An Interactive Design Study of Microscope Cluster

Need Assessment Survey Report
MSME Design Clinic Scheme

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Design Clinic Scheme

The scheme is an effort to increase awareness about the value of design and establish design learning in MSMEs and increase competitiveness of MSME products and services through design.

For easy percolation of design thinking and philosophy and maximum benefit for MSME units the Design Clinic Scheme is divided at 3 broader levels. These activities are helpful in smooth transition into several levels of design intervention in industrial and business activities of MSMEs.

- Design Awareness Seminar
- Design Awareness Programme
  - Need Assessment Survey
  - Design Clinic Workshop
- Design Projects

The larger purpose of design is to do things in a better manner, to improve a situation and to make a positive difference. The role of design in business is to create value. A company can use the design process to add value to products, services, and the organisation. A well-designed product, service, or organisation is always more valuable.
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Contents

1. Design Clinic Scheme
2. Acknowledgment
3. Contents
4. Objective of the DAP
5. Introduction to various Organizations
6. About Ambala Cantt
7. All the clusters Based in Ambala Cantt
8. Introduction to Microscope Cluster
9. Different Microscopes
10. Introduction to Microscopes
11. Production Cycle of the Microscope
12. Process of Manufacturing
13. People met in Microscope Cluster
14. Need Assessment Survey and Opportunity areas for Design
15. Areas for Design Intervention
16. Way Forward
Design Awareness Program

Objectives
The objective of need assessment survey is to generate detailed cluster information to understand the core issues related to-

- Raw Material and components at different stages of manufacturing
- Infrastructure setup and work station
- Skill and techniques
- Product form, shape and usage
- Tools and technology in use
- Capability of manufacturing unit
- Present Market status
- Current Competition
- Packaging, logistic and storage
- Exhibition, display and merchandising

Methodology
Questionnaire survey of manufacturing and sales units. Discussion with unit owner and artisans. Process observation. Find traces from earlier technique and usage of tools and material. Self observation and analysis.

Expected Deliverables
This extensive design research and awareness program is intended to provide qualitative and detail data of the cluster to generate insights about the industry which would help to address the existing problems and future opportunity area for design intervention or scopes which can be further workout and can be taken up during the design clinic workshop and areas taken up as design projects with in and outside the cluster scenario.

Participants
The Design Awareness Program is conducted by A Balasubramaniam, Gurgaon in association with

- PHD Chambers, New Delhi
- National Institute of Design, Ahmedabad
- ASIMA, Ambala Cantt
- Micro Small and Medium Scale Enterprise, Ambala Cantt.
PHD Chamber of Commerce and Industry, established in 1905, is a multi-state organization working at the grass root level and with strong national and international linkages.

The Chamber acts as a catalyst in the promotion of industry, trade and entrepreneurship. PHD Chamber, through its research-based policy advocacy role, positively impacts the economic growth and development of the nation and contributes significantly to socio-economic development and capacity building in several fields.

PHD Chamber's geographical span covers the 10 States of Chhattisgarh, Delhi, Haryana, Himachal Pradesh, Jammu & Kashmir, Madhya Pradesh, Punjab, Rajasthan, Uttar Pradesh, Uttarakhand and the Union Territory of Chandigarh. PHD has a direct membership of over 1,600 corporate entities and serves more than 45,000 indirect members through 150 Association Members and 8 Secretarial Affiliates.
The National Institute of design (NID) is internationally acclaimed as one of the foremost multi-disciplinary institutions in the field of design education and research. The business week, USA has listed NID as one of the top 25 European & Asian programmes in the world. The institute functions as an autonomous body under the department of Industrial Policy & promotion. Ministry of Commerce & Industry, Government of India. NID is recognized by Dept. of scientific & industrial research (DSIR) under Ministry of science & technology. Government of India, as a scientific and Industrial design research organization.

NID has been a pioneer in industrial design education and is known for its pursuit of design excellence in India. NID’s graduates have made a mark in key sectors of commerce, industry and social development by taking role of catalysts and thought leadership.
The Association was established in the 1972-73 and is a registered body under Punjab Societies Act 1860 to act as a central body for the flourishing scientific instrument manufacturing communities in Ambala.

The Association is an active body, which is being run in a democratic and totally transparent manner. The association also organizes training programs, practical workshops, visits to various institutes of national importance, visits to large scale industries etc. It is regularly in touch with local science degree colleges, engineering colleges, medical colleges and arrange interaction with the faculty.

ASIMA regularly makes presentations Scientific and government institutes and communities and interacts with heads of the various govt. engineering colleges regarding upgradation of Ambala industry.
Worldwide, the micro small and medium enterprises (MSMEs) have been accepted as the engine of economic growth and for promoting equitable development. The major advantage of the sector is its employment potential at low capital cost. The labour intensity of the MSME sector is much higher than that of the large enterprises. The MSMEs constitute over 90% of total enterprises in most of the economies and are credited with generating the highest rates of employment growth and account for a major share of industrial production and exports.

In India too, the MSMEs play a pivotal role in the overall industrial economy of the country. In recent years the MSME sector has consistently registered higher growth rate compared to the overall industrial sector. With its agility and dynamism, the sector has shown admirable innovativeness and adaptability to survive the recent economic downturn and recession.

As per available statistics (4th Census of MSME Sector), this sector employs an estimated 59.7 million persons spread over 26.1 million enterprises. It is estimated that in terms of value, MSME sector accounts for about 45% of the manufacturing output and around 40% of the total export of the country.
Ambala was constituted as a district by merging the jagir estates of hitherto independent chieftains whose territories had lapsed or had been confiscated by the British Indian Government. The City was established in the year 1843 and is an important centre for manufacturing of scientific & surgical instruments.

**Location**

Ambala is located in Ambala District bordering Punjab and Himanchal Pradesh. It has an average elevation of 264 metres. Situated 200 km north of Delhi and 50 Km south of Chandigarh, this town is extremely well connected by the rail and road network.

**Demographics**

As of 2001 India census, Ambala Cantonment had a population of 62150. Males constitute 61% of the population and females 39%. Ambala Cantonment has an average literacy rate of 79%, higher than the national average of 59.5%; with 64% of the males and 36% of females literate. 12% of the population is under 6 years of age.
History
As per ancient Indian history, Aryan people resided at Ambala at some point in time. There was a very popular place called Sarudhna near Ambala, which was the Aryan country's capital at that time. Ambala was given the status of a district in the year 1847. The British built a Cantonment here, and the Cantonment has grown bigger and includes an army and air force base.

Industry and Business
Ambala Cantt is known for its scientific & surgical instruments manufacturing industry. The clientele of this industry includes an impressive list of prestigious colleges of India and overseas clients. Ambala is famously called the "City of Scientific Instruments".

Ambala district has industries in metal casting, kitchen mixer grinder manufacturing, and submersible motor pump manufacturing. It is also famous for its wholesale cloth market, which sells some of the best cloth material.
Scientific Instrument Clusters in Ambala Cantt

Ambala Cantt is a hub for scientific instruments with more than 800 units engaged in this business. The scientific instruments industry is employing more 4000 skilled and semi-skilled people. It is using more than 50 types of different raw material to manufacture more than 20,000 different types of instruments.

The scientific community caters mostly to schools, colleges, engineering institutes, medical colleges and hospitals. It is also a major supplier for universities research laboratories, quality control lab of industries and defence/space applications in India. The annual turnover of the industry is approx. 800 crore with approx. 200 crore being the export component.

1. Electrical
2. Electronics
3. Heating & Cooling Equipments
4. Physics Instruments & Optical Equipments
5. Microscopes & Accessories
6. Glassware
7. Fibre Glass Anatomical Models
8. Pharmacy & Physiological Instruments
9. Ophthalmic & Dairy Equipments
10. Woodenware & Metalware
A microscope is a scientific instrument that helps in seeing micro objects i.e. objects that are too small to see with naked eyes. Microscope was a revolutionary invention during the 17th century that was essentially invented to study small tissues or microorganism. It is used in various laboratory researches. There are many types of microscopes that serve specific purposes. Some commonly known are simple, optical or compound microscope.

The microscope cluster in India grew post independence to cater to a growing number of schools and colleges by providing cheaper alternatives to the imported microscopes. Early microscopes were copies of imported microscope models made by sand casting and the quality of microscopes gradually improved with the availability of material, process and technical know how.

Today microscope manufacturers form one of the largest cluster of the Ambala Scientific Community both in terms of size and number of people employed.
Different kinds of Microscope

There are many types of microscopes made or traded in Ambala but biological microscopes forms the majority of the microscopes manufactured and sold.

Biological Microscope are used to study the living organisms and this type of microscope is preferred by students, professionals and even hobbyists to conduct research or undertake project activities in their respective fields of interest. Biological Microscopes are commonly utilized for medical, clinical, and educational applications.

Different configurations of biological microscopes made in Ambala Cantt. are

Student Microscopes
Medical Microscopes and
Pathological Microscopes
Different kinds of Microscope

Student Microscope

A Student microscope is a low power (with 3-10x optical zoom) double lens optical microscope with an eyepiece adjusted with twin knobs wherein each of the knobs meant for coarse and fine focus adjustments respectively.

In such microscopes, the primary lens is often fixed atop a rotating platter so that different lenses could be adjusted into the line of view. The student microscope usually comes with a choice of two different powers.

It is a range of economical microscope manufactured for bulk in use in school science classes especially in primary and secondary schools.
Different kinds of Microscope

Medical Microscope

Medical microscope are high power compound light microscope with features making it suitable for application in the medical and clinical laboratories for diagnostic purposes.

The optical zoom of the objective of such microscopes must have at least 100x to get the desired magnification. The high magnification in medical microscope ensures visibility of the smallest component in blood and helps in identifying parasites and bacteria.

It contains similar parts as that of a compound student microscope with variations in specifications like the stage, condenser and number of objectives with higher zoom.
Different kinds of Microscope

Pathological Microscope

Pathological microscope are used in laboratories for conducting investigation or examining blood tissues or other human body tissues to diagnose a disease or deficiency in the body.

It is used by the pathologists to get a magnified view of the samples on a slide to identify the cause of a disease and suggest possible remedy. Pathological microscopes can be found in various designs and functional efficiency levels as per the diverse needs in accordance with the investigation to be undertaken.

The make of such microscopes is very much similar to compound microscope and come in a variety of configurations. Most of the pathological microscopes made in Ambala are Binocular Co-axial with Mechanical stages and LED light source.
MICROSCOPE
PARTS and
COMPONENTS

Image Courtesy: Kalgidhar Scientific Works
Production Flow of Microscope
Process of Manufacturing

Metal Body of Microscopes

Casting done by Pressure Die-Cast. Excess materials and wastage gets recycled.

Plastic Components

Plastic components are made using manually operated injection molding machines.
Process of Manufacturing

Milling And Drilling

All the metal parts have to go through milling and lathe machines. The operation is done using either manual or automated CNC machines. The final finishing and drilling of holes is done by hand using a master template.
Lens Production

Lens making is one of the most complex and labor intensive processes. The process starts with cutting blanks from a sheet of optical quality glass and then shaping one side into a convex or a concave curve. The lens is finally polished using fine felt on automated machines before it can be assemble inside the objectives.
Process of Manufacturing

Paint and Surface Coating

Most of the machined metal parts are powder coated.

Objective Eye Piece Assembly

Objectives and Eye piece assembly starts by cementing multiple lens together to get the correct specification. These lenses are then carefully assembled inside the objective with plastic sleeves and a protective cover is fixed to it.
Process of Manufacturing

Final Assembly and Quality Test

Depicted here are various steps for the final assembly of the microscope. The most crucial part is the mating process of the head unit to the mechanical slide by lapping the surfaces which come in contact. All microscopes are manually tested before packaging and shipping.
Process of Manufacturing

Packaging

Microscopes are packed inside a thermocol box and can be sold with or without a sturdier wooden casing/container.
MSME Ecosystem in Microscope Cluster

The Ambala microscope cluster can be broadly divided into the following Sub-Categories depending on the size and function of the unit.

**Component Manufacturers**
Component manufacturers are units which make the different parts and mechanical assemblies of the microscope. Components or parts made are

- Microscope Body
- Fixed as well as Mechanical Stage
- Lens and Optical assemblies
- Gears and slides
- Plastic Knobs and Covers

Most of the units supply parts to the machining and assembly units.

**Traders**
Traders are units which get their microscopes assembled outside and often supply parts designed by them. Their main focus is usually branding and marketing.

**Machining and Assembly**
Majority of the units in Ambala deal with the final machining and assembly of the microscope and outsource most of the component to other specialized units. Amount of machining and assembly depends on the size of the unit and machines used by them are Milling and lathe.

**Small Manufacturers**
Some of the units present in Ambala are involved in making majority of the components for the microscope and their final assembly. Most of these units supply to larger traders and dealers to be sold under their brand names.

**Large Manufacturers**
Only a handful of industries deal in complete manufacturing of the microscope from metal casting to marketing and sales. Often these units have their in-house design team and are able to compete with international standards when it comes to quality and service.
B L Scientific Instruments Co.
Nicholson Road, Ambala Cantt

Jatinder and Mohnish Sehgal

People Working: 20-25
Annual Turnover: 1.5 Cr

Manufacturers of microscopes: Students, College, Medical and Pathological.

Final machining and assembly of components. Packaging and Transportation. Sells under own brand name through dealer network mostly in South India.

Marketing and sales networking.

Absence of control over the entire manufacturing process leading to quality limitations. Processes like objective assemblies are non standardized.
Debro Engineers
Cross Road No. 9, Ambala Cantt

Deepak Sehgal

People Working: 15-20
Annual Turnover: Not Disclosed

Manufacturers of microscopes: Students, College, Medical and Pathological.

Final machining and assembly of components. Sells under own brand name through Dedicated exporter only.

Quality control and Production

Design and networking limited due to singular exporter controlling the kind of microscope sold.
Sudheer Scientific Works
Bengali Mohalla, Ambala Cantt

Sudheer Kumar

People Working: 20
Annual Turnover: 1-1.5 Cr

Manufacturers of microscopes: Students, College, Medical and Pathological.

All kinds of machining and assembly except metal casting. Has own lens manufacturing plant and objective assembly unit.

Design of the products and innovations in mechanics.

Trained and skilled labor shortage. New design gets copied so difficult to invest on something new.
Gaurav Manufacturing Enterprises
Panna Cottage, Near Civil Hospital, Ambala Cantt

Gaurav and Satya Kant Awasthi

People Working: 30
Annual Turnover: Less than 1 Cr

Manufacturers of microscopes: Students, College, Medical and Pathological and Stereoscopic.

All kinds of machining and assembly except metal casting. Has own prism manufacturing plant and Tooling design center using VMC and HMC. Most of the products manufactured are sold through local traders.

Quality and Material finish as all the manufacturing process is controlled and standardized.

Lack of brand and marketing channels leads to over dependency on sellers for product guidelines. High overhead costs lead to less investment in design and innovation of new products.
Advance Scientific and Surgical Co.
Science Market, Near Hargolal Dharamshala, Ambala Cantt

Raman Nagpal

People Working: 20-25
Annual Turnover: 1 Cr

Manufacturers of microscopes: Students, College, Medical and Pathological.

Machining of pre cast metal components. All optical components are bought from outside for final assembly of the product. Sells under its own brand name through dealership network across India.

Timely delivery of products due to component sourcing techniques.

Lack of new or different product puts more pressure on marketing channels.
**Blue Star Scientific Industries**  
Chameli Pul, Guru Nanak Marg, Ambala Cantt  

Vikas Kakkar  

People Working: 5  
Annual Turnover: 20 Lakh  

Manufacturers of microscopes: Students, College, and Medical.  

Finishing of machined components. Objective and lens assembly mostly done outside. Also supplies to major manufacturers under their brand.  

Also does trading in other scientific instruments.  

Lack of space and storage. Low volume of production does not allow investment for developing any new products. Highly dependent on components sourced from outside which adversely effects quality.
Bharat Scientific Works
Cross Road No. 6, Ambala Cantt

Raj Kumar Malhotra

People Working: 15-20
Annual Turnover: 2 Cr

Manufacturers of microscopes: Students, College, Medical, Pathological and Travelling.

Most of the machining and component manufacturing done in-house. Has lens assembly unit for making optics and objectives. Also supplies components to others.

Investment in infrastructure and quality control. Also some level of design investment for plastic components for selling visually distinct product.

Workshop planning and component movement around the floor leads to increased time for production. Compromise in the quality of paint due to venders setup.
Ski-Hi Optical Instruments
Ram Nagar, Ambala Cantt

Harish Banga

People Working: 5-7
Annual Turnover: 25-30 Lakh

Manufacturers of microscopes: Stereoscope and Zoom Stereo.

Machining and assembly of the microscope. Deals directly through selected exporters. Products are highly specialized and limited in numbers.

One of the few people doing own lens development work for providing high quality equipment.

Competition from cheaper products. Has to do own objective assembly due to shortage of trained technicians.
Dhir Scientific Work
Timber Market, Ambala Cantt

Ramesh Kumar

People Working: 15
Annual Turnover: 60 Lakh

Manufacturers of microscopes: Students, College, Medical, Pathological and Travelling.

Work mostly centered around machining and final assembly of the product. All the manufactured components are sourced from outside. Sells mostly to repeat customers and has limited marketing interest.

Invests time and effort on mechanical assembly components as rest of the design is same for everyone else in the market.

Newer generation moving away so investment in unit is decreasing. Storage and packaging issues due space and floor planning.
The Micro Instrument Co.
Durga Nagar, Ambala Cantt

Rakesh Dhiman

People Working: 15
Annual Turnover: 50-60 Lakh

Manufacturers of microscopes: Binocular Coaxial Pathological.

Most of the manufacturing done by self. Metal casting work also done using gravity-dies'. Has products of various range and quality for selling locally and export.

Sourcing of lens and mechanical component mostly done from reputed companies with high quality standards.

New design similar to existing products manufactured by other companies so little advantage in marketing and brand development.
Kalgidhar Scientific Works
Near B D Sr Sec School, Ambala Cantt

Amarjeet Singh

People Working: 15
Annual Turnover: 2.5 Cr (50 Lakh from microscopes)

Trades in microscopes: Students, College, Medical, Pathological and Projection.

Supplies specific components to equipment manufacturers and does the final objective assembly and quality checks. Has own storage and packaging area.

Strong brand presence and sales channel. Company focuses majorly in print media and brand development through visuals and graphics.

Depends on other manufacturing units for most of the component assembly effecting quality and standardization of products.
Quality Scientific and Mechanical Works
HSIDC, Industrial Growth Center, Ambala Cantt

Dheeraj and Neeraj Bahl

People Working: 30-35
Annual Turnover: 3 Cr

Manufacturers of microscopes: Students, College, Medical, Pathological, Stereoscopic and Operational.

Most of the manufacturing done by self. Most of the cast metal parts are outsourced but have their own dies. Also have their own lens manufacturing and objective assembly unit with high quality control standards.

Brochures etc. done in-house with focus on brand and design.

Using old box design due to nature of supply and demand in the industry. Box material and design used is old and does not compliment products sold in export market. Needs highly skilled labors to work on CNC and VMC machines which is effecting the overall production of the company.
Scientific India
Industrial Estate, Ambala Cantt

Ajay Aggarwal

People Working: 20
Annual Turnover: 2 Cr

Manufacturer of microscopes: Students, College, Medical and Pathological.

Major components like Metal casting for microscope body and nose piece outsourced to other manufacturers. Final machining and fitting done in-house.

Systemic work space and inventory system keeps the place uncluttered and sorted.

Quality of the product is worker dependent and combined with the lack of technical experts makes it difficult to invest in new innovative products.
UniLabs Microscope Manufacturing Co.
Cross Road No. 3, Punjabi Mohalla, Ambala Cantt

Rajiv Aggarwal

People Working: 15
Annual Turnover: 2 Cr

Manufacturer of microscopes: Students, College, Medical and Pathological. Also Deals in Stereo and Projection Microscopes.

Machining and assembly of metal components. Mechanical parts and objective are sourced from outside and assembled at the unit. Most of the selling is done through govt. tenders.

Infrastructure and scope for expansion.

Same products competing with cheaper alternatives leaves little advantage when selling the product specially through tenders. Ergonomic issues for worker assembling the final product due to sitting posture.
Kwality Micro Scientific
Punjabi Mohalla, Near B D High School, Ambala Cantt

Gaurav Verma

People Working: 5
Annual Turnover: 70 Lakh

Manufacturer of microscopes: Students, College, Medical and Pathological. Also deals in Digital microscopes.

Machining and fitting of finished metal components. Mechanical parts and objective are sourced from outside and assembled at the unit.

Provides modifications in design (digital microscopes) as per the customers requirement.

Infrastructure and assembly area makes the unit cramped. Storage issues due to non specific area for packaging and transport.
**M K Optical Works**  
Opp Sadar Police Station, Ambala Cantt

Sanjay Rastogi

People Working: 15-20  
Annual Turnover: 1.5 Cr

Manufacturer of microscopes: Students, College, Medical and Pathological.

Machining and fitting of metal components. Mechanical parts and objective are sourced from outside and assembled at the unit. Sells under its own brand through major dealership network across India.

Unit setup can produce large quantity of products when required.

Quality and safety issues due to unskilled labors.
Kanwaljit Scientific Industries
HSIDC, Industrial Estate, Ambala Cantt

Harpreet Singh

People Working: 8-10
Annual Turnover: 75-80 Lakh

Manufacturer of microscopes Components: Adjustable Mechanical stage.

Machining and finishing of separate parts used in mechanical stage assembly. Most of the parts are metal casts outsourced as per the customers design. Sells directly to local microscope manufacturers mostly.

Specialized setup for manufacturing singular parts increases productivity as not much time is wasted in setting up the machines.

Lack of R&D and material experts. High cost of manufacturing due to use of expensive materials and wastage.
D S Engineers
HSIDC, Industrial Estate, Ambala Cantt

Rajinder Singh Rooprao

People Working: 8-10
Annual Turnover: Less than 1 Cr

Manufacturer of microscopes Components: Rack and Pinion assembly, Gears assemblies and Brass components.

Machining and finishing of mechanical parts mostly used in slide assembly. Most of the parts are turned on lathe as per the customers design. Sells directly to local microscope manufacturers mostly.

Has own engineering design setup for component manufacturing.

People working in close proximity of machines without adequate safety measures or ergonomic considerations.
Dhiman Plastic Industries
Azad Nagar, Opp Pooja Filling Station, Ambala Cantt

Jasbir and Ranbir Dhiman

People Working: 15
Annual Turnover: Not Disclosed

Manufacturer of microscopes Parts: All kinds of plastic parts used in microscopes.

Manufacturing of plastic parts using hand molding, semi-automated and automatic press machines. Makes own tools and dies for others by reverse engineering components.

Low cost setup allows for cheaper parts made available to microscope manufacturers.

Quality of die and material used leads to aesthetic issues with the manufactured components. Also laborers work in unergonomic positions without proper safety measures.
Aggarwal Casting
Near Sharma Petrol Pump, Jagadhri Road, Ambala Cantt

Neeraj Aggarwal

People Working: 10
Annual Turnover: Not Disclosed

Manufacturer of Metal Parts: Casting of Metal body parts for microscopes.

Casting of metal parts in different materials using pressure die casting and sand casting processes. Most tooling work is done by self by reverse engineering old parts on CNC machine.

Stock parts are sold to manufacturers having low quantity requirement and cannot afford their own dies, reducing investment burden on them.

Quality of product is low as dies’ are mostly made by reverse engineering old components. Also parts supplied are same for everyone forcing them to invest on other processes for cost competitiveness.
Precision Instrument House
Timber Market, Ambala Cantt

Naresh Kumar

People Working: 15
Annual Turnover: 1 Cr

Component Supplier: Turned metal parts and electrical components for scientific instrument industries.

Metal turning and engineering of parts and components used in microscopes and other scientific instruments.

High precision component and engineering of metal parts.

Overhead costs mainly due to use of expensive materials and small margins.
Core Issues at Cluster Level

Due to the diverse nature of manufacturing and sale of microscope many cluster level issues are faced by the manufacturing units. Most of the issues are due to shortage of skilled workers and technicians combined with the limited quantity in which microscope sells.

All the factors combined have led to the Ambala Microscope cluster lagging behind in technological innovation, international standards and design.
Design & Development

Issues

- The form and shape has been in use for more than 20 years.
- Design of the product has not kept up with the technology used for production.
- Ergonomic factors are not incorporated in the design and thus stand below par when compared to products from abroad.
- Perception of product as low quality as the product looks dated.
- Advancement in optics and mechanics is not reflected due to the old design of the product.
- Similar looking products in the market do not add to the manufacturers’ competitive advantage.

Recommendation

- Form of the product can be redesigned to give the product a new and fresh identity which allows it to become more marketable.
- Form designed for the product can be done by incorporating newer technologies and gives the product cost benefits.
- Additive cosmetic design on the existing product can give it a new look without changing the underlying structure and minimal investment.
- Quality upgradation of the product can be achieved by using newer materials. This also adds to the cost saving and production time.
- Modernize the product by incorporating digital interfaces, touch screens, recording devices, cameras and more.
Issues

- Dated machining processes restrict suggesting new design interventions.
- Most of the work is labour-intensive and depends on individual skills leading to irregularity in production.
- Methods used for quality control like manually adjusting objectives do not meet international standards leaving the product uncompetitive in the export market.
- Use of traditional tooling and machining process leads to increased fatigue and lower production.

Recommendations

- Newer manufacturing setups can be used as alternatives to reduce the production time and the processes involved.
- Quality control mechanism can be introduced by using validating mechanism and by imparting skills to the worker.
- Collaboration with specialists in India or abroad can be used as a stepping stone improving product and brand.
Majority of manufacturers still use manual machines for milling, turning or drilling.
Issues
- Focus is more towards copying rather than doing something new.
- High investment cost for developing new designs is usually not feasible for smaller units.
- Limited knowledge about the product and its working.
- Limited resources like material and technical experts reduce the scope for experimentation.
- No sharing of best practices by the cluster.

Recommendations
- New innovative ideas for existing products can be looked into to improve mechanisms and manufacturing processes.
- Knowledge about optics and its proper handling can be discussed to generate awareness amongst the manufacturers for improved quality.
- New product range with their manufacturing setups can be developed to explore markets and use.

Most of the in-house development happens by slightly changing the shape of the original component by using clay metal filling.
Innovation in Process

Issues
- Most of the manufacturing process is done manually and parts are cluttered all around the unit.
- Mounting process on the jigs is not measured and leads to dimensional errors during the machining of the product.
- Product quality is more dependent on the worker’s understanding than any measurable parameters.
- Outsourcing of most of the components without standardized system leads to increased amount of time in finishing the product.

Recommendations
- Use of jigs and fixtures should be relooked to reduce errors generated during the manual process.
- Newer assembly line setups to reduce production and manufacturing times by streamlining the work flow.
- Rationalisation of components to ease the manufacturing process and improve the quality and increase the quantity of the products manufactured.
- Introducing new engineering materials and processes that help the product look contemporary.
Workstation & Tooling

**Issues**
- Tools and dies mostly reversed engineered without proper technical drawings making it less accurate.
- The workstations are usually not organized making it harder for the workers to focus.
- Workstations not specifically designed for the particular process leads to decreased productivity and increases the amount of effort needed to do the job.

**Recommendations**
- The place for assembly and manufacturing should be properly organized for quality as well as health issues.
- Quality of tools and dies can be improved and design can help in technical inputs that reduce human errors.
- Safety parameters can be introduced into the manufacturing units which makes the worker comfortable and willing to focus on the process.
- Inbuilt quality control systems in the workstations as check mechanisms to reduce the rejection rate of end product.
**Market**

**Issues**
- Everybody sells the same or similar design hence no distinction can be made when it comes to brand and technology.
- Only major advantage comes from the sales network of the individual manufacturer whose basic aim is to sell cheaper than the competitors.
- Cheaper selling prices have led to cost cutting without proper design thinking which leads to reduced quality of the product.
- No new markets are explored due to lack of trained experts or any know how in this field.
- Markets are mostly controlled by dealers who have little interest in design and innovation as such hence the investment on innovation falls on the manufacturer.

**Recommendations**
- Newer markets for the existing products can be explored like exports or educational sectors catering directly to the end user like toys etc.
- New products can be designed to be sold in the local market or surrounding areas with minimal investment to the manufacturer.
- Component sourcing can also be looked into, at a cluster level to increase the quality and reduce the cost of production.
- Standardization of product design and graphics across all products will help in a better brand image.
Training and Skill Up-gradation

Issues
- Most of the workers are trained through experience.
- Most of the learning for workers comes from repetitive process which does not allow them to apply their own thinking for problem solving.
- Shortage of skilled labours leads to manufacturers using untrained workers further affecting their quality and production.
- People dealing with multiple tasks hence they are not able to focus on their core strengths.

Recommendations
- Worker ethics should be central to all manufacturing units focusing on central training facilities and discussion forums.
- Specialization of labourers to increase productivity and reduce the chances of technology or idea leakage.
- Improving the capabilities of workers to think on their own and understand issues so they are able to tackle problem on their own.
Ergonomics & Environment

Issues
- People working close to the machines without safety measures.
- Dust particles in the air are not regularly filtered out increasing health and safety issues.
- Workers do not have proper sitting or standing postures leading to greater fatigue and lower productivity.

Recommendations
- Ergonomics of the whole setup can be relooked for better working conditions which in turn improves productivity.
- Controlled working environment for delicate assembly processes should be used like temperature and air control systems when assembling lenses.
- Environment-friendly processes should be used for disposing waste.
Working with metal, plastic and glass material exposes workers to air borne particulate matters. Also there are no safety devices like Protective glasses, masks or gloves.
Issues
- Boxes used for packaging are heavy and bulky.
- Transportation and storage of empty boxes takes excessive space and adds to the overall cost of operations.
- Rigidity in the packaging material for the product makes it difficult to adapt for newer designs.
- Materials used for packaging and storing of the product have not been updated to keep up with newer standards in the market.

Recommendations
- Options relating to packaging material and design can be explored to give a more cost-effective solution.
- Use of modular systems for packaging and collapsible designs can be used to reduce storage space required for empty boxes.
- Graphics and colour can add important visual identities to the packaging materials and make them more attractive and user-friendly.
- Components can be made interchangeable to make them serviceable and reduce logistics cost.
Issues

- Most of the manufacturing is run from small sized units which make it difficult to expand.
- Cluttered work area and floor arrangements lead to wastage of space.
- Frequent power shortages also affect productivity and continuity.
- For smaller manufacturers with limited number of machines, mounting of jigs used for production of different microscopes results in more time used for setting up the machine and less time for production.

Recommendations

- Proper use of space and demarcation of workstation can help improve process flow and storage between the processes.
- Floor plan can systematically change the way the infrastructure is used and increase efficiency and production quantity.
- Newer machines can be added to some of the existing infrastructure to improve the quality of the product and reduce the time needed to finish a process.
- Existing machines and the way it is used can be reworked to increase production capacity.
Exhibition & Display

Issues
- Display of the products is not central to most of the units for selling their product.
- Reluctance of manufacturers when asked to take part in exhibitions.
- Company specific innovations are not prominently displayed.

Recommendations
- Modular systems for exhibiting products at various forums can be designed for manufacturers interested in marketing their products.
- Display racks and shelves can be designed for these units which will help them market the product better.
- Graphics and branding can be also done for people dealing directly with the end user to increase marketability.
- Experience zones can be set up where potential users can touch, feel, use and experience the products first-hand.
Issues
- Most of the graphics done in-house or locally without understanding the buyer.
- Brand importance only recently felt by manufacturers as most of their selling is done through human to human network.
- Non distinct visual identity of the products puts greater amount of pressure on highlighting other features.
- Similar looking products do not give any competitive advantage to the manufacturer.

Recommendations
- Catalogues and manuals can be designed to better advertise the product.
- Branding for the company and product should be a major focus for units trying to sell their products in the market and their visual identity can be designed to better reflect the company.
- Websites etc. can be an important tool in selling their products and establish a brand name.
Inter-cluster Communication

Issues
- Trust issues keep the manufacturer from discussing their common problems or innovations. Important because single units are not big enough to handle all the issues on their own.
- Brain drain and poaching as skilled worker in demand.
- No common forum for discussing design related issues.
- People secretive of their process although most of them are making the same product using similar resources.
- Highly competitive and cost cutting measures dragging the overall quality standard down.

Recommendations
- Common facilities and forums for manufacturers to discuss common issues which are design related like mechanics, materials and production techniques.
- Sharing of best practises will help enhance the stature of the entire cluster.
- Association level system as a checking mechanism to control misuse of design and ideas by people who are copying others and affecting the quality of goods produced by the cluster.
- Collective vision for growth which incorporates regular feedback on design and market trends to benefit the cluster as a whole.
Issues

- Manufacturers of basic components have limited resources and technology for production which affects the end product quality and design.
- Manufacturing units are dependent on workers for maintaining quality without the use of standardized benchmarking system.
- Due to small size of these units people are unwilling to invest on innovation and design.
- People hesitant when investing in design as they fear it will be copied and leave them with no advantage even after investing on design.

Recommendations

- Standardizing the production process and components will reduce cost burdens on smaller units as it will save time and effort involved in delivering the final product.
- Investing on brand India will yield better returns as people will be willing to pay more for higher quality and designs.
- R&D and design centres for the manufactures to help them innovate without majorly investing on the required infrastructure.
- Systems design can be used for quality validation facilities and benchmarking mechanism for filtering out unproductive units which affect the overall standard of the cluster.
Issues

- Slow manufacturing process due to old machines and techniques.
- Some of the components require greater effort for manufacturing due to limitations of machines available increasing the overall time and cost required for production.
- A logistics and storage issue reduces their daily limit for production.
- Workers skill and training are limited to following the same process repetitively without understanding the larger process.

Recommendations

- Design interventions can be at various levels of manufacturing like tool design, components and mechanics.
- Changes to jigs and fixtures can improve productivity by making repetitive processes more streamlined and easier to follow.
- Surface finishing and paint work can be improved by using proper techniques for coating and drying process allowing for a better quality of the finished product.
- Combining resources from different manufacturers and using their core strengths to improve productivity.
Market share and Profitability

Issues

- People do not want to expand productivity or quantity as there is limited market for them.
- Most of the manufacturers do not understand markets for newer product or range of products entirely different from microscopes.
- Quality emphasis is mostly on optics but without new design and aesthetics it makes limited impact on their market share.
- Most people try to save cost by using cheaper materials for important components which leads to lower quality and hence profitability.

Recommendations

- Websites and brochures can be better designed to improve the perceived visual quality of the brand.
- Different products can be designed which uses the same machining and process to explore new markets for the manufacturers.
- Cost saving measures can be taken by looking at alternate materials and machining process.
Materials and Resources

Issues

- Most of the wastage produced comes from machining of brass and aluminium fittings.
- Chemical wastes produced due to lens manufacturing are left untreated.
- Metal wastages are resold as scrap but manufactures has to bear the cost of storage and collection.

Recommendations

- Design of the components to use less machining.
- Alternate materials for the components which can be directly used saving labour and storage costs.
- Assembly process reducing use of electricity and other non-renewable resources.
- Validation system and benchmarking of components at each level of manufacturing to reduce rejection of an assembled product.
Materials and Resources

Metal waste for recycle or scrap are stored in drums or floor which is then sold to scrap dealers.
Product Serviceability

Issues

- Most of the products do not have interchangeable parts which increase cost of inventory and storage required.
- Components for each finished good are machined to fit together which leads to issues of repair and servicing.

Recommendations

- Improve interchangeability of parts of an assembled product to make it easier to repair or upgrade.
- Systems design for managing tools and other inventory items like colour coded boxes for different items making it easier to identify and use.

Components are machined to fit with a particular microscope part and will not assemble with any other part properly due to the manual process used for manufacturing.
Value Addition

Recommendations

- Digital interfaces, additional screens for imaging are being tried out that can enhance the product’s quality.
- New materials, new form and new looks can contribute in enhancing the product’s image.
- Integrating a camera or other recording devices can also help in modernising the product.
Creating Positive Difference to the MSME

Recommendations

- A robust design and innovation exercise will help in developing new products that can find new markets.
- Common facilities centre can be located in Ambala that can have CNC machining and other contemporary processes of manufacturing.
- Sharing best practices will enhance the stature of the entire cluster.
- Better branding, better packaging will also help in contributing to the revenues.
Other Issues

**Optics**
As an important part of the microscope and a major component which decides the quality of microscopes, there is a definite lack of technical know how affecting the overall standard of the product.

**Electricity**
Due to the nature of machinery used issues related to electrical shortages lead to inconsistency in production and extra time required for delivery.
Areas for Design Intervention

Areas for major design intervention which directly affects the Ambala Microscope cluster are

1. Product Design
2. Packaging Design
3. Systems Design
4. Graphics Design
5. Engineering Design
**SWOT Analysis**

<table>
<thead>
<tr>
<th><strong>STRENGTHS</strong></th>
<th><strong>WEAKNESSES</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Ambala has a significant Microscope manufacturing history giving it immense credibility.</td>
<td>• Crucial raw materials have to come from outside which increases the total cost of production.</td>
</tr>
<tr>
<td>• Ambala Cantt is the center for all kinds of components and parts required for microscopes.</td>
<td>• Same products are made by everyone leaving no uniqueness or individuality.</td>
</tr>
<tr>
<td>• The manufacturers have over the years become aware of the market realities and competitions.</td>
<td>• The industry competes on rate/price of the product instead of focusing on quality.</td>
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<tr>
<td>• Ambala’s scientific instrument industry brand helps in getting buyers more easily.</td>
<td>• Issues with basic infrastructures like Electricity, Loans and skilled workers.</td>
</tr>
<tr>
<td>• Proximity to Delhi allows easy procurement of imported parts and components and also grants access to larger markets around the Capital Region.</td>
<td>• Due to lack of technical know how the industry is always behind the curve so products are not up-to-date.</td>
</tr>
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<td></td>
<td>• Quality issues due to untrained workers and old machines.</td>
</tr>
<tr>
<td>OPPORTUNITIES</td>
<td>THREATS</td>
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<td>------------------------------------------------------------------</td>
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<tr>
<td>• There is immense scope for the industry to grow into a well</td>
<td>• Traders taking advantage as they are able to run their businesses without major</td>
</tr>
<tr>
<td>defined cluster with technical inputs from outside.</td>
<td>investors pushing manufacturers out.</td>
</tr>
<tr>
<td>• Develop and design new products which are up-to-date and</td>
<td>• Cheaper imports from China</td>
</tr>
<tr>
<td>meets the modern buyers requirements.</td>
<td>• Low cost of selling and competitive pricing which can eventually make the industry</td>
</tr>
<tr>
<td>• New innovation in products can be explored.</td>
<td>unsustainable.</td>
</tr>
<tr>
<td>• Using the existing manufacturing facilities, manufacturers</td>
<td>• Quality issues hurting Brand India which leads to reduced export markets.</td>
</tr>
<tr>
<td>and vendors can diversify into newer product range.</td>
<td></td>
</tr>
<tr>
<td>• Developing common facility centers with specialists and</td>
<td></td>
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<tr>
<td>modern machines to Design, Develop, Manufacture and Test new</td>
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<tr>
<td>products.</td>
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</tbody>
</table>
Way Forward

Design Clinic Workshop

A workshop will be conducted over a period of five days which aims to have the following topics.

1. Sharing the need assessment survey with the entire cluster and discuss future agenda.
2. Bringing in Subject matter experts who will help improve processes and design.
3. Introduce design concepts like better form, colour, aesthetics, ergonomics, cost reduction, systems approach to component design, user requirement and sustainability.
4. Convey the importance of better Design, Branding and Packaging.
5. Emphasize on shared practices.
6. Initiate a discussion on common facility center.
7. Conduct one to one session to sort individual design issues and give over the counter solutions.
8. Promote MSME schemes for design Projects.
Way Forward

Common Facility Center

A centre that will cater to the needs of the cluster can be located in a central area in Ambala with the following:

Design & Innovation Centre:
This centre can cater to the design requirements of the MSME units and help develop new products, improve processes and help the units be more innovative.

Prototyping centre:
A place where new products, parts and components can be prototyped for trials. Can include traditional methods of prototyping and digital 3D printing facilities.

CNC facilities:
A place where MSME units can get parts manufactured accurately and fast. Can include 5-axis milling, lathes and such other machines.

Painting / Finishing centres:
A place for painting and finishing the parts, so as to minimize clutter in individual units and help in modernizing the units.

Testing and Benchmarking facility:
To raise the standards of all manufactured products, the cluster can have a testing facility that will standardize the products and benchmark them with the best.
Way Forward

Other Issues that need attention

Although these are beyond the scope of the exercise attending to these issues will help productivity and cluster level improvements.

2. Skill Development of Laborers.
3. Easy loans and Financial assistance.
4. Setting up a quality and testing center
5. Encouraging inter-cluster communication
6. Exposure to better practices in India and Abroad
Supported By

Ministry of MSME
Design Clinic Scheme
Govt of India

In Association with

NID
PHD Chambers
ASIMA
1. Bringing in Subject matter experts

2. Introduce the concept of design for better form, colour, aesthetics, ergonomics and cost reduction.

3. Systems approach to component design and sustainability.

4. Convey the importance of better Branding, Graphics and Packaging.

5. Emphasize on shared practices.


7. One to one session to solve individual issues

8. Promote MSME schemes
# Planned Schedule for the Workshop

<table>
<thead>
<tr>
<th>Date</th>
<th>Theme</th>
<th>Design Expert</th>
<th>Presentation1</th>
<th>Presentation2/ Discussion</th>
<th>Clinic</th>
<th>Visits</th>
</tr>
</thead>
<tbody>
<tr>
<td>13 Feb</td>
<td>OVERVIEW</td>
<td>A.Balasubramaniam</td>
<td>Design for Industry</td>
<td>Sharing the NAS findings: Industry overview</td>
<td>One-on-One Industry Designer Interaction on Design Issues</td>
<td>Visit MSME units with experts for design interaction</td>
</tr>
<tr>
<td>14 Feb</td>
<td>INNOVATION</td>
<td>Amit Krishn Gulati</td>
<td>Innovation for the cluster</td>
<td>Brainstorming &amp; Techniques for Innovation</td>
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<tr>
<td>15 Feb</td>
<td>PROCESS IMPROVEMENT</td>
<td>Gurmeet Singh</td>
<td>Materials &amp; Process Improvement</td>
<td>Labo-Med Experience: Sharing best practices by Puneet Gupta*</td>
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</tr>
<tr>
<td>16 Feb</td>
<td>BRAND DEVELOPMENT</td>
<td>Sunali Aggarwal</td>
<td>Web design for small industries</td>
<td>Brand &amp; Visual identity, Packaging Design</td>
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<tr>
<td>17 Feb</td>
<td>FUTURE</td>
<td>AshwiniGoel &amp; Vipan Sarin</td>
<td>Way forward for the cluster</td>
<td>Brainstorming on CFC Conclusion</td>
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</tbody>
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Day 1: Theme of the Day
Overview

Visiting factories to discuss issues.
Presenting the merits of design intervention.
Day 1: Schedule and Visits

11:30-01:30  Visit to SME Clusters by design expert Mr. A. Balasubramaniam. Units visited were Quality Scientific and Kanwaljit Scientific Industries.

Lunch

03:00-04:00  Inauguration session by Mr. Sameer Kant Mishra and Mr. Vivek Seigell.

04:00-05:00  Introduction to design clinic scheme by Mr. Shashank Mehta and Ms. Bindoo Ranjan. Discussion about DAP and brief about projects covered by the program and eligibility.

Tea and Networking

06:00-06:30  Presentation on Intellectual Property Right by Mr. Rahul Taneja.

06:30-07:30  A brief introduction to design and its applications by Mr. A. Balasubramaniam. Presentation on areas for design application and how design can improve growth.

07:30-08:00  Video presentation on design application and future of microscope design by Mr. A. Balasubramaniam.

Networking and Dinner

Guest of Honours

Mr Vivek Seigell

Mr Shashank Mehta

Ms Bindoo Ranjan
MSME Unit Visited:
Kanwaljit Scientific Industries

Discussions on mechanical assembly of the stage and materials took place.

Detailed discussion on the material usage and alternatives were discussed. It was suggested that the majority of the parts can be re-designed and made out of engineering plastics for improving performance and manufacturing.

New ideas were also discussed related to form and aesthetics of the product.
MSME Unit Visited:
Quality Scientific and Mechanical Works

This unit is one of the only MSMEs in Ambala visited which had a lens coating plant for a superior quality optics.

Design discussions were mostly focused on highlighting the better quality which the unit is able to manufacture and how new design will help them in further improving their products.

Investments can be kept low by introducing part molds and dies. The unit had a keen sense of design and that was appreciated.
An introductory presentation on how to start using design in a small industry was presented through examples and case studies of January Design.

Areas of design intervention were also discussed where investments are low and effects of design can be seen and felt by everybody.
Day 2: Theme of the Day
Innovation

Suggesting new product categories. Demonstrating detail design. Discussing innovation in this sector through examples.
Day 2: Schedule and Visits

11:30-01:30  Visit to SME Clusters by design expert Mr. A. Balasubramaniam and Mr. Amit Krishn Gulati. Units visited were Goyal Microscopes and Gaurav Manufacturing Enterprises.

Lunch

03:00-05:00  Design presentation and Workshop on Innovation in Microscope by Mr. Amit Krishn Gulati.

Tea and Networking

05:00-06:30  Group session and discussion on new products using microscope manufacturing processes. Ideation and conceptualization of new products and its design with Mr. Amit Krishn Gulati.

06:30-07:00  Video presentation on product innovation and technology by Mr. A. Balasubramaniam.

07:00-09:00  Presentation and Detailed discussion of NAS report and its finding by Mr. A. Balasubramaniam. Q&A about the report and agenda for following days.

Networking and Dinner

Expert Of The Day

“Amit Krishn Gulati is the founder and managing director of Incubis Consultants, one of India’s leading multidisciplinary design studios. Incubis employs over 45 professionals in Design, Engineering and Architecture at its New Delhi studio. He is also involved with design education and is a visiting faculty at The School of Planning and Architecture, New Delhi, IIT Roorkee, and The National Institute of Design, Ahmedabad and is actively engaged in creating design awareness in India and served on the CII National Committee on Design for many years.”
MSME Unit Visited: Goyal Microscopes

A typical unit that assembles microscopes which parts sourced from majority of component and parts manufacturers.

On the spot suggestions were given on improving quality by using correct screws and bolts which will help in getting a clean look for the product.

Looking at an inexpensive microscope that was sold for INR 650 the designers thought that this can sell as a hobby microscope with some minimal changes in the form of knobs and color. This can be a new category in itself and can be marketed through toy shops and hobby stores.
MSME Unit Visited:
Gaurav Manufacturing Enterprise

This is one of the more progressive units of Ambala which is geared up large scale production. The facilities include fully automated Vertical Milling Center, Horizontal Milling Center and Prism making unit.

The invested in processes and people which they hope to leverage for large orders.

Issues discussed include reducing the labor part of painting and exploring automated process for finishing the microscope.

The unit is interested in developing indigenous design of microscopes that will give competition to China and is willing to explore the MSME scheme for that.

On the spot solutions included better storage and shelving systems and improving packaging for reducing costs and volume.
Presentation: Innovation

The design expert for the day was Amit Krishn Gulati, who presented his vision for innovation in this sector. Through a comprehensive presentation he demonstrated the thought process involved in coming up with innovative new concepts by repositioning your point of view. He also presented case studies of design and architectural projects done for the industry that demonstrated this thought process.

Participants were involved in brainstorming for new categories of microscopes that is within the means of the present setup.

New design directions were also explored by the participants in a freewheeling discussions with the designers.
Design of new Toy Microscope

In a highly participative and enthusiastic brainstorming session new ideas for microscopes were developed. Design of a new toy microscope based on the existing product was taken forward and conceptualized.

1. No fine adjustment required
2. Using of plastic parts and components
3. Use brighter colors to make it visually attractive for children
4. LCD screen and camera to capture image and share it with friends
5. LED lights to remove the use of reflectors and condensers
6. Movable arm to adjust angle of the head unit
7. Semi knock-down for easier storage
8. Design of objective assembly to make it more child friendly
9. Rubberized coating on surface to make it safer
10. Snap-fit parts to make assembly easier
11. DIY box for allowing kids to assemble the microscope on their own
Future Microscope

Discussions led to the future of microscope industries and the cutting edge innovations that are prevalent today internationally.

Digital microscope with touch screen controls, Magnification attachments for smartphones, web cam and computer connectivity were some of the ideas discussed.
Knob Design and Color Suggestions

Based on the discussions with the MSME units visited new concepts were developed for easily usable knob and suggestions of colors for a child's microscope.

Even small suggestions like this can help units in exploring new markets.
Day 3: Theme of the Day
Process Improvement

Discussing production methods and materials during factory visits. Suggesting change in design using newer, better materials. Ideating on new concepts.
Day 3: Schedule and Visits

11:30-02:30  Visit to SME Clusters by design expert Mr. A. Balasubramaniam and Mr. Gurmeet Singh. Units visited were Microscopes Hoose & Co, Optics Manufacturing Unit, Dhiman Plastics and Aggarwal Casting.

Lunch

03:00-04:00  Design presentation and Workshop on Materials and processes by Mr. Gurmeet Singh.

04:00-06:00  Interactive session on design of Pathological microscopes using alternate processes and materials to save on cost and production time with Mr. Gurmeet Singh.

Tea and Networking

06:30-07:30  Design presentation and interactive session on students and medical microscopes for newer markets.

07:30-09:30  Brainstorming session exploring various issues related to Design, Manufacturing and Marketing in SME clusters.

Networking and Dinner

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“Gurmeet Singh is an architect and a product designer. He has 12 years of experience in product / automotive, crafts, exhibition, furniture and structure design. He is an educationist visiting faculty at IILM school of Design Gurgaon. Gurmeet brings in a wide array of skills in the area of product and automotive design, structures, small product ideas and patentable technologies, interiors, furniture, crafts and museum architecture.”

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Expert Of The Day
MSME Unit Visited:
Microscopes House & Co.

This unit is typical of Ambala which is into scientific instruments, microscope and other scientific aids.

Mr Singh showed us early development of the single column microscope that works like a basic magnifier of slides and objects. The product lends itself to being represented as the hobby microscope for the children.

The unit was advised about getting into telescopes and other optics based instruments as an extension of their core competence.

Discussions also happened on finishing edges, reducing the number of screws, introducing engineering plastics and other such small changes that can significantly improve their product range and processes.
MSME Unit Visited: Optics Manufacturing Unit

The unit visited supplies lenses and objectives to most of the microscope manufacturing units of the cluster.

While the end products are precise the entire process is basic and rudimentary.

The lenses are made from imported glass that are ground for a particular focal length through processes which are mostly manual add labor intensive. The whole unit can benefit from modernization of work area, automation and incorporating safety measures.

The future of the cluster can also hinge on developing units like this so as to modernize the whole cluster.
MSME Unit Visited: Aggarwal Castings

Another vendor for the cluster that supplies pressure die cast parts that constitute major components of the microscope.

The process of casting and die making was demonstrated and discussed with the designers.

Safety measures were advised for the laborers involved.

The role of components in the overall design of the microscope was discussed. The unit head was advised to proactively get new shapes and forms designed and manufactured and supplied to small manufacturers.
MSME Unit Visited: Dhiman Plastics

Dhiman plastic is a vendor and supplier of plastic parts of the microscope like knobs and base plates.

The process of die development was discussed and use of engineering plastics like Nylon and Deldrin to get quality components was suggested.

The design of the base itself could be improved to transfer all joining surfaces to plastic so that machining on the metal parts can be eliminated. This can help manufacturers save cost and process time.
Presentation: Materials and Processes

Gurmeet Singh made an interesting presentation on his work with engineering materials, automotive parts and large scale installations at museums.

He demonstrated through case studies that design can help in saving costs and combining parts thereby reducing process time as well.

A discussion followed on the pathological microscopes amongst all the participants where across the board solutions on saving material and improving design was demonstrated.
Discussion on Pathological Microscopes

The pathological microscope which is a major product that comes out of the microscope cluster was taken up for discussion on improving the design for combining parts and saving costs.

Suggestions that emerged were visually demonstrated. Reducing the casting weight and volume, better location parts, self locking plastic covers, substituting plastic for the mechanical stage, etc. were some of the design solutions that were suggested.
Color Options for Pathological Microscopes

One of the participants raised the issue of color schemes for pathological microscopes.

A series of new colors for the existing plastic parts were suggested that will help them differentiate and refresh their range.
New concepts for small student and hobby microscopes were presented based on discussions with the MSMEs.

The idea was based on making the microscopes look attractive to children and encourage them as potential users.

The manufacturing was based on use of plastic molding instead of metal casting to reduce cost on machining and surface finishing.
Concepts were presented for improving the aesthetics and functions of a student microscope.

Concepts involved design of the castings color schemes and form.

Care was taken to utilize all existing critical components so that investments on new design are minimal.
Day 4: Theme of the Day  
Brand Development

Demonstrating the use of brand development and online marketing techniques to increase visibility. Packaging design discussions with new materials.
Day 4: Schedule and Visits

11:30-02:30  Visit to SME Clusters by design expert Mr. A. Balasubramaniam. Units visited were Maffik Instruments, R A Instruments and B L Scientific.

Lunch

03:00-05:00  Presentation and Workshop on Brand Design and Online Marketing by Ms. Sunali Aggarwal.

Tea and Networking

05:00-06:00  Interactive session on Graphics Design and Website Design with Ms. Sunali Aggarwal. Across the table solutions to existing systems and exploring of newer ideas for websites.

06:00-06:30  Design Presentation on product graphics and Importance of Packaging by Mr. A. Balasubramaniam.

06:30-08:30  Workshop and interactive session on microscope box and alternate methods of packaging microscopes with Mr. A. Balasubramaniam and Mr. Vikram Singh.

Networking and Dinner

“Over the years, Sunali’s role has evolved from being just a front end designer to User Experience Design Consultant. With over 9 years of experience, she has managed to work on a variety of web based products-portals, applications or softwares. She has tried not to be repetitive in the kind of projects she works on, hence, have now gathered a lot of experience in tackling all sort of problems related product design and development. She has worked on all phases of product (web based) development cycle, from ideation to conceptualization to design to implementation to marketing, etc.”
MSME Unit Visited: Maffik Instruments

The visit to Maffik Instruments was done to understand trends in production streamlining.

Located in Ambala city the production center, the store, the processes are scientifically worked out for efficiency of production.

Mr Vipin Sarin spearheads this organization and is also instrumental in influencing other MSME units in following a systemic and scientific approach to production.
MSME Unit Visited: R A Instruments

The unit works on educational aids and models and had requested for a visit by the designers.

Though not in the microscope cluster they are involved with other industries and learn from each other.

During the visit suggestions were given for improving the quality of educational aids and making them attractive enough for home toy buyers.

If implemented these hobby products can become a part of the new range of hobby products including the hobby microscope.
MSME Unit Visited:
B L Scientific

B L Scientific is also a major player in the manufacture of microscopes. Located in the Heart of the city the real estate is at a premium.

The place occupied by the cartons, packaging and boxes can easily be saved by better design of packaging.

Suggestions on collapsible packaging that occupies less volume and storage area were given.

The unit was also keen on developing new forms for their microscopes that will bring in new markets.
Sunali Aggarwal who works with new media and website design made an interesting pitch for better design of brands and online presence.

She explained the nuances of online marketing and the benefits of selling through portals like Paytato. Discussions and queries followed by participants who were keen to have a global presence and build Brand Ambala.
A presentation on packaging that helps in establishing and selling a brand was made. Case studies were shown where small and large changes in packaging helped in establishing quality and improving aesthetics.

Packaging design included labels and graphics, materials and structure, that contribute to the overall brand image.
Box Design and Ideation Session

Presented by Mr Vikram Singh of Ideal Package, a supplier based in Ambala, the presentation was on a variety of innovative materials and processes used for packaging of microscopes.

Innovations included reduction of materials for cost savings, easy to adapt to various sizes and shapes, modular cushioning systems, reduced use of thermocol that saves space and box design that are easy to pack and transport.

Discussions on how to reduce packaging cost and make it more sustainable for the environment followed.

Collapsible case design was also discussed to save storage space and transportation cost.

Participants were also informed about the redesign of the microscope to reduce packaging cost by having a knock down design.
Day 5: Theme of the Day
Future of Microscope Cluster

Discussions on way forward.
Brainstorming on new concepts.
Discussions on Cluster development and CFC.
Day 5: Schedule and Visits

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>12:00-01:00</td>
<td>Presentation on various areas where design application can help the cluster in improving their products.</td>
</tr>
<tr>
<td>01:00-02:00</td>
<td>Presentation and interactive session of Project case studies to better explain the design process and its usefulness.</td>
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<tr>
<td></td>
<td><strong>Lunch</strong></td>
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<tr>
<td>02:30-03:00</td>
<td>Presentation on marketing and best practices sharing by FIBOX</td>
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<tr>
<td>03:00-03:30</td>
<td>Detailed discussion on design projects applicable in the Ambala Microscope Cluster under the MSME Scheme and cluster level projects which can be taken forward.</td>
</tr>
<tr>
<td>03:30-04:00</td>
<td>Visit to SME Cluster by design expert Mr. A. Balasubramaniam. Unit visited was Sudheer Scientific Works.</td>
</tr>
<tr>
<td>04:00-05:00</td>
<td>Brainstorming sessions on the manufacturing process involved in the production of microscope and The Common Facility Center.</td>
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**Closing ceremony and planning of future agenda for the microscope cluster.**
MSME Unit Visited:
Sudheer Scientific Works

The visit marked a long discussion on design projects that can benefit the unit and help in upgrading themselves.

Since the unit is already in a progressive state they are looking to use design to differentiate themselves and create new global markets.

Color schemes on plastic parts of the pathological microscope were discussed and subsequently provided.
Project Development and Discussion

Case studies on working on a design assignment and the stages thereof were presented and discussed. This included projects with small industries and grass root innovators. Participants were encouraged to explore project opportunities that are both big and small, which can be taken up individually or as a cluster.

Discussions on potential design assignments that will benefit the cluster and fetch new markets were done.
Project Interventions Suggested for different stages of Manufacturing Process

- **Materials**: Quality testing for improved end product. Packaging and transport mechanism.
- **Model**: Improved processes and machines. Skill up-gradation. Die and mold design.
- **Design**: Training and skill development. Workshop and floor design for efficiency. Systems design for process. Tools and jigs for reducing effort and increasing productivity.
- **Components**: Shelving design to increase capacity. Proper packaging to reduce damage.
- **Assembly/Transport**: Benchmarking tools and technical specifications.
- **Sub-Assembly**: New box design. Use of newer materials for packaging.
- **Casting**: Improved processes and machines. Skill up-gradation. Die and mold design.
- **Machining**: Selection appropriate color scheme. Stickers and logos. Quality, materials and process of painting.
- **Finishing**: Ergonomic stools and work tables to reduce fatigue. Design and development of new assembly processes.
- **Paint/Graphs**: Logos and brand identity. Brochure and catalogues. Websites and stationary. Design of display shelves and systems.
- **Manuals and diagrams**: Video tutorials of the product for schools and colleges.

**New Products for alternate Markets**: Expand range by adding new models.

**Form and Shape for new visual Identity**: Design new components and mechanics.

**Project Interventions Suggested for different stages of Manufacturing Process**

Brainstorming on Common Facility Center and Manufacturing Processes

Suggestions on Common Facility Center emerged that it can have a variety of processes starting from pattern making, die making to CNC machining and finishing and packaging.

Apart from this it could also have an innovation, and incubation center, a design center with software licenses, an exhibition center and certification lab.

Suggestion on making a dry port at Ambala was made where import and export of all the parts can take place.
Summary of solutions discussed during interactive sessions, group discussions and visits to the SME clusters

- Trickle down effect, how majority of the manufacturing is dependent on a few key processes and parts. Study the effects of these units and process which can be used to improve the production and reduce cost for manufacturing.
  - Lens manufacturing – cutting and grinding
  - Raw material procurement for optics – need for own glass manufacturing plant
  - Metal die-casting process – more accurate processes and cheaper tooling

- How to diversify skills and experiences obtained during the years into newer products.
  - Lens manufacturing for camera, telescope and spectacles
  - Machining process used to be applied for newer product like DIY kits for kids, telescopes, binoculars and toy Microscopes
  - Manufacturing of Die-cast components can be used for production of other products with quicker sale time and lower cost of production

- Building brand Ambala by maintaining quality and improving supply chain. The Manufacturing units should take pride in their product and build around it.
  - Quality should be for enhancing brand image

- Product should be designed to show improvements in optical technology
- Process should be streamlined for manufacturing by using various methods for e.g. The 5S
- Experience and skills build in the years should be utilized for training of younger generation
Quick Fix Solutions to the existing product range to improve both their aesthetics and manufacturability.
- Stickers and other ornamental design to impart freshness to the existing product
- Changing knobs and other areas of human interaction like flaps with better design and colors
- Reduce use of materials to save on material cost and production cost
- Use better screws and accessories to improve the visual appearance of the finished product with minimal investments
- Redesign of components which fit on the microscope to reduce time required for their fitment and make them aesthetically pleasing
- Use of rubber padding and suction cups to make the product stable instead of focusing on weight to provide stability

Reduce number of processes to decrease production time and skill involved.
- Combine parts during casting to reduce assembly time
- Use alternate materials like Glass-filled Nylon or Deldrin for mechanical components to reduce on machining time
- Painting of microscopes by looking at alternative methods of surface finishing to reduce labor involved
- Use slider mechanisms and snap-locks to fit components

Engineering design of microscope parts and components.
- Reduce wall thickness of metal and plastic components and introduce ribs to maintain strength
- Use plastic components with metal inserts for critical parts while reducing manufacturing cost
- Look at newer methods of slider assemblies like ball bearings and channel inserts to reduce processes like lapping
Other Points Discussed

1. Exploring alternate processes for batch production of microscope components while maintaining the quality and cost parameters – using high quality sand casting with CO2 core similar to automobile industry for production of microscope body.

2. Use extruded plastics like Nylon or Deldrin for making racks and pinions to reduce post machining processes – this can be done by either cutting grooves on extruded material or molding the material with the proper grooves etc.

3. Setting up of design innovation and prototyping center along with the CFC to focus on developing newer design of microscopes and testing them for production before actual manufacturing.

4. Diversifying into other precision manufacturing processes using the same set of skills and manufacturing limitations of the present industry.
## Discussion on Future of the Microscope Cluster

### 0 – 1 Years
1. Product design to catering to new and existing markets.
2. Graphics and website design to help improve the brand.
3. Re-design existing product line by adding aesthetic elements to give it a refreshed look.
4. Explore use of newer materials to save production time and cost.
5. Re-design mechanical components for efficiency in production and material usage.
6. Work on the quality of surface finishing and paint to improve the products perceived value.

### 1 – 3 Years
1. Design and build completely new range of product to emphasize on brand development.
2. Diversify into other new products which can be made using the same machining processes.
3. Improve workstation and tooling design to streamline the production.
4. Training and testing facilities can be setup to support the manufacturers.
5. Standardize components and specifications around the cluster for quality check mechanisms.
6. Re-design of packaging and box.

### 3 – 10 Years
1. Improve manufacturing process and introduce newer technologies at a cluster level.
2. Facilitate innovation in product through design and research.
3. Design for global standards to expand into the export market.
4. Use of advanced machinery like CNC and VMC.
5. Waste management system workshop design.
6. Technology and design collaboration as capacity building step.
Summary of Design projects discussed during the 5 day workshop

1. Design of entirely new medical/clinical microscopes
2. Design of entirely new pathological microscopes
3. Design of entirely new student microscopes
4. Design of a digital microscope for pathological use.
5. Design of toy microscopes for kids market
6. Design of websites and online marketing processes for units
7. Design a range of microscopes for cluster level
8. Design of new catalogues and brochure for the units
9. Design of new boxes and packaging methods
10. Design of collapsible packaging design as space saving methods
11. Product graphics and design changes to the existing products
12. Systems design project for units to improve workspace and shelving mechanisms
13. Design of components like microscope body covers using newer materials like plastics
14. Design of benchmarking mechanisms to reduce wastage and improve quality check methods
15. Design of existing products to introduce new innovative ideas like inbuilt cameras
16. Design of microscopes using motorized systems which can be controlled using computers
17. Re-design of existing microscopes by changing existing components like knobs and flaps
18. Re-design of base for pathological microscope for material and cost saving
19. Re-design of the mechanical stage to incorporate plastics
20. Design modular packaging systems to reduce the time of box assembly and manufacturing
21. Design microscope boxes using materials like extruded PE to increase life and quality of box
22. Design of microscope to make it more suitable for packaging and transportation
23. DIY hobby kit with children microscopes for kids to use and learn microscopy
Student Microscopes

PROJECT 1

To design a new students microscope with improved aesthetics and visual elements keeping in mind the current trends and usage.

The new product will be ergonomically designed to make it more user friendly and have safety features for use in schools and colleges.

The design can be extended into a complete range by working on a set of colors and accessories like knobs, protective eye pads etc.

Manufacturing detail for the design will be done to keep assembly processes at minimum by using plastics etc. and by reducing the number of post manufacturing process were ever possible.

PROJECT 2

Re-design of Existing microscopes by introducing more aesthetical elements like stickers and vinyl to make the product visually more attractive.

The exercise allows the microscope to have some individual identity of its own in the market making it visually distinctive amongst the other microscopes.
Medical/Clinical Microscopes

PROJECT 1

A range of new microscopes can be designed for use in clinics and medical colleges with improved ergonomical and safety features.

The overall aesthetics will reflect the newest microscopes used around the world and the design will also make it suitable for exports.

The mechanical assembly and materials used can be looked into to improve features and make it easier to manufacture.

PROJECT 2

Re-design of existing components and accessories used in the microscope to give it a more distinct visual identity.

Knobs, objective casings, mechanical stages etc. can be given new forms and shapes to make them more visually appealing.
Pathological Microscopes

PROJECT 1

To design a systems based pathological microscope with improved aesthetics and visual elements making it suitable for Indian as well as export markets.

The new design will incorporate interchangeable parts for customized assembly while reducing overall cost of production. The new product will also have scope for external attachments like USB connectivity to computers and inbuilt cameras allowing it to work in various environment.

The design will be done keeping in mind the user – Diagnostic Labs, Clinics and other medical Facilities and Laboratories. The production process for the microscope would be according to the existing system of manufacturing techniques available with the units.

The design details of the new microscope will also help in reducing assembly time by use of new materials and redesign of existing components were ever necessary.

PROJECT 2

To design completely new digital microscope for pathological use. The product can have digital interfaces for viewing, analyzing and probably even transmitting data through the net.

The new design will usher in a new era of microscopes in Ambala and will bring about a much needed upgradation to the entire cluster.
PROJECT 1

A new set of microscopes can be designed to explore the kids market. The design will have multiple features like image capturing, rubberized grips etc. to make it more exciting for children.

The manufacturing can be done in plastics to reduce the cost of production and a range of colors can be explored to make it more attractive to kids.

Ergonomical issues will be addressed by design of properly shaped and sized knobs and buttons to make it more suitable for kids to use.

PROJECT 2

A do it yourself kit can be designed based on the toy microscope design which will help the kid in understanding the internal workings and mechanisms of a real microscope.

The microscope kit can be combined with spare slides and a detailed information guide to be used as an educational material.
Component Design

PROJECT 1

Engineering design exercise can be done to help in re-design of existing parts like Mechanical Slides, Knobs and Gear Assemblies of the microscope making them more suitable for existing manufacturing techniques.

The new products can be designed with engineering plastics like Glass-filled Nylon or Deldrin to reduce the steps required for finishing a product or to reduce the overall weight.

Newer manufacturing techniques and processes can also be introduced like Dual Injection Molding and Metal inserts into Plastic Parts to achieve a balance between cost of production and structural requirements.

This will also help in more automation and reduce dependency on skilled labor.

PROJECT 2

Re-design of existing components and microscope parts like the base and the body arm to reduce material used and minimize the machining processes required.

PROJECT 3

Design of the mechanical stages by using plastics. The new design can be done to reduce number of components used for their assembly by combining parts during the molding process.

Materials with better structural stability will be explored to give increased accuracy and precision.

Use of more engineering materials will also reduce the overall cost of production by reducing the number of production processes used in comparison to the more traditional technique.
Catalogues and Brochures

PROJECT 1

Catalogue, Brochures, Booklets and Manuals can be designed for existing as well as new products which will help in improving the Brand Visibility.

The design of all graphical elements will be done to allow users to make change in their literatures on their own helping them keep their catalogues etc. updated.

PROJECT 2

Graphics design exercise for designing of new brand identity and logos for the manufacturers.
Packaging Design

PROJECT 1

Design of a new box can be done to improve its manufacturing and assembly issues. Newer materials will be explored for both the outer box and the inner packaging materials making the new design better for storage and transportation.

The design will also add to the overall aesthetics of the microscopes by giving the packaging a more quality conscious appearance.

PROJECT 2

Box for microscope packaging can be redesigned into a collapsible unit making it better for space saving storage.

The new design will be done in newer materials instead of wood to give it more rigidity and better structural strength.

The design will be done keeping in mind the local manufacturing processes to reduce dependence on materials sourced from outside.

PROJECT 3

Modular system for packaging to increase the overall adaptability of the design.

The new product will allow microscopes with different designs, forms and sizes to be packaged using the same solution reducing in inventory cost for the manufacturer.

The design will also reduce the cost of manufacturing and time required for its assembly reducing the overall cost of production.
PROJECT 1

The product presentation and services will be streamlined for web stores like PAYTATO as presented during the five day workshop.

The exercise will include design of online catalogues which can be shared with clients along with studio quality images for the products displayed.

PROJECT 2

Re-design of existing websites can be done by changing the over-all look and feel of the existing websites and helping units upgrade to a more aesthetically appealing system.

The design can be done in collaboration with the existing website coder to maintain continuity and reduce the turnaround time.

PROJECT 3

Project would involve design of new websites for microscope manufacturers.

The process includes layout design and coding for the websites. Also images to be uploaded will be professionally shot to emphasize on product and quality.

Focus would be on building brand image through online presentation while highlighting key features about the unit after a detailed research exercise.

PROJECT 4

A set of online guides and tutorials can be designed for use by kids and professionals.

The video presentation can be designed to educate users about proper usage of microscopes and its maintenance.

The exercise will help in manufacturers connect with user which will in-turn help them in improving their products. Also the project will act like a marketing tool by emphasizing on the companies focus on quality and approach towards design.
PROJECT 1

Tools and jigs for the lens manufacturing units can be designed to reduce the overall dependence on labors’ skill.

The process can be streamlined by using automated mounting machines and jig fixtures to increase precision and accuracy in manufacturing.

The design of these jigs and systems will also make the process of manufacturing safer and easier to learn compared to the existing system.

PROJECT 2

A new range of microscopes can be designed as knock-down units to reduce the cost of packaging.

The more compact form achieved will be easier to handle and transport making it more suitable for exporting safely.

PROJECT 3

Introduce motorized systems for microscope operations making it usable through online services.

The new systems design increases the overall usability and efficiency of microscopes by making it easier for users to operate.
Brainstorming sessions were used as a tool to involve the visiting MSMEs into discussing some important design based issues and organizing the suggestions into workable solutions.

Some of the points discussed were:

1. Brand Ambala
2. Graphic Design
3. Marketing and Branding
4. Advanced Microscopes
5. Price maintaining
6. Painting Process
7. Tender and Quotation
8. Optical Coating
9. Packaging and Materials
10. Innovation
11. Finishing of the Product
12. Product Presentation
13. Automation in Process
14. Molding of Plastic Components
15. R&D Work
16. Prototyping
17. How to Discuss Copying
18. Documentation of Microscope
19. Processes in Manufacturing
20. Passing down the Skills
21. Lens Manufacturing
22. Transport of Finished Product
23. Transportation of Raw Materials
24. Labor Education and understanding
Other topics for discussion

1. Call in experts in plastics design like SABIC PLASTICS and BAYUR MATERIAL LABS

2. Call in engineer experts in machining and tooling design to help understand areas for improvements and share technologies which can be used for production

3. Training experts to help units better understand some of the machines

4. Skill up-gradation for newer generation to maintain continuity of the important manual processes

5. Call in management experts to help the units better organize itself both as an independent manufacturer and as a cluster

6. Arrange marketing seminars and workshops to teach manufacturers about proper selling channels
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