reliability with its features beneficiary to all the sectors in applications.

The Approach

The innovation was driven primarily by the need to create a world-class ‘Import Substitute’ within India and change the Indian perception towards Indian Products.

Our aim was to create a truly “Made in India” product and contribute towards the “Atmanirbhar Bharat Abhiyan”.

The Benefits

The initiative has created solutions to the complex requirements. With a prime focus on accuracy and quality, we provide end to end solutions from designing to mass production supplies to our customers. All these have made the innovation sustainable to satisfy the market demands with the below benefits to our customers.

- Freedom of choice for their comprehensive needs
- Fast Prototyping – Fast Deliveries.
- Competitive Pricing – The 3D epoxy technology eliminates the high cost injection molding, minimizing the design cost of the product. This features low cost developments and low pricing of the product.
- Import Substitute – With Global Standards.
- Capacitive switching solutions.

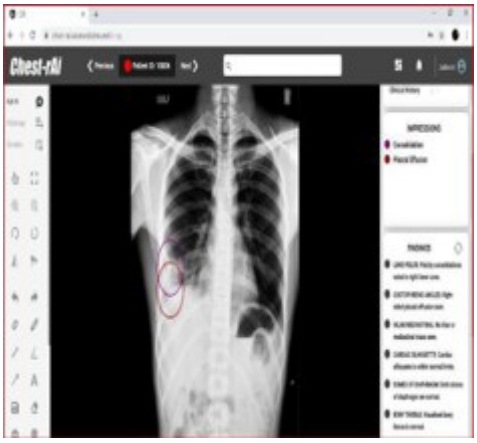
The Future

Keetronics has entered a new innovative domain “Functional Printed Electronics”, which merges printing technology and electronics. This is an emerging technology with wide applications like printed heaters, temperature sensors, printed displays, printed antenna and printed batteries.

IME & IMD is increasingly in demand in the Automotive, Medical Device, and White Goods markets for creation of smart surfaces within their products.

L&T Technology Services

AiKno



L&T Technology Services Limited

L&T Technology Services Limited (LTTS) is a global leader in Engineering and R&D (ER&D) services. With 769 patents filed for 57 of the Global Top 100 ER&D spenders, LTTS lives and breathes engineering. Our innovations speak for themselves – World's 1st Autonomous Welding Robot, Solar 'Connectivity' Drone, and the Smartest Campus in the World, to name a few.

LTTS' expertise in engineering design, product development, smart manufacturing, and digitalization touches every area of human lives - from the moment one wakes up till the time one goes to bed. With 72 Innovation and R&D design centers globally, we specialize in disruptive technology spaces such as 5G, Artificial Intelligence, Collaborative Robots, Digital Factory, and Autonomous Transport.

The Innovation: LTTS AiKno®

AiKno® is LTTS home grown AI platform which is incubated within LTTS's CTO office's platform and solutions group. The AI platform need was envisioned as an accelerator to support services/business and thereby providing required growth to customers. Over various customer engagements and discussions, LTTS realized the need for an end to end AI based solution that can take data from various sources(structured, unstructured), treat the data and then apply various AI techniques to generate AI models to be deployed for use-cases like meta-data extraction, predictive analytics, image analytics, log analytics, chat bots, video analytics and others for engineering applications. This was addressed by having customizable and reusable set of components that can be assembled to solve variety of AI problems. AiKno® is built on 3 major pillars namely - Machine Learning (ML), Image Processing (IP) and, Natural Language Processing (NLP). It deals with variety of data that includes sensors data, image/video data and textual data thereby using one or more combination of three pillars of AI technologies. AiKno is capable to handle complex engineering data from variety of data sources in engineering domain. Each of the components are reusable, proprietary and API enabled. The cognitive framework helps in increasing accuracy of AI system through closed loop feedback. We have built our own OCR which is trained in more than 190 engineering symbols that helps in handling symbols used in engineering documents . AiKno has filed more than 35 patents as of today. It connects industrial assets, data, analytics, and processes to drive human-edge in machines to successfully navigate the Industrial Engineering challenges and give businesses the competitive edge. Powered by Machine Learning, Vision Based Computing, Natural Language Processing and strengthened by years of cumulative experience of LTTS experts, AiKno® is transforming by optimizing production, distribution, and field-services across all the industries.

The Approach

LTTS has developed a cognitive intelligence framework termed AiKno® which combines contextual intelligence and AI, enabling customers to leverage data and AI technologies to solve various engineering problems. It includes predictive analytics, intelligent virtual agent, image processing, data extraction, data visualization, cognitive framework, image and video analytics. AiKno components can be connected to provide customized solution for engineering use cases. The solution pipeline can be integrated with any application to achieve the critical business objective. Below are the major solutions that is developed using AiKno framework.

1. Smart Data Extraction
2. Predictive Analytics
3. Media Analytics
4. Intelligent Virtual Agent

The Benefits

- Data driven suggestive mechanism which leads to optimal decision-making process and thereby moving traditional applications into intelligent application
- Enhancing the edge AI capability for enhancing data driven approach across organizations.
- AiKno® based IP and LTTS in house domain expertise will provide early go to market which helps customer to realize their technical and business goals early as compared to others.
- The IP and patents created as part of our AiKno components and roadmap – enabling the IP revenue to the organization

The Future

To Bring in a set of standalone IP based products from AiKno as below:

- A Business user friendly Meta Data Extraction solution reducing the technical interventions for customizations.
- A self-service Predictive Analytics engine which can suggest the best model possible on the given data under the given constraints.
- A Media Analytics framework for auto-tagging of credits to ensure efficient search, with minimal manual efforts.

The Innovation: Asset Reliability Center (ARC)

All Industrial manufacturing organizations invest heavily on Assets and Processes to meet their business objectives. One of the primary challenge industry faces is how they can get the best out of their installed Asset base by extending its useful Life for reliable Operations. Many Industrial manufacturers have increasingly started to focus on investing in new technologies to transform and Improve their operations. Most of these Industry 4.0 and connected enterprise initiatives in the Industry are also based around Asset Lifecycle.

Asset Reliability Center (ARC) is a portfolio of 5 solutions and 1 Advisory service being offered by LTTS, to help Customers drive reliable Manufacturing operations with optimal performance by balancing Costs, Availability and Reliability of Assets. The ARC portfolio can help Asset-intensive manufacturers identify and then methodically address concerns related to Asset Reliability at Key Functional Levels - From Factory level to Asset component level. ARC Portfolio is a cohesive yet flexible offering for both Big and small Manufacturers; to select solutions in tandem or exclusively depending on their requirements and challenges.

The Approach

Improving asset reliability for manufacturing centers, requires a nuanced and holistic approach. Each solution or service within ARC portfolio identifies individual problems across functional levels and addresses shortfalls in Maturity of Engineering Data, Operations Compliance, Spare-parts and Procurement, Mfg. Process Reliability, Mfg. Asset Reliability and component-level Diagnostics. In addition to these variables, ARC also addresses a common pain-point of data transparency that is persistent across all levels. The ARC Frameworks sufficiently enhances the visibility of actionable data insights on existing assets, thereby introducing means to enact any meaningful improvements initiatives for asset reliability.

The Benefits

- Capability to address Asset reliability challenges under one wide Umbrella with flexibility to select from ARC “Solution bouquet” based on requirement
- Multiple Architecture options for deployment: On-Premise, Cloud, Hybrid and Partner Platform Integration
- Feasibility to deploy individual solutions in an “as-a-Service (aaS)” approach for greater speed-to-implementation
- Partner alliances with Microsoft, SAP, PTC, AVEVA, Siemens, Ignition and other technology providers, to suit needs of our Customers
- Identification of Priority Areas for Improvement for prompt results of Initiative
- Optimization of Maintenance and Inspection costs and Efficient Spares Planning
- Reduced Inventory and Procurement Costs
- Reduction in Overall Downtime and Improved Asset Uptime

The Future

Under the new normal; Importance of sustaining assets and ensuring their reliability has gained significant traction within our global Fortune 500 customer base, across varied industry segments. With projected market of $18.7 Billion by 2025 at CAGR of 10.7%; ARC is a unique offering with potential return in investment.

The Innovation: Chest X-Ray Imaging

Chest X-Ray Imaging is one of the most accessible and affordable radiological examinations to identify many pulmonary diseases and other thoracic diseases. In the current practice, the radiologist examines the chest x-ray and prepares a report that includes impressions and findings. This report, along with the patient history and additional tests forms the basis of treatment. With the advent of digitization, x-ray films turned digital, and handling and communication of this data became far easier than ever before. Therefore, new tools and technologies using Artificial Intelligence became necessary to equip radiologists to handle the large volume of image data. These tools would reduce radiologist workload to a significant extent without compromising quality of reports. Also, this would allow radiologists to focus more on complex medical image data analysis tasks and emerging multi-modality image data.

Chest-rAi is an AI-based chest X-ray analysis system to assist radiologists in improving the speed and accuracy of the diagnosis. It enables the Radiologists to identify the 10 (will be scaled up to 34) prominent lung symptoms related to various pulmonary and other thoracic diseases, using chest X-ray. The solution includes symptom detection, localization and generates reports for identified symptoms. Chest-rAi analyses chest radiographs using machine learning techniques to identify and highlight various pulmonary and other thoracic diseases. It is a deep learning system blended with a traditional radiologist approach of systematically examining a chest radiograph. It is built on hierarchical classifiers compared to state of art large multi-label classifiers along with visual indicators that can highlight the regions of interest specifically and Mobile & Web-based application to demonstrate above features.

The Approach

Chest-rAI is a deep learning system blended with a traditional radiologist approach of systematically examining a chest radiograph. It is built on hierarchical classifiers along with visual indicators that can highlight the regions of interest specifically. It uses active learning methods effectively to improvise the quality of the training data along with radiologist annotated validation sets. It demonstrates AI-based results using 2 types of login Hospital Radiologists and Individual Radiologists in both the web and mobile application. Radiologists can alter the results if they want to modify them and can share the reports with anyone using their preferable sharing platform.

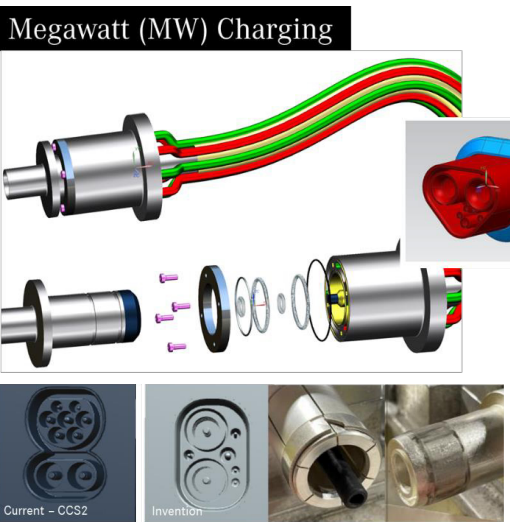
The Benefits

- **Radiologists:** The solution assistant improves efficiency of the Radiologists enabling them to use their time optimally. And generates contextual reports for predicted abnormalities to reduce the reporting workload by ~75%.
- **Patients:** It facilitates better care by fast triaging and providing more accurate radiological findings. The patients were able to get reports faster, reduces missed diagnosis by 5-6% and treatment enrolment time by 50%.
- **Medical Education System:** Automates reporting of negative cases & positive cases using the Chest-rAiTM solution is a great help to train future Radiologists on symptom identification, localizing areas of interest and standard report generation.

Conclusion and Future

It saves significant time (min 50%) by reducing efforts in analyzing and report writing and encourages WFX that finds relevance in the current pandemic situation. With defined input data set, Chest-rAiTM can be used to train the Radiologists on individual or combination symptom detection that aids in avoiding wrong reporting or missing any symptoms.

Mercedes Benz Research and Development India (MBRDI)



Established in 1996, MBRDI is the largest R&D center for Daimler outside Germany, working seamlessly for all business units of MB cars and vans. MBRDI engages close to 8000 professionals who work across design, CAE, embedded E/E, IT, AI, deep learning, cloud, and data analytics competencies, thus driving the digital aspirations of Daimler. MBRDI envisions to be the Centre of Excellence for Daimler in Engineering and IT domain and aims to provide the necessary digital tailwinds to Daimler, as the auto industry evolves into new era of driving and customer experience.

The Innovation

Our innovations highlight our talent, desire, and capability to deliver Innovations from India and put India on the innovation map for the world to take a note. Innovation for us, though being a part of a MNC in India, is a serious business.

Some of the exemplary Innovations designed and developed in MBRDI are described below:

- **Megawatt Charging Connector Assembly:** (for fast charging of electric vehicles) supporting high charging current up to 3000A, the innovative solution has potential to be a global standard (MCS 3.0), recognized by the global task force of OEMS and suppliers (CharIN). This will enable a car, as big as today's S-class with a range of 700km, to be charged in flat 3-4 minutes. Faster than filling fuel in a tank of 90 litre capacity.
- **MBUX Interior Assist:** Intelligent luxury, enabled by deep learning, through which the car can respond to body movements and gestures, intuitively operating the windows, controlling the lights, adjusting seat height automatically, and detecting occupants.
- **Xentry NVH Diagnosis:** Radically simplifies NVH Diagnosis through the sensors of smartphone by analyzing vibrations and noise in the car, thus empowering technicians, reducing warranty costs, improving retail efficiency, and lowering operating cost.

The Approach

We leverage both the centralized & de-centralized models to nurture a culture of Innovation.

The central team:

- defines a broad & inclusive Org. level strategy, formulates frameworks & methods for people to adopt & follow,
- enables platforms for learning, collaborations & experimentations and
- celebrates Innovators & Innovations alike.

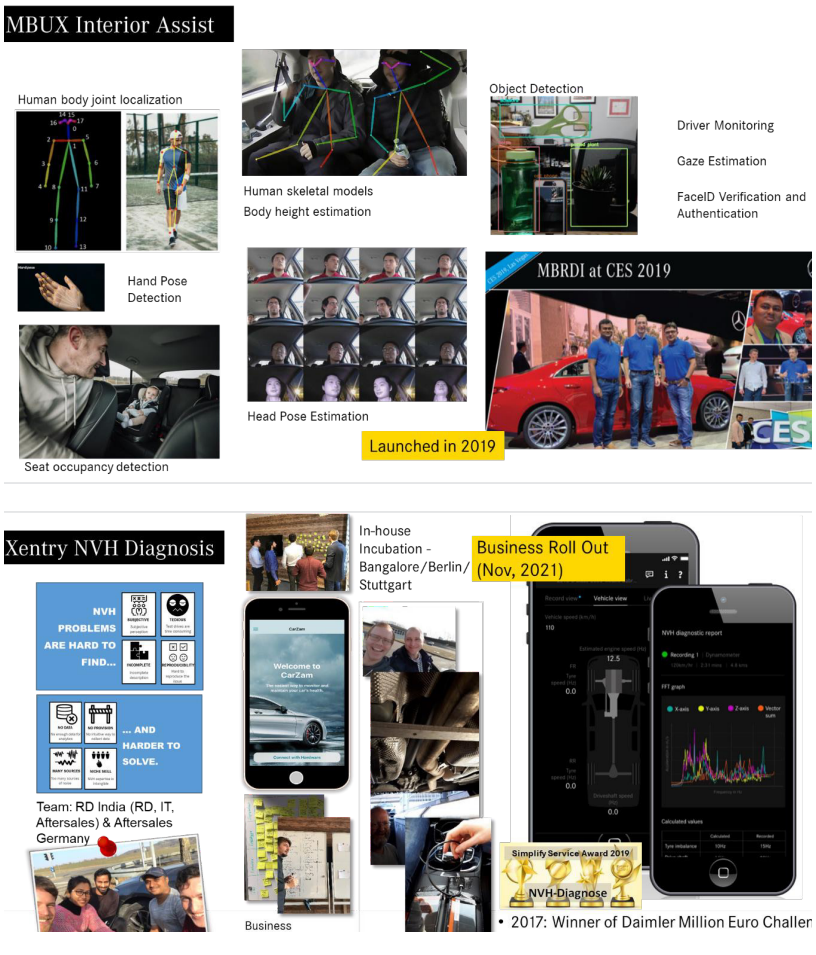
Our passionate engineers across depts. collaborate with Business stakeholders, internal & external eco-system players (Start-ups, Academia, Industry players) to experiment & ideate on key focus areas aligned with our Business strategy. We experiment with incubators, accelerators to nurture intrapreneurship culture helping us realize / pivot our ideas in fast-paced manner.

The Benefits

MBRDI over the years has been able to keep pace with its growth and its increasing patent count that has seen an increase in contribution in not only the conventional areas of product development but also in the emerging and exciting areas of Connected, Autonomous and Electric powertrain. These areas as widely acknowledged hold the potential to redefine the future of mobility. The innovations, highlighted above, already substantiate this point significantly.

The Future

MBRDI has always taken pride to be a digitally oriented organization that successfully has always managed to bring in the right talent mix with progressive skill sets. With the global strategy heavily relying on digital, MBRDI is fully equipped to build and design the products of the future.



Microlit

Established in 1991, Microlit is one of the world's leading manufacturers & exporters of laboratory liquid handling instruments. Our product range includes micropipettes, bottle top dispensers, electronic burette, electronic pipette filling device and other micropipette accessories. With our patented products, innovative technologies & unfaltering trust of 8000+ consumers in 65+ countries, we are recognized as a respected & dependable brand in Healthcare and Lifesciences industry. Our offices are located in India (HQ), USA & Brazil.

With a research-oriented & customer-centric team of product design engineers, our product design blends the best of functional performance & user experience. Our innovative products have helped us carve a niche in R&D industry while providing our users high level of precision & accuracy in their research work.

During the 30 years of innovation & constant product improvements, Microlit has stood by its vision of 'To be preferred choice of high precision liquid handling instruments'.

The Innovation

Innovation 1: First Miniature Micropipette in the world with 'Tip Ejector System' and Two-Step Plunger Operation

Lilpet Pro is a fixed volume miniature micropipette designed to be distributed as part of the diagnostic test kits and to perform sensitive laboratory operations with safety, accuracy and ease. It is optimally designed - 130 mm in length and 12 grams in weight, to fit inside test kits and in our users' hand ergonomically. The two-step plunger operation of Lilpet Pro enhances the accuracy of tests by enabling last drop dispensing. The presence of a tip ejector has extended the use of this mini pipette to the healthcare industry wherein it is extremely important to dispose tips without the risk of cross-contamination.

Innovation 2: Unique 'Single Operation Calibration Mechanism' in micropipettes

Microlit NERO is a next generation micropipette with patent-pending UniCal™ technology. The UniCal™ mechanism allows our users to re-calibrate their micropipettes conveniently in a single operation. This eliminates any trial and error as prevalent in the calibration procedures of other micropipettes. Users also do not need to disassemble the pipette for recalibration as is required by other single operation calibration procedures. Microlit NERO also has a unique µAir™ technology which ensures minimum dead air space between the piston and the liquid in the tip for improved accuracy and precision.

Innovation 3: Bottle Top Dispenser for Hydrofluoric Acid

Microlit LENTUS™ is a high precision liquid handling instrument engineered with carefully selected and tested materials for use with Hydrofluoric Acid, high purity media and acids and bases for trace analysis. Built by our in-house team of products design engineers, LENTUS™ houses Springless Valve™ technology for high chemical compatibility and the recirculation valve to avoid spillage of hazardous chemicals when the instrument is not in use.

The Approach

Our innovation objectives are defined based on the customer feedback and product lifecycle. For each new product/feature, in-depth analysis of market size, competition and scope of improvement is thoroughly studied. A project report is then created defining detailed product specifications, development time, target cost and necessary vendor collaborations. The prototyping step includes the development of core product technology to mitigate technology risks. We then proceed with industrial and engineering design adhering to product design guidelines to manufacture robust and aesthetically attractive products. Educating our users about the new features and technologies is also a key component of our innovation process.

The Benefits

Innovation 1: The presence of tip ejector in Lilpet Pro miniature micropipette has made it a perfect fit for the diagnostic test kit industry as it enables the disposal of pipette tips without the risk of cross-contamination.

Innovation 2: The introduction of UniCalTM Single Operation Calibration Mechanism in NERO micropipette has enabled quick in-lab calibration without using the hit and trial method. This has reduced the recalibration cost and time and has also enabled frequent recalibration.

Innovation 3: Microlit LentusTM has enabled safe and accurate dispensing of Hydrofluoric Acid and other corrosive chemicals in the lab at a minimal pricing.

The Future

In the near future, Microlit R&D will be focusing on electronic instruments and software innovation for workflow automation of our user processes. For instance, our 21 CFR compliant E-Burette software is a necessity for FDA regulated pharmaceutical customers to securely store and access their experiment data.

Nokia Solutions and Networks India Pvt Ltd

At Nokia, we create technology that helps the world act together. As a trusted partner for critical networks, we are committed to innovation and technology leadership across mobile, fixed and cloud networks. We create value with intellectual property and long-term research, led by the award-winning Nokia Bell Labs. Adhering to the highest standards of integrity and security, we help build the capabilities needed for a more productive, sustainable, and inclusive world.

In India, Nokia has been connecting people since 1995 - the first GSM call was made on a Nokia handset over a Nokia built network. From enabling growth of the 2G technology, bringing high quality 3G services, pioneering 4G to now steering India towards the 5G revolution, we have been an integral part and celebrate this journey of 25 years of mobile telephony in India. The manufacturing operations, global delivery centers and research and development setups in India reflect Nokia's unwavering focus on the country and enhanced proximity to its customers.

The Innovation

1) NWCC Enhancements:

- Dense environments, like apartment buildings, introduce specific Wi-Fi challenges: multiple CPEs operate close to each other, some of the frequencies are over-utilized. Network-wide channel management tackles these issues. An AI-based algorithm groups CPEs and processes them together. Benefits are Wi-Fi radio is used more effectively, Wi-Fi 6 BSS Coloring can be applied, and manual intervention not required.
- NWDS (NWCC Deployment Server) is an automated NWCC lifecycle management and orchestration platform. Reduces NWCC deployment time from 3 weeks to 2 days. Turnkey solution providing change tracking, upgrade and scaling capabilities. Also provides integrated monitoring and alerting solution and Cost Optimization recommendations

2) RAAR (Repair using Analytics and AR):

- 5G Radio products have complex product design, leading to bigger size Printed Circuit Boards, with over 17000 components/board. During trials and volume manufacturing, troubleshooting and analyzing for defects/failures was arduous. RAAR is a solution that combines Analytics – to provide first base statistics of product and historical failure analysis and Augmented Reality – that augments the board to real-time defect module and guides operator to interested location instantly. The application enables operator to access corresponding troubleshooting guidance and allows random component search for better analysis. This reduces overall repair TAT and improves operational efficiency.

3) Smart Spare Management:

- Chennai Factory uses >300 Testers for radio product manufacturing. These Testers perform testing at different stages of production consisting of multiple spare parts which may require replacements to ensure continuous production. Engineers spent >60 min on average to complete the maintenance/ downtime activity. Sometimes, wrong spares were also retrieved which further delayed process. SMART SPARE Management enabled faster retrieval of spares. The request for spares is raised through a spare management portal. The spare inventory status is available real-time through IoT devices connected to the Spare storage racks. An audio and visual alert is raised in spare room which allows fast, easy and accurate retrieval of spares(<1min). Entire system uses wireless pLTE connectivity for data transfer and communication.

The Approach

Vision

An agile and smart Manufacturing Service, fully automated and green that is self-learning and able to predict and prevent: “The Conscious Factory”

Mission

Being a trusted innovative partner providing cost-effective and time to market advantages to business groups and customers using DART+C transformation to support new product introduction, volume, and end of life production.

DART+C (Digitalization, Analytics, Robotics, Transparency, Connectivity) strategy is used to drive innovation mind set based on our stakeholder inputs/expectations. We collaborate with our ecosystem partners to drive innovation to bring in new products and services. Our ecosystem partners include Nokia Business Groups, External Technology Partners & University Partners.

The Benefits

Nokia WiFi Cloud Controller (NWCC) – Network wide Channel Management:

- WIFI load is distributed equally across all channels in the radio band for a group, Majority of channel change is triggered only once per day to CPE, Channel congestion is avoided by balancing CPEs across different WIFI channels.
- NWDS reduces NWCC deployment time from 3 weeks to 2 days which is 86% improvement in the deployment lead time.

RAAR Repair Using Analytics and AR:

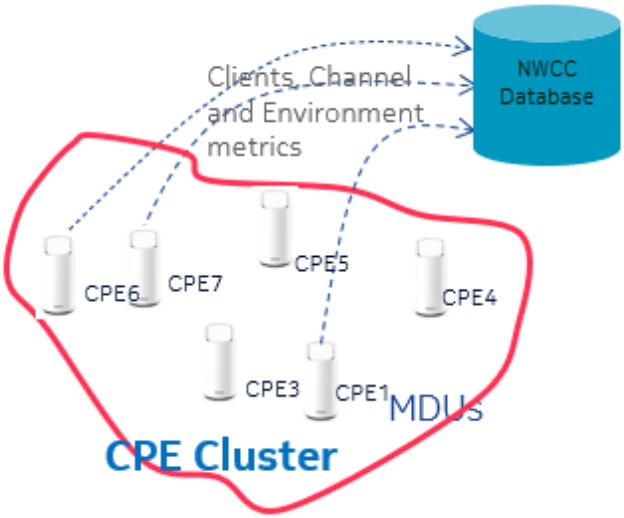
- Repair TAT for complex 5G boards reduced from 7Hrs. to 60min
- Instant location of suspected components
- Historical data analysis eliminates multiple data source dependency

Conscious Spare Management:

- 95% reduction in spares retrieval time
- 30% reduction in MTTR(Mean Time To Repair)
- Zero Picking Error
- Easy Scalability of the solution due to wireless connectivity.

The Future

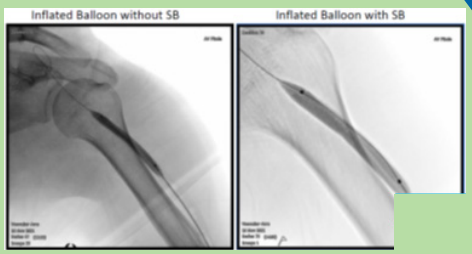
- **NWCC** - Add machine learning algorithms to continuously learn environment and tune the WiFi performance
- Implement **RAAR in the early phase of product design/prototyping** to enable further reduction in time to market
- **Smart Spare Management** - Scale up pick to light solution to other areas in manufacturing and offer it as a solution to enterprise customers

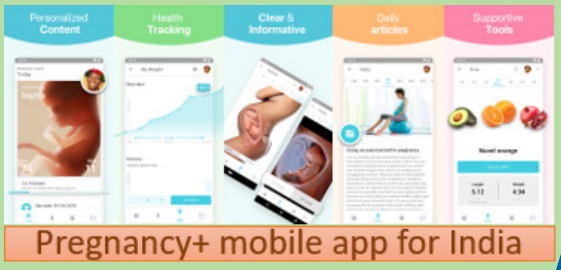


Smart Spare Management:

PHILIPS

Philips





Pregnancy+ mobile app for India

Established in 1996 as a top-notch software research and development organisation of Royal Philips, Philips Innovation Campus, Bengaluru (PIC-B) has been developing meaningful innovations for over two decades, with the purpose to improve the lives of 2.5 billion people a year by 2030. Over 4000 professionals are working on innovative solutions across the healthcare continuum to improve people's health. With an inclusive and diverse global culture, PIC-B offers a unique and thriving work culture for all its professionals having passion to make a difference.

The innovation campus plays a strategic role creating customer-centric products and solutions, leveraging on digital technologies, advanced SW engineering, catering to markets of India, Japan, Middle East & Turkey, APAC and Africa. It is a global development center for multiple business innovating from global, this hub is supported by a front-end research team, design team and a strong Intellectual Property & Standards (IP&S) group, making it a center of distinction. As PIC-B marks its 25th year milestone, its focus is to accelerate the digital solutions journey of Philips.

The Innovation

Philips StentBoost Mobile

StentBoost Mobile is a software product that runs on compatible Philips Zenition series mobile surgery interventional X-ray systems. It is a unique medical software interventional application (iApp) with the powerful capability of improving visualization of stents in arteries during endovascular interventions.

This innovative medical software interventional application (iApp) produces a high resolution image of a deployed stent in vessels, while the catheter is still in place. The StentBoost Mobile image confirms stent deployment and allows better visualization of other objects, such as previously placed stents. StentBoost Mobile is a simple and quick application that enables vascular surgeons to take any corrective action required immediately, while the patient is still in the examination room. Compared to other invasive imaging techniques that require expensive consumables, StentBoost Mobile offers verygood value for money. StentBoost Mobile images can be transferred to the host Zenition system for archiving it to its internal database or to an external PACS server.

The basic principle of the system is that after a series is made with the markers of the stent or balloon delivery catheter in place, StentBoost Mobile automatically detects these markers in all frames of the exposure series. StentBoost Mobile centers the frames of the acquisition series based on the markers. It then integrates the image content. This results in enhancement of even the smallest contrast objects in the image, such as stents or calcifications, and reduced noise of the surroundings. Basically, as long as there are two markers in place, StentBoost Mobile can enhance any contrasting material in the direct environment of the markers.

The Approach

1. Developed by Philips Innovation Campus IGT Mobile Surgery team (Bangalore) and Philips Healthcare Innovation Campus Mobile Surgery team (Pune)
2. Enhances stent visualization to support precise stent placement and deployment using the patented StentBoost Algorithm of Philips Image Guided Therapy Netherlands adapted for cost effective Mobile C-Arms
3. Saves Time and Money for Customers and Patients
4. Saves Time: Images are available in seconds to support fast decision making
5. Subtract enables fine control of positioning by visualizing the stent in relation to the vessel wall

The Benefits

1. First to market Stent enhancement software medical device available for Mobile C-Arms
2. Improved Stent visualization while Catheter is in place with following clinical applications - Post-positioning, Balloon positioning, Combined stents, Stent in stent, StentBoost Mobile Subtract
3. Noise reduction of Images in the enhanced Stent view in-surgery

The Future

StentBoost Mobile is currently deployed in North American markets and the plan is to deploy in Europe and Rest of the world by 2022. Future enhancements to StentBoost Mobile planned include deployment on next generation products of IGT Mobile Surgery.

The Innovation

Philips Pregnancy+ App

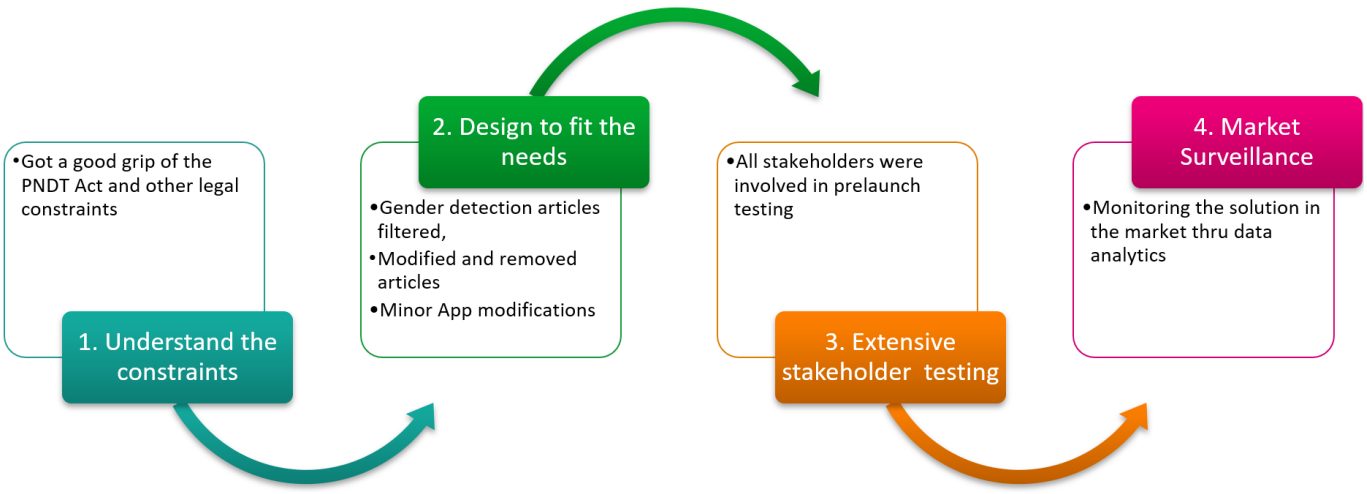
Pregnancy+ mobile app features expert advice, daily blog articles, mother care tips and interactive 3D models so parents-to-be can track baby's development. The tracker app can be personalized so parents, the future grandparents and family can join in on the fun. Family circle will be able to follow baby's development in the womb and be up-to-date with pregnancy progress. (note: this app is not intended for medical use, or to replace the advice of a trained medical doctor.)

Key features include:

1. Interactive 3D models showing baby's development (from blastocyst to fetus to baby)
2. Detailed pregnancy week by week guidance on what to expect in each week of pregnancy
3. Baby size visualizer: Track baby's size in fruits, animals and sweets
4. Hospital bag tool to prepare the woman during the 3rd trimester
5. Kick counter
6. Contraction timer
7. Pregnancy weight log
8. Daily pregnancy info
9. Customizable birth plan
10. Pregnancy calendar
11. To-do list
12. 1000s of baby names
13. Pregnancy due date calculator
14. Baby shopping list
15. Pregnancy diary to keep track of prenatal appointments
16. Daily blog posts

The Approach

The Philips Pregnancy+ app was developed by the team in India for global release in collaboration with UK and Malaysia teams. While the app was enjoyed by global users, it needed adoption based on PNDT act in India. (The PCPNDT Act prohibits sex selection, and to regulate pre-natal diagnostic techniques for purposes of detecting genetic abnormalities/ metabolic disorders/ chromosomal abnormalities/ certain congenital malformations and for the prevention of their misuse for sex determination leading to female feticide). Pregnancy+ mobile app was revamped to comply to the Indian law by adopting the existing articles and content for PCPNDT regulations and bottle-feeding guidelines.



The Benefits

Parents-to-be are quite anxious and eager about the change that is going to come in their life.

1. This app gives the freedom and ease to keep tabs on everything related to the health and wellbeing of mom and baby-to-be
2. Mom can visualize the baby growth through 3D models and feel assured
3. Never miss an important task/activity related to pregnancy – helped by various built-in tracker like Kick counter, weight log, birth plan etc.
4. Mom gets the information needed through all the trimesters and at the right moment based on the baby's growth. She need not go through plethora of articles.

The Future

Grow the reach of the app to 3 lakh monthly active users by Q1 2022 from current of 0.9 lakh monthly active users. Understand exact needs of Indian mothers-to-be and provide AI driven hyper personalization. Making the app and its content available in multiple Indian languages. Beyond 2022, build proposition to serve pregnant women with high risk by partnering with health care providers and payers.

Reliance
Industries Limited
Growth is Life

Reliance Industries Limited

Reliance Industries Limited (www.ril.com) is a Fortune 500 company and the largest private sector corporation in India. We are a significant global player in the integrated energy value chain and have established leadership position in the Retail and Digital Services business in India.

Over the past four decades, we have emerged as a stakeholder-centric organisation, building for India, and innovating for India. Driven by a set of timeless values and a contemporary vision, we have created three hyper-growth engines that align with India's needs of tomorrow.

The Innovation

- On-line Adsorptive Technology for the Purification of Thermic Fluids
- Adsorptive Technology for the Purification of NMP & Sulfolane Solvents used for Aromatic Extraction
- Catalytic Technology (RELOX) for oxidizing volatile organic compound from nitrogen used in solid stet polymerization of Polyester Resin
- Catalytic Technology (REL-ORCAT) for Olefins removal from BTX Stream in Aromatic Plants
- Innovative product, RelFarmS, as a soil nutrient and for sodic soil amendment from Refinery Sulphur
- Patents filed/granted in India and abroad on all the innovations mentioned above.

The Approach

Our innovative projects are run under stage gate framework having embedded risk management component at each stage of the project to take care of any unforeseen uncertain situations. This helps us dealing effectively with typical risks such as regulatory, intellectual property, market, technology, safety, manufacturing, financial etc.

The Benefits

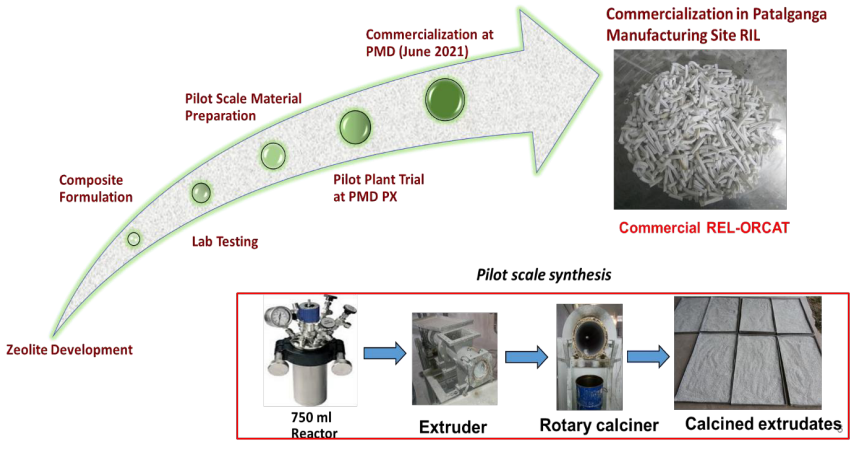
The cost benefit is ~ 150 Cr by in-house development and commercialization of catalysts/adsorbents in the Reliance manufacturing sites. The other benefits are improvement in operation reliability, safety, reduce import dependency and improved product quality.

The Future

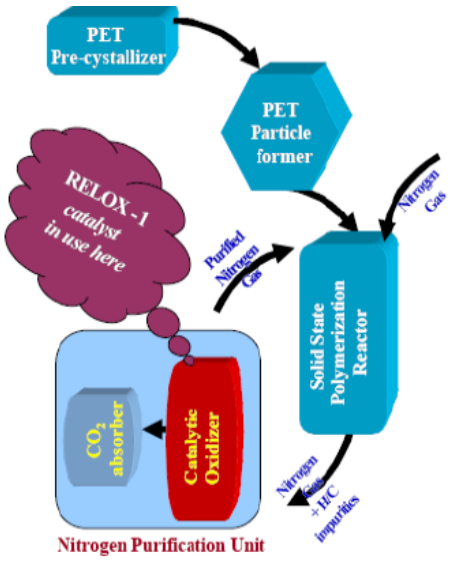
The future focus would be to develop technologies in areas such as circular economy, oil to chemical, new materials, bio innovation, greener petrochemical processes, affordable & clean energy options. The major goals would be to transition into a net carbon zero company by adopting green technologies/alternate energy & bringing improvement in sustainability through decarbonization initiatives.

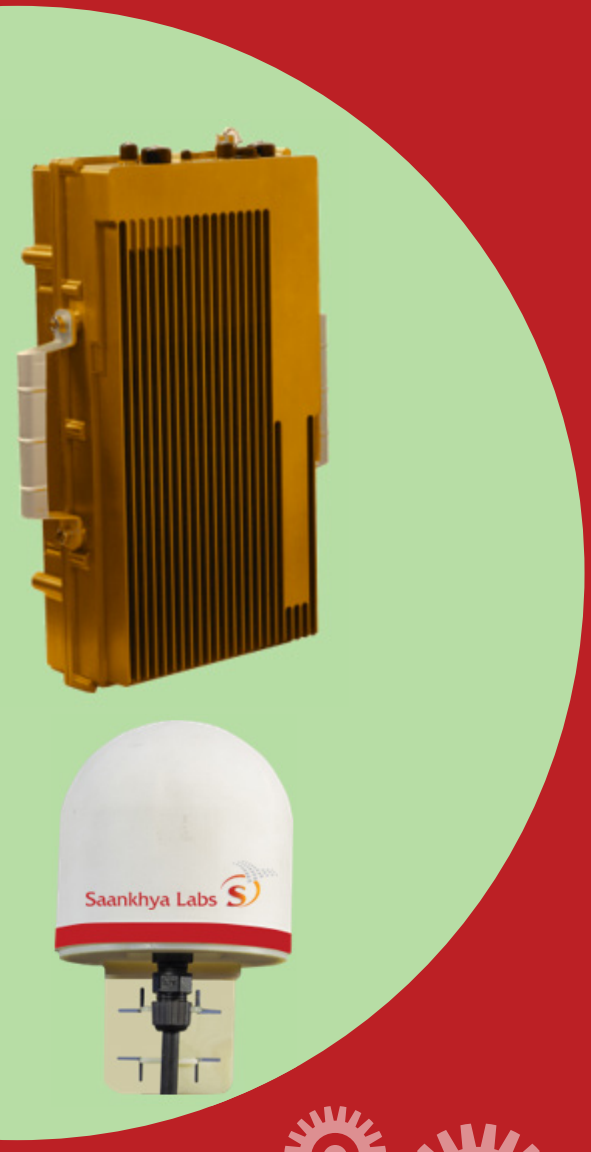
- **Commercialization of RELAD-TF Adsorbent at RIL Manufacturing Sits for Thermic Fluid Purification**

- **REL-ORCAT Catalytic Technology for Olefin Removal from BTX Stream in Aromatic Plants**



- **RELOX (Oxidation) Catalyst at Polyester Resin Plants, Hazira**





Saankhya Labs

Saankhya Labs is a disruptor and a leader in wireless communication solution. As a wireless communication solutions and semiconductor company, we have developed end-to-end communication platforms with three focus areas – 5G NR, 5G Broadcast and Satcom. The solutions are powered by award-winning, patented Software Defined Radio (SDR) chipsets.

Saankhya's strong and diversified expertise in VLSI Architecture, Cloud and Virtualization Solutions, RAN Infrastructure, DSP Software, Mixed Signal RF & Systems engineering, Application Development and Field Testing makes us one of the most focused, vertically integrated wireless communication solutions company in the industry today.

With several international technology patents and unique 'chips-to-systems' expertise, Saankhya's solutions include world's first production SDR, next gen open RAN Solutions for 5G networks, multi-standard DTV modulators and demodulators, satellite communication modems for IoT applications and many other award-winning solutions. We are developing future ready communication solutions for tomorrow and beyond.

The Innovation

Saankhya Labs has developed a variety of innovative products and solutions. Some of our innovative solutions include

- **SL-3000** is a full featured, front end system-on-chip powered by Saankhya's award winning, patented Software Defined Radio (SDR) architecture. They can support multiple waveforms. The Ultra-Low Power, Small Footprint Chipsets with advanced computational capabilities can be used in wide spectrum of applications.
- **Broadcast Radio Head (BRH)** is next-gen Digital Terrestrial Transmission system. BRH is deployed in Low Power Low Tower (LPLT) configuration instead of the traditional High Power High Tower (HPHT) configuration. This enables efficient spectrum reuse. It cellularizes the broadcast transmission and provides ubiquitous coverage both indoor and outdoor to support Direct to Mobile reception. It can be used to broadcast variety of content including video, software and firmware upgrades, OTT content, emergency alert messages, public safety announcements etc.
- **Broadcast Media Distribution Platform** is a software solution which enables direct delivery of content to mobile devices over the broadcast network. It is the core of the 5G Broadcast solution which is based on the convergence of broadcast and broadband networks.
- **Navdoot** is a 2 Way MSS Terminal which is installed in fishing vessels. It is a compact lightweight, low power terminal. It enables satellite based real time tracking of fishing vessels and allows fishermen in deep sea to communicate with shore.
- **5G RU** are multiband 5G Remote Radio Units based on ORAN 7.2x split. They are highly integrated radios which are physically compact, light weight and suitable for outdoor deployment. The Radio Units can be integrated with 3rd party ORAN 7.2x compliant DUs to form gNodeB providing high speed data, mobility, voice and broadcast/ multicast services to meet the demand of 5G NR mobile carriers

The Approach

Saankhya's approach to innovation is development of future ready communication solutions which fulfill a market need or demand. Our leadership team works with the employees and proposes a vision for the development of the products and solutions. Our approach to innovation is to look beyond the obvious and think big in order to overcome a specific industry problem. Our main motto is to bring differentiated products through industry leading innovation We also extensively collaborate with industry and academia as well as with our end customers to develop innovative products and solutions.

The Benefits

The innovative products and solutions of Saankhya Labs are beneficial to end consumers.

- **SL 3000** The Software Defined Radio (SDR) architecture enables the same chipset to be used in wide variety of applications through simple software change. These applications include broadcast, satcom and 5G
- **Broadcast Radio Head** The BRH enables Direct to Mobile reception with ubiquitous coverage indoors and outdoors. It reduces total cost of ownership of cost of TV network by reducing capex and opex by over 20%
- **Broadcast Media Distribution Platform** The solution offloads the heavy video content from broadband network to broadcast network, thus decongesting the mobile network
- **Navdoot** It can help fishermen get weather alerts, potential fishing zone alerts, GIS and Mapping data, shore to ship and ship to shore communication etc. They can also send SOS messages in case of emergency.
- **5G RU** They minimize the physical footprint and power consumption and help an operator reduce capex and opex.

The Future

Saankhya Labs will continue to work with our partners and customers and develop innovative communication products and solutions. Some of the products and solutions in the pipeline include next gen chipsets, radio units, cognitive RAN solutions and Sat IoT modems and gateways.

Spice Healthcare Private Limited

Spice Healthcare Private Limited ("SpiceHealth"), is one of India's fastest growing healthcare service providers with the mission to provide world-class healthcare services at affordable prices to the masses. We believe that Quality Healthcare is a Human Right, and thus, we are striving to provide accessible and affordable healthcare and diagnostic services across the country.

Spice Health was conceptualized during 2020, when Covid-19 was at its peak and the need of affordable and accessible healthcare without compromising on quality, became abundantly clear.

We launched in November 2020 by disrupting the market of RT-PCR testing in the country with country's first ever NABL & ICMR approved Mobile RTPCR testing laboratory. At a time when an RT-PCR test cost, on average, Rs. 2400, and the country was running out of capacity, we built mobile laboratories each with the capacity to process 3,000-4,000 tests per day at only Rs. 499. Impressed with our vision & innovative offering our first laboratory was inaugurate by Hon'ble Home Minister, Shri Amit Shah & Ex-Hon'ble Health Minister, Dr. Harsh Vardhan.

So far, we have conducted more than 5 Million tests across New Delhi, Haryana, Maharashtra, Uttarakhand and Kerala, Assam, Tamil Nadu, UP, Punjab making us the fastest growing diagnostics company in the country. We have marked our presence across 14 cities with 16 mobile and static RTPCR & pathology labs & have also set up vaccination centers across 5 state.

The Innovation

Revolutionized the Covid-19 & RTPCR testing & healthcare industry by:

a) Launching the Country's First ever NABL & ICMR approved high throughput laboratories, with each laboratory with a capacity of conducting 3000-4000 tests a day and report within 24 hours as compared to usual 24-48 hours.

b) Offered the RTPCR at Rs. 499 only when other laboratories were offering the test at Rs.2400 plus across the country – Brought the price down by 80%.

c) Launched the country's first ever Genome sequencing laboratory, to identify new strains.

d) End-to end IT integration & digitization of testing process right from sample collection to processing to reporting through Unique Spicehealth App & software.

e) First & only company to have API integration with ICMR for reporting- Thus as soon as a sample is processed it's reported to the customer, state authorities & ICMR in real time basis.

f) Expanding in Mobile pathology & TB testing labs & smart health centers to further support the healthcare infrastructure by providing affordable, accessible, quality healthcare services to the country.

The Approach

When Covid-19 was at its peak, India's faced a massive challenge: how to trace, test and treat its population to slow down the spread of the disease.

SpiceHealth on realization of the same & after months of R&D found some glaring gaps:

a) Lack of enough laboratories in the country made the test inaccessible.

b) Non-availability of high throughput labs : not nearly enough to serve 1.3 billion people

c) Insanely high cost of the most essential test – Priced at Rs.2400-Rs.4800.

d) Usual long reporting time of 24-48 hrs.

Thus Spicehealth came up with a low cost, mobile, high through set-up with launch of India's first Mobile RTPCR labs, each with the capacity of 300-400 test a day reporting with 12 hours & offering the test at only Rs.499. Making tests Affordable, accessible & faster, and could easily set-up even in the remotest parts of the country on short notice.

The Benefits

a) Brought Paradigm shift in RTPCR pricing: We brought the Price down by 80% by offering the test at Rs. 499 when others labs were still charging Rs.2400 plus. This lead the governments relook & bring down the price of RTPCR across the country.

b) Covid testing made Accessible: Ensured to make the test accessible for all, as our Mobile laboratories could reach the remotest parts of the country, thus ensuring the testing to be made available across the country.

c) Helped in break the chain: IT driven end-to-end integration ensured within 12-24 reporting the reports that were being in real time basis with the patients, state authorities & ICMR. Thus supporting the early tracking, tracing & isolating technique implementation by the state authorities to break the chain.

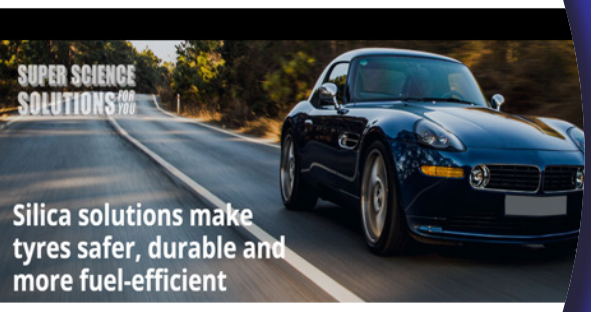
d) Vaccination centers to further curb the spread: Also we set-up vaccination centers across the country to further support the fight against Covid.

The Future

The company aims to disrupt the healthcare sector, through affordable, accessible and innovative healthcare solutions and IT development.

We are working to use our mobile model of bringing the lab & smart health clinics to the patient at affordable prices beyond Covid-19. We also intend to bring new technologies in the field of oncology, radiology, infectious disease screening from countries like the US, Germany, Israel as well as from domestic research laboratories to the masses at affordable prices and at a large scale. SpiceHealth also committed to play an active role in PM Modi's plan to eradicate TB by 2025.

Tata Chemicals



A part of the over $100 billion Tata Group, Tata Chemicals Limited is a global company with interests in businesses that focus on essentials for LIFE: Living, Industry and Farm Essentials. The story of the company is about harnessing the fruits of science for goals that go beyond business. The Company manufactures inorganic chemicals, crop protection, agriculture inputs, and nutritional solutions.

The company has a strong position in the crop protection business through its subsidiary company Rallis India Ltd. Tata Chemicals has world class R&D facilities in Pune and Bangalore.

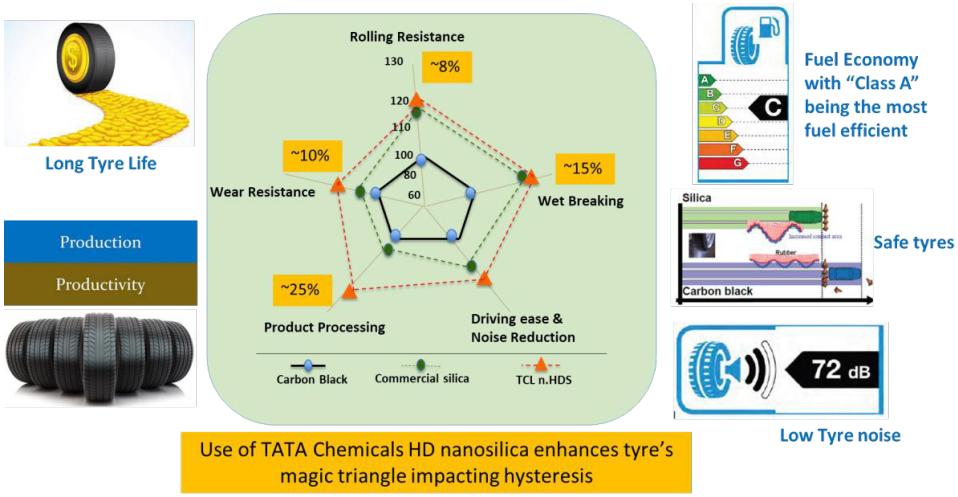
Our Innovation Centre, today, is home to world-class R&D capabilities in nanotechnology and biotechnology.

- Delivering high performance for stakeholders
- Caring for the community
- Nurturing a committed and passionate workforce

The Innovation

High Dispersible Silica:

High dispersible silica is majorly used as filler in energy efficient tires to improve the mileage of vehicle. Green tire is a new product concept and consumers are not yet fully aware of all benefits associated with the energy efficient tire such as lower rolling resistance (better fuel efficiency), improved wet grip (safe tyres) and improved abrasion resistance (longer tyre life). TCL has developed patented technology to make the HDS from rice husk ash (An agri waste) for developing the green tyre. The use of TCL developed high dispersible nanosilica lends excellent reinforcing effect by reducing the heat build-up & rolling resistance of tyres. Novel method of synthesis, customization of structure, morphology, particle size, surface area & particle porosity makes it unique for making greener tyres and replacing carbon black. We have demonstrated the positive impact of HD -nanosilica in the tyre performance with improved tyre life (10% higher), wet traction (15% improved) & vehicle fuel efficiency (by 4-6%).



Use of TATA Chemicals HD nanosilica enhances tyre's magic triangle impacting hysteresis

Fructo-oligosaccharides:

Fructo-oligosaccharides (FOS) are the prebiotic dietary fibre to address lifestyle related disorders such as obesity, diabetes, digestive and cardio-vascular ailments becomes major concerns in recent times. TCL's Innovation team developed fermentation based, solely indigenous, patented, economically viable and competitive process for production of FOS. The process allows 65% yield compared to global benchmark of 55%. Technology allows transforming sugar into a prebiotic molecule used as a sugar replacer without adding any calories. FOS is a dietary fiber and replaces sugar without adding calorie. TCL FOS is being used in sugar free Chyawanprash during pandemic.

The final product was >95% pure using Sequential Simulated Moving Bed Chromatography (SSMB) and produced non-hygroscopic, free flowing, highly dispersible powder using three stage drying technique, both the technologies are first of its kind in India.

TCL has commissioned their world class, state of the art, cGMP & CFR-21 (Part-11) compliant FOS manufacturing facility with production capacity of 5000 MT of highly purified FOS per year. TCL is leading player in Indian market with ~ 60 % market share.

Tata Hitachi

Tata Hitachi, one of India's oldest construction machinery companies and largest excavator company, is a joint venture between Tata Motors and Hitachi Construction Machinery (HCM). The partnership with HCM commenced in 1984 and is today one of the longest-standing JVs in the industry. The company has a manufacturing presence in Dharwad and Kharagpur and over 240 customer facing touchpoints including sales and service.

Set up in 1961 as the Construction Equipment Division of TATA Engineering and Locomotive Company (TELCO), today, the company boasts of a diverse portfolio of mini excavators, construction excavators, mining excavators, backhoe and wheel loaders, and dump trucks, apart from a wide range of attachments, all catering to a broad range of applications. The company also offers industry-best options for after sales services like Annual Maintenance Contracts, Full Maintenance Contracts, Site Support Agreements, and more. This year marks the 60th year of operations of the company.

The Innovation

Tata Hitachi fosters a culture of innovation led by the top management, which adheres to the vision of the company, while at the same empowering managers also to take critical decisions. At the fulcrum this is the company's stated customer-centric philosophy, and a drive to localise and indigenise. Such innovation encompasses process improvements, cost reductions and product-enhancements. This culture of innovation is institutionalised through an innovation management system and Innovation policy. The company's leadership drives Innovation at all levels by:

1. Raising the bar; setting stretched targets
2. Creating Platforms for innovation, allocating resources
3. Active participation and involvement
4. Reviewing progress, providing feedback
5. Debottlenecking
6. Encouraging workforce to take risks
7. Ownership of ideas by Senior Leadership
8. Rewarding & recognizing good work.

Tata Hitachi's culture of innovation is institutionalised through a process of collaboration and knowledge sharing. Dedicated sessions are conducted for learning and development. These include bulletins on latest information housed on our portal, management addresses and Executive Committee meetings with functional and vertical heads to share best practices and new initiatives, interactions and learnings between functions through Obeya/Kobeya reviews, knowledge sharing sessions, SGA reviews, Kaizen reviews, Sambandh-Newsletter, Hitachi-Newsletter.

Innovations are maintained in portfolios like Kaizen, Cost reduction initiatives for sustained profitability (CRISP), Small Group Activity (SGA), Value Engineering (VE), functional improvements etc. Cross-learning and deployment is facilitated through platforms like 'Yokoten' (Horizontal Deployment) Newsletters, Obeya/Kobeya (KPI-visualization), Intranet, TPM-circles, Ochibo (learning from mistake), Regional-meet, Consite-Conference, CFT-reviews and Department reviews, Hitachi-JDTs.

The Approach

Tata Hitachi also uses basic principles of Knowledge-Creation, Storage, Dissemination, Application for knowledge management through various knowledge sharing platforms like Intranet, Market survey, Competitors' benchmarking, voice of customer, JV partner (Hitachi), concept reviews, design reviews, vendors & in-house capacity analysis, Work Instructions, Cost War-room, TPM, SOPs, OPLs, Training manuals.\

Also at play is the company's active collaboration with group partner TATA Motor and external agencies like industry and trade bodies, multi-lateral organisations and institutions of excellence in academia and R&D to maximize the value of our innovation. We also subscribe to publications, among others to gather business and market intelligence. Other sources include Tata World, Hitachi University, Exhibitions, Industrial visits etc.

The Benefits

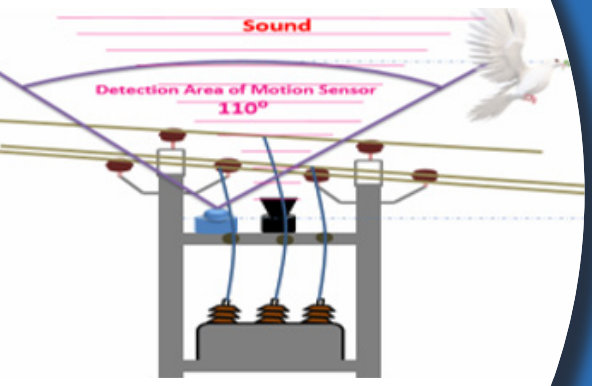
On the back of this culture of innovation, the company has introduced 25 new-to-market and 35 new-to-firm products and services, apart from garnering 4 patents, one design patent and 4 trademarks. In addition, the benefits that accrue can be enumerated across several levels as well as stakeholder groups. These include areas like focused cost-reduction, CFTs, Kaizens- Knowledge gained about new-supplier-base, new manufacturing-technologies, Value-Addition, Value-Engineering, Localization, Logistics-optimization, automation, digitization, control-plan, OPLs, worksheets, training-manuals, integrated across products & plants.

Advantages also include Design-Learning like engine-emission controls technologies, SMEs, accelerated testing-EP-bench test, Field-debugging test with remote-monitoring through Machine control system, Use of alternate materials like Carbon-fibres, polyamides.

In addition, rewards also accrue to stakeholders such as employees, who are rewarded for superior performance through significant difference in performance-bonus and salary increase, fast-growth scheme, performance-based promotions, job-rotations, Job-enrichment, leadership training, special projects for high performers along with nomination to Hitachi-group competitions, CII competitions and internal competitions. Contributions also recognised through Performance Redefined thru Ideas for Driving Excellence (PRIDE), Kaamyabi R&R schemes.

The Future

Tata Hitachi believes in a customer-centric approach, with a deep focus on indigenisation. This extends to the culture of innovation in the company, which is bolstered through a rigorous process of collaboration, knowledge-sharing and reward mechanisms for success. This philosophy has held the company in good stead in terms of market standing for sixty years since its incorporation. Going forward, Tata Hitachi seeks to build on these to consolidate its position as a company valued by its stakeholders, both internal and external.



Tata Power - DDL

Tata Power Delhi Distribution Limited (Tata Power-DDL) (earlier North Delhi Power Limited) took over the license to distribute electricity to the North & North West part of Delhi through a competitive bidding process initiated to reform the distribution sector. The organization was incorporated in July 2002 as a JV of Tata Power (51%) and Delhi Government (49%) on the Public-Private Partnership (PPP) model. The company changed its name from North Delhi Power Limited to Tata Power Delhi Distribution Ltd. in November 2011, to signify the direct relationship with the Tata Power Company Limited, and thus to significantly leverage its Tata lineage for enhancing sustainability and growth of business. The company has achieved unprecedented reduction in AT&C losses since inception bringing it down from 53.1% in July 2002 (during takeover) to 7.86% at the end of FY 20. At present, Tata Power-DDL has presence in India in nearly 15 States & UT and working with 20+ Discoms including Goa, Haryana, Uttar Pradesh, Chhattisgarh etc. as well as in International cities such as Benin, Eko, Kaduna, Kano etc. Tata Power-DDL is the first Indian utility to be a member of Global Intelligent Utility Network Coalition (GIUNC) which is a coalition of 14 power utilities worldwide and is working towards accelerating the development of common standards, technology solutions and processes for intelligent networks. Tata Power-DDL is focused and committed to the road ahead and is exploring new opportunities to replicate its experience of distribution reforms both in India and abroad. It is leveraging its unique learning and skillsets solely and in collaboration with leading utilities and technology providers like GE, IBM, Enel, Omron, 3M, Panasonic, AES, Mitsubishi etc. in the areas of communications & smart grid technology, change management, consumer service delivery and business process re-engineering. Tata Power-DDL has also collaborated with leading international and national Institutions like Harvard, MIT, Reyrson University, IIT Delhi, Punjab Engineering College, Delhi University, Netaji Subhas Institute of Technology etc. to carry out research activities in energy space.

The Innovation

Motion Sensor Detectors for reducing bird electrocution:

A large portion of 11KV network in Tata Power DDL is Bare Overhead type, that is 60%, and there is more than 27 thousand pole mounted transformers. The bare overhead network and pole mounted DTs are more prone to faults due to external factors one of which is bird electrocution. This result in unscheduled power cuts which in turn impact reliability, customer satisfaction, revenue loss due to unserved energy. Which can cause 0.1056 million unit loss at the rate Rs 10 in six months. Tata Power-DDL developed a Motion Sensor Detector that is an electronic device developed in-house using PIR sensors and Arduino costing, to reduce faults due to birdage on selected double pole structures by 70%. This device detects motion of birds over Double Pole Sub-Station, Overhead Lines, and other bare arrangement of Distribution system. The arrangement have a siren, after motion detected by Motion Detector the output pulse is given to siren producing an irritating sound of horn which deflects the birds, which in-turns saves the lives of birds and stops interruption.

Statistical Model for Load Estimation using Artificial Intelligence (AI):

Future demand prediction is an important aspect of electricity distribution business as it enables the utility to proactively design its network in a way that it is robust enough to withstand the increasing demand. Quality of proactive planning hinges on accuracy of demand prediction. The earlier approach of year on year load growth calculation using peak snapshots was only 57% accurate resulting in over and under planning of the network, which in turns resulted in decrease in reliability and unnecessary CAPEX investment.

In Tata Power-DDL, In order to enhance accuracy of load estimation, Statistical Model has been developed. A data rectification logic using Big Data Analytics is used to remove sustained outliers present in the data on account of fault and maintenance activities. The rectified data is then fed into prediction model which identifies seasonality and trend in the data to determine future daily peak demand for upcoming three years.

Statistical Model for Load Estimation using Artificial Intelligence (AI):

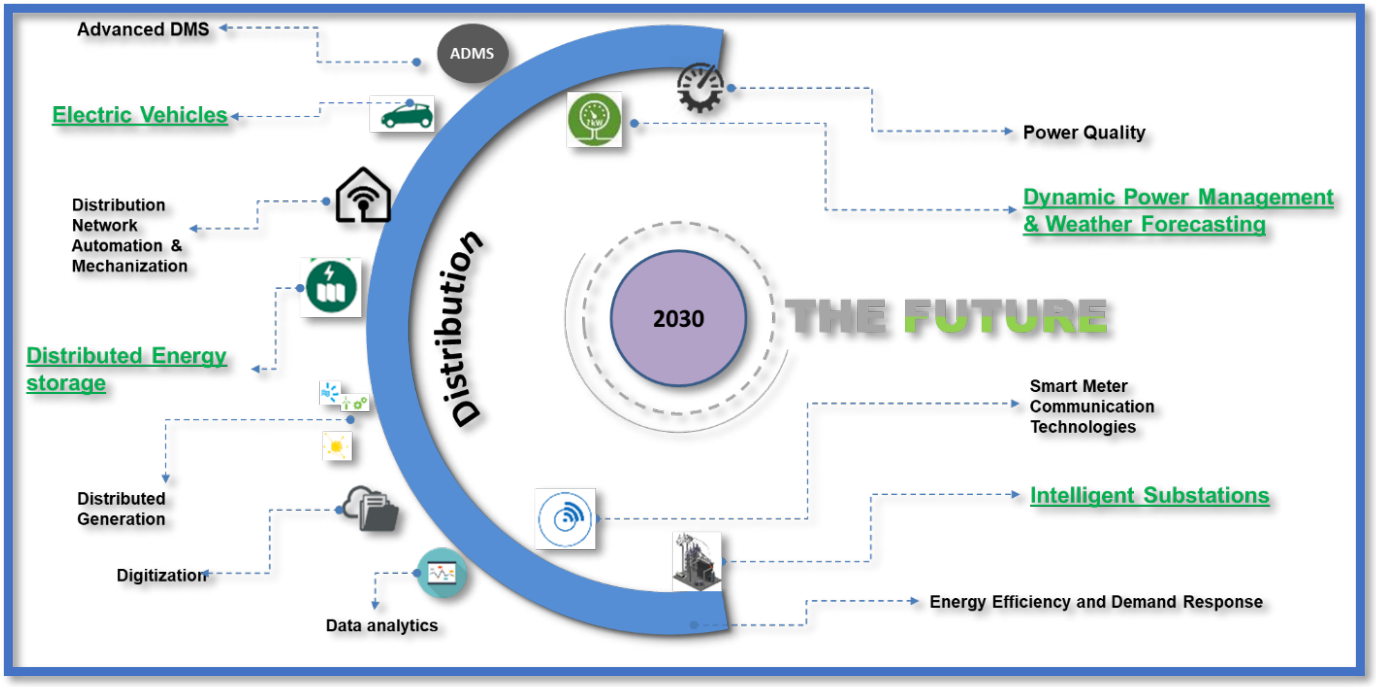
Power Cable, a capital intensive & integral component of the Power System Network. No provision of dedicated ROW for laying of underground power cables. Post inclusion in the power system network poses serious complications to cable network. Cables get damaged due to external agencies interferences. Power cables are joined after every 250 meters of cable lengths. The conventional designed cable jointing kits did not include any feature to inhibit the flow of water to entire cable lengths. This lead to water ingress through long cable lengths, even after cable jointing sections. To inhibit the flow of water through the cable joints to further lengths of cable after cable jointing, a new component has been introduced in the cable jointing kit that is CFIP (Compressive Forced Ingress Protection) water inhibitor barrier. Thus restricting the damage to only short cable lengths and inhibiting the flow of water after cable jointing. This component creates a compressive force to seal water during breathing cycle of cable. So in any of the adverse condition, sealing by this component remains intact.

The Approach

Tata Power-DDL is collaborating with 175 National and International Technology Partners, Institutional and Financial partners to not only bring efficiencies in its Licensed Area but also working towards Sectoral sustenance and building a future proof Industry.

The Future

Tata Power-DDL, in its excellence journey, firmly believes in continuous improvement. Tata Power-DDL's change management experience, distributed leadership system, adoption of latest technology; robust competence development process and innovative & open work culture are the key strategic boosters which helps in building and sustaining competitive advantage in the changing business scenario. A journey which began a decade ago for empowering the consumers in Delhi now holds the potential to transform the distribution sector in India and similarly help utilities across the globe.



Tata Steel Limited

Tata Steel group is among the top global steel companies with an annual crude steel capacity of 34 million tonnes per annum. It is one of the world's most geographically diversified steel producers, with operations and commercial presence across the world. The group recorded a consolidated turnover of INR 1,56,294 crore in the financial year ending March 31, 2021. A Great Place to Work-CertifiedTM organisation, Tata Steel group, together with its subsidiaries, associates and joint ventures, is spread across five continents with an employee base of over 65,000. Tata Steel is also part of Responsible SteelTM, providing the Company a platform to build on its sustainability credentials and enabling a responsible ecosystem for the steel industry. Tata Steel was recognised as DJSI steel sector leader in 2020. Besides being a member of worldsteel's Climate Action Programme, Tata Steel has won several awards and recognitions including the World Economic Forum's Global Lighthouse recognition for its Jamshedpur, Kalinganagar and Ijmuiden Plants. Tata Steel India ranked as India's most valuable Metals & Mining brand by Brand Finance, Steel Sustainability Champion 2020 by worldsteel, and 'Most Ethical Company' award 2021 from Ethisphere Institute, among several other recognitions.

The Innovation

The Innovation#1: 1st in World Digital Twin in Sinter Making - Use of Machine Learning to reduce Stack Emission

Sintering is Agglomeration of Iron ore fines where heterogeneous raw materials (around 22 types) are converted into homogeneous product called Sinter and charged into Blast Furnace. Sintering is a very complex process where 100 process variables are controlled to achieve desired set of output KPIs like stack emission, return fines, etc. Maintaining stack emission below the set norm is a condition for CTO (consent to operate). Also, future expansion of production facilities is linked to it.

Therefore, it is the most important KPI from operational and strategic perspective. Since the commissioning of Sinter Plant (SP-3) in 2005, stack emission was never below norm of 50mg/Nm3-hr. To bring stack emission under control, one new Electrostatic Precipitator (ESP) and one bag filter was added to subordinate the main process ESPs. The stack emissions of SP#3 still varied between 70mg/Nm3 to 80mg/Nm3, much beyond Central Pollution Control Board (CPCB) norms of 50mg/Nm3. In FY19, ~60 Hrs of delay occurred due to slow rate of production to control emission.

Multi-KPI control requirement in Sintering is the challenge. If the KPIs are controlled individually, they tend to produce conflict in process control since they are governed by common control levers. This problem necessitated a unified control framework to control multiple KPIs utilizing common control levers. Therefore, Digital Twin of Sinter Plant was conceptualized as a first-in-world solution. This entails a cognitive soft sensor created to determine the best possible change in control levers to help achieve maximum stability in Process and maximize performance of KPIs. It utilizes simulations based on prediction models to gauge outcome of KPI performance. This is done with optimized iterations to arrive at best control lever combination. Digital Twin, the replica of sintering process, helped reduce return fines by 2%, Stack emission by 60% bringing in savings of 100 Cr INR.

Approach

Sinter making is a complex and hazardous process involving 100's of process parameters to control through digital and human intervention. So, our first attempt was to covert all manual processes into automatic or semi-automatic processes and optimize operational parameters through daily management, Kaizen, Gemba etc. and through the continuous innovation mechanisms. We also have installed new systems such as ESP, Bag Filters through moderate CAPEX investment to avoid business "going concern" and meet our internal sustainability objective. But with all these investments also we were not able to bring down emission level lesser than the pollution control board norm i.e., <50 mg/Nm3. Although further addition of sophisticated new technologies could have reduced the emission below the target, but all were CAPEX heavy (>50 Cr.) and subject to high installation (>1 month) and maintenance time. The huge investment and production loss were not sustainable, so it was the inflection point for a breakthrough innovation. Through internal workshops, multiple brainstorming sessions involving internal process experts and leveraging Tata Group ecosystem, a digital solution was arrived at. So, the genesis of the "Sinter plant Digital Twin" was a combination of both business need and Tata Steel's continuous quest for improvement and become a global benchmark in Steel Industry.

Benefits

- Stack emission reduced from 70 mg/Nm3 to 35 mg/Nm3. Achieved best-ever Stack Emission of 29mg/Nm3 in Sept 2020.
- Stack Emission has been running below 40mg/Nm3 consistently since implementation
- Nos. of Environment Alerts (>150 mg/Nm3) which directly goes to Central Pollution control board (CPCB) reduced to almost Zero from 100 nos.
- Zero production loss on account of Environmental reasons (Savings: 5 Cr INR/Annum). Earlier, the plant had to stopped or reduce machine speed to control stack emission.
- Major Capital investment to bring stack emission below 50 mg/Nm3 could be averted (Savings: 100 Cr INR i.e.1 bn USD)
- Return fines (Yield loss) reduced by 2% (Savings: 5 Cr INR/Annum)
- Positive impact on Environment, Operations, Community and Company's reputation.

Future:

At Tata Steel Jamshedpur, there are 4 Sinter Plants. After implementation at Sinter Plant#3, this innovative solution has been horizontally deployed at Sinter Plant 1, 2 & 4. As this project is 1st time in Industry, it has also been horizontally deployed at Tata Steel Kalinganagar plant. Deployment is underway at the recently acquired plant of Tata Steel Bhushan Steel Limited, Angul.

As Installation of new technologies (e.g., Bag filter/ MEROS system) in any Sinter plant to control emission involves a. Long Shutdown Duration (>1 Month production Stoppage) i.e., huge production loss, High CAPEX (>60 Cr.) and safety challenges with minimal physical intervention, other players in the steel industry has also shown keen interest in this technology. Potentially this solution can be implemented at their premises with location specific adjustments and which has got a saving potential of more than 300 Cr. Next level could be exploring possibilities of deployment of this technology in related industries (e.g., cement) and offer customized solutions. As part of growing need for sustainable Green Manufacturing this technology can be a game changer for times to come.

Innovation#2: First-of its Kind CO2 Capture Plant in Steel Plant

Amongst the many CO2 capture technologies, amine-based technologies are the most suitable for separation of bulk CO2 from Blast Furnace gas as well as other low-pressure dilute CO2-containing flue gas streams. Non-amine-based processes are more complex and energy intensive with limited commercialization so far. Tata Steel took its first strategic step in the journey of decarbonization leveraging its wide internal and external ecosystem and installed a first-of its kind CO2 capture plant in Steel sector. The installed plant can capture 5 tons of CO2 from 20 tons of hazardous Blast Furnace gas in a day. This is unique in a sense that nowhere CO2 was being captured from such a hazardous gas and after capturing the high calorific value gas is again fed back into the network for further utilization. The next step is to make use of the captured CO2. This captured CO2 will be used to replace purchased CO2 for treatment of waste-water to precipitate out free lime in Gas Cleaning Plant. On the other hand, the remaining CO2 will be injected in steel making vessel as a replacement of purchased Argon and Nitrogen there by providing benefit of increased vessel life, reduction in reflow and use of Oxygen. Such initiatives have been employed in very few steel plants in the world.

Approach

Steel is one of the most 'hard-to-abate' sectors and contributes to about 8% of the total GHG emission. Tata Steel has continuously pursued technology led excellence through development and deployment of breakthrough technologies. Keeping with its Tata value of "Responsibility", Tata Steel has undertaken the long-term goal of decarbonization. To achieve this goal, it is imperative to pursue breakthrough technologies as well as operational process improvements. Tata Steel has Seven technology leadership areas (TLA), one of them is Hydrogen and Decarbonization. under this TLA Tata Steel has undertaken a two-pronged approach to decarbonization: Carbon Direct Avoidance (CDA) and CO2 Capture and Use (CCU). Under CCU we have undertaken many novel projects to generate hydrogen and utilization of captured CO2 to convert it into value added products. Our first breakthrough was the installation of this CO2 capture plant from Blast Furnace gas.

Benefits

This technology offers range of possibilities in heavy hard to abate CO2 intensive industries. The key value proposition of this technology provides are -

- Lower CAPEX and 15-20 % lower OPEX
- > 95% CO2 recovery with >99 % purity
- 3-4 years of solvent life
- Scalable upto 2500-3000 TPD CO2

Apart from this technology benefits, it opened up multiple utilization avenues to complete the CO2 entrapment cycle. We have plans to utilize this CO2 in waste water treatment, steel making vessel purging and also conversion to products, which has huge saving potential in terms of purchased gas replacement and improving operating efficiency.

Future:

This 5 TPD CO2 capture plant is just the beginning of the long journey of carbon capture and utilisation endeavours at Tata Steel. In this plant, Blast Furnace gas stream has been used to capture CO2 and it has four major components such as CO2, CO, H2 and N2. Amongst these components, CO2 and N2 being inert, do not play any role in generating energy or converting iron oxide to iron. In future, we aim to successfully separate N2 from the Blast Furnace gas stream post CO2 removal, and feed the CO enriched gas back into Blast Furnace through Top Gas Recycling (TGR) to further reduce CO2 footprint.

Captured CO2 can be converted through economically viable and commercially available technologies into value added product such as methanol using H2 in methanol synthesizer, building materials, salts etc. As we aspire to become a carbon neutral steel maker, our future endeavours will be aimed at installing scaled up version of CO2 capture installations, implement breakthrough technologies and monetize the integrated solutions (technology + knowhow) across steel and other related sectors.

Tech Mahindra

Tech Mahindra offers innovative and customer-centric digital experiences, enabling enterprises, associates and the society to Rise.

We are a USD 5.1 billion organization with 126,200+ professionals across 90 countries helping 1058 global customers, including Fortune 500 companies.

We are focused on leveraging next-generation technologies including 5G, Block chain, Cybersecurity, Artificial Intelligence, and more, to enable end-to-end digital transformation for global customers.

Tech Mahindra has consistently emerged as a leader in sustainability and is recognized amongst the '2021 Global 100 Most sustainable corporations in the World' by Corporate Knights.

The Innovation

Innovation 1: Technology for All – BHAML

As a part of Makers Lab, we frequently interact with different groups of people, and are on panels in various forums. One such time when we were panelists for AIC and interacting with the winners of an All-India contest for Children Innovators, there was this group of young school students who had come from a remote area in Chhattisgarh. They had identified Amaranths as a source of nutrition for the malnourished population in their vicinity and had made a juice which improved the condition of local children to a great extent.

While mentoring them, they asked us how they can extend their solution, and we naturally mentioned that you may make a powder and sell it across the world. The boy exclaimed, "Only if I had known English, I would have made a website and taken my product across the world and solved malnutrition across the world!" The genuine wish of solving a problem across the world was being hampered only by a language which is spoken by only 5% of world population.

This thought did not let us rest, and we created BHAML – Bharat Markup Language. The tool which can allow anyone to code in their own language and create a web page of their own! What a way to address the Digital Divide!

BHAML was made Open Source, and it is dedicated to the numerous kids in the rural area, who are being left out only for the want of a language. It already supports 10 Indian languages, and will soon be available in all 27 Indian languages. Currently it supports HTML and we have plans to extend it to CSS/ Javascript and other programming languages as well!

Benefits

- In the Tech for Good space: Tech Mahindra have developed multiple solutions like BHAML for bridging the digital Divide in India and across the world.
- BHAML was made Open Source, and it is dedicated to the numerous kids in the rural area, who are being left out only for the want of a language. It already supports 10 Indian languages, and will soon be available in all 27 Indian languages. Currently it supports HTML and we have plans to extend it to CSS/ Javascript and other programming languages as well!

Innovation 2: Innovation during COVID time

When COVID Struck, we were all in lockdown, and such a big issue across the world had turned our world upside down. Until that point, virology was never our subject of focus, and out of curiosity, we started reading and understanding about the virus.

We went through hours of information on the net as well as through academic papers and got a basic understanding of the structure of the virus. Then we decided to compare the virus molecular structure with other commonly available viruses and protozoa. To our surprise, we found that structurally, the molecular model of Malaria protozoa matched that of the Corona virus. Around this time, the Hydroxychloroquine, which is a Malaria medicine was found effective against the virus. That is when we published our first paper on LinkedIn.

On receiving encouraging feedback, we decided to take this further. We decided to look at 8000 FDA Approved drugs and computationally analyze using molecular docking, which ones of them are likely to work against the virus. Using AI, we also checked some of the Ayurvedic medicines and found encouraging results for 20 of FDA Approved drugs as well as some Ayurvedic medicines.

The 20 FDA Approved drugs were then tested by our partners in-vitrio (in a petri dish) and 3 molecules emerged better than the rest. That was very encouraging. But how do we prove this further? So with our partners, Reagen Biosciences, we got a 3d printed lung using human epithelial cells and tested in the working model of this infected lungs, and one molecule emerged. This molecule has been published and we are awaiting further approvals for trials.

This research underlined how curiosity fuels innovation and inspired us to think differently to address some of the most difficult problems faced by humanity.

Benefits

- Drug discovery time has lessened
- The molecule that we found will help humanity
- The process that we followed for this research is repeatable

The Future

- To continue with our research and
- To being to work on human trials

Innovation 3: Vetturino

Vetturino directly reads all the primary parameters from the vehicle like speed, RPM, engine temperature. But it doesn't just stop there. It is capable of reading all 160+ service parameters from the vehicle which include individual cylinder misfires, engine fuel rate, exhaust pressure, engine power, and more. And all this is directly configurable from the cloud application.

Optimization: Vetturino has been built in-house from scratch. The Cloud-based enterprise application is a very powerful and flexible tool. It is highly customizable and can be tailored to the enterprise needs. While both Vetturino, the device, and the cloud application are coupled, they can be configured to work independently as well. The device can be used with a different cloud application, and the application can be used with a different device as well.

Vetturino is suitable for fleet management as well as monitoring individual vehicles. Vetturino can be used for managing convoy • The leader of the convoy would be able to plan the route as well as to add vehicles and assign drivers to those vehicles • Driver of convoy vehicle would be able to see his position w.r.t remaining vehicles in a convoy • Leader shall get an alarm in case of any threshold breaches or deviation to route by vehicle • Vetturino device shall act as WiFi router so these devices shall act as repeaters for transmitting data • Vetturino can connect to the cloud via various methods, including WiFi and GSM, which make it ready for future 5G network expansions

Benefits

- 75 % reduction in vehicle failures caused due to un-monitoring
- Up to 20% increase in performance of vehicle as driving patterns are being monitored
- Estimated to earn $1M revenue business in 3 years.

The Future

- Vetturino is suitable for fleet management as well as monitoring individual vehicles. Vetturino can be used for managing convoy.
- The leader of the convoy would be able to plan the route as well as to add vehicles and assign drivers to those vehicles.
- Driver of convoy vehicle would be able to see his position w.r.t remaining vehicles in a convoy
- Leader shall get an alarm in case of any threshold breaches or deviation to route by vehicle
- Vetturino device shall act as WiFi router so these devices shall act as repeaters for transmitting data.
- Vetturino can connect to the cloud via various methods, including WiFi and GSM, which make it ready for future 5G network expansion.

Innovation 4: Panchang Intelligence for Accurate Weather Prediction

Tech Mahindra team started the analysis as a research project. We developed a weather forecast based on the Panchang rules that involve planetary positions. Then we tested this with 40 years of revalidated data (1980 to 2020) across 7 locations in India and 8 locations across the world, spanning all continents from Australia to America. The results have been amazing, as we are able to see a very high level of accuracy across the world. Further, we built a weather channel for anyone to visit and view the results. Additionally, an API for the same has also been made available. The weather channel takes the input as a GIS location in terms of latitude/ longitude. It also has a feature to point a location on the map or enter a pin code (India). Based on this and a time range, the daily rainfall predictions are given.

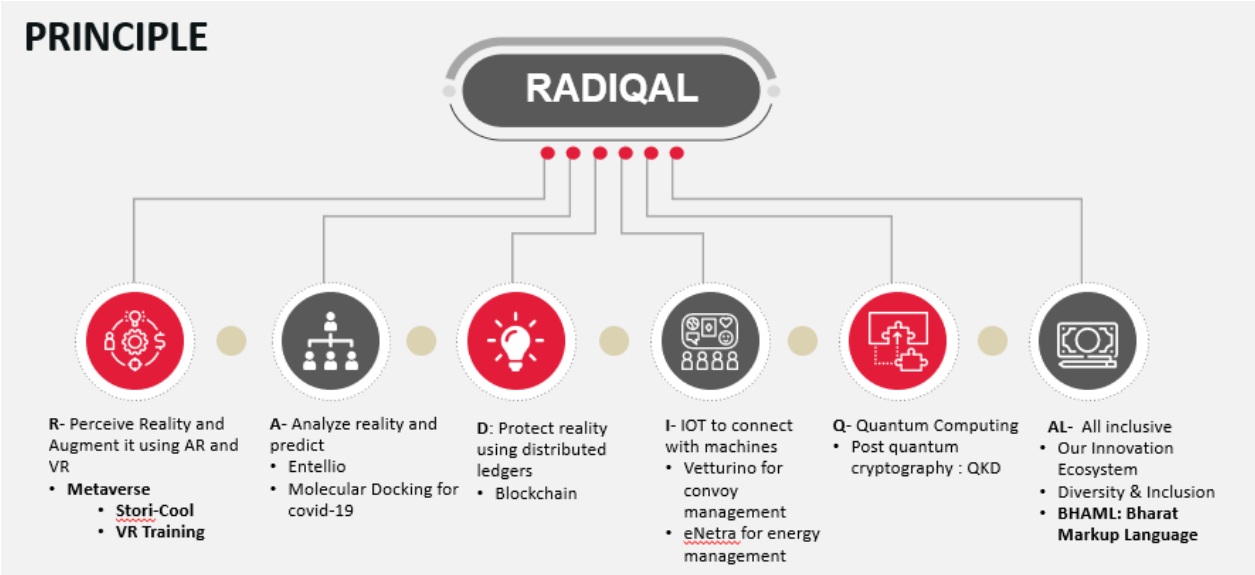
Benefits

- Accurate prediction
- Long-term weather prediction

The Future

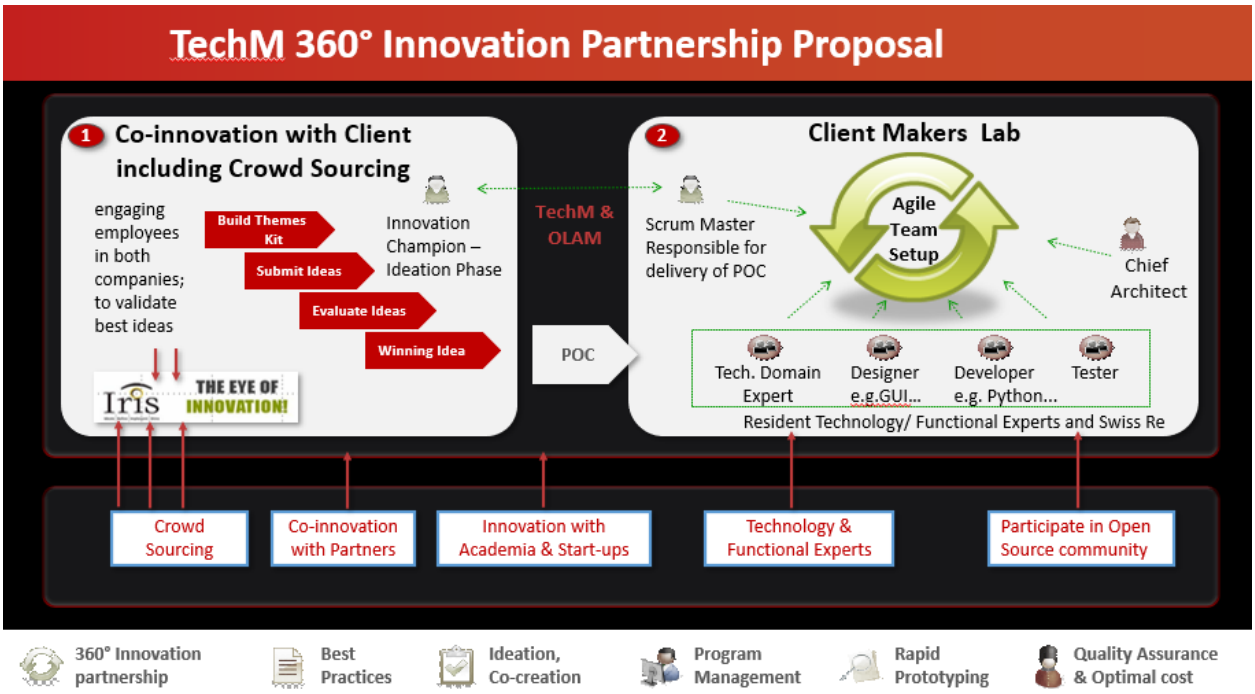
Tech Mahindra team has built this weather channel which is about to be launched. We are also publishing the results in appropriate journals so that they can be validated. We believe that this API and weather channel will be relevant for multiple areas, E.g. • Agriculture • Insurance • Banking and Finance • Building Infrastructure and many more.

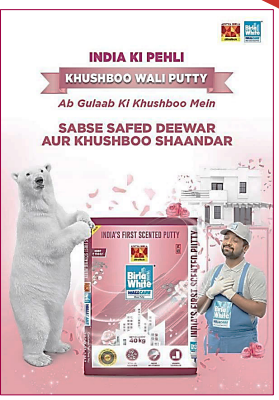
The Approach



The RADIQAL Principle very aptly encompasses the approach of Innovation at Tech Mahindra. We dwell on latest technologies with a focus on first principal research, creating Ips like Storicool – Your story animated as you speak, Entellio -Intelligent AI based conversational framework etc. We work with all- co-innovating with customers (e.g. the first SI to build a Post Quantum Cryptography use case with BT) with our employees and with society at large.

Our intent at Tech Mahindra is to have a workforce brimming with ideas, which get converted into products with support from an Innovation Council which backs them. This process has been running and has created the Ips like BHAML and Vetturino.





Ultratech Cement Ltd

BirlaWhite is a unit of UltraTech Cement Ltd., flagship company of the US $48.3 BN Aditya Birla Group. A global conglomerate, the Aditya Birla Group is in League of Fortune 500. Anchored by an extraordinary force of over 140,000 employees belonging to 100 nationalities, the Group is built on a strong foundation of stakeholder value creation.

BirlaWhite is a construction materials company with a specialisation in white cement & white cement based value added products. In 1988, Birla White commenced its production of white cement in India since inception, Birla White is the 7th largest white cement producer in the world & cemented its place as a market leader.

The brand has constantly reinvented by creating products that fulfil the needs of consumer, and thus becoming a vital part of construction evolution in India. Birla White's value-added products are also CII certified eco-friendly- Green product with no risk health hazard.

The Innovation

Birla White, since its inception, has been the market leader in the base coat category and boasts an impressive portfolio of white cement-based surface finishing products. From the innovation in White-Cement based putty, Birla White has been introducing various innovative products and services, keeping consumer needs at the forefront. In the past two years, we have accelerated the innovation cycle and introduced 9 new product variants in the market.

Innovation-01 Development of Fragrant Putty (Rose/Lemon/Sandal)

Birla White has come up with World's first scented putty aimed at improving the painters' well-being. Created this product after extensive research involving painters across the country and have ensured that our product is superior in every sense. Birla White Wall Care Rose/Lemon/Sandal Putty is infused with the smell of different fragrances, which elevates the mood of a putty applicators & painters, improves the overall work efficiency. The power of smell creates a positive working environment that directly benefits the putty applicators & painters and consequentially benefits the homeowner in terms of speed and quality of work. This product received good feedback from market. Now, this product has become a major contributor in the Birla White business.

Innovation-02 Development of Bio-shield Putty

During the challenging pandemic phase, Birla White came at the forefront to offer safe houses to the homeowners and introduced India's first Anti-viral putty, a product which offers protection on walls from bacteria, viruses, fungi & algae.

Innovation-03 Development of Wall seal Waterproof Putty

Birla White offer a best Waterproof Putty to consumer which is a white cement-based with 2x water resistance and German Active Silicon Polymers which provides a strong base on a plaster/concrete and mortar wall surface before application of topcoat paint or distemper and protects the walls from water with excellent durability.

The Approach

Birla White's 6 stage innovation framework:

1. **Ideas, Concepts & Initial Scoping:** Assimilating ideas from consumers, employees and ecosystem partners, filter through concepts
2. **Business Case:** Understanding volume and value additives, scalability and target group
3. **R&D – Product Design:** Indigenous formulation at reasonable raw-material cost, reverse engineering of competition offtakes and stringent lab evaluation to arrive at desired output
4. **Consumer Validation:**
   - Application study – Consumers & Influencers
   - Willingness to recommend (channel) and purchase (consumer)
5. **Pilot Launch**
   - Testing the product in select markets
   - Observe product acceptance
   - Identifying scope for improvement
6. **Improve & Scale Up**
   - Improved product introduced Pan-India

The Benefits

- **FRAGRANCE PUTTY** - World's 1st fragrance Putty
  - Designed exclusively for painters' wellbeing
  - Environment friendly (Zero VOC)
  - Creating a good work environment for painters
  - Reduction of bad odour from putty/ paints while working
  - Help painters receive appreciation from clients
- **BIO-SHIELD PUTTY** - India's 1st Anti-viral Putty
  - Protection of consumers from Bacteria, viruses, algae & fungi.
  - Provide highest whiteness & smoothness among all putty products available in the market
- **Waterproof Putty** – India's best waterproof Putty
  - First time offering 2X water resistant properties
  - Offers long lasting benefits
  - Unmatched whiteness with superior finish

The Future

Birla White will continue to listen to the pulse of the consumer through continuous listening (to understand the changing needs of the consumers) and deep listening (to understand the scope of improvement in products and services) and provide the best of products and services in the market.

VST Tillers Tractors Ltd

VST Tillers Tractors Ltd. was established in the year 1967 by the VST Group of companies. With a legacy of more than 53 years, VST continues to drive farm mechanization and empowerment of Indian farmers.

The organization is the largest Indian manufacturer of Tillers, 4WD Compact Tractor and amongst the leading producers of the other category Tractors, Engines, Transmission, Power Reaper and Precision Components. VST also exports products to European, Asian and African markets.

To further strengthen its product portfolio and offer world-class technology customized to match the needs of Indian customers, VST has entered into strategic alliances with Pubert from France for Power Weeders and Zetor from the Czech Republic for Tractors.

VST believes in leveraging electric, driver optional, and connected vehicle technologies to offer sustainable, productive, and profitable farming solutions and has made a strategic investment in Monarch Tractor (Zimeno Inc) – Maker of the World's First Fully Electric, Driver-Optional Smart Tractor.

The Innovation

VST MT 932 (30 HP)

Over the past one decade there is a spurt in the demand of compact segment Tractors ranging from 20-30 HP, specifically for the medium farmers for fulfilling their multiple needs of inter-cultivation, spraying, horticultural applications etc. Also, concurrently there was evolution of compatible implements technology like electrostatic sprayers, reversible plough, Multiple PTO speed implements etc. which called for more technologically sophisticated compact Tractors.

Visualising the need VST decided to bring in the most advanced featured compact segment Tractor in the 30 HP segment with built in features like:

1. Powerful 30 HP engine
2. 9+3 Synchromesh gear box
3. Mid PTO
4. Multi Speed Live PTO
5. Reverse PTO
6. Highest Lift capacity of 1250 Kgs
7. Best ergonomically designed operator control systems
8. 4 WD for maneuvering in toughest conditions
9. Hydrostatic Steering system for easy maneuverability and achieving the lowest Turning radius which is the basic need for row farming, spraying and inter-cultivation

The challenge was to embed the above technologies into a compact segment tractor which VST achieved through a systematic and customer centric approach.

VST 165 DI (16 HP)

Power Tillers are the wonderful technological machine for small farmers who cannot afford Tractors. However, these are basically walk behind machines. This leads to drudgery and restricts longer hours of field operation by the farmers. With acute shortage of farm labour due to urban migration, bringing comfort in the use of power tillers was the need of the hour which eventually increases its usage for longer hours during farming.

VST visualized the need for a robust high powered power tiller which can perform like a small tractor and also eliminating the drudgery through walking along for longer hours, hence decided to design and develop a powerful 16 HP engine with a robust compatible gearbox, unique adjustable seat and wider rotary (750 mm) which is the first among the power tillers to increase the productivity thereby helping the small farmers to double their income.

The product is designed by focusing on MDR Technology (Maneuverability, Durability, Reliability) and product is the best performer among the segments.

The Approach

In both the product innovations the basic approach was CUSTOMER CENTRIC wherein to identify the basic needs of the end user i.e. farmer, through frequent one to one interactions to assess the present as well as future requirements of the farmer. In order to have futuristic approach a large sections of younger generation farming community was interacted to understand the pulse and future product requirements.

These requirements and the present available products were bench marked and through a statistical method the results were analysed and world gaps (basic requirement by the end user which the present products does not have the feature) were identified and concentrated on fulfilling these world gaps through systematic design approach and achieved the desired results which made VST the first mover in both the products through customer centric innovations.

The Benefits

The new innovative feature compact tractor of 30 HP has enabled VST to expand the market base across India as the Tractor can be used in Multiple applications such as in row farming & spraying as well as open land applications. The new operator friendly features such as synchro, side shift comfortable adjustable seat has

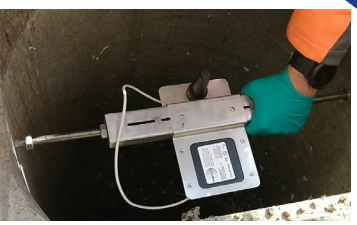
captured the younger generation of farming community which is a very prospective approach to bring back the younger community back to farming.

The new innovative featured power tiller, due to its robustness and seating comfort has captured large segment of farmers who cannot afford tractors whereas this power tiller is fulfilling all their farming needs. With the provision of comfortable seat long hours of farming activity is ensured which ultimately helps in farmer to increase his income through higher productivity.

The Future

VST being the front movers in bringing Mechanisation to the small and medium farmers by introducing power tillers and compact tractors, has drawn up an ambitious plan for the next 5 Years to bring the best technological innovations to this sector thereby farming will no longer be a burden but will be a pleasure.

To augment the vision, VST has prepared a technology road map such as HST Tractor, Electric Tractor, IOT enabled implements etc. And In the SFM sector, VST has plans to revolutionise through new technologies such as electric weeders, autonomous power tillers and Reaper binder etc.



Wipro

Wipro Limited is a leading global information technology, consulting and business process services company. We harness the power of cognitive computing, hyper-automation, robotics, cloud, analytics and emerging technologies to help our clients adapt to the digital world and make them successful. A company recognized globally for its comprehensive portfolio of services, strong commitment to sustainability and good corporate citizenship, we have over 220,000 dedicated employees serving clients across six continents. Together, we discover ideas and connect the dots to build a better and a bold new future.

The Innovation

1. TopGear

TopGear is an innovative crowdsourcing platform enabling a new-age delivery model powered by 70K+ employees across the organization. TopGear Community leverages the platform to collaborate, enhance skills and engage on live customer projects globally.

We enhance our millennial talent base's learning culture and outcome, accelerating Wipro's journey into the Future of Work by adopting a gig model.

This first-of-its-kind platform enables employees to learn and earn, enabling workforce transformation. It's an opportunity for innovative project delivery to the work from anywhere model - a new normal in the post-pandemic world. We can inner-source talent and fulfill project teams and customers' requirements, thereby supporting the business operations.

The scope of work is atomized and hosted as 'challenges' on the platform. Community members compete on TopGear beyond their allocated project work & winners are rewarded.

TopGear is a true showcase of innovation in engaging diverse talent to meet customers' needs

2. Connected Healthcare

The current healthcare landscape has long standing inefficiencies. This gets compounded by ageing population and increased patient inflow. Wipro's Connected Healthcare platform is built to not only aid in self-care and remote care but also focus on impacting the value chain to provide better connected-healthcare.

New Innovations in the platform:

Coldchain solution brings data transparency, immutability, real-time tracking of medical supply chain aimed at solving the issues around counterfeit drugs (1 Million+ death/ year) and pharma supply chain losses (35 B USD / year loss temperature related issues). The solution incorporates Geo-fencing, anti-counterfeiting capabilities, Real-time update of ambient transportation conditions.

Wipro's Codemix chatbot enhances the patient experience by giving them the ability to interact in Fusion languages (Hindi-English, English-Spanish, etc.) to get the desired information and connect with doctors. The solution offers an intuitive approach to integrate patients across different ethnicities

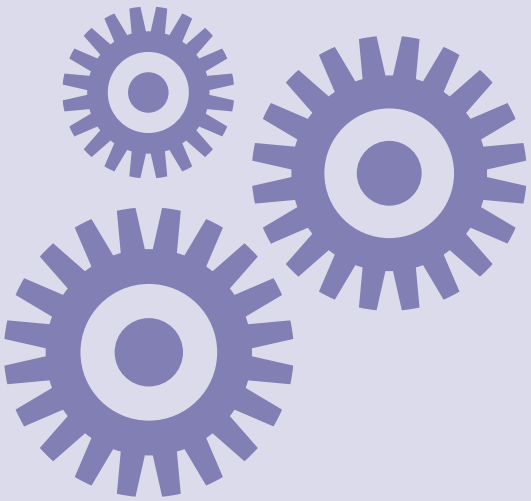
Home-care Module:

- Ognomy is an innovative mobile and telehealth focused application reimagining sleep centers by removing barriers to diagnosing and treating Sleep Apnea making treatment affordable.
- Dialysis at home to meet the rising demand of self and home-based dialysis therapies for better and personalised patient outcomes

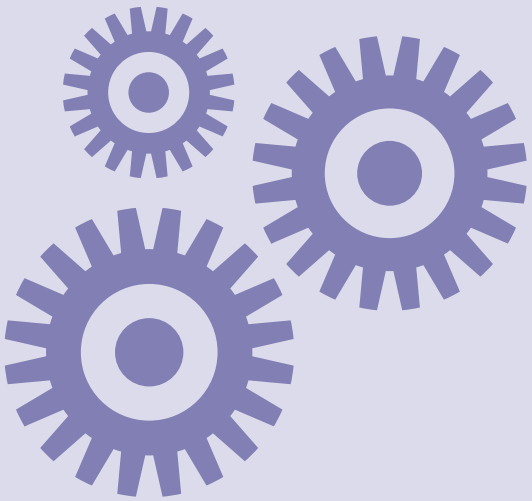
3. Industrial Transformation

Wipro's suite is transforming Products, Processes and people by leveraging IoT, Robotics, Cloud, Drones, AI and Augmented analytics to deliver an integrated approach to data handling, assets handling, workforce augmentation and Process Integration across Industries.

Condition based monitoring of assets across manufacturing ecosystem and intelligent decision making is driven by IoT platforms. Deployed Use case is Sewage-Monitor, a state of the art Millimetre Wave sensor with NB IoT for networking. The extremely low power device provides capability to predict waste water or sewer blockages avoiding the associated cost of clean-up. Unique component of the solution is a device designed by Wipro. The suite leverage Robotics Platform to provide hardware agnostic highly reusable turnkey solutions encompassing process digitization, centralized orchestration, remote management, vision assistance and predictive analytics. Deployed use case is Drone based inventory management solution with autonomous-navigation in GPS denied environment, CV based ML-algorithm to count stock and WMS integration.



Special Award Fostering Industry Academia Interactions



Tata Consultancy Services (TCS)

Tata Consultancy Services is an IT services, consulting and business solutions organization that has been partnering with many of the world's largest businesses in their transformation journeys for over 50 years. TCS offers a consulting-led, cognitive powered, integrated portfolio of business, technology and engineering services and solutions. This is delivered through its unique Location Independent Agile™ delivery model, recognized as a benchmark of excellence in software development.

A part of the Tata group, India's largest multinational business group, TCS has over 528,000 of the world's best-trained consultants in 46 countries. The company generated consolidated revenues of US $22.2 billion in the fiscal year ended March 31, 2021 and is listed on the BSE (formerly Bombay Stock Exchange) and the NSE (National Stock Exchange) in India. TCS' proactive stance on climate change and award-winning work with communities across the world have earned it a place in leading sustainability indices such as the MSCI Global Sustainability Index and the FTSE4Good Emerging Index. For more information, visit www.tcs.com.

The Innovation

TCS Academic Interface Programme (AIP), as a function, started over 20 years ago in a humble way with a vision to bridge the gap between Academia and fast evolving IT Industry and to enhance the employability skills amongst the students.

As the Technology is advancing rapidly and Industries are orienting themselves to this rapid change, the gap between Industry and Academia is widening. In this context, TCS designed AIP framework to collaborate with Academia at various levels like, Institute Management, Faculty, Students, Heads of the Department, Training and Placement Offices, etc. to bridge this gap. Under this framework, AIP conducts various activities for Academia to create awareness on latest and emerging technologies, enhancing employability skills to make the students industry ready, offers internships to the students, support curriculum enhancement through participation in various academic boards, designing / delivering various credit and elective courses based on industry needs, etc.

Approach

TCS AIP team, in collaboration with academia, conducts various activities to upskill the knowledge of latest technologies and improve employability of the students, enhancing the subject knowledge of the faculty by bringing industry perspective through Faculty Development Programs and the overall development of the institutes. Some of the key activities are as follows:

- Workshops for students on technical topics and soft skills
- Faculty Development Programs for faculty
- Designing / delivering credit / elective / value-added courses / degree programs
- Participation in various Academic Boards
- Participation in Contests, Events, Hackathons etc. as Knowledge Partner
- Internships for students
- Industrial Visits for students

Benefits

Key benefits for the academia are as follows:

- Enhancement of students' quality and make them industry ready
- Improved employment opportunities
- Curriculum alignment with industry needs

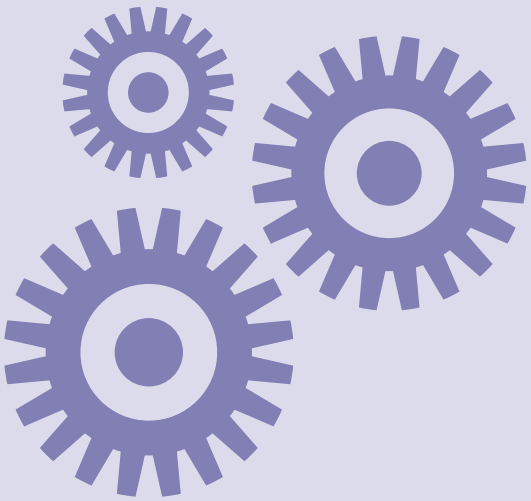
Key benefits for the Industry are as follows:

- Increase in industry ready talent pool
- Opportunity to give back to Society by contributing through education eco system
- Improvement of TCS brand in academia to attract the talent pool

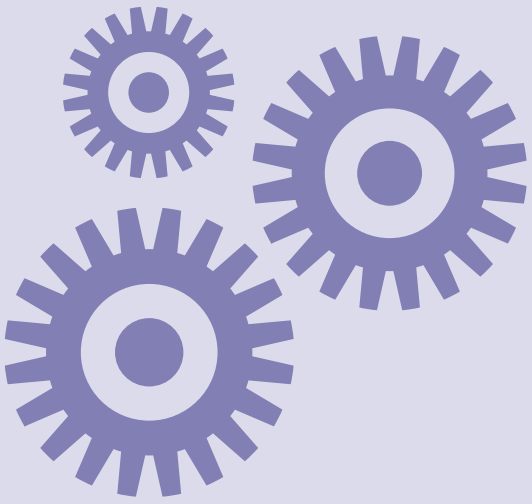
The Future

The focus for future is on the following:

- Expand our reach to institutes and students from Tier-2 and Tier-3 places
- Influence the curriculum through academic board memberships
- Enhance subject knowledge of faculty by bringing industry perspective through Faculty Development Programs



Most Innovative Research Institutions



Indian Institute of Technology Roorkee

Indian Institute of Technology - Roorkee is among the foremost institutes of national importance in higher technological education and in Engineering, Basic and Applied Science research. Since its establishment, the Institute has played a vital role in providing the technical manpower and know-how to the country and in pursuit of research. The Institute ranks amongst the best technological institutions in the world and has contributed to all sectors of technological development. It has also been considered a trend-setter in the area of education and research in the field of Science, Technology, and Engineering. In 2021, the institute entered the 175th year of its existence. Currently, IIT Roorkee is one of the biggest technical institutions in the country, having the largest number of academic units. It has 23 academic departments covering Science, Engineering, Architecture and Planning, Humanities & social sciences, and Management programmes, 1 school, 3 academic centres, 8 academic service centres and 3 supporting units.

The Innovation

1. Visco-elastic Energy Dissipating Link Elements for Earthquake resistant housing construction

An alternative technique to construct earthquake-resistant housing construction (Low & High Rise) based on the concept of energy dissipation/ Damping.

How is it different? The conventional earthquake-resistant measures are based on ductility (capability to undergo large deformations with significant damage). In contrast, in the present technology, effective use of damping (energy dissipation without significant damage) is explored through friction between the blocks and yielding of visco-elastic link elements.

Approach

The damping based vibration control is a much-preferred solution compared to other resisting mechanisms, particularly in civil engineering structures. Currently, an internationally accepted technique for enhancing the damping in the structure is being employed to the supplemental damping devices (or dampers) such as friction dampers, metallic or plastic dampers, viscous dampers etc. These supplemental dampers are a costlier solution and require a specialized design and manufacturing process. In the present research work, a new and affordable inter-linked concrete block with visco-elastic link elements in load-bearing masonry buildings as well as infill in multi-storey RC frame buildings is conceptualized to exploit the frictional and viscous damping present in the system. Fraction damping arises due to the rigid surfaces between two blocks in contact and sliding over one another. Viscous damping occurs from the yielding of visco-elastic link elements that restrict each block's translational and rotational movement. The sliding friction can be effectively used as a damping mechanism for energy dissipation and sometimes may be very effective where other mechanisms may not be effective or desirable. The main advantage of fraction damping offers uniform dissipation across the entire frequency range. Thus, introducing an inter-linked block masonry system with a visco-elastic link is a promising, new-generation system in the medium to high seismic zones and a subject of great concentrated research. The potential for energy absorbing capacity of the proposed technology, which is the prime attribute to sustain a civil structure for resisting any extreme earthquake loadings, is a widely accepted technique nationally and internationally.

Benefits

A huge source for the consumption of Industrial Waste from the Power and Steel industries (fly-ash, slag etc.) in the construction of concrete blocks (Meeting in NITI Ayog, New Delhi, dated 16.01.2017 on the "Policy framework on Utilization of Fly ash and Slag" held under the Chairmanship of Dr. V. K. Saraswat, Member, NITI Aayog. Its first meeting was held on 17.05.2016 in NITI Ayog, New Delhi, on "Incentivizing Mineral Waste Use").

A huge source the consumption of used/ discarded rubber tyres from the Automobile Sector in the Preparation of Visco-elastic Energy Dissipator Link Elements (comprehensive report by INAE, 2015 entitled " Development of Scientific Recycling of End of Life Automobiles (ELA) in India and the Role of Research and Development" authored by NS Mohan Ram, Consultant, TVS Motor Company Ltd; Basudam Adhikari, Material Sciences Center, IIT Kharagpur and S. Sugmar, Deputy Director CIPET, Chennai). These two types of waste not only increase exponentially but at the same time are more & more injurious to the environment as well as to health.

Finally, Seismically safe housing construction (Load Bearing: directly on the block up to 4 storey and High Rise (> four-storey) frame with inter-linked block masonry as in-fills). This type of construction is not only earthquake resistant & structurally sound but also has several advantages such as environment-friendly cost efficient/ easy to handle/based on clean & green technology/ semi prefab or precast/ less water consumption/ speedy construction at site/ high quality/ free from residual and seasonal cracking (temperature/shrinkage/creeps etc.)/low maintenance/ long life etc. This method will help achieve the National Mission for Urban Housing "Housing for All by 2022".

Future of the Technology

The proposed technology may become a huge source of self-employment and industrial growth since the economic viability of inter-linked block masonry system is mainly based on two facts (i) mass production of slotted blocks (ii) preparations of visco-elastic link elements from the "ply" of used/ discarded rubber tyres. The interlinked

slotted blocks may easily be prepared using locally available materials such as cement, sand, aggregate with industrial waste (such as fly ash, slag, silica flume etc.) in standard sizes as conventional bricks are prepared in kilns. The low-cost machine for the construction of slotted blocks may also be easily designed indigenously. It may start manufacturing these blocks at the minimum cost that may be sold in the market with a reasonable profit. This will be very beneficial for the country since the manufacturing of conventional brick requires enormous earth material resources, which are depleting day by day. It is challenging to sustain the manufacturing of bricks in future. The preparation of visco-elastic link elements has opened a new direction for the MSME.

2. Nitrogen-Doped Reduced Graphene Oxide (N-rGO) for High-Performance Supercapacitor

Innovation

The depletion of conventional fossil fuels and increasing demand for renewable energy resources have drawn the scientific community's attention to develop energy-efficient storage devices (batteries, supercapacitors and fuel cells). Among all these, the supercapacitor has been recognized as a future energy storage device(s) due to its high-power delivery capabilities, long cycle life, and high operational temperature range (-40˚C to 70˚C) with low charging/discharging time. Despite all these advantages, the major issue with the supercapacitor-based device is its poor energy density, as the present used commercial supercapacitor(s) has very low energy density (5-10Wh/kg) and is significantly lower than that of present-day popular storage device Lithium-ion battery (100-250Wh/kg). For increasing the energy density of supercapacitor, one requires the appropriate electrode-electrolyte combination. With regards to electrode materials, graphene-based nanostructures have been explored extensively as the electrode material(s) because of their novel surface and structural physiochemical characteristics. Further, the doping of heteroatoms could increase the wettability of material in aqueous electrolyte, which in-turn could reduce the resistance for charge flow enhancing the overall electrochemical performance. Most commercial supercapacitor devices employ organic electrolytes to attain high operational cell voltage but suffer from low ionic conductivity and high viscosity, thereby, limiting their power capabilities. To overcome these drawbacks lately, aqueous electrolyte(s) are being explored because of their low cost, higher ionic conductivity, nonflammability and requiring less sophistication for cell fabrication. However, the major drawback of such electrolytes is their limited theoretical potential window of 1.23 V, though practically limited to 1 V only for symmetric supercapacitors. In the present invention, a simple, low-cost, and scalable method has been developed to synthesize nitrogen-doped reduced graphene oxide (N-rGO) employing environment-friendly mild conditions of greener reducing agent, mild temperature, and near-neutral pH. The as-synthesized N-rGO have been used as the electrode material for developing high cell voltage aqueous electrolyte-based supercapacitor devices.

Approach

The present invention has developed a simple one-pot wet chemical solution-based approach to synthesize nitrogen-doped reduced graphene oxide (N-rGO) by employing amino acid as a greener reducing and nitrogen doping agent under mild temperature conditions and near-neutral pH. It resulted in a simultaneous reduction of graphene oxide (GO) and in situ doping of the reduced graphene oxide microstructure with nitrogen. The

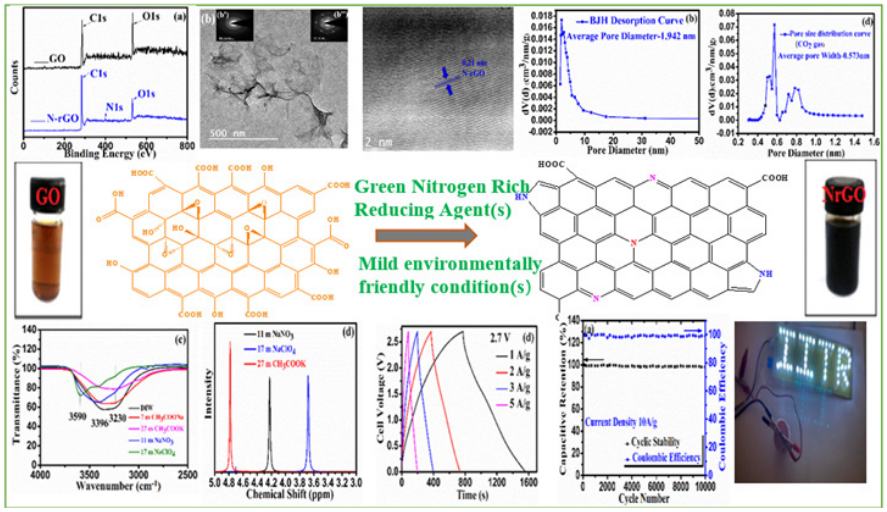
resulting N-rGO product was then well characterized with different spectroscopic and microscopic techniques such as UV-Vis, FTIR, Raman, X-ray photoelectron spectroscopy (XPS), 13C Nuclear magnetic resonance (NMR); field emission scanning electron microscopy (FESEM), transmission electron microscopy (TEM/HRTEM); and BET surface area analysis. All these techniques have confirmed that the starting precursor GO has been significantly reduced using this approach along with the simultaneous doping of N in its structure to produce micro/meso porous N-rGO. Remarkably, the N-rGO product could be used as the binder-free active material to develop electrodes in different aqueous electrolytes to design a high-voltage N-rGO//N-rGO symmetric supercapacitor.

Benefits

The present invention provides a simple, low-cost and scalable greener wet chemical process to synthesize nitrogen-doped reduced graphene oxide (N-rGO) containing micro/mesoporous structure, showing fairly high conductivity and higher surface wettability. These features assist in providing high specific capacitance. Further, the present invention has developed a high cell voltage symmetric supercapacitor (N-rGO//N-rGO) of up to 2.7 V in neutral electrolytes with a high energy density of 128 Wh/kg at a power density of 813 W/kg and cyclic stability of about 98-99 % after 10000 cycles. The cell voltage of up to 2.7 V in aqueous electrolytes for N-rGO//N-rGO symmetric supercapacitor obtained in the present invention is comparable to the commercially available organic electrolytes-based supercapacitor devices. It could light 54 white LEDs after charging for ~ 15s from a single cell, demonstrating the promising potential of present invention for the fabrication of low-cost sustainable aqueous electrolyte-based future energy storage device.

Future

The present invention providing a simple, low-cost and greener process for N-doped reduced graphene oxide and could be scaled-up for developing an efficient binder-free electrode material for future energy storage devices. The present invention is also promising to develop aqueous electrolyte-based sustainable high-voltage energy storage devices, which could overcome the limitations of the present commercially available organic electrolyte-based energy storage devices.



3. Simultaneous removal of arsenic and fluoride from contaminated water using novel hybrid adsorbent.

Invention

The present invention aims to develop a water filtration unit that can be useful for the treatment of arsenic and fluoride contaminated groundwater comprising or configured to comprise new adsorbents. The presented water treatment unit provides an economical and easy to use solution to mitigate this problem. The present system for removing arsenic and fluoride from groundwater comprises the following.

- A primary storage tank for keeping the contaminated groundwater on the top
- A second chamber for the adsorbent particles in the form of a fixed bed column,

- New adsorbents mixed with an appropriate ratio in the column to maintain continuous flow for a more extended period.
- A secondary tank at the bottom for the storage of treated water
- An influent flow regulator provided just below the top storage tank containing contaminated water to regulate the flow rate of influent in the chamber containing the adsorbents
- A tap at the bottom of the secondary storage tank containing the treated water to take out the treated water for consumption.

Innovation

- The entire system works with the help of gravity; hence, it does not require any power
- Its design is straightforward as it does not comprise any moving mechanical parts.
- The contaminated water passes through the adsorption chamber with a controlled flow rate to provide sufficient contact time with the adsorbents and ascertain the proper adsorption of arsenic and fluoride.
- Spent adsorbents are managed effectively with value addition and creating no secondary pollution
- Can treat both arsenic and fluoride-containing groundwater
- Treatment cost is highly competitive

Approach

Initially, acid-base treated laterite (ABTL) and aluminium hydroxide nanoparticle (AHNP) based adsorbents were prepared in the laboratory and experiments were performed in a small scale filter unit (200 ml per h) by using a synthetic solution of arsenic and fluoride as well as real groundwater samples collected from Chhattisgarh under a project sponsored by Ministry of Drinking Water and Sanitation, GoI. The technique was patented for simultaneous removal of arsenic and fluoride from water. The scale-up of this unit was also done under the Swachhata Action Plan project and tested at Ambagarh Chowki, Chhattisgarh. It performed successfully as expected. It can treat 20 L of water in four hours. The spent adsorbent management has been found successful through cement less paver block and brick production. AHNP based spent adsorbent is also found to be an effective catalyst for catalytic pyrolysis of biomass and wastes.

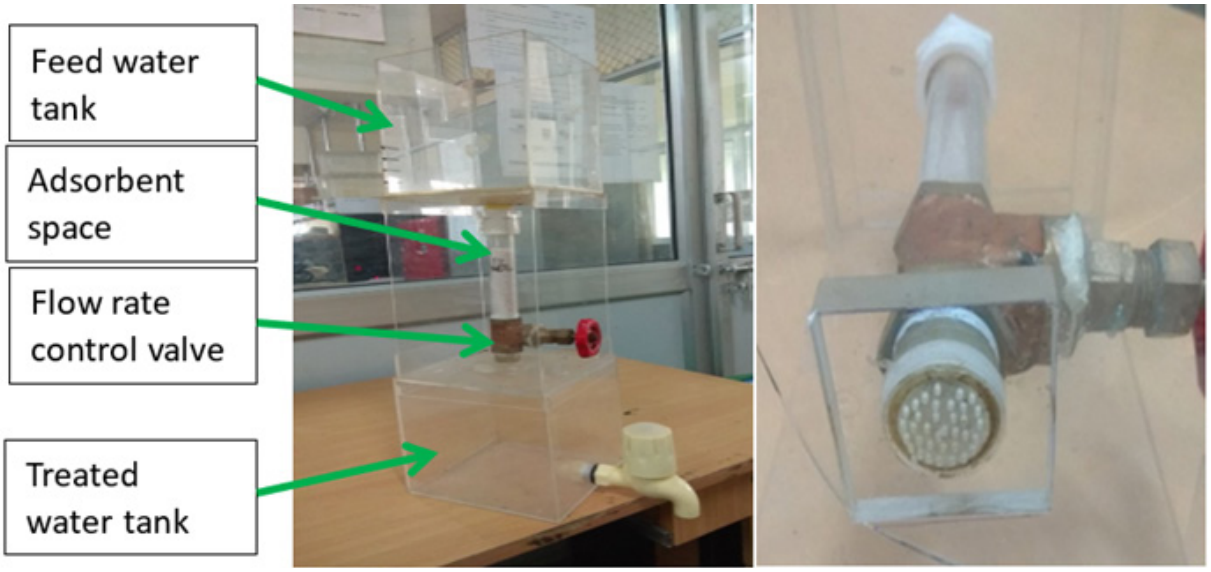
Benefits

- This filter unit can be assembled easily at any site, and it is cost-effective also.
- It is easy to install and can be operated by any layman just after 1st time training
- The present technology can be used where the economic condition of the people is not good.
- Present technology easily meets the demand for drinking water for a family of 4 members, as it produces 20 L per day.
- The filter unit designed is portable and does not require electricity; can be used anywhere, even in remote villages.
- Also, the spent adsorbent from the filter unit can be easily managed by preparing brick and plastic paver blocks.
- AHNP based spent adsorbent is also found to be an effective catalyst for catalytic pyrolysis of biomass and wastes.

Future of the technology:

The scale-up version (5 L/h) is tested in real field and found successful; there is huge scope to reduce the cost of the filter system. The P.I group at IIT Roorkee has collaborated with Bhumi RO System Pvt. Ltd, Roorkee to bring the technology into the commercial market. One proposal on this purpose has been submitted to PMO against a recent call. Discussion is also going on with a TATA group NGO to implement this technology in

Assam for arsenic removal. The spent adsorbents have been used to prepare paver block, and the technology is developed by IIT Roorkee and Y.B. Scientific, Roorkee. Catalytic application of the spent AHNP adsorbent is also tested and published in Chemosphere journal. Overall, the commercial success of this technology is highly expected.



Prototype tested at Chhattisgarh
(Two 10 litre tanks, 450 g adsorbent bed)

Indian Institute of Technology Madras

The Indian Institute of Technology Madras (IIT Madras) is a premier academic institute, well-known both nationally and internationally for excellence in higher technical education, research, innovation, entrepreneurship and industrial consultancy. IIT Madras has been consistently ranked as the No.1 Engineering Institution in India right from the inception of the National Institutional Ranking Framework (NIRF) of Govt. of India six years ago (since 2016). It was also adjudged as the 'Top innovative Institution' in the country in Atal Ranking of Institutions on Innovation Achievements (ARIIA) in 2019 and 2020.

IIT Madras, established in 1959 in sylvan settings within the city of Chennai, has about 600 faculty members, 9500 students and 1200 administrative & support staff. The Institute has sixteen academic departments and several advanced research centres in various disciplines of engineering and sciences. IIT Madras has produced more than 52,500 top-notch engineers, scientists and managers so far, who have contributed significantly to the economic and social development globally and nationally. About 1500 Patents applications were filed by the Institute and ~80 intellectual properties were transferred to industry and others in the recent past. A unique feature of IIT Madras is its large and well-facilitated Research Park, a facility that houses start-ups and nurtures Industry-Academia collaboration. IIT Madras engages research actively with a large number of companies and academic institutions in India and abroad.

The Innovation

A filtering means for tracking information flow in Android operated devices & minimalistic object oriented linux

Linux is the default operating system in many distributed systems frameworks supporting containers, dockers and microservices. The mechanisms used for securing the linux include selinux, Berkley packet filters (BPF) etc. The current invention is significantly different from these approaches and it provides a light weight object oriented extension to the linux kernel by providing object oriented message filters for system call interception at the kernel level. These are easy programmable filter extensions to the kernel and allow rapid customization and security enhancements to the kernel for different applications. In the context of microservices frameworks, the per container filters can be used in programmable orchestrations among microservices deployed in wide area distributed system. CloudMOOL a private open stack based cloud built on Minimalistic Object Oriented Linux (MOOL) optimizes machine learning workloads.

TendonFill" grout for civil engineering applications

In post-tensioned (PT) concrete systems are widely used in high-rise buildings, railway/highway bridges, power plants, etc. To protect the PT steel strands (backbone of such structures) from corrosion, the interstitial space between the plastic strands and ducts carrying them are supposed to be completely filled with cementitious grouts. However, research at IIT Madras showed that grouts available in the market do not have suitable properties required to achieve complete filling of ducts – leading to unprotected strands and its corrosion. Through the IMPRINT India scheme, IIT Madras (in association with L&T Construction and Ultratech Cements Ltd.) has developed a pre-blended/ pre-packaged grout – named as "TendonFill". TendonFill uses significant quantity of indigenous materials such as fly ash (to achieve low carbon footprint) and small quantities of various special chemical admixtures. It exhibits excellent fluidity and its retention, resistance against segregation (i.e., negligible bleeding & softgrout formation) etc. to achieve century-long corrosion protection. TendonFill (being patented by IIT Madras) is India's best HPG and perhaps world's as well for achieving century-long corrosion protection of various construction projects.

NeoFly and NeoBolt

NeoFly is India's first and only manual, active, high performance, personalized wheelchair. It is designed for good health, energy conservancy, compactness, and style. With the NeoBolt it is portable in an auto-rickshaw/ car, which makes it one of the best wheelchairs for the Indian conditions.

NeoBolt converts NeoFly into a safe roadworthy vehicle to enable wheelchair users to have independent outdoor mobility. The User can independently attach the NeoBolt to the wheelchair in less than 10 seconds, converting it into a roadworthy three wheel electric scooter.

NeoBolt is battery powered, travels 30 km per charge and can go upto 25 kmph. The battery can be recharged in 4 hours and is portable for easy recharging. It has a reverse gear for convenient parking & mobility. It has all features of a road worthy vehicle such as a headlight, Indicators, Horn, Reverse, Digital Display and Mirrors.

Approach

IIT Madras continues to give importance to research and innovations to solve the problems faced by the industry and society at a large. Researchers at IIT Madras have identified existing product's weakness/drawbacks or unavailability of a product/process, addressed the same through innovative solutions to arrive at much more versatile/novel versions of the same or new product. At IIT Madras the ideation part is taken care by the 39 Centers of Excellences, the proof of concept development is taken up by Gopalakrishnan Deshpande Center for Innovation & Entrepreneurship, and, commercialisation taken care by the Technology Incubation Centre from the Entrepreneurship angle and Centre for Industrial Consultancy & Sponsored Research (IC&SR) from the Patenting and Intellectual Property Rights angle.

Benefits

Technology developments and transfer helps to address immediate needs of the nation. It provides an opportunity for the researchers at IIT Madras to work on real-world problems and find feasible, effective and scalable solutions for most. It encourages students to focus on innovation and entrepreneurship activity and thus more job creators are being graduated from the Institute. The above said three innovations and others in the Institute are unique in development and helps the nation to achieve atmanirbharta. Needless to say each of these solve at least one problem that the common man faces.

The Future

At IIT Madras, research, innovation, technology transfer and entrepreneurship activities are given importance and made as a critical factor for assessment of faculty members and students activity. Institute continues to engage with industries in R&D activities and resolve their problems so that their competency at the international level increases. The Institute will continue to focus on generation of new intellectual properties of high societal value.

Indian National Centre for Ocean Information Services (INCOIS)

Indian National Centre for Ocean Information Services (INCOIS), an autonomous body under Ministry of Earth Sciences (MoES), Hyderabad with a mission to provide ocean data, information and advisory services to society, industry, the government and the scientific community through sustained ocean observations and constant improvements through systematic and focused research in information management and ocean modelling.

It provides various ocean information and Early warning services to the coastal population on tsunamis, storm surges, high waves, etc through the in-house Indian Tsunami Early Warning Centre (ITEWC). The Potential Fishing Zone (PFZ) and Ocean State Forecast advisories (OSF) advisories will help the users to plan their activities at sea. INCOIS provides training and capacity building to national and international participants on Operational Oceanography and early warning services.

INCOIS has a prominent international presence, being a permanent member of the Indian delegation to IOC of UNESCO, founding member of the Indian Ocean Global Ocean Observing System (IOGOOS), the Partnership for Observing the Oceans (POGO) and member of the Global Ocean Data Assimilation Experiment (GODAE) OceanView Science Team (GOVST) and Patron's Group. INCOIS houses the IOGOOS secretariat and the Sustained Indian Ocean Biogeochemistry and Ecosystem Research (SIBER) International Programme Office. Through the Regional Integrated Multi-Hazard Early Warning System for Africa and Asia (RIMES), INCOIS provides ocean information and forecasts to member countries.

The Innovation

The GAGAN Enabled Mariner's Instrument for Navigation and Information (GEMINI):

Fishermen receive the ocean information services of Indian National Centre for Ocean Information Services (INCOIS) through various dissemination modes starting from Telephone / fax to Mobile applications, website and other innovative ICT methods. However, there is a huge gap in receiving this information when they are out at sea beyond mobile signal range. To address this, the only feasible method is to use satellite transmissions, but they are very costly and not affordable by fishermen.

INCOIS realized GEMINI system in collaboration with Airports Authority of India (AAI) and industry partner M/s Accord Software Systems, which is a low-cost, one-way satellite communication system that can be used to broadcast the lifesaving and safety information address this.

INCOIS developed an android mobile application (GEMINI) with in-house expertise that can be paired with GAGAN receiver through Bluetooth which can decode and display the INCOIS services including critical information like tsunami early warning messages, high wave & cyclone information, potential fishing zone advisories, etc. in their local coastal languages.

Approach

Marine fishing is highly risky profession and fishermen can encounter with risks of loosing life and their property during fishing operations. Timely availability of information on ocean disasters/state of ocean combined with fish availability information helps them to overcome these challenges enabling effective fishing operations and informed decisions.

GPS Aided GEO Augmented Navigation is primarily meant for Civil Aviation. As per International standards in navigation systems, the Message Type 63 (MT-63) is an empty null message stream. INCOIS identified this as a great opportunity for sending real-time information to fishermen in the deep sea. INCOIS customized the MT-63 to broadcast alert messaging services and developed a novel fail-proof communication system to alert coastal communities to mitigate the damage caused due to natural disasters.

Benefits

Information by INCOIS became very critical as they provide livelihood and sea safety information. The availability of this information on-the-go and without any mobile signal, is a major challenge. This becomes a huge obstacle in the communication to the user, experienced dominantly during the recent OCKHI cyclone period. The fishermen who ventured for deep sea fishing before the onset of the OCKHI Cyclone could not be contacted and informed them to return to nearest shore immediately. This inability in communication resulted in loss of life, major injuries, damages, and loss of fishing crafts. The present GEMINI system can addresses these gaps.

Future of the Technology

The GEMINI system developed by INCOIS can also be extended to other alert generating agencies for timely & effective last mile reach of their alert/early warning messages to the stakeholders for the benefit of the society and the Nation.

KUMARAGURU
college of technology
character is life

Kumaraguru College of Technology, Coimbatore

Kumaraguru College of Technology (KCT), Coimbatore is a private Engineering College started in 1984 under the auspices of Ramanandha Adigalar Foundation, a charitable educational trust of Sakthi Group, a sprawling 156-acre campus in the IT corridor of Coimbatore, KCT is an autonomous institution affiliated to the Anna University, Chennai and approved by All India Council for Technical Education (AICTE). KCT has been accredited by National Assessment and Accreditation Council (NAAC) with Grade 'A' and all the eligible UG programs have also been accredited by National Board of Accreditation (NBA).

The able guidance and patronage of Arutselvar Dr. N. Mahalingam, Founder, Sakthi Group along with the efficient administration of Dr. B. K. Krishnaraj Vanavarayar, Chairman, the resourcefulness of Sri. M. Balasubramaniam, Correspondent and the foresightedness of Sri. Shankar Vanavarayar, Joint Correspondent have equipped the College with excellent facilities, spacious classrooms, seminar halls, well-equipped laboratories, sporting amenities, dedicated high-speed internet connectivity (broadband) and well-qualified faculty.

1) Eco-friendly sanitary napkins from natural Fibre

The Innovation

In India Nearly 1,13,000 tonnes of sanitary pads are disposed every year which do not degrade for years. We took a survey and found that nearly 70% of the menstruating women were not satisfied by the existing sanitary pads. So we wanted to give a solution that is a win-win solution for both women's personal hygiene as well as for the environment.

We produced a natural sanitary pad with our unique natural material called Kenaf fibres. Kenaf is a fibre which has very good antimicrobial properties and great absorbency. The Kenaf leaves are edible, but the stem goes as a waste. The plant grows even without water. The fibres are extracted using a retting process and pulped with no chemicals and just mechanical process and processed pulp is used as an absorbent core in the sanitary pads. All the layers of the napkin are replaced with all natural materials. The pads are tested as per BIS certification and the technology is also patented.

The unique feature.

1. Cost of raw material and processing is very cheap that it makes it affordable for all class of people
2. Made from all natural raw materials that it makes it completely biodegradable
3. Made from All natural materials with no toxins and chemicals that it is safer for humans to use
4. A win-win solution for both women's personal hygiene and the environment

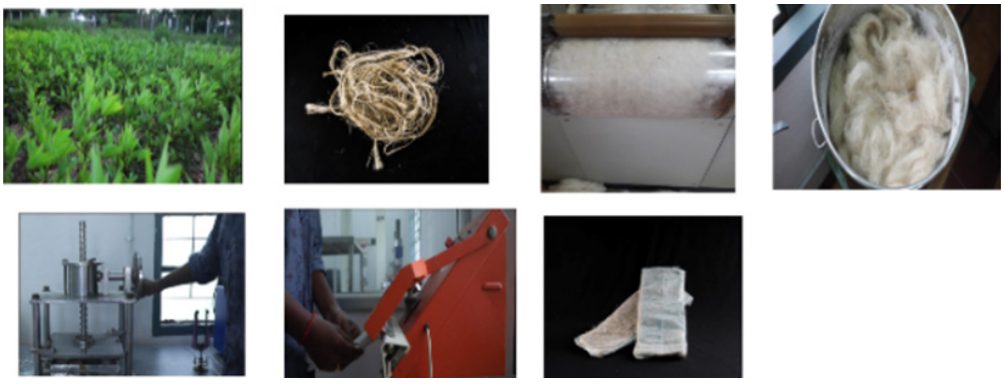
Approach

1. Kumaraguru College of technology is keen about solving environmental problems with sustainable solutions.
2. Identification of Kenaf fibre as one of the best fibres suitable for absorbent core because of its very good absorbing tendency, antimicrobial properties, and pulping tendency.
3. Identification of cotton spun lace nonwovens for top layer and starch-based bioplastics for bottom layer for preventing leakage.
4. Manufacturing of all the layer with wings that is more comfortable that lasts for 6-8 hours
5. Test marketing phase - where manufactured pads were given for testing and received good feedback on the product.

Benefits

Farmers were benefited with an extra income that could be generated from kenaf fibres which goes as a waste. Women experienced no itching, rashes or irritation while using the product and felt highly satisfied by the soft natural feel of the pads. Pads that reach landfill or in composting facility degrades within 6-12 months of disposal.

Figure 1: Development of Eco-friendly sanitary napkins from natural Fibre



The future

We would like to create necessary awareness to all rural women in India to maximize the usage of this product thus helping the Nation to have sustainable environment. Also using the same technology can be extended to manufacture on Baby diapers and adult diapers.

Figure 2: The Team "Bliss"

2) Low Weight Modified Jacquard for Handloom Weavers

The Innovation

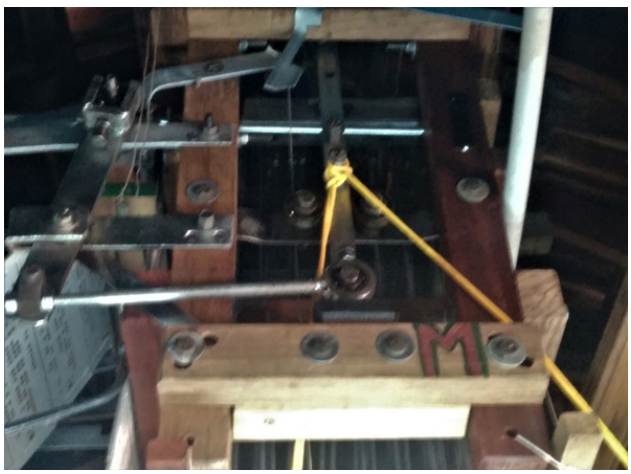
Handloom provides livelihood for 3.14 million households and is one of the oldest and the largest cottage industries in India. A handloom is a simple machine used for weaving and the Jacquard box is an attachment to a loom set up. Heavy weight Jacquard box is an attachment to a loom set up that enables loom to hoist self-reliant warp threads methodically for generating a textured pattern on handloom products. High pressure needs to be applied by foot pedalling to lift the jacquard box by the weaver. More foot pedalling of the weight loaded Jacquard attachment to form the design on the fabric leads to joint pain and fatigue. KCT has developed this Modified Low Weight Jacquard Box by reducing the weight of lifting rods / connecting rods by reducing the diameter and hooks by replacing with lightweight Aluminium Magnesium Alloy 5052 material without affecting the shed formation. This modified low weight jacquard is cost-effective when compared to pneumatic/electric lifting mechanism. Salient features of the low weight modified Jacquard include

1. Weight of the entire jacquard box is reduced substantially
2. Handloom operator's fatigue is reduced, and weavers may engage in operation process more than 9 hours
3. Regular earning is increased due to higher productivity
4. Medical expense for fatigue and joint pains treatment are reduced for weavers thus increasing their savings
5. The modified low weight Jacquard is a cost-effective innovation.

Approach

The need to reduce the human drudgery in the handloom weaving was identified through a field study. Identification of alternate lifting mechanism and light weight material for development of hooks and reduction in weight of jacquard elements were carried out in discussion with industries and academic experts in the field of mechanical / metallurgical engineering. Fabrication of prototype light weight jacquard hooks with Al-Mg alloy and Nylon GF were developed. Cost effective low weight modified Jacquard with Al-Mg 5052 hooks that significantly reduced the human fatigue was designed through field trials. Weavers were imparted skill training on electronic card punching and Entrepreneurship.

Figure 1: Full View of an installed Low Weight Modified Jacquard in a handloom



Benefits

The force required to pedal was solved by incorporating low weight materials Al-Mg 5052 alloy and Noryl (Poly phenylene Oxides with polystyrene) in jacquard elements such as hooks. The weight reduction for lifting bars, linking rods, sliding cylinder rod were made by reducing the diameter. By this method the leg /knee pain and fatigue of weavers were significantly reduced. The study revealed that the weavers were free of physical fatigue while using modified jacquard. Using modified Jacquard, the productivity was improved without any additional investment because of reduced fatigue factors.

The future

The low weight modified Jacquard innovation for handloom weaving has a wide scope in the handloom industry as it is one of the major occupation next to agriculture. The innovators have identified to partner with handloom Jacquard manufacturers to commercially launch and install the innovation in the looms, collaborating with the Department of Handlooms, Government of Tamil Nadu.

Figure 2: The inventors with low Weight Modified Jacquard invention

3) Autonomous Multifunctional Agricultural Robotic Platform (i-farmer)

The Innovation

Agriculture has been changing rapidly in India in the past few decades. Farmers have turned towards precision agriculture to collect and analyse data to effectively manage resources to improve crop and environment quality. Even with such technological advantages, the shortage of manpower challenges the farmers from achieving optimal yield. The project focuses on automating the multipurpose platform for precision agriculture where various attachments can be added to the vehicles such as boom sprayer, transplanter, drum seeder, etc.

The developed agricultural platform can be operated in three modes:

1. Manual mode
2. Teleoperation using joystick
3. Complete autonomous mode

Approach

The expert system that provides autonomy to the tractor is built above the Robot Operating System (ROS). The fully autonomous system utilizes (Real-Time Kinematic Global Positioning System) RTK GPS, wheel and steering column encoders, and IMU for autonomous navigation and path planning. The fused sensor data is fed to an expert system which facilitates path planning and navigation. Although teleoperation does not require any sensor, we have utilized them to record and verify the path planned and traversed by the tractor.

Benefits

- Majority of the field vehicle manufacturers in the automotive industry focus on designing vehicles to suit large scale farming methods whereas the Indian scenario involves small scale farming. To bridge this the vehicle platform has been designed to specifically suit the needs of small-scale farmers according to the crop used.
- Automation of the field vehicle reduces the dependence on manual labour which is scarce to find in recent times.
- As the design of the sub systems are modular, retrofitting on commercially available vehicles opens up interoperability among various field vehicle manufacturers.

The future

- Electrification of renewed tractor
- To automate other agricultural vehicles such as harvester, weeder, fruit picker.
- Automation of tractors for digital agriculture: It is essential to develop accessories to accommodate multifunctionality which includes ploughing, spraying, puddling, weed removal.

Figure 1: Field testing of autonomous tractor (I-farmer)

Figure 2: Project Team

4) A Doctor To Be (ADTB)

The Innovation

ADTB (A DOCTOR TO BE) is a fully automated patient monitoring robot incorporated with AI/ML and IoT concepts to enhance future access in serving, disinfecting the covid -19 patients. The nurse in COVID ward has to collect the vitals and they have to provide tablets to covid patients three times a day periodically, so the risk of infection is more proven in the case, so we are coming up with an autonomous robot ADTB to satisfy the basic needs of the patients and to check their conditions of the patient periodically.

The robot is incorporated with a thermal IR sensor to record the temperature of the affected patients. The robot contains a cluster that holds a sanitizer dispenser, SPO2 to measure the amount of oxygen-carrying haemoglobin in the blood, and an automatic tablet dispenser with sterilizer and serve the items to patients. A disinfecting spray channel is attached on both sides of the robot to disinfect the covid wards. Besides, the robot uses Artificial Intelligence for various purposes like mask detection to verify everyone is wearing a mask or not, to capture and analyse the details shown in the multiparameter patient monitor (ICU), facial recognition, and a multilingual chatbot to interact with the patients. It can also detect eye related diseases especially black fungus. All patient details and vitals are stored in database.

Approach

The product passed the 9th (last) level in TRL where it was spectated by professionals for standing unique, combining all functionality and aesthetics. The review and tests for ADTB are given by well professional doctors from the best hospitals in town. As per the nurses the product is very useful to them and reduces the burden. To meet all the requirements of non-contact approach, keeping the surrounding germ free and strongly standing on the aspect of minimal effect of spread, the features are on the point.

Benefits

This product can help nurses with over shifting and night shifts. There is no direct touch with the patients. When the robot attends to the patient, it sterilises the entire environment using sanitizer spray attached to the sides, as well as the robot itself with UV disinfection lights. It contains a multilingual chatbot, so patients can converse with it in their preferred language. Through the offered display, doctors can interact with patients.

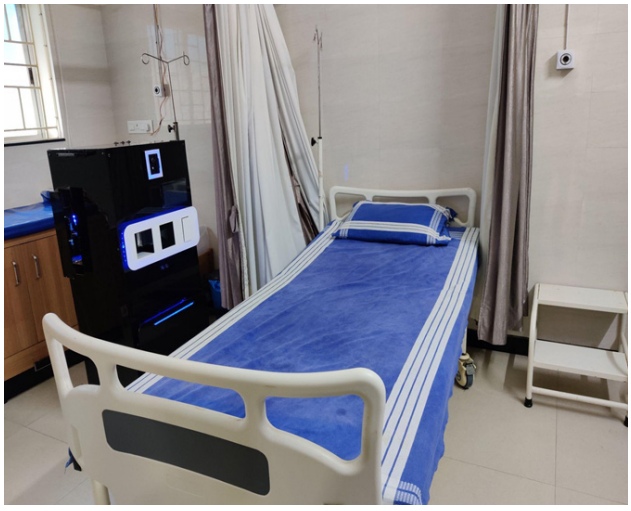
These characteristics aid in decreasing the effect of spread and flattening the curve. The main advantage of this product is that it can be used even in post covid situations.

The future

Product enhancement: This product can be enhanced with additional features. Enhancing the product to be used not only in health care sectors but also in public places as an immobile product.

Market Strategy: Creating awareness about the product. Approaching hospitals, medical health centres and quarantine centres to implement the product.

Figure 1. Fully Automated Patient Monitoring Robot attending Admitted patients



Thiagarajar College Of Engineering, Madurai, Tamil Nadu

Thiagarajar College of Engineering (TCE), Madurai Tamil Nadu established in 1957, by philanthropist and industrialist Thiru. Shri. Karumuttu Thiagarajan Chettiar. This 64 year-old autonomous institution is aided by State and Central Governments, approved by All India Council for Technical Education, accredited by National Board of Accreditation (NBA) and affiliated to Anna University, Chennai and TCE ranked 71st in NIRF 2021 ranking. The College offers 9 Undergraduate, 8 Postgraduate and Ph.D. Programmes in various Engineering, Science and Architecture disciplines. The College has 12 Departments, 260 faculty members and 4200 students. The College has a Technology Business Incubation (TBI) unit supported by the DST and hosts 25 deep technology start ups. The college facilitates Commercialization of innovation with its Industrial connect and enabling students to start their own ventures. The college has T.S.Srinivasan Center for Automotive Research in the campus sponsored by TVS Motors Ltd. to support innovation on product development and E-mobility.

A process and a system for manufacturing of tiles/blocks from waste plastics"- Indian Patent No. 344670

The Innovation

The present innovation Plastone blocks falls under the category of paver block like structural materials developed using waste plastics and aggregates and also with other waste materials like ceramic waste, PET bottles, and granite waste, lime stone, Bakelite and construction debris. The plastone blocks developed from waste plastics as a binder has the ability to replace the concretes. The polymeric solid waste composed of many polymers such as Poly ethylene, Poly propylene undergo softening at elevated temperature without releasing gases and the as formed viscous liquid when sprayed over aggregates facilitates tight binding through compaction process. The structure formed after compacting the mixture of waste plastics and aggregate at hot condition to a definite shape is called as Plastone blocks.

Approach

The research group led by Dr. Vasudevan had earlier developed a technology for using waste plastics to replace the existing coal tar raods with plastic bitumen blended tar roads. Usually referred to as Plastic roads and has been approved by Indian Road congress. The team has laid so far 175,000 kms of road across India. The team with further interest to manage the solid waste has developed a new technology that is referred to as Plastone, which could be used as pathway blocks, workstops and pre-fabricated structures for the construction of low cost toilets.

Benefits

- Plastone can consume all filmy waste plastics both mono layered and multi layered packaging covers.
- Plastone when used for the construction of low cost toilet structures throughout India, the disposal of waste plastics no longer a problem.
- The other raw materials used is solid wastes like granite, ceramics, lime stone and concrete debris and this helps to solve disposal of solid waste by making the product namely Plastone.
- Plastone is made up of waste plastics and other solid waste materials only.
- Hence Plastone is a new find to solve the problem of disposal of very many wastes in one stroke.

Future

Development of 3D printing of blocks for pavement and pre-fabricated structures using waste plastics.

Electrochemical machining of Ti6Al4V diaphragms for aerospace applications

The Innovation

The Ti6Al4V diaphragms are a critical component of the Light Combat Aircraft. They are used in the Power Take Off (PTO) shaft that transmits power from aircraft engine to the gear box. Presence of surface asperities in the form of micro cracks, built-up edge, plastic deformation, heat-affected zones, and tensile residual stresses will lower the fatigue strength. Hence a good surface finish (Ra <0.1 μm) is necessary for these components. The diaphragm is a thin part with varying cross sectional thickness. The diaphragms consist of inner and outer flexible plates. The plates are flat on one side and have a profile on the other side. Machining of these diaphragms to the special contour with desired surface finish is quite critical. Traditional machining process induces internal stress and yields poor precision & poor surface finish, in spite of higher machining hours. To overcome the disadvantages of conventional machining, a novel electrochemical machining (ECM) process was designed and developed to machine multiple diaphragms simultaneously. The developed ECM process consumed one tenth of the conventional machining time and yielded improved precision and surface roughness around 0.07 microns.

Approach

There are essentially three stages involved in this innovation

Stage 1: Prototype ECM for large Surfaces: Electrochemical machining though being widely practiced as one of the non-conventional process, but applicable for micro surfaces or drills. The TCE team has developed a process that machineswith a surface roughness of 0.07 microns and with high precision.

Stage 2: Lab Level Simultaneous Machining of both surfaces: The process has the ability to machine front and back sides of the diaphragms simultaneously.

Stage 3: Lab level to Pilot level: The process offers bulk machining of diaphragms upto 100 Nos in 45 minutes.

Benefits

The developed process would help the manufacturer to conserve approximately around 75% of the working hours of a CNC machine per diaphragm. The process also accelerates the manufacturing of most crucial part of the light combat aircraft in India.

The Future

The as developed process can be extrapolated in machining precision biomedical implants and also the finer metal based membranes for water and Air purifiers.

Augmented Reality based Therapy for Children with Autism (ART - AC) product

The Innovation

ARTAC (Augmented Reality based Therapy for Children with Autism) product is developed based on the **Curriculum book** of children with Autism that is followed by Autistic schools/centers. ARTAC application contains the **3D model** of the objects that are present in the curriculum book with respective audio, animatic movements of the particular object. It is a customized application that supports two languages such as Tamil (native language) and English (common language) and in the future, it will be available for other regional languages (Hindi, Telugu, Malayalam, etc.). It can be deployed in AR technology-supported Smart phones/Tablets. It has been developed with two types of AR (Augmented Reality) technology namely Marker-based AR (with target image) and Marker-less AR (without target image). It has been integrated with UI (User Interface) component designed application that enables children with autism to interact easily without external support from therapists/ Special educators.

Approach

The traditional therapy for autism children is offered by special educators through a special curriculum that enhances learning through exchange of pictures. However, the educators still find it difficult to reinforce learning because of distractions among the students. The ARTAC product with its interactive multimedia enables perception based learning among the autistic children. This product uses two concepts namely Marker-based AR to enhance perception based learning and Marker-less AR to enhance cognitive learning. ARTAC grabs the attention of the children and engages them by 90% whereas the traditional way of learning with the flashcard is by 40%.

Benefits

- Flexible learning and customization concerning children's interests are the unique factors of ART - AC among others.
- ART - AC reduces the parent's and special educator's day-to-day interventions in cognitive therapy and behavior analysis.
- ART – AC enablesthe children to interact with the imaginary world.

- In ART - AC, the Creation of curriculum-based learning for Children with autism is strongly replaced with creating a 3D digital learning process using Augmented Reality.
- Perception-based learning is the unique learning in ART - AC.

The Future

Initially developed ART - AC product with native language “Tamil” and developed for “English” language. ARTAC product would be extended to other regional languages.

– ART - AC will be deployed on any mobile/tablets. (Anytime/Anywhere learning)

Paavai Engineering College

Paavai Engineering College was established by Shri.CA.N.V.Natarajan, charted accountant, Chairman, in the year 2001. Our vision is to be a globally model Institution all set for taking 'lead role' in grooming the younger generation socially responsible and professionally competent to face the challenges ahead. Paavai Engineering College is an autonomous, self-finance institution and accredited by NAAC with "A" grade. At present the college offers 15 UG programs, 7 PG programmes and 4 programmes recognized as research centers and CSE, IT, EEE, ECE, MBA are permanently affiliated programmes. Our college has established MoUs with Taiwan universities and totally 65 MoUs are made Industries and Institution in India and Abroad.

Obtained AICTE-CII platinum status for the past six years. Categorized as Band B institution (All India rank between 26 to 50) in ARIIA - ATAL Ranking of Institutions on Innovation Achievements.. Received all India level first rank – Best internship record during internship day organized by AICTE and Internshala for the past three consecutive years. Achieved champions of champion's trophy in Sports among Anna University affiliated colleges for the past six years.

The Innovation

Innovation I: Intelligent IV fluid bottle for health care using robotic arm

The saline flow rate, oxygen level in the brain are monitored and controlled, also eject the venflon with the help of robotic arm using mobile application and fault identification of sensors using IOT. In all hospitals, a nurse is responsible for monitoring the saline fluid level continuously. P2N IC system is developed, which collects the sensor values from the patient and send it to the mobile application by the connection of WI-FI module, we can connect number of P2N IC kit. If any fault is identified in the kit, an alert mail will send to the server through that the fault is rectified.

Innovation II: Designing of Low-cost Drones for Agricultural Purpose

The drones are designed with low cost for farming community. The low cost drones are used in agricultural field for spraying seed and fertilizer. Drone enabled technology helps in analysis of soil in the field. Even the average farmer can also afford to get this for his field. This monitoring, spraying system helps in agricultural field to improve their productivity, maintaining the water supply system, higher efficiency besides being safe to human and environment.

Innovation III: Solar Insect Light trap

This is solar based insect trapping device. This is used to kill the harmful pests and insects attacking the plants. Due to the usage of solar battery the electricity is supplied to the device. Instead of using pesticides this device is placed in the field. Cost for the pesticide used are saved and the plants are free from toxic, By using this device the human and environment are not affected. This is easy to carry and replace in the field wherever it is necessary. It reduces the man power and improves the agriculture work. We can use the device to prevent crop from insects. It can save the pesticides and reduce the cost. It prevents side effects when pesticides are used. It can play the vital role in the future.

Approach

Paavai Engineering College makes conscious efforts to leverage its potential to develop solutions for real life problems. The college adopts interdisciplinary and collaborative approach to promote the research activities. The college motivates to engage their students at all levels, irrespective of their departments, in their research activities and motivate them to participate in the process of technology development, along with faculty members. The college believes that the students and faculty members are equally important to develop an ecosystem in which innovative ideas can flourish from seeds to products. The students are mentored by the faculty members using the resources of Centers of excellence such as MSME business Incubation center, Paavai soft Innovation center, Institution's Innovation cell, Entrepreneur development cell and so on.

Benefits

The college always made its sincere effort to inspire the faculty members and students to carry out the research activities, which always benefit the society. The technological advancements and research breakthroughs in the college benefit the students' community by inculcating a culture of inquisitiveness, continuous learning and opening avenues for them to explore their interests and accordingly ideate. The college encourage inter disciplinary research as well as development of solutions which fulfill the needs of society. The three referred innovations i.e. Intelligent IV fluid bottle for health care using robotic arm, Designing of Low-cost Drones for Agricultural Purpose and Solar insect light trap address the healthcare and agricultural sectors of society, which is the immediate need of society.

The Future

The college has a standard practice of ideation through various hackathan, project expo and final year projects. By utilizing the centers of excellence for research, pave the way for publishing journals and patent, which has been considerably improved. Now, our futuristic action is going to be focussed in establishing Startups, product enhancement and commercialization. The institution aspires to continue moving in this direction always. CII innovation award has come at the right time to further boost the efforts in this direction

Thiagarajar Polytechnic College (TPT)

Thiagarajar Polytechnic College (TPT) is a Government Aided Institution was established in 1958 immediately after the post-independence by the Philanthropist Sri.Karumuttu Thiagarajar and nurtured by Sri.M.S.Chockalingam. The Institution offers 12 diploma programmes in various branches of engineering/technology. The Institution has produced more than 60,000 diploma technocrats who lead in various capacities in top ranking organizations across the globe.

TPT has crossed Silver Jubilee, Golden Jubilee and now successfully treading in the Diamond Jubilee phase under the dynamic leadership of the Chairman Sri.C.Valliappa, Vice-Chairmen Sri. Chocko Valliappa, Sri.Thyagu Valliappa and the Principal Dr.V.Karthikeyan.

The Institution always promotes quality Technical Education, Research, Innovation, Entrepreneurship, Industry Institute Collaborations, etc. aligning with its vision and as a result, TPT has been conferred with many significant laurels like third term NBA accreditation for five diploma programmes for six years 2018-2024, AICTE-CII Mentor Award, Best Polytechnic College Award by Government of Tamil Nadu, etc.

The Innovation

1) Smart Dache

Shopping carts in malls, supermarkets, etc. are push and pull conventional carts and have experienced little changes. Also, one needs to stand in long queues for payment, which is a time-consuming process. The innovative Smart Dache is an intelligent cart that can be moved with the help of the buttons provided and makes automatic billing. A display structure is provided which helps the easy navigation of the products. This product can be used in places like airports and railways stations where heavy goods are to be carried.

2) e-Bike Fuerza

Electric vehicles are in a greatest demand in our society. “Fuerza-Smart Electric Motorcycle” is an eco-friendly, pollution free bike which uses electric power driven by a motor drive for the vehicles’ movement. This vehicle runs on an average range of 70-80 km for a single time charge. Hence, it provides high efficiency, pollution free safe ride. It provides comfortable driver position which suits for long drive. An emergency charging of 30 minutes can provide a range of 15 km and it is made of an inbuilt charger. This is innovative methodology can be applied to any scrap bike and converted into e-bike.

3) Sol Anemo Water Generator

Owing to the high demand of getting pure drinking water, our innovative product Sol Anemo Water Generator is a self-generating machine which is used to get pure form of drinking water. This product generates water by its own electrical energy and involves VCRS method in which the refrigerant undergoes phase changes. The vapour-compression technique absorbs and removes heat from the space to be cooled and rejects heat elsewhere. Solar panels are used to supply power for running the compressor. The fan attached to the vertical wind turbine collects the atmospheric thin air and converts it into water molecules.

Approach

The institution follows Innovation Management System through standard practices being adapted in various centres like IPR Activity Centre, Start-up Activation Centre, Institution Innovation Council, Entrepreneurship Development Cell, Industry Institute Partnership Cell, High Skill Training Centres etc. functioning in the campus. These centres encourage the generation of innovative ideas among the students through ideation process, analysis of gaps, analysing the impact of each idea and further selecting and transforming the suitable idea into a commercialized product with the support of the Government, Non-Government Agencies, Industries, Alumni, Management, etc.

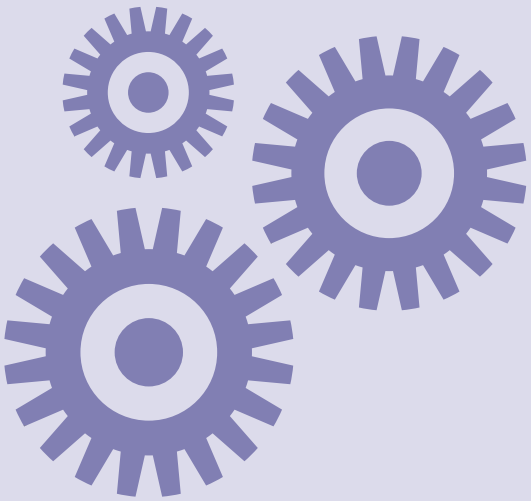
Benefits

The avenues for the innovations in the Institution benefit the students as they are provided with a number of platforms to explore their innovative ideas along with the help of their faculty and involve themselves in generation of new ideas, product developments and thereby help them in becoming successful entrepreneurs.

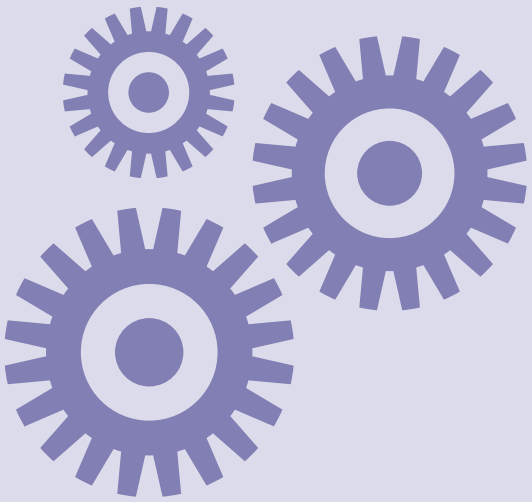
TPT’s Innovations have been beneficial to the Public, Farmers, Agricultural Sector, Construction Industry, etc. It also has served the society during the pandemic. The Institution has created more number of start-ups through its Innovations and Best Practices. The Institution also contributes in fulfilling the UN’s SDGs.

The Future

TPT firmly believes in nurturing innovation, research and entrepreneurship among the students in alignment with its vision to produce world class technocrats. More number of collaborations will be made with the industries to provide solutions to industrial problems and enhance the start-ups. Aptly, CII Innovation Award will further motivate us in this direction.



CII Industrial Innovation Awards - In Media



THE ECONOMIC TIMES

Making its mark in innovation

Fluid Controls, recognised as being one of India's most innovative companies, has been feted at the CII Industrial Innovation Awards

etpanache@timesgroup.com

Fluid Controls Private Limited has been recognised as being one of the Top 25 Innovative Companies of the Year in CII Industrial Innovation Awards at the DST-CII Technology Summit 2021. The two-day virtual event with the theme 'Leveraging Global Technology Collaborations: New India@75' was conducted on December 16 and 17.

Started in 2014, the CII Industrial Innovation Awards are among the most coveted innovation honours in the country. Fluid Controls Private Limited was chosen as the winner among 25 top innovative companies in India via a three-stage evaluation process, which culminated in a presentation to a grand jury. The jury included S Gopalakrishnan, chairman, CII Startup Council, and the grand jury for CII Industrial Innovation Awards 2021, Dr Pronab Sen, country director, IGC's India Central Programme, Prof UB Desai, founding director, Indian Institute of Technology Hyderabad, and others.

Started in 2014, the CII Industrial Innovation Awards are among the most coveted innovation prizes in the country

(Left) Sophie Moochhala, MD, Fluid Controls; and (right) Dr Tansen Chaudhari, COO & CTO, Fluid Controls

The award received by Fluid Controls Private Limited recognises the vision of the company, which was established in 1974 by Dr YE Moochhala, a PhD from Northwestern University, US, to indigenously design, develop and deliver high quality, high-performance products which delight customers. His legacy of innovation has been successfully carried forward by the current MD and COO, Sophie Moochhala and Dr Tansen Chaudhari, respectively.

From its inception, the company has had a clear ethos of original research and development. Following a rigorous approach, all new product designs and innovations are based on specific client and application requirements. Since 2011, Fluid Controls has developed over 25 new products and published 22 technical articles.

Products designed by Fluid Controls Private Limited include high pressure and cryogenic valves, customised connectors, bellows sealed valves and pre-fabricated systems for diverse sectors such as nuclear, railway brake piping systems and oil and gas.

The Fluid Controls R&D Center at Pune is recognised by the Department of Scientific & Industrial Research (DSIR) and houses a design laboratory, the latest design software and an NABL-approved product performance testing and metrology laboratory.

CII Recognises IIT Roorkee Second Year In A Row

IITR Awarded The First Position In The Most Innovative Institutions Category

Roorkee (The Hawk): For the second year in a row, IIT Roorkee has been selected by the prestigious Confederation of Indian Industry (CII) for the Industrial Innovation Awards.

This year, under the Most Innovative Research Institutions category, IIT Roorkee has been awarded the first position. The second and third positions have gone to IIT Madras and Indian National Centre for Ocean Information Services, Hyderabad (INCOIS), respectively.

Last year IIT Roorkee was adjudged as 'The Most Innovative Institute of the Year' for its innovation quotient.

The awards were announced today at the 27th DST-CII Technology Summit in the presence of Dr. Srivari Chandrashekhar, Secretary, DST, Government of India & Mr. Kris Gopalakrishnan, Past President, CII &Chairman, CII Industrial Innovation Awards.

The awards are based

novation ecosystem in the institute, the following innovations have contributed to IIT Roorkee being selected for this award

·Visco-elastic Energy Dissipating Link Elements for Earthquake resistant housing construction by Prof. Pankaj Agarwal, Dr. Amit Goyal, Dr. Nidhin and Mr. Naveen, all from the Department of Earthquake Engineering.

·Nitrogen-Doped Reduced Graphene Oxide (N-rGO) for High-Performance Supercapacitor from Prof. Anil Kumar and Dr. Sahil Thareja from the Department of Chemistry.

·Novel hybrid adsorbent for simultaneous re-

and urged everyone to continue nurturing their innovation framework to revolutionize our industries for an exciting future. He further said that India is still is an agriculture country and 65% of total Indian population depend upon agriculture sector, hence we need to bring innovative solutions to uplift the sector for better life and health of the people. He further added "For innovations to be successful, industry has to handhold and nurture innovation so that innovations become translatable".

Mr Kris Gopalakrishnan, Past President, CII & Chairman, CII Industrial Inno-

from ideation to creation. This award reinforces our belief that we are on the right path and we need to

THE HINDU

Indian National Centre for Ocean Information Services (INCOIS) here has been conferred with the 'Industrial Innovation Award 2021' instituted by Confederation of Indian Industry (CII) in the category 'Top Innovative Research Institutions -2021' on Friday. The award is in recognition of the development of GAGAN-enabled mariner and instrument for navigation and information (GEMINI) system for dissemination of ocean information services such as potential fishing zones advisories, ocean state forecasts, high wave alerts, tsunami early warning services, etc. to fishermen and seagoing community.

THE HINDU

The Thiagarajar College of Engineering (TCE), Madurai has secured the second position in the 'Top Innovative Research Institution (Other Engineering Colleges)' category at the recently concluded 'CII Industry Innovation Award 2021'.

EducationDiary.com

Top CII Innovative Institution Award 2021 For Thiagarajar Polytechnic College

Bengaluru : Salem-based Thiagarajar Polytechnic College emerged as the winner in the CII instituted 'Industrial Innovation Awards 2021' among polytechnics, making the 64-year old polytechnic in the country to have won this honour.

SpiceHealth wins the prestigious CII Industrial Innovation Award 2021

ANI | Updated: Dec 20, 2021 18:41 IST

Gurugram (Haryana) [India], December 20 (ANI/NewsVoir): SpiceHealth, one of India's youngest and fastest growing healthcare startup, has won the prestigious CII Industrial Innovation Award 2021 in the "Top 25 Innovative Company" category. SpiceHealth was awarded for "revolutionizing RT-PCR testing & healthcare industry in the country".

CII (Confederation of Indian Industry) Industrial Innovation Awards were instituted in 2014 to identify and celebrate innovative Indian enterprises across industry segments and sectors.

Confederation of Indian Industry

The Confederation of Indian Industry (CII) works to create and sustain an environment conducive to the development of India, partnering Industry, Government and civil society, through advisory and consultative processes.

CII is a non-government, not-for-profit, industry-led and industry-managed organization, with over 9000 members from the private as well as public sectors, including SMEs and MNCs, and an indirect membership of over 300,000 enterprises from 294 national and regional sectoral industry bodies.

For more than 125 years, CII has been engaged in shaping India's development journey and works proactively on transforming Indian Industry's engagement in national development. CII charts change by working closely with Government on policy issues, interfacing with thought leaders, and enhancing efficiency, competitiveness and business opportunities for industry through a range of specialized services and strategic global linkages. It also provides a platform for consensus-building and networking on key issues.

Extending its agenda beyond business, CII assists industry to identify and execute corporate citizenship programmes. Partnerships with civil society organizations carry forward corporate initiatives for integrated and inclusive development across diverse domains including affirmative action, livelihoods, diversity management, skill development, empowerment of women, and sustainable development, to name a few.

As India marches towards its 75th year of Independence in 2022, CII, with the Theme for 2021-22 as **Building India for a New World: Competitiveness, Growth, Sustainability, Technology**, rededicates itself to meeting the aspirations of citizens for a morally, economically and technologically advanced country in partnership with the Government, Industry and all stakeholders.

With 62 offices, including 10 Centres of Excellence, in India, and 8 overseas offices in Australia, Egypt, Germany, Indonesia, Singapore, UAE, UK, and USA, as well as institutional partnerships with 394 counterpart organizations in 133 countries, CII serves as a reference point for Indian industry and the international business community.

Confederation of Indian Industry
The Mantosh Sondhi Centre
23, Institutional Area, Lodi Road, New Delhi – 110 003 (India)
T: 91 11 45771000 / 24629994-7
E: info@cii.in • **W**: www.cii.in

Follow us on:

cii.in/facebook cii.in/twitter cii.in/linkedin cii.in/youtube

Reach us via our Membership Helpline: 00-91-99104 46244, 91 11 41193300

CII Helpline Toll Free Number: 1800-103-1244