



Workshop Compendium: Learnings from Workshops

Technology Cluster Manager

Technology Centre Systems Program (TCSP)

Office of DC MSME, Ministry of MSME



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Background and Context

MSMEs form the bedrock of our economy with a contribution of more than 30% to India's GDP. To survive in this modern technological world, learning, developing, and upskilling are required. Indian MSMEs lack on several parameters when it comes to technological advancement and there is a need to address this by using a well-structured learning approach.

Technology Centre Systems Programme (TCSP) is a national program undertaken by the Ministry of Micro, Small and Medium Enterprises with the assistance of the World Bank in an attempt to help the its Technology Centres (TCs) keep pace with the technological advancements. The program seeks to enhance the technological and skill base of MSMEs in some selected manufacturing sectors through the strengthened Technology Centers (both existing and upcoming).

The Technology Cluster Manager (TCM) under the aegis of TCSP aims to:

- Increase business opportunities for MSMEs through market linkages
- Enhance the competitiveness of the cluster business environment
- Increase the number of MSMEs utilizing the services of TCs
- Develop a financially self-sustainable business model for cluster related services provided by TCs identify emerging technologies for the selected sector for TCs
- Evaluate existing training programs & develop new training programs for rollout at TCs
- Conduct gap analysis of TCs
- Strengthen the capabilities of TCs to provide technical advises to their clients
- Increase awareness amongst stakeholders on Environmental, Health, and Safety (EHS) requirements.



Under TCM, more than 100 hours of learning and knowledge assimilation workshops have been conducted for all TCs to enhance their know-how of the latest technologies, improve productivity, improve their work culture etc. These workshops were designed to enhance the operational activities and fostering new technologies at all TCs. The workshops have been organized in sectors like Engineering, Auto, ESDM, Leather, Glass, and Fragrance & Flavours. Some of the topics that have been covered in the workshop are welding, automation, robotics, usage of 3D printing, productivity improvement, electric vehicles, etc.

The learnings from these workshops have been compiled to serve as a knowledge-sharing mechanism amongst various TCs. The document has been made to serve as a ready reckoner for all the TCs to implement the learnings from the workshops and organize similar workshops across other TCs and clusters.

Workshop Title	1. Workshop on Additive Manufacturing Technology (3D Printing)
Date and Venue	28 th June 2019 PL Palace, Mahatma Gandhi Road, Agra, Uttar Pradesh
Target Beneficiaries	<ul style="list-style-type: none"> • Footwear, Accessories & Sole manufacturers. • Technical institutes. • Academia & Training institutes.
Workshop Summary	The workshop was organized to leverage the latest technology in the field of footwear sector for the preparation of innovative products. These technologies would enable value addition in the existing products being manufactured in the cluster. This allows for enhancing the basic skills of workers by introducing 3D printing technology (additive manufacturing) for the sole & footwear manufacturers. This technology promises to reduce the time taken for the development of sole molds. CoreEL Technologies from Bangalore was invited to present the usage of 3D printing insole mold technology. Various factors related to cost optimization, turnaround time, accuracy was also discussed during the workshop.
Trainers profile	CoreEL Technologies is a Bangalore based Customer Application Specific Product & Solutions (CASPS) company offering innovative solutions, ranging across Intellectual Property (IP) cores, Design & Development, System Design & Prototype Development, Next-Gen Digital products, Integrated solutions, Low Volume Manufacturing, System Upgrades, and Obsolescence management, EDA tools, COTS products, Semiconductor solutions, and Technology Training. They are a leading developer of advanced electronic system level products and provide solutions to three primary markets - Aerospace & Defense, Digital Media Broadcast, and Universities & Institutions of higher learning. CoreEL is an authorized partner and distributor for Stratasys 3D printers.
Key Takeaways	<p>Some of the major takeaways from the workshop are as below: -</p> <ul style="list-style-type: none"> ➤ 3D printers are based on additive manufacturing technology. ➤ 3D printing technology can be used for the manufacturing of prototypes as well as functional products and functional parts of machines depending upon the type of product and its application. ➤ Products manufactured through a 3D printer are expensive, however, they save a lot in terms of manufacturing time as compared to the conventional process of mold making for the sole. ➤ For the footwear sector, this technology can only be used to develop sole molds, heels, and footwear accessories. ➤ Limited color options, textures, and finishes are available in products manufactured through 3D printers. ➤ Although the machine is designed to work twenty-four hours a day, it must be shut down if it reaches the threshold temperature of 60-70°C. ➤ Normally it takes 15 hours to get sole mold from the 3D printer and one day to develop CAD design for the printer. ➤ Shelf Life of resins and material used in 3D printers is one year. ➤ 3D printers are quite expensive, cheaper versions of Polyjet (300x100x350) costs around 32-35 lakhs. Printers of HP are also available in the market.
Relevant sectors for replicability	<ul style="list-style-type: none"> ➤ Engineering ➤ Auto Components ➤ Medical ➤ Fashion Accessories

Workshop Title	2. Sensitization Seminar on Productivity Improvement Programme
Date and Venue	06 th August 2019 Bhawna Clarks Inn, Agra, Uttar Pradesh
Target Beneficiaries	Semi Mechanized and Export-oriented Footwear Manufacturing unit.
Workshop Summary	The workshop was organized to sensitize the operational performance and manufacturing competitiveness of the Semi Mechanized and Export-oriented footwear manufacturing units at Agra. Productivity Experts from URs Productively, Dr. Gautam Gopala Krishnan & Mr. Raja Chidambaram highlighted the best practices across the world for waste minimization and emphasized on using concepts like time & motion study, right-first-time, lean manufacturing to maximize the efficiency of raw material and manpower. Global statistics related to footwear productivity, efficiency, SAM was shared with the manufacturers
Trainers profile	URs Productively was established in the year 1993, founded by Mr. Raja Chidambaram an Industrial Engineer from NPC/APO. The organization provides a wide range of value-added services to improve the productivity and competitiveness of companies across many industrial sectors including the leather and footwear sector since 1995. The services of URs include Structured Productivity Improvement Studies, Bench Marking and Business Excellence, Quality Management Systems, Total Quality Management, Energy management, ICT, Learn To Do (LTD) training programs.
Key Takeaways	Some of the major takeaways from the workshop are as below: - <ul style="list-style-type: none"> ➤ All units must establish productivity and Quality Standard Operating Procedures. ➤ Enterprises should introduce Work-study concepts for improving productivity. ➤ All units should start capturing and analyzing productivity and quality data for upper closing and other operations. ➤ In the case of footwear manufacturing units, productivity improvement varies between 10% to 25%. ➤ Factories should train their employees in modern methods of quality management to improve their problem solving and decision-making capabilities. ➤ Video library should be made to train under-performing operators at units. ➤ The clearance of dead stock and better management of WIP (Work In Progress) can result in the availability of more productive space. ➤ Absenteeism and operators shortage is a major issue leading to footwear manufacturing units running at 60-70% capacity. There might be hidden and controllable reasons that might contribute to absenteeism and indiscipline. ➤ Systematic training and sensitization of concepts like Right First Time Quality can improve the quality of the products. ➤ Tools like Bottleneck Identification and Line balancing, Skill Matrix, Capacity study, Capturing hourly production, method improvement should be rigorously followed by the footwear manufacturers.
Relevant sectors for replicability	<ul style="list-style-type: none"> ➤ Engineering ➤ Apparels & Textiles

Workshop Title	3. Workshop on Attitude Management
Date and Venue	27 th April 2019 Central Footwear Training Institute, Agra
Target Beneficiaries	Trainers of CFTI Agra
Workshop Summary	This workshop was mainly focused on developing a positive attitude and to develop cognitive skills, to instill the trait of not giving up when faced with a challenge. Soft skill trainer Shailja Ranjan Raj highlighted various behavioral and psychological barriers to the performance and sensitized the faculty and staff for the need for self-improvement and self-analysis. Locus of control inventory was checked for all TC faculties which will help the management in understanding an individual's behavior and strengths.
Trainers profile	Shailaja Ranjan Raj possesses a varied corporate experience along with a strong, interpersonal, and human relations aptitude. He has evolved himself as an HR professional by being immensely involved with numerous projects in the areas of Human Resources in Manufacturing, FMCG, Engineering as well as IT industry where he has had the longest stint. He has been proactively supporting, educating, and empowering executives, line managers, and others to enhance performance within the organization. His expertise is in the areas of Human Resources Management, Personal Effectiveness, Management Development, Managerial Effectiveness, Interpersonal Effectiveness, Problem Solving Skills, Customer Service, Team Building, Communication Skills, Sales Communication Skills, Presentation Skills, Selling Skill, Sales Effectiveness, Motivational Workshops & Operational Excellence, Train the Trainers Workshop and Outbound Training.
Key Takeaways	Some of the major takeaways from the workshop are as below: - <ul style="list-style-type: none"> ➤ A Quantitative & Qualitative analysis of behavioral skills is possible only through a systematic approach and an action plan can be devised to change the perception of people. Locus of control inventory can be evaluated based on the questionnaire developed by the experts. Different aspects of Locus of Control are given below¹: <ul style="list-style-type: none"> ○ <i>Internal (I)</i>: A person with an internal orientation believes that his or her future is controlled from within. It represents self-confidence in a person's ability to control what happens to him or her in an organization. However, this person may sometimes be unrealistic in assessing difficulties and may ascribe personal failure to situations over which he or she had no control. ○ <i>External others (EO)</i>: A person with an external-others orientation believes that his or her future is controlled by powerful others. Very high EO scores (30 or higher) indicate dysfunctional dependence on significant other people for achieving one's goals. ○ <i>External-Chance (EC)</i>: A person with an external-chance orientation believes that his or her future is controlled primarily by luck or chance. To an extent, the lower the EC score, the better, because a person with a low EC orientation is more likely to utilize another potential in trying to achieve goals. ○ <i>Ratio of Scores</i>: The ratio of your I and E scores can also provide information about your orientation. Ratios greater than one are beneficial, and action plans can be created to change ratios that are lower than desired.
Relevant sectors for replicability	➤ All manufacturing units

¹ The Pfeiffer Library Volume 8, 3rd Edition.

Workshop Title	4. Workshop on Waterjet Cutting Technology
Date and Venue	20 th September 2019 Indo Danish Tool Room, Jamshedpur
Target Beneficiaries	<ul style="list-style-type: none"> • Sheet metal auto parts manufacturers • General engineering MSMEs
Workshop Summary	<p>The workshop was organized to leverage the Waterjet cutting technology in the field of metal cutting for making prototypes, profiling of auto parts, etc. This technology would enable value addition in the existing products being manufactured in the cluster. Water Jet Machine is highly versatile:</p> <ul style="list-style-type: none"> ➤ It can cut blanks for auto frame parts. ➤ It can practically cut any material including hardening steel as it is a cool cutting process with zero heat-affected zones (HAZ). ➤ It is suitable to cut die elements of sheet metal and forging dies. <p>M/s Flow Bangalore Waterjet Pvt Ltd, Bangalore was invited to present the concept and usage of Waterjet Cutting Technology. Various factors related to cost optimization, cutting time, the accuracy of waterjet cutting also discussed during the workshop.</p>
Trainers profile	Flow is the world leader in the development and manufacture of UHP waterjet technology, Headquartered in Kent, Washington. M/s Flow Bangalore Waterjet Pvt Ltd, Bangalore is working in this field for the last 45 years. Flow is the inventor of Abrasive Waterjet Cutting. Flow having many contributions to raise WJ cutting technology to a great height. M/S Flow has capabilities to offer complex customized solutions to Aerospace Industries, Defense, Heavy Engineering, Automobile, Electronic Components, etc. since 1974, Flow has delivered over 13,000 waterjet and abrasive waterjet systems to customers in more than 100 countries.
Key Takeaways	<p>Some of the major takeaways from the workshop are as below: -</p> <ul style="list-style-type: none"> ➤ Waterjet cutting can cut all types of metals of varied thicknesses. ➤ Waterjet technology can be used for the manufacturing of prototypes as well as the profiling of functional parts of machines depending upon the type of product and its application. ➤ Products manufactured through a Waterjet cutting are expensive as compared to Laser cutting, however, the Waterjet machine is inexpensive than laser cutting. ➤ Prototypes and profiling done by Waterjet cutting can save time in comparison to CNC machining and saves the cost of manufacturing. ➤ There are no Water Jet Machines in Adityapur and versatility of this machine will support die making, proto making, and profiling activity in a significant way. ➤ For cutting tool steels and toughening group, steel waterjet is one of the best processes as it is a cool cutting process. ➤ To manufacture Die elements like pressure pad, die holder it gives a significant advantage for a narrow profile in thick materials and coupling together with CNC milling it gives an unparalleled advantage. ➤ Maintenance of waterjet is easy as compared to laser cutting technology. ➤ It's a user-friendly technology and easy to learn and operate. ➤ The cost of 5 axis waterjet machine with processing tolerance of approx. 0.02 mm would be around Rs. 2.5 INR.
Relevant sectors for replicability	<ul style="list-style-type: none"> ➤ General Engineering <ul style="list-style-type: none"> ○ Fabrication of vessels ○ Profiling of vehicle body manufacturing

Workshop Title	5. Workshop on Welding Automation – “The future of Welding - Automation, Robotics, and IoT”
Date and Venue	19 th October 2019 Indo Danish Tool Room, Jamshedpur
Target Beneficiaries	<ul style="list-style-type: none"> • Fabrication MSMEs • General Engineering industries
Workshop Summary	The workshop was organized to leverage the latest advancements and fostering of new technologies in welding through automation, industry 4.0, artificial intelligence, and machine learning. Kemppi India of Bangalore was invited as a keynote speaker to deliver a session on the advancements and use of industry 4.0 i.e artificial intelligence and machine learning in the welding methods to make welding processes more precise and safe. The AI/ML gives predictive and data-based inputs for welding by MIG, TIG, or MMA of manual welding as well as automated and robotics welding. The expert from Tata Motors, Jamshedpur presented work done by Tata in automation and the use of robotics for safe welding practices. A representative from NIT Jamshedpur highlighted the automation of welding and research being done to detect welding defects effectively.
Trainers profile	<p>Kemppi provides state-of-the-art welding solutions using the latest technologies. It is a Finnish company with a partner network spread across 60 countries. With many firsts, Kemppi was the first company to launch an inverter-based welding machine in 1977, followed by the world’s first digital welding machine in 1993.</p> <p>Kemppi is geared for Industry 4.0 with many futuristic solutions. Their welding manufacturing software is universal and it works like the ERP for the welding industry. Just like any ERP system, Kemppi provides a holistic solution where core teams in an organization come together to plan, execute, and monitor their production. Many large organizations are using Kemppi TQM welding software, where the ERP and welding team are involved and it gives a different dimension to their ERP system.</p>
Key Takeaways	<p>Some of the major takeaways from the workshop are as below: -</p> <ul style="list-style-type: none"> ➤ The Welding processes have a rich history in the metal joining process, however, advancements of industry 4.0 in terms of robotics, IoT have taken these traditional processes to new heights with improved ergonomics. ➤ Application of these advanced technologies of industry 4.0, automation, AI/ML is changing the traditional welding practices and making them safer, productive, accurate, and inexpensive. ➤ Products & services provided by Kemppi for the advancement of welding methods have covered entire bandwidth including different welding methods, equipment, and various accessories ranging from software, special purpose machine, safety equipment, etc. ➤ Application of robotics in welding can make the processes safer, faster, and economically viable, and the free-up manpower can be utilized for other value addition activities. ➤ Various researches are going on to detect the internal defects of manufactured parts through welding. The use of these advanced technologies in welding methods will improve the quality of the weld and increase the detectability with the aid of technology. ➤ The cost of welding automation may go high but with semi-automation, MSMEs can start using these advancements economically.
Relevant sectors for replicability	<ul style="list-style-type: none"> ➤ General Engineering <ul style="list-style-type: none"> ○ Sheet metal SMEs ○ Vehicle body manufacturing

Workshop Title	6. Workshop on Water Jet Cutting Machine
Date and Venue	4 th September 2019 IGTR, Aurangabad
Target Beneficiaries	<ul style="list-style-type: none"> • Metal fabrication MSMEs related to shipbuilding • IGTR, Aurangabad, • MSME TC Vizag
Workshop Summary	The workshop was organized to leverage the latest technology in the field of metal cutting. These technologies would enable value addition in the existing products being manufactured in the cluster. Various parameters like process improvements and its technical usage in various sectors like Defense, Aerospace, Marine, ROI, and its usage on different materials like Titanium, Glass, Granite, Aluminum, Fiber, Stainless-steel, etc were discussed during the workshop.
Trainers profile	Flow is the world leader in the development and manufacture of UHP waterjet technology, Headquartered in Kent, Washington. M/s Flow Bangalore Waterjet Pvt Ltd, Bangalore is working in this field for the last 45 years. Flow is the inventor of Abrasive Waterjet Cutting. Flow having many contributions to raise WJ cutting technology to a great height. M/S Flow has capabilities to offer complex customized solutions to Aerospace Industries, Defense, Heavy Engineering, Automobile, Electronic Components, etc. Since 1974, Flow has delivered over 13,000 waterjet and abrasive waterjet systems to customers in more than 100 countries.
Key Takeaways	<p>Some of the major takeaways from the workshop are as below: -</p> <ul style="list-style-type: none"> ➤ Waterjet cutting technology is one of the fastest-growing major machine tool processes in the world due to its versatility and ease of operation. There are multiple advantages to adding waterjet cutting capabilities. ➤ <i>Versatility:</i> Abrasive waterjets cut material from 1/16 inch to over 10 inches of thickness in high or low volume with the flexibility of cutting the same thing every day or changing materials to meet customer demands. ➤ <i>Simplicity:</i> This machine enables to cut a variety of materials with ease, whatever the shape, dimensions, or material may be. ➤ <i>Accuracy:</i> A precise waterjet starts with the stability of the table, all the way to the control of the waterjet stream. ➤ TC Vizag has confirmed its interest in this technology as it will help shipbuilding manufacturing units in Vizag.
Other Relevant Sectors	<ul style="list-style-type: none"> ➤ Aerospace ➤ Automotive ➤ Energy ➤ Oil & Gas ➤ Transportation ➤ Agriculture ➤ Architecture

Workshop Title	7. Workshop on Internet of Things (IoT)
Date and Venue	23 rd September 2019 Hotel Ambassador Ajanta, Aurangabad.
Target Beneficiaries	<ul style="list-style-type: none"> • MSMEs related to Auto components manufacturers. • Academia & Training institutes.
Workshop Summary	The workshop was organized to leverage the latest technology in the field of the Internet of Things. The objective of the workshop was to sensitize the cluster and create awareness about the latest technology i.e. Internet of Things (IoT). Experts from the IoT field explained the various types of IoT platforms and its application including a case study on solid waste management through IoT, opportunities in IoT field, Startup project case study, and the driver for digital transformation.
Trainers profile	<p>Mr. Ravinder K, Founder-Director Agent Technologies Corporation, India, having over 12 years of industrial experience in MNCs (Sr. software engineer at LG, a principal software engineer at Honeywell, DSP specialist at Dell).</p> <p>Mr. Ravi Nishesh Shrivastav with over 13 years of industry experience with organizations like NIIT technologies, Cyient, Infosys, and Accenture. He is currently working as a solution architect for digital city solutions with Cyient Limited, Hyderabad.</p>
Key Takeaways	<p>Some of the major takeaways from the workshop are as below: -</p> <ul style="list-style-type: none"> ➤ <i>IoT Basic</i>: A basic introduction with a real-time example, applications, Industrial IoT 4.0, digital transformation, design and development (hardware, device, applications) ➤ <i>Technology and Platform of IoT</i>: Existing platform available in the market, an existing platform can be leveraged to bring in some real-time implementations, trends in current digital industrial transformation, next-generation AI-based IoT solutions. ➤ <i>IoT as a decision support system</i>: Data usage through IoT, IoT is becoming an important part of our life with connected homes, offices, smart cities, vehicles (audio, video, fuel sensors, speed sensors) GPS, etc. ➤ <i>Implementation challenges</i>: How various proposition fit-in, selection of right hardware, and software. ➤ <i>Business Streams</i>: Broad understanding of industrial applications of IoT, electric vehicle, ➤ TCM team is drafting the course content for a training program on IoT.
Other Relevant Sectors	<ul style="list-style-type: none"> ➤ Automobile ➤ Defense ➤ Aerospace ➤ Education ➤ Manufacturing

Workshop Title	8. Workshop on Electric Vehicle (EV)
Date	27 th September 2019
Venue	IGTR, Aurangabad
Target Beneficiaries	<ul style="list-style-type: none"> MSMEs related to electric vehicle components manufactures Academia & Training institutes Students and faculty of IGTR, Aurangabad
Workshop Summary	The objective of the workshop was to spread awareness about business opportunities in the Electric Vehicle sector for the MSMEs and academic institutions. The expert from EV explained about electric batteries, Electric Two Wheelers, new Business Ideas, dealer requirements with minimum investment, conversion kits to upgrade existing bikes, electric cars - OEM business, etc.
Trainers profile	<p>Mr. Hemant Padhye, having 32+ years of experience in the areas of automotive engineering, powertrains, and program management. He has worked with organizations like General Motors, TATA Motors, Bajaj Auto, Visteon (USA), KOEL (USA). His domain expertise includes Electric Vehicles, Powertrains, drives, and Automotive Product Development. He has handled multiple vehicle and powertrain programs including localization & development of powertrains.</p> <p>Mr. Prabudha Roy, a BITS Pilani Alumina of 1978 is a Senior Managing Consultant from IBM – San Francisco with a demonstrated history of helping organizations accelerate adoption and avoid disruption in the people's side when implementing projects that bring about enterprise-wide changes. Prabudha has also worked with L&T India and USA for over 30 years. Prabudha is a certified Consultant in Blockchain Essentials and Design Thinking Practitioner from IBM, USA.</p>
Key Takeaways	<p>Some of the major takeaways from the workshop are as below: -</p> <p>EV provides a lot of opportunities for entrepreneurs in various domains like retail, Production, innovation, etc. Some of the opportunity areas are given below</p> <ul style="list-style-type: none"> ➤ Electric Batteries: Batteries are the core component of any electric business. There is a scope of selling batteries for these vehicles. ➤ Electric 2 Wheelers: Business opportunity as Dealership with minimum investment. ➤ Used Bikes: Selling of Conversion kits to upgrade current bikes could be a business opportunity. ➤ The Electric Cars segment provides an opportunity for several MSMEs to develop themselves as OEM to these manufacturers. ➤ Scope of developing new products like Battery Rickshaw, Electric Buses, Electric Bike, etc. ➤ Opportunity for setting up charging stations for Electric Vehicles at Fuel Station.
Relevant sectors for replicability	<ul style="list-style-type: none"> ➤ Automobile ➤ Electric Vehicle ➤ General Engineering

Workshop Title	9. Workshop on glass manufacturing defects
Date and Venue	24 th June 2019 Centre for the Development of Glass industry, Firozabad, Uttar Pradesh
Target Beneficiaries	<ul style="list-style-type: none"> • Glass Manufacturing MSMEs • TC officials • Technical Institutions
Workshop Summary	The objective of this workshop was to create awareness for the glass manufacturing MSMEs about various glass manufacturing defects and to provide updates on on-going project activities at CDGI. TCM glass manufacturing expert Mr. C V Raju informed about various glass defects and possible reasons and way-outs to minimize the defects. Representatives from CDGI notified stakeholders about the ongoing project of pot manufacturing by the slip casting method. The project would take 2-2.5 months for completion. The stakeholders were further informed that Central Tool Room, Ludhiana is working on a project to develop a machine for automation in the bangle joining process.
Trainers profile	Mr. C. V. Raju is a Ceramic Engineer from the Indian Institute of Technology, Banaras Hindu University Varanasi. With 40 years of varied experience in the Glass design and development industry, Mr. C.V. Raju is an expert in the manufacturing technology of Glass ranging from container glass (amber and flint), television (CRT) glass (B/W & Color), glass for lamp and lighting industry. For over 30 years, Mr. C.V. Raju has been heading several projects in the manufacturing of specialized glasses such as Crystal, Opal, Borosilicate, and Ophthalmic. In addition to the process requirements of glass chemistry, melting, and forming, Mr. Raju also has hands-on experience in planning, implementation, and stabilization of large glass industry-related projects.
Key Takeaways	<p>Some of the major takeaways from the workshop are as below: -</p> <ul style="list-style-type: none"> ➤ MSMEs should hire trained inspectors who can identify the defects quickly and provide corrective actions for the same. ➤ To reduce defect and rate of rejection, glass manufacturing MSMEs may adopt the following tools/techniques <ul style="list-style-type: none"> ○ Deploying a trained inspector for inspection ○ Use digital technologies like thermal cameras to check furnace operations. ○ Hourly statistical analysis of defect distribution. ○ Issue of AVO (Avoid Verbal Orders) to the Production department ○ Root cause analysis of all defects with a corrective action plan. ➤ Pot development by the Slip casting method will take three months at CDGI ➤ Ludhiana TC is developing a bangle joining machine, Which will be available soon for a trial run.
Relevant sectors for replicability	<ul style="list-style-type: none"> ➤ Furnace based industries in Glass sector

Workshop Title	10. Workshop on best practices in the glass manufacturing sector
Date and Venue	14 th October 2019 Hotel Parador, Agra Road, Firozabad, Uttar Pradesh.
Target Beneficiaries	Glass Manufacturing MSMEs, TC officials, Technical Institutions
Workshop Summary	The workshop was conducted at Firozabad to sensitize stakeholders about best practices in the glass manufacturing sector. Technical experts from FIC UK, Falornitech Italy, and Glass Services Czech Republic shared information about electric boosting, electric pot, and day tank furnaces respectively. MSME owners enquired about the usage and applicability of e-boosting in the vicinity of Firozabad, as units have to face several power cuts.
Trainers profile	Mr. Andreas Zucconi is the Commercial Director of M/s. Falorni Gianfranco, where he has contributed immensely to the achievement and completion of big projects in almost all glass fields from tableware, container glass, glass wool, and others. Mr. Yuri Zozulia is a Glass Technologist associated with the world-famous Glass Services (GS) operating out of the Czech Republic. GS brought the usage of computers, computer simulation, and predictive technologies into the world of glass. Dr. Zia Haider currently engaged as Technical Consultant to F.I.C (U.K) Ltd. holds a Ph.D. in Glass Technology from the world-renowned University of Sheffield U.K. Over a career span of five decades, Dr. Zia has worked in Design, Engineering, and operation of Glass Melting and conditioning in various companies worldwide.
Key Takeaways	Some of the major takeaways from the workshop are as below: - <ul style="list-style-type: none"> ➤ The Day Tank Furnace is suitable for the production of very high-quality glass. ➤ The main features of the furnace are the following: <ul style="list-style-type: none"> ○ Transportable and compact. ○ Interchangeable melting tank. ○ Easy Glass drainage. ○ Low consumption of energy. ○ Automatic combustion system. ○ Alarm system with phone controller. ➤ Main Features of electric pot furnace are mentioned below: <ul style="list-style-type: none"> ○ High quality of the glass due to very good homogeneity of the mass of glass. ○ The operational cost is very low. ○ Zero combustion emission into the atmosphere (no smoke). ○ A fully automatic temperature control facility is available. ○ Compact design and lightweight allow easy transportation. ○ Lower heat losses result in lower outside skin temperature ○ High-quality long-lasting heating elements ➤ The main features of the electric boost system are given below: <ul style="list-style-type: none"> ○ Increased melting output and stabilization of glass flow. ○ Reduced emissions. ○ Improved glass quality. ○ Prevention of critical situations in case of pull change. ○ Constant furnace temperature. ○ Computer Modeling – establishing optimum dimensions and positioning of the boosting system.
Relevant sectors for replicability	➤ Furnace based Industries

Workshop Title	11. Workshop on energy conservation in the glass manufacturing sector
Date and Venue	20 th December 2019 Hotel Parador, Firozabad, Uttar Pradesh
Target Beneficiaries	<ul style="list-style-type: none"> • Glass Manufacturing MSMEs • CDGI Staff
Workshop Summary	The workshop's objective was to sensitize and foster new technologies on energy conservation in the glass manufacturing sector and to appraise the stakeholders with ongoing project activities of CDGI. Mr. D S Dubey from Central tool Room, Ludhiana, shared the status of the bangle joining machine with the stakeholders. CDGI informed the audience that the first trial of dried pot manufactured by the slip casting method will be done by 15th February 2020. TCM experts suggested deploying equipment like Recuperators, Bubblers, Electric Boost in the process to increase fuel efficiency.
Trainers profile	Mr. C. V. Raju is a Ceramic Engineer from the Indian Institute of Technology, Banaras Hindu University Varanasi. With 40 years of varied experience in the Glass design and development industry, Mr. C.V. Raju is an expert in the manufacturing technology of Glass ranging from container glass (amber and flint), television (CRT) glass (B/W & Color), glass for lamp and lighting industry. For over 30 years, Mr. C.V. Raju has been heading several projects in the manufacturing of specialized glasses such as Crystal, Opal, Borosilicate, and Ophthalmic. In addition to the process requirements of glass chemistry, melting, and forming, Mr. Raju also has hands-on experience in planning, implementation, and stabilization of large glass industry-related projects.
Key Takeaways	<p>Some of the major takeaways from the workshop are as below: -</p> <ul style="list-style-type: none"> ➤ CDGI will launch the following services to serve the cluster in a better way: <ul style="list-style-type: none"> ○ Thermal Imaging Camera ○ Endoscope ○ RUL and Creep Measurement apparatus ○ Glass Tempering Facility ➤ CDGI is in process of getting NABL accreditation for its glass testing laboratory. ➤ Set up of Entrepreneurship Development Cell at CDGI, to facilitate MSMEs for UAM registration, counseling, credit linkages, market linkages, GST services, IPR facilitation, incubation, etc ➤ Central Tool Room (CTR), Ludhiana is working on the Bangle Joining Machine project. ➤ MSMEs can save energy by adopting equipment like Bubblers, Air Gas Burners, Electric Boost, electric heating, etc.
Relevant sectors for replicability	<ul style="list-style-type: none"> ➤ Furnace based industries. ➤ Energy Consultanting services

Workshop Title	12. Technical workshop on Attar and Essential oil
Date and Venue	07 th September 2019 P.L Palace, Kannauj, Uttar Pradesh
Target Beneficiaries	<ul style="list-style-type: none"> • Attar and Essential oil manufacturers • Academia & Training institutes
Workshop Summary	The technical workshop was organized to create awareness for MSMEs regarding the extraction techniques used in the fragrance and flavor sector. TCM expert, Dr. Ragvan presented the different techniques of extraction like solvent extraction and also informed MSMEs to use solvent techniques to form a new product. Sh. Shakti Vinay Shukla, Director FFDC informed the MSMEs about the improved version of deg and bhapka. Chief Guest, Sh. Subrat Patak, MP informed that the issue of MSMEs from Kannauj has been discussed in the parliamentary session. He further shared that he got approval for the opening of attar and perfume university at Kannauj. TCM Representative shared the Diagnostic study report of Kannauj Cluster, which was largely approved by the stakeholders.
Trainers profile	Dr. R.S. Ragavan is a Fragrant and Herbal Extraction expert with over 35 years of professional experience in manufacturing facilities of plant-based products (herbal) and specializes in new product development, process engineering design, technical consultation, project management, quality assurance, production, regulatory administration, and market communication. Dr. Ragavan has exemplary experience in Fragrant Material, Herbal Extraction and Production, Floral Fragrances, Phytochemicals, Natural Dietary Supplements, Natural Food Colors & Flavors, Essential Oils, Spice Oils & Oleo Resins and Health & Personal Care Formulations. He has more than 5 years of international exposure and experience of working in countries like Sri Lanka, Iran, Hong Kong, and the US.
Key Takeaways	<p>Some of the major takeaways from the workshop are as below: -</p> <ul style="list-style-type: none"> ➤ FFDC Kannauj is using the production plant for distillation and value addition of essential through a fractionating column and other equipment. ➤ The solvent extraction process can be used to produce oleoresin, resinoids, absolutes, and concretes. ➤ The cost of oleoresin products is higher as compared to attar and essential oils and requires less effort to produce. ➤ The extraction process is the same as of distillation but chemical solvents are used as a substitute for water during the extraction of oleoresin products. ➤ Normally it takes 4-5 hours to get absolutes. ➤ The uses of concrete and oleoresins are more convenient at the customer end. ➤ The shelf life of oleoresin products is more than 1 year if stored as per recommendations.
Relevant sectors for replicability	<ul style="list-style-type: none"> ➤ Industries involved in Medicinal, Food & Flavors, and Perfumery products.

Workshop Title	13. Technical workshop on extraction techniques in F&F sector
Date and Venue	09 th September 2019 Hotel Classic Grande, Imphal, Manipur
Target Beneficiaries	<ul style="list-style-type: none"> • Essential oil manufacturers • Academia & Training institutes.
Workshop Summary	The technical workshop was organized with the stakeholder workshop where TCM Part-time expert, Dr. Ragvan presented the different techniques of extraction like solvent extraction and also informed MSMEs to use solvent techniques to form a new product.
Trainers profile	Dr. R.S. Ragavan is a Fragrant and Herbal Extraction expert with over 35 years of professional experience in manufacturing facilities of plant-based products (herbal) and specializes in new product development, process engineering design, technical consultation, project management, quality assurance, production, regulatory administration, and market communication. Dr. Ragavan has exemplary experience in Fragrant Material, Herbal Extraction and Production, Floral Fragrances, Phytochemicals, Natural Dietary Supplements, Natural Food Colors & Flavors, Essential Oils, Spice Oils & Oleo Resins and Health & Personal Care Formulations. He has more than 5 years of international exposure and experience of working in countries like Sri Lanka, Iran, Hong Kong, and the US.
Key Takeaways	<p>Some of the major takeaways from the workshop are as below: -</p> <ul style="list-style-type: none"> ➤ A variety of indigenous plants are present in the NE region which has high medicinal properties. ➤ The extraction of medicinal plants will help pharmaceutical companies to develop medicines from it. ➤ Most of the indigenous aromatic plants which have high yield properties are used to create expensive perfumes and flavors for the food industry. ➤ The solvent extraction process can be used to produce oleoresin, resinoid, absolutes, and concretes. ➤ The price of extractions is high as compared to essential oil and possesses high aromatic and medicinal value. ➤ The uses of concrete and oleoresins are more convenient at the customer end. ➤ Shelf life is more than 1 year if it kept with all the precautions.
Relevant sectors for replicability	<ul style="list-style-type: none"> ➤ Industries involved in Medicinal, Food & Flavors, and Perfumery products.

Workshop title	14. Workshop on Artificial Intelligence and Machine Learning
Date and Venue	24 th July 2019 Conference Hall, Central Tool Room and Training Center
Target Beneficiaries	Technical Staff of CTTC
Workshop Summary	Technical workshop on artificial intelligence and machine learning was aimed to provide a theoretical as well as practical perspective on how to integrate software applications in AI to the hardware or the embedded systems. Academy of Robotics, Vizag (AOR) team took a session on the implications of human control for the science, design, and engineering of intelligent automation systems. To build, test, break, and learn from the systems under meaningful human control in practice and design educational programs on the use of meaningful human control in autonomous intelligent systems.
Trainers Profile	Academy of Robotics is the brainchild of skilled professionals, providing education in the field of Robotics Technology. They provide a platform to the students, to unleash their Dreams, Skills, and Creativity, and assist them to explore their budding Hidden potentials. Let them explore the Hidden Horizons and cross the boundaries they never thought they could. Founded by an elite team from across the world with more than 2 decades of experience in the IT industry, Directors from India and abroad have worked a lot to put their expertise in the organization and tailor-make it for Indian learning standards.
Key Takeaways	Some of the major key takeaways from the workshop are as below: - <ul style="list-style-type: none"> ➤ Meaningful artificial intelligence and machine learning is particularly important for the rapid industrialization, and the human resources skillset needs to develop to operate the machines for the smooth transition of the economy. ➤ It was proposed to develop an in-house training session -or- a set of webinars for the developing the CTTC AI wing and to train the team online how the machine inputs will be sent to the AI application or after processing how the output of the AI program will be transported back to the machine. ➤ CTTC officials and faculties appreciated the training content on AI & ML and visited AOR, Vizag office to explore more on the current development and infrastructure. ➤ CTTC accepted to continue long-term AI & ML courses as part of a curriculum on a partnership basis. ➤ AOR also conducts TOT on robotics technology.
Relevant sectors for replicability	<ul style="list-style-type: none"> ➤ General Engineering ➤ Auto Components Manufacturers

Workshop Title	15. Workshop on best practices in 5S for productivity enhancement of MSMEs
Date and Venue	27 th .August 2019 Central Tool Room and Training Centre, Bhubaneswar, Odisha
Target Beneficiaries	<ul style="list-style-type: none"> • CTTC Staff • MSMEs from Bhubaneswar and Cuttack Engineering Clusters
Workshop Summary	The workshop was organized to appraise & sensitize the cluster members about the best practices on “5S”. 5S is a system for organizing spaces, so work can be performed efficiently, effectively, and safely. This system focuses on putting everything where it belongs and keeping the workplace clean, which makes it easier for people to do their jobs without wasting time or risking injury. TCM technical expert presented a case study on 5S- productivity enhancement followed by a video dissemination session. A group exercise was taken on the core concept of 5S to evaluate the learning of participants. The stakeholders including technical staff from TC enquired about the process of implementation of 5S.
Trainer Profile	Mr. Gopala Krishna K N is a Mechanical Engineer with over 30 years of experience. in general and precision engineering. His two decades of experience includes designing and conducting training programs on Quality Tools, Quality Management, Quality Improvement, Production line, Latest Technology, and Design Verification. Over the past decade, he has been active as an Independent Trainer, Consultant, and Business Excellence Professional engaged in developing and delivering Lean Six Sigma Corporate training and certification programs. He has extensive experience in the development of customized training courses (curriculum and training content) for workmen and supervisory staff (Training of Trainers) across domains of Six Sigma, Lean, Continuous Improvement, Business excellence, Quality Control/ Quality Assurance/ SPC/ SQC and ISO 9000 series.
Key Takeaways	<p>Some of the major key takeaways from the workshop are as below: -</p> <ul style="list-style-type: none"> ➤ 5S is an important tool for productivity enhancement for MSMEs. It organizes spaces so that work can be performed efficiently, effectively, and safely. ➤ IPFC can help MSMEs for the trademark, registration of patents, developing business plans, designing project proposals, getting a copyright, etc. ➤ MSMEs can adopt quality tools/certifications like ZED, ISO, lean six sigma, 5S, Kaizen for quality and productivity improvement. ➤ Literature, videos, PPT on 5S is available with the trainer and MSMEs can use it. ➤ MD, CTTC confirmed the implementation of 5S at Bhuvneshwar TC.
Relevant sectors for replicability	<ul style="list-style-type: none"> ➤ General Engineering ➤ Auto Components Manufacturers

Workshop Title	16. Technical workshop on Advanced Welding Technologies
Date	20 th December 2019
Venue	Odisha Young Entrepreneur Association, Khapuria Industrial Area, Cuttack, Odisha
Target Beneficiaries	<ul style="list-style-type: none"> • Fabrication Engineering industries • Industry Associations • Government Institutions • Academic institutions
Trainers Profile:	Dr. Sushovan Bask is from Engg. Dept of Jadavpur University, Kolkata and working as Assistant Professor at CV Raman Global university since 2017. He has over 10 years of research experience in welding technology and characterization. He has worked on esteemed projects like BRNS project of “Development of Aluminum-Stainless Steel transition pipe joints for cryogenic and vacuum applications using CMT (Cold Metal Transfer)” and Tata steel’s project on “Plasma welding of high strength steel”. He has organized many seminars on advanced welding workshops in other countries and his articles on welding-related topics have been published in more than 10 US magazines.
Key Takeaways	<p>Some of the major key takeaways from the workshop are as below: -</p> <ul style="list-style-type: none"> ➤ Knowledge related to the ergonomics of new welding machines was shared with MSMEs. ➤ Certified welders earn more than their peer group ➤ Bose College of Engineering has announced to establish an advanced version welding workshop lab which would support MSMEs on a job work basis. ➤ MSMEs requested to conduct a boiler training cum certification program on welding at CTTC and further requested TCM to develop capacity-building proposal for skill enhancement of the cluster’s welders.
Relevant sectors for replicability	<ul style="list-style-type: none"> ➤ General Engineering Sector

Workshop Title	17. Technical Workshop on Industry 4.0
Date	24 th September 2019
Venue	Central Tool Room and Training Center, Bhubaneswar, Odisha
Target Beneficiaries	The technical staff of CTTC
Workshop Summary	The objective of this technical workshop on Industry 4.0 was to create awareness about sustainable strategies for smart manufacturing, deliberate on how organizations could continuously improve, innovate, and share technological advancements. Representatives from Siemens and DigiTech Controls & System, Pune delivered the workshop.
Trainers Profile	DigiTech was founded in 2006 to provide total consultancy solutions with a skill development platform for automation, Mechatronics, Robotics, CNC, and PCB manufacturing for teaching and research in engineering education. DigiTech is the global technology leader in the design and manufacture of PLC and Robotic based industrial technology for education as well as for industry with complete technology solutions that have transformed the way education teaches the theory application and implementation of controls, robotics, and Mechatronics. DigiTech Control has a tie-up with the Siemens for establishing Industry 4.0 lab.
Key Takeaways	Some of the major key takeaways from the workshop are as below: - <ul style="list-style-type: none"> ➤ Importance of industry 4.0 on Improved Productivity, Improved Efficiency, Increased Knowledge Sharing and Collaborative Working, Flexibility & Agility, Makes Compliance Easier, Better Customer Experience, Reduces Costs and Creates Innovation Opportunities was shared with stakeholders. ➤ CTTC expressed its interest in setting up industry 4.0 lab at TC and requested DIGITEC to submit the proposal to enter MOU for the same.
Relevant sectors for replicability	<ul style="list-style-type: none"> ➤ General Engineering Sector

Workshop Title	18. Workshop on Python
Date and Venue	19 th -20 th October 2019 MSME-DI Bengaluru
Target Beneficiaries	IT Students & professionals
Workshop Summary	The objective of the workshop was to promote new learnings and business decisions among students and professionals and to evaluate and generate revenue means for the TC. Knowledge and basics of python were shared with professionals by Dr. Suresh Kumar, Doctorate in Computer Science (BITS Pilani). Ten Professionals participated in the workshop and got benefitted in terms of learnings and business decision making.
Trainers profile	Dr. S Suresh Kumar is working with the Datatrained institute which offers specialized courses on data sciences. He is a versatile, accomplished, and results-oriented data scientist with over 24 years of professional experience working with Govt of India / Indian Navy and Lead Organizations in delivering value-added results. A business-minded data scientist with a demonstrated ability to deliver valuable insights via data analytics and advanced data-driven methods. Relied on as a key adviser in driving global, multi-billion-dollar growth; gains in customer loyalty; and record-setting profit improvements.
Key Takeaways	Some of the major key takeaways from the workshop are as below: - <ul style="list-style-type: none"> ➤ Python is user friendly and easy to learn and it is used in the development of prototypes. ➤ Python is a high level and general-purpose dynamic programming language that focuses on code readability. It has fewer steps when compared to Java and C. ➤ Most automation, data mining, and big data platforms rely on Python. This is the ideal language to work with for general-purpose tasks. ➤ The takeaways also included Python's web frameworks and applications, Its enterprise and business applications with python. ➤ Python is easy to read, even for a low skilled programmer so it is suitable for use amongst multi-programmer and large development teams, especially those with coding inexperienced team members.
Relevant sectors for replicability	<ul style="list-style-type: none"> ➤ IT and software industry

Workshop Title	19. Workshop on Data Science with Excel and Power BI
Date and Venue	23 rd - 24 th November 2019 MSME -DI, Bengaluru
Target Beneficiaries	IT Students and Professionals
Summary	This workshop was organized to provide practical training to the IT students and professionals on data sciences with illustrative examples and to create an outreach of the TC among MSMEs & IT professionals. Dr. Suresh Kumar, from the Datatrained, conducted this training program. One of the workshop objectives was to create an advanced level of awareness on the types of data, the role of a data scientist, and the types of tools available for data analytics.
Trainers profile	Dr. S Suresh Kumar is working with the Datatrained institute which offers specialized courses on data sciences. He is a versatile, accomplished, and results-oriented data scientist with over 24 years of professional experience working with Govt of India / Indian Navy and Lead Organizations in delivering value-added results. A business-minded data scientist with a demonstrated ability to deliver valuable insights via data analytics and advanced data-driven methods. Relied on as a key adviser in driving global, multi-billion-dollar growth; gains in customer loyalty; and record-setting profit improvements
Key Takeaways	Some of the major key takeaways from the workshop are as below: - <ul style="list-style-type: none"> ➤ The participants benefited by learning the basics of data analytics with Excel and Power BI. ➤ Power BI is a Business Intelligence (BI) and Data Visualization tool for creating custom and interactive dashboards from different data sources while Microsoft Excel is a software application from Microsoft that is used for data analytics, mathematical operations, and data organization. ➤ One of the workshop takeaways was an advanced level of awareness on the types of data, the role of a data scientist, and the types of tools available for data analytics. ➤ The participants learned to gather, transform, model, and visualize data with Power BI and usage of advanced Excel Statistical functions.
Relevant sectors for replicability	<ul style="list-style-type: none"> ➤ Students & Trainees of all TCs ➤ Marketing & Finance Professionals

Workshop Title	20. Workshop on Data Science for Smart Business Decisions (using Tableau software)
Date and Venue	18 th -19 th January 2020 MSME -DI, Bengaluru
Target Beneficiaries	IT Students and Professionals
Summary	The workshop was aimed at the promotion of TC services among MSMEs along with revenue generation and to educate MSMEs on Data Science for Smart Business Decisions (using Tableau software). The workshop was conducted by Dr. Suresh Kumar, He provided Practical training on data sciences with live industry illustrations and covered both Technical / Non -Technical aspects of sectors such as healthcare, automotive, finance, etc. More than thirteen students participated in the workshop and benefited in terms of new learnings.
Trainers profile	Dr. S Suresh Kumar is working with the Datatrained institute which offers specialized courses on data sciences. He is a versatile, accomplished, and results-oriented data scientist with over 24 years of professional experience working with Govt of India / Indian Navy and Lead Organizations in delivering value-added results. A business-minded data scientist with a demonstrated ability to deliver valuable insights via data analytics and advanced data-driven methods. Relied on as a key adviser in driving global, multi-billion-dollar growth; gains in customer loyalty; and record-setting profit improvements.
Key Takeaways	Some of the major key takeaways from the workshop are as below: - <ul style="list-style-type: none"> ➤ The participants benefited by learning the basics of data analytics with Tableau ➤ Tableau is a rapidly growing data visualization and analysis software application. ➤ One of the workshop takeaways was learning about the different views Tableau offers, including Maps, Parameters, Calculated Fields, Bar Charts, Line Charts, and Tables (with heat map variations). ➤ The workshop participants benefited by learning to create core visualizations in Tableau (bar, line, map, storyline, table, heat map) ➤ The workshop curriculum included information about how to download and install Tableau and how to load external data into Tableau.
Relevant sectors for replicability	<ul style="list-style-type: none"> ➤ Students & Trainees of all TCs ➤ Marketing & Finance Professionals

Workshop Title:	21. Workshop on low-cost automation and robotics
Date:	8 th February 2020
Venue:	Startup Hub, ITI Dooravani Nagar, Bengaluru
Target Beneficiaries:	<ul style="list-style-type: none"> • IT Students • MSMEs
Workshop Summary:	<p>The objective of the workshop was to support MSMEs in implementing automation using robotics with the least cost implications. Daniel Hahn, TCM Expert conducted the workshop. A total of 62 participants from industry and academic institutes attended the workshop. The various aspects of robot applications were explained with examples including safety issues with robots and robot handling, economic analysis for robot applications, capital investments, and operating costs involved. The industrial processes for which robots application has been successful were shared by the speaker with real examples and animations. A video of training was made, and it would be shared with the participants soon.</p>
Trainers profile:	<p>Dr. Ing. Daniel Hahn is an expert in Robotics and Automation. Dr. Hahn has more than 18 years of extensive experience and knowledge in the fields of electronics manufacturing, automation strategies, human-centered engineering, and mechatronics. He has a strong link to industry and was part of several industry workshops about industrial automation, robot applications, robot/control requirements, economic analysis, life cycle management, robot cell examples, etc.</p> <p>Furthermore, Dr. Hahn has developed a new online learning platform with remote access to a real robot. This learning platform has already 10 member universities in India with Indian students executing five different industry projects with Assembly, Welding, 'Sense & Pick & Place', and Palletizing. As a complementary action, a student exchange program with India had been initiated in 2014 with APS, where Dr. Hahn was responsible for the scientific part in addition to plant and fair visits.</p>
Key Takeaways	<p>Some of the major takeaways from the workshop are as below :</p> <ul style="list-style-type: none"> ➤ There are various aspects of robot applications including safety issues with robots and robot handling, economic analysis for robot applications, capital investments, and operating costs involved. ➤ A thoughtful review of the implementation of the industrial processes of robots is required before its implementation at MSMEs. ➤ The Selection of a suitable robot is an equally important factor in the process of automation. ➤ Before initiating the process of implementing automation through robots one needs to have awareness about the global recent trends in the robotics, automation space, and the contradictory perspectives on the usage of robots in industries. A clear understanding of manpower requirements is also required as a pre-implementation exercise. ➤ One of the takeaways was details of robots manufactured in India and Eg. INROBOT at Ahmednagar which is a Robot supplier based out of India. ➤ Understanding the benefits of Industry 4.0 and automation and the practical aspects of automation. ➤ Robotics can improve worker safety aspects and can reduce production lead time.
Relevant sectors for replicability	<ul style="list-style-type: none"> ➤ Engineering sector ➤ Automobile Industries

22. Photo Gallery



Workshop on Additive Manufacturing Technology (3D Printing)



Sensitization Seminar on Productivity Improvement Programme



Workshop on Attitude Management



Workshop on waterjet cutting technology



Workshop on Welding Automation – “The future of Welding - Automation, Robotics, and IoT”



Workshop on Water Jet cutting machine



Workshop on Internet of Things (IoT)



Workshop on Electric Vehicle (EV)



Workshop on glass manufacturing defects and updates on-going projects



Workshop on best practices in the glass manufacturing



Workshop on Energy Conservation



Technical Workshop on Attar and Essential oil



Workshop in extraction technique in F&F sector



Workshop on Artificial Intelligence and Machine Learning



Workshop on best practices in 5S for productivity enhancement of MSMEs



Technical workshop on advanced welding technologies



Technical Workshop on Industry 4.0



Two days workshop on Python



Workshop on Data Science with Excel and Power BI



Workshop on Data Science for Smart Business Decisions (using Tableau software)



Workshop on low-cost automation and robotics