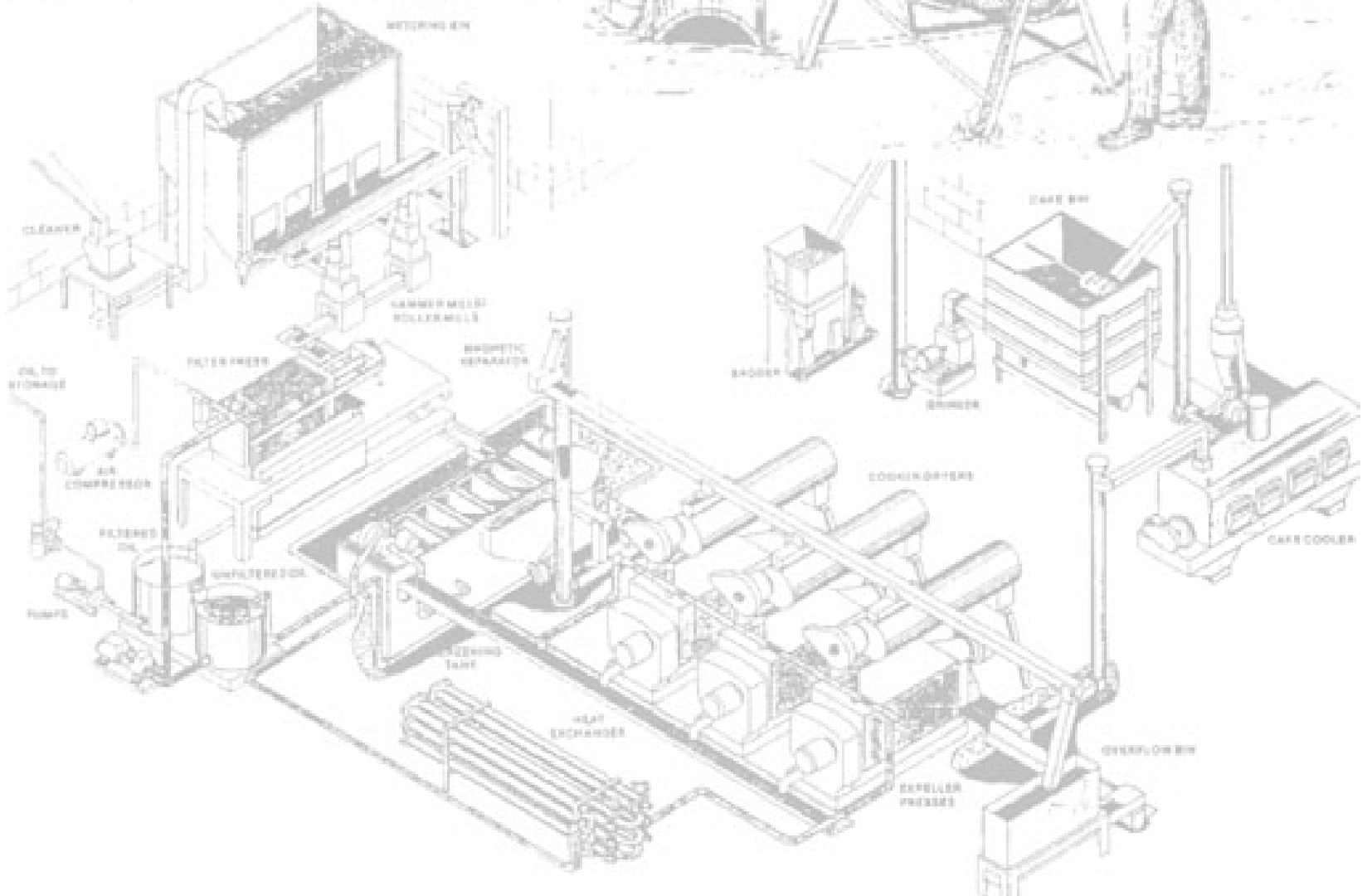
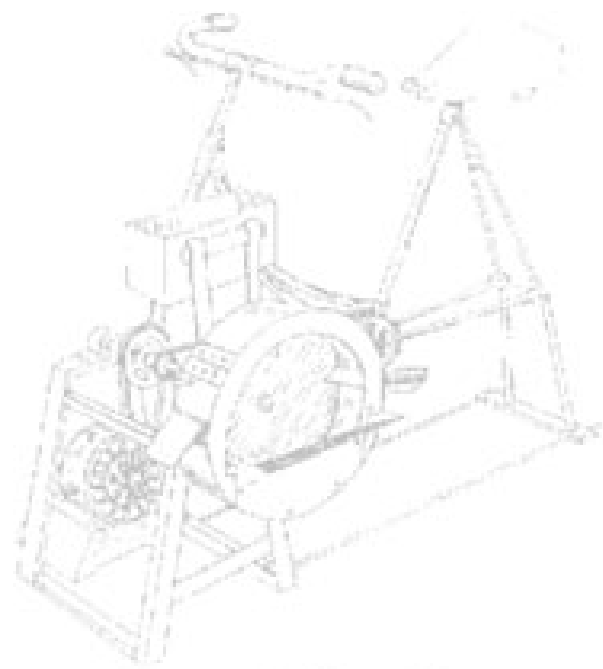


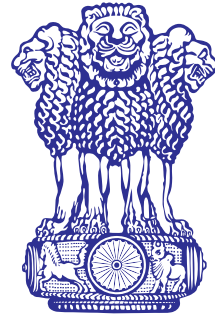


# Lean Manufacturing Competitiveness Scheme

Success Stories to Share







सत्यमेव जयते

# Lean Manufacturing Competitiveness Scheme

## Success Stories to Share





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## Message



The Lean Manufacturing Competitiveness Scheme is one of the ten components of the National Manufacturing Competitiveness Programme (NMCP) of the Ministry. Under this scheme, various productivity enhancement and waste reduction techniques are implemented in Micro, Small and Medium Enterprises under the supervision of a professional. By adopting the cluster approach and with financial assistance from the programme Micro, Small and Medium Enterprises are encouraged to collectively bear the consulting expenses which may otherwise be beyond their reach.

The pilot phase of this scheme has been implemented successfully covering various sectors across the country and very positive feedback has been received from beneficiaries units and other stake holders. In most cases, the units achieved remarkable improvements in work place management, quality, safety and delivery. In addition, they reported upto 20% increase in their productivity.

Indian MSMEs produce a diverse range of products. Due to lack of information, scarcity of resources and unorganized ways of marketing, MSME sector often faces problems in exploring their business and retaining existing ones. I am sure that, this brief collection of success stories of Lean Manufacturing Techniques in the form of a compendium will encourage MSMEs and other stake holders to adopt productivity enhancement techniques.

**Madhav Lal, I.A.S.**  
Secretary  
Ministry of Micro, Small & Medium Enterprises  
Government of India

## Message



It gives us immense pleasure to bring out this brief compendium of Case Studies on the successful implementation of the pilot project on Lean Manufacturing Competitiveness Scheme. The National Productivity Council is privileged to have been associated with this project in the capacity of National Monitoring & Implementation Unit (NMIU). It has been spearheading the Productivity movement in the country for the past 55 years and through this project the productivity focus on MSMEs has been further strengthened. In this pilot project for 100 clusters, over 1000 MSMEs participated in the scheme and an overwhelming majority of them have achieved excellent results. The overall annual savings obtained by the participating units is about Rs. 60 Crores. Besides this about Rs. 3 Crores were realized from sale of scrap through 5S implementation, the average inventory reduction is about 25%, production capacity increased by 10% without any addition of equipment, delivery performances were improved by 10 to 50% and over 10000 employees were trained in Lean concepts.

We sincerely hope that this Compendium will create a multiplier effect of the scheme on the stakeholders thereby benefiting many more MSME units and further as a catalyst in transforming our MSME sector into a global leader in manufacturing.

**Harbhajan Singh, I.A.S.**  
Director General  
National Productivity Council



## Foreword



The Ministry of Micro, Small & Medium Enterprises launched Lean Manufacturing Competitiveness Scheme (LMCS) under National Manufacturing Competitiveness Programme (NMCP) for the benefit of Micro, Small & Medium Enterprises (MSMEs) in 2009 on pilot phase in 100 mini clusters. The Scheme was basically a business initiative to reduce “waste” in manufacturing. The interventions lead to reducing waste, increasing productivity, introducing innovative practices for improving overall competitiveness, inculcating good management systems and imbibing a culture of continuous improvement.

The evaluation report on implementation of pilot LMCS has recommended the continuation of the Scheme keeping in view benefits amounting to about 20% increase in productivity to the implementing units. The scheme is being up-scaled with a Total Project cost of Rs 240.94 cr. (GOI contribution Rs 204.94 cr.) in the 500 mini clusters during for 12th Five Year Plan.

A compendium of success stories of Lean Manufacturing Competitiveness Scheme has been compiled by National Productivity Council (NPC), New Delhi. I hope this publication of a few success stories of the LMCS in the form of compendium will facilitate easier dissemination of information about the benefits of Lean practices amongst MSMEs and to motivate them for adopting Lean Techniques to increase their productivity.

**Amarendra Sinha, I.A.S.**

Additional Secretary & Development Commissioner  
Ministry of Micro, Small & Medium Enterprises  
Government of India



## Inaugural Awareness Programme

Office of Development Commissioner, the Ministry of Micro, Small and Medium Enterprises (MSME) conducted an Inaugural Awareness Programme on Lean Manufacturing Competitiveness Scheme for MSME sector on 29th July, 2009.

Speaking on the occasion the Minister of State (Independent Charge) for MSME, Shri Dinsha Patel emphasized the need for MSME sector to become more competitive in the local as well as international market thereby contributing in the growth of country's economy. He expressed confidence that MSME units will enhance their competitiveness and productivity with the help of this scheme.

Shri Dinesh Rai, Secretary (MSME), while delivering the Keynote address highlighted the economic scenario in the MSME sector and the need for manufacturing competitiveness.

Shri Madhav Lal, Additional Secretary and Development Commissioner (MSME) welcomed all the participants and described about the implementation approach for the scheme.

# Lean Manufacturing Competitiveness Scheme

## Background

The Government of India recognizes 'Manufacturing' as an important contributor to the national economy besides being a source of employment for the emerging young population. The National Manufacturing Competitiveness Council (NMCC) was set up by the Government of India to serve as a policy forum for credible and coherent policy initiatives in the manufacturing sector. NMCC has prepared a 'National Strategy for Manufacturing' which outlines the policy and strategies to be pursued towards higher levels of growth and employment. One of the long term strategies identified by NMCC is the National Manufacturing Competitiveness Programme (NMCP), aimed at enhancing the competitiveness of micro, small and medium enterprises through a number of interventions that help these enterprises to modernize and become competitive. In the Programme 10 schemes with an outlay of Rs. 956 crores have been drawn up for SMEs which will be implemented in the Public Private Partnership (PPP) model.

## The scheme

### Introduction

The "Lean Manufacturing Competitiveness Scheme" which is one of the ten components of the NMCP, is very important from the productivity perspective of MSMEs. The scheme has been implemented through clusters, initially, for 100 clusters on a pilot basis.

### Coverage and Eligibility

The Scheme is open to all the units throughout the country which qualify as Micro, Small or Medium as per the definition of the MSME Act. (The Micro, Small and Medium Enterprises Development Act, 2006). All the participating units must have unique EM no. The units must be located in same geographical location and producing same or similar range of products. Only MSMEs of manufacturing sector are eligible to participate in pilot phase.

### Implementation Approach

The approach involves identification of mini-cluster(s) within clusters, in the form of a Special Purpose Vehicle (SPV), to which Lean Manufacturing Consultants (LMCs) are engaged to assess the existing manufacturing system of member units of the mini cluster(s) and stipulate detailed step by step procedures and schedules for implementing and achieving Lean techniques.

### Implementation Structure

A three tier structure has been formed for implementation of the scheme:

- **Mini Cluster (MC)** Units (8-12 nos) desirous of participating in the scheme would form a SPV (Special Purpose Vehicle) or a DPG (Distinct Project Group) under an existing SPV or Association. The Mini cluster would be assisted by a Lean Manufacturing Consultant.

- **National Monitoring and Implementing Unit (NMIU)** At the next higher level, NMIU would monitor and facilitate implementation of the scheme. The National Productivity Council (NPC) has been assigned the role of NMIU.
- **Screening and Steering Committee (SSC)** The highest level, SSC, would provide overall direction for the Scheme which was headed DC, MSME and representatives from various Government & professional organizations.

**Financial Assistance** Financial support by the Government of India upto a maximum of 80% of the Consultant fees for each Mini Cluster is provided in the first year of implementation. Remaining 20% is to be borne by the beneficiary MSME units. The financial assistance from Government of India under the Scheme is envisaged towards the cost of conducting awareness programme and implementation of Lean techniques.

## Lean Manufacturing – The concept

Lean Manufacturing or Lean Production, which is often known simply as LEAN, is a production practice that considers the expenditure of resources for any goal, other than the creation of value for the end customer, to be wasteful, and thus, a target for elimination.

Lean manufacturing was developed by the Japanese automotive Industry, principally Toyota, following the challenge to re-build the Japanese economy after World War-II. Until the 1990s it was really only the automotive industry that had adopted Lean manufacturing. Since then it has spread to aerospace and general manufacturing, consumer electronics, healthcare, construction and, more recently, to food manufacturing and meat processing.

Lean is the set of “tools” that assists in the identification and steady elimination of waste (muda). As waste is eliminated quality improves while production time and cost are reduced. Examples of such tools are Value stream Mapping, 5S, Kanban (Pull Systems), and Poke-Yoke (error-proofing). Lean Manufacturing, also focuses on improving the “Flow” or smoothness of work, thereby steadily eliminating mura (“unevenness”) through the system. Techniques to improve flow include Production Leveling, “pull” production (by means of Kanban) and Heijunka Box.

### Lean Manufacturing Tools & Techniques

The basket of tools & techniques used in Lean manufacturing is given below:

5S	Failure Modes and Effects Analysis (FMEA)
Total Productive Maintenance (TPM)	Cellular Manufacturing
Visual Control	Statistical Process Control (SPC)
Kanban	Value Stream Mapping (VSM)
Standard Operation Procedure (SOP)	Six Sigma
Quality Function Deployment (QFD)	Single Minute Exchange of Dies (SMED)
Just in Time (JIT)	

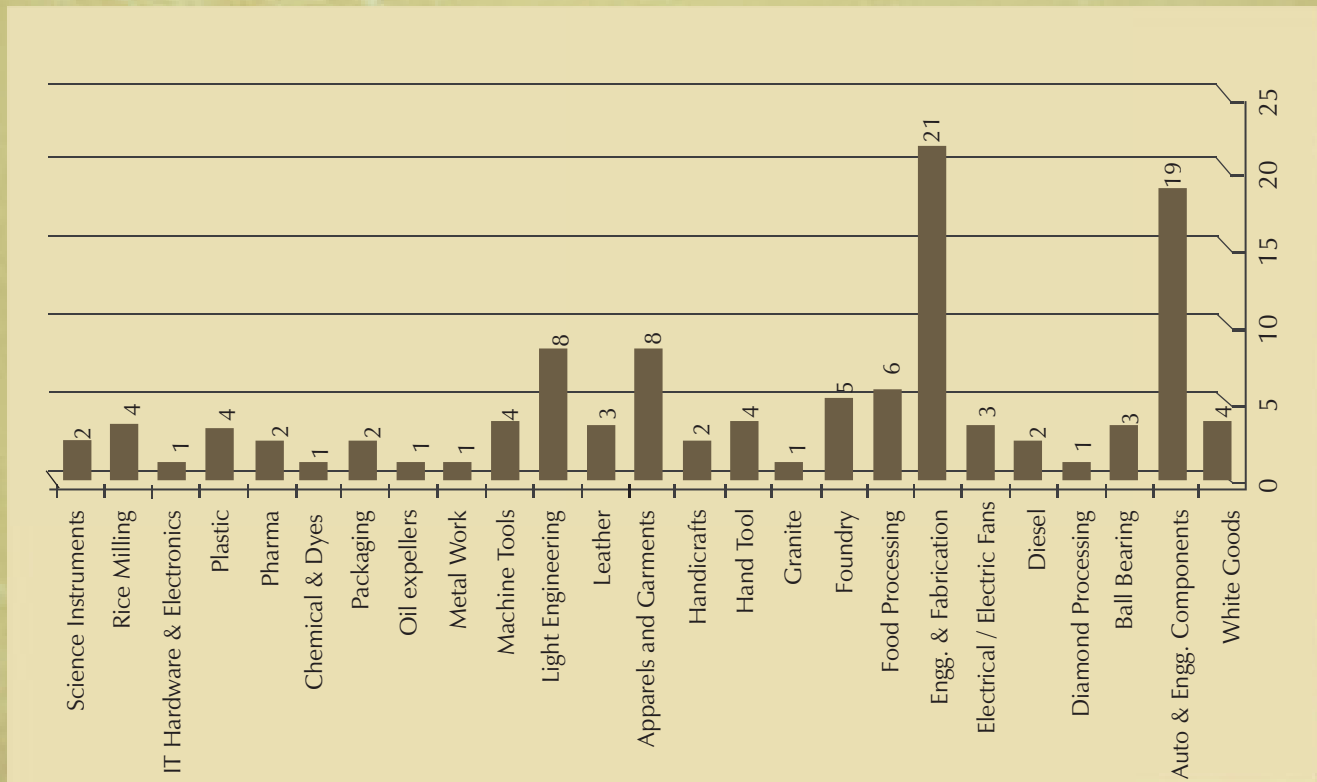
## Scheme Coverage State wise



The success factor of the scheme has been due to the comprehensive coverage of the clusters throughout the country through Awareness Programmes aimed at motivating the clusters to participate in the scheme. The state-wise distribution of the SPVs formed is shown pictorially as above.

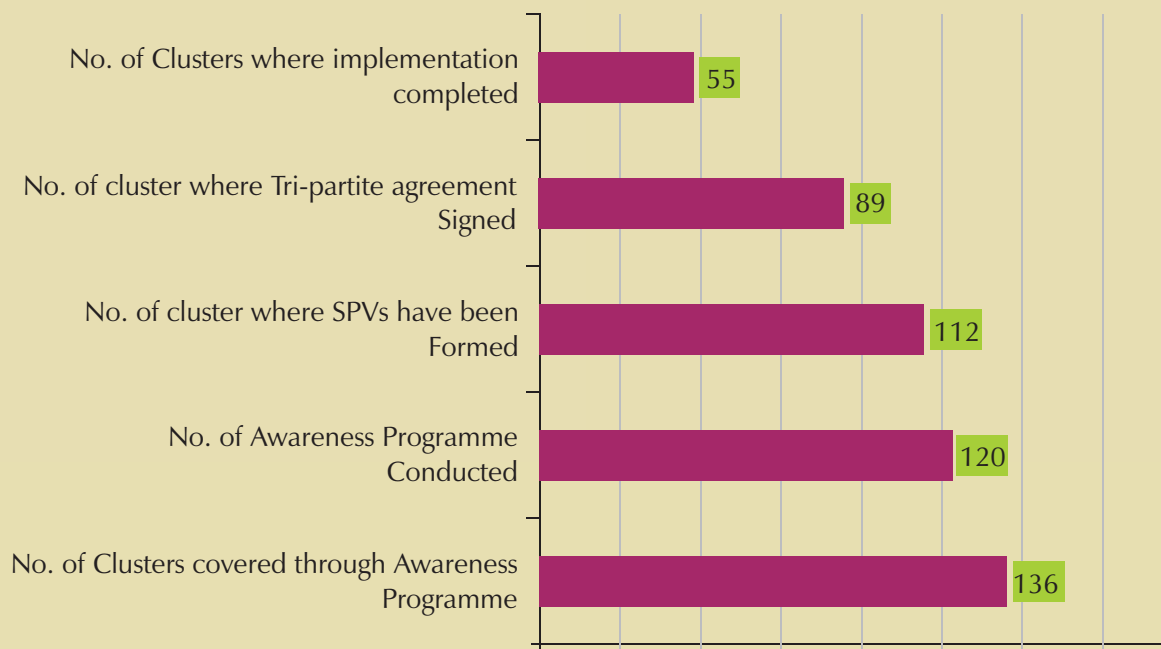
## Scheme Coverage Sector wise

These 112 SPVs represented most of the manufacturing sector/sub-sector of the economy comprising the highly technical automotive component sector to artisan based Handicraft sub-sector.



## Achievement of Scheme

The pilot scheme has been very successful. Under the pilot scheme a total number of 112 SPVs represented by around 1000 MSME units have been formed. Out of these, 55 SPVs have been able to successfully complete their Lean interventions. The salient performance of the scheme is as shown below:





## Summary of Results Achieved

The results achieved in the pilot scheme have been very encouraging. The units who have undergone the Lean interventions have greatly benefited through improvement in their productivity and performance. The units have been able to remarkably reduce the inventories (Raw Material, WIP and Finished goods) and the delivery performance. The implementations of 5S and visual management system have given a new and organized look to the shop floor. The work force has realized the benefits of “Lean Manufacturing” and are more satisfied and happy with the work environment.

No. of Clusters started implementing LM	89
No. of Clusters successfully completed	55
No. of SMEs participating in LMCS	900
Annual Savings from LM	₹ 60 Cr
Salvage Value of Scrap from 5S implementation	₹ 3 Cr
Increase in Production capacity without CAPEX	10 %
Space reclaimed for productive work	10%
Increase in Inventory turnover	25 %
Reduction in Manufacturing Lead Time	5-30 %
Improvement in OEE ( Model Machines)	15%
No. of Kaizens generated	>7500



## Orientation Programme

A one day orientation programme was held on 20th August, 2010 at New Delhi for the Lean Manufacturing Consultants (LMCs) who were empanelled with National Monitoring & Implementing Unit (NMIU) under this scheme. The programme was inaugurated by Shri Madhav Lal, AS&DC, MSME. While speaking on the occasion, he stressed the need of qualified and experienced LMCs in India and hoped that the scheme would provide a platform for the consultants to have a better understanding of the need of MSMEs.

The LMCs who were handling different clusters under the scheme shared their experience with the participants. They were provided a kit comprising all necessary documents like LMCS guide, various formats etc. The programme provided a platform for the LMCs to clarify their queries and doubts.



## Awareness Programmes

A total no. of 120 awareness programmes were held covering around 136 clusters in the identified locations spread across the country. These programmes were held with the involvement of Industries' Associations/existing SPVs/OEMs etc. wherein the interested units were made aware of the Scheme Guidelines, eligibility criteria and other documentation requirements. The units were exposed to the Lean concepts, tools & techniques and were informed about the benefits to be derived through this scheme.

The platform was also used to impress upon the associations about the rising need for their member units to become more competitive in the current cut-throat competition, which could easily be made possible through the implementation of Lean Manufacturing. They were advised to motivate their members to actively participate in the scheme.

# Auto Components Cluster

Lucknow, Uttar Pradesh

The cluster named 'Lucknow Automotive Components Manufacturing Association' (LACMA) comprised 11 units. The SPV was a result of the initiative of Tata Motors Limited as a part of its Vendor Development Programme. The cluster was manufacturing automotive components viz. fabricated auto parts, pressed components, chassis frames, air tank etc. The cluster was supplying its components mainly to Tata Motors Limited, Lucknow.



**Shri Punit Arora, Proprietor**

The Unit:

## Engineering Enterprises

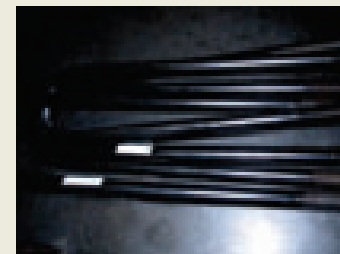
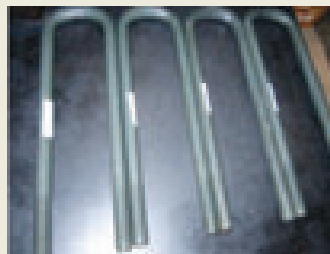
Type of Unit : Small

The unit is a leading manufacturer of U Bolts (front axle type and rear axle type) which is an important component in Automobile Industry. The unit was established in 1996 and has grown over last few years with annual turnover of ₹ 9 crores. The unit has a workforce of 46 employees. The unit has acquired ISO 9001 certification and is a vendor of Tata Motors Limited, Lucknow.

### Lean Journey

During Diagnostic survey it was observed that the company was facing acute problem of high rework. The workplace was also not in proper condition and the unit was lagging far behind as far as 5S culture was

“ Lean Manufacturing Project has made us aware of the powerful concept of increasing profitability through reduction in Muda, Muri and Mura in work processes. By applying principles of Lean Manufacturing in reducing wastage in material movement, reduction in rework by controlling variation in work output and preventing overburdening by redesigning storage trolleys and bins & re-laying out a few machines, we have been able to increase production levels while utilizing our manpower effectively. ”



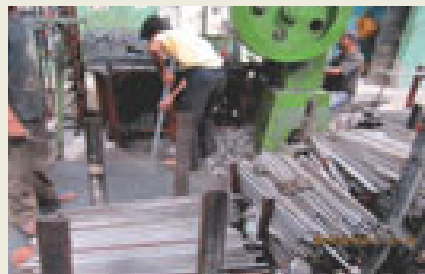
*(Photographs of some of the products)*

concerned. Another major problem faced by the unit was high breakage of tools in Chamfering area. All these problems were affecting the unit's Production Capacity, Quality of Products and also resulting in financial loss.

### Lean Tools Used: Kaizen, 5S, VSM

At the outset, the entire unit was divided into various zones for 5S implementation and for each zone various teams, comprising zone leader and zone members were formed. Training was given to staff and workmen on the concepts of 5S. Unwanted items and scrap were removed from shop floor and proper system of storage of required tools, equipments, dies etc was developed. Periodical Audit formats were developed and internal audits conducted for monitoring the status and progress of 5S activities.

Helper for collection of cut bars behind the Cutting m/c. During cutting, bar used to jump creating the possibility of hitting the operator



Before



After

Guide and J type stopper provided for collection of cut bars on the table thereby preventing the bar from jumping and hitting the helper

Inspection fixtures were placed over powder Coated jobs as there was no space for placing the same in the products' trolley. This was resulting in soiling of finished products



Before



After

Additional tray provided in the products' trolley for placing the inspection fixtures

Various formats were designed for data collection to record the occurrence of rework and tool breakage which was analyzed through brainstorming to arrive at the root causes of rework and tool breakage. The root causes identified were further studied in detail to develop corrective and preventive measures for the same. Several Kaizens were developed during the process and were implemented.

As the housekeeping of the shop floor was not proper, a concept of 5S and Visual Management was used to improve the aesthetics of the shop floor. Gangway marking was done on the entire shop floor, Display Boards were placed on machines, Posters on 5S and Safety were also placed on the walls of shop floor and various strategic locations. The employees welcomed the initiative as they could appreciate the benefits accrued in terms of lower search time of tools and materials, cleanliness on floor, greater safety etc.

5S reward scheme was designed and implemented in the unit and regular 5S audit was scheduled for a period of six months. Each zone was audited and assessed for the sustainability of good housekeeping. The zone which scored the maximum was awarded with an appreciation certificate and also with monetary benefits.



Before

Inspection Fixtures kept in Haphazard manner



After

Proper Board provided for placing Inspection Fixtures

### Overall Benefits

Reduction in Rework	80%
Savings in Tool Breakage	500%
Capacity Increase	25%
5S Score improvement	From 22 to 66 on 100 scale
Inventory	From 7 days to 3 days
Quality Rejections	From 1000 ppm to 223 ppm
Annual Savings (₹.)	₹ 70773/-

# Auto Components Cluster

Chennai, Tamil Nadu

The cluster named 'Chennai Manufacturer Cluster' comprised a total no. of 8 units and was manufacturing fuel pipes, sheet metal components, fabricated components, link rods, fuel pipes, bumper assembly, castings and fabrication & assembly components. It was promoted by Tractors and Farm Equipment Limited (TAFE), Chennai. The units were mainly vendor of TAFE.



**Shri S. Shanmugam, MD**

The Unit:

**India Industries**

Type of Unit : Small

M/s India Industries is manufacturer of automobile parts. They manufacture & supply components like bar stock, machining cold forged/hot forged parts, fasteners, fulcrum pins, pull rod, clevis and other parts using state of the art CNC turning centers, single spindle automats, center less grinders, thread rolling machines, milling machines, surface grinders and drilling machines. Both ferrous and non-ferrous raw materials are used with main focus on steel grades. The core processes are CNC turning, milling, drilling, grinding & thread rolling. The unit was established in the year 1985 and the number of employees is 112. Current turnover of the unit is approx. ₹ 10 crores. The major customers are Greaves Cotton India Ltd & Brakes India Ltd.

“ It’s our pleasure that we have improved our production through Lean manufacturing.....through this we have improved our quality and reduced cost of production. We are thankful as our entire management system is in good shape for the last one year because of this scheme. ”



*(Photographs of some of the products)*

## Lean Journey

During the diagnostic study, it was found that setup changes were done frequently as the number of components produced was high but the production batch size was small. The time taken for setup changes considerably reduced the time available for production while also increasing the cost of the cutting tools.

## Lean Tools Used: SMED, Kaizen

To address the above mentioned issues the unit selected two projects:

- Set-up time reduction
- Cutting Tool cost reduction

A separate Lean team was formed to work on each of the projects.

The set up time data of all the machines for a period of one month was collected. The machines were categorized into 3



different categories based on setup time & number of set-ups in a month. The total set-up time per month for all the 3 categories of machines was found to be 6800 minutes. It was observed that various activities were done after the set-up change process was initiated; as a result the set-up time was high. Root causes were identified and action plans were developed to address the concerns.

The team then observed and studied the above action plans for a period of 1 month and analyzed the results. A reduction in setup time was observed as the setup time reduced to 5440 minutes, saving 1360 minutes in a month.

For the second project on reducing cutting tools' cost, several kaizens were evolved. The cutting tools cost data for a period of 7 months was collected which was approx. ₹ 72,707/- per month. Cost details and the quantity used for each tool and type were captured. The type of tool which contributed to a major portion of the total cost was identified. It was observed that the inserts" types of tools had the maximum contribution towards the cost of tools. The cost of all tools of inserts type was collected and tabulated. Tools which were identified with highest cost were TNMG160408 VM NC3120 and TNMG160404 VM NC3120. Analysis was carried out to identify the concerns of these tools. Brainstorming was done among the team members to find out the probable causes for high tool consumption. Action plan was worked out to address various concerns. Tool life monitoring chart was designed to keep track of tool usage. The savings per Year had been estimated to be around ₹ 50,469/-.

5S implementation was taken up to bring in a culture of cleanliness and good housekeeping which improved visual appearance of the shop floor.

No.	Activity	Concern	Action plan
1.	Bringing tool from store	Tool searched & brought from store after starting setup change	Tool to be brought from store before starting setup change
2.	Bringing drawing from QC area	Drawing brought from QC area after producing first piece	Drawing to be brought from QC area before starting set up change
3.	Bringing raw material from store	Raw material brought from store after starting set up change	Raw material to be brought from store before starting set up change
4.	Bringing measuring instrument from QC area	Vernier brought after producing first piece	Measuring instrument be brought before starting setup change.

### Setup Time Reduction



### 5S Implementation

#### Overall Benefits

20% Reduced setup time.

Over all tool cost reduced by 5.5% per month.

110 Kaizens were evolved, estimated savings was ₹ 40000.

Annual Saving of ₹ 1.50 lakhs.

# Auto Components Cluster

Faridabad, Haryana

The cluster comprising of 10 units were involved in the manufacturing of Machined Parts, Plastic Moulded parts, Pressure Die casting, Press Components etc. and was promoted by the SPV 'Integrated Association of Micro Small and Medium Enterprises of India'(IamSMEof India). The SPV mainly supplies its components to Automobile Sector and Telecom sector.



**Shri G.P. Singh, CEO**

The Unit:

**PMT Engineers Pvt. Ltd.**

Type of Unit : Small

PMT Engineers Pvt. Ltd. was established in 2010 with an aim to produce truly world class products. The turnover of company is about Rs. 2.63 Crores. Total employee strength is around 30. The company provides mainly machining services for automobile Industries. The company supplies machined aluminum caps which are used in engine heads of cars.

## Lean Journey

The main problems identified in the diagnostic phase were inadequate utilization of Machines, Improper plant layout resulting in unnecessary movement, poor housekeeping, high production cost and quality defects.

“ We are convinced that Lean will give competitive edge. ”



*(Photographs of some of the products)*

## Lean Tools Used: 5S, Layout, TPM

To start with, training was given to all staff & workers and the whole factory was divided into zones and zonal teams were formed to implement 5S in these zones. A “TRAIN – DO” model was adopted for implementing each of the S's, by first imparting the training followed by hand-holding the implementation. The photographs on the next page show the implementation of 5S activities at shopfloor area.

It was observed that the maintainability was very poor between installed machines & walls owing to the limited accessibility to the area. The LMC and the Team studied the entire process for least movement, effective utilization of shop floor space and alignment of material movement according to process sequence. After in-depth analysis, the team suggested improved layout and implemented it successfully.



Before



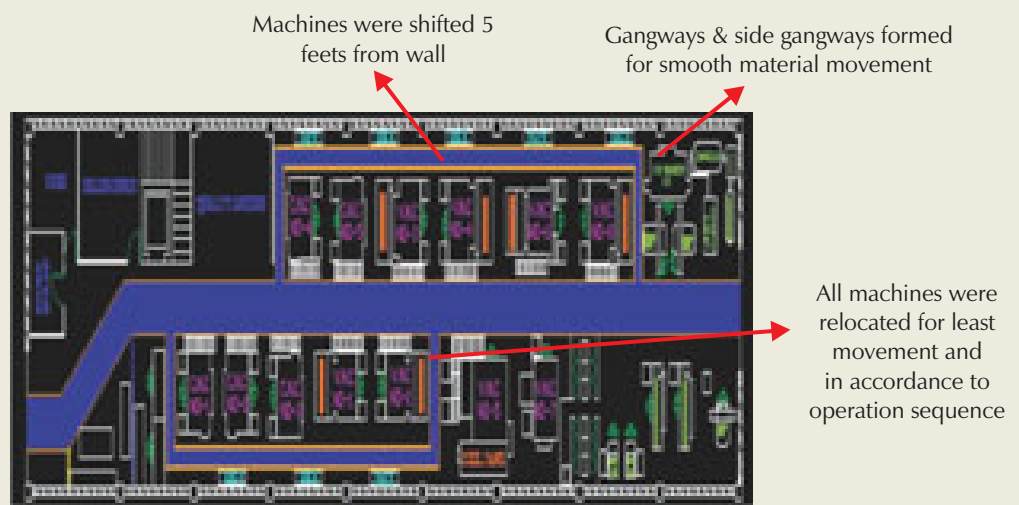
After

The LMC trained all operators on CLITO (Clean, Lubricate, Inspect, Tighten and Oil). Problems were observed and brainstormed for further root cause findings and corrective/preventive measures were taken. Machine specific TPM planner, daily check sheets, list of critical spares parts etc. were prepared and maintained which reduced the breakdowns from 80% to 20% and reducing the planned shutdown.

The company was facing pressure from major clients to reduce their rates. Cycle time of top 5 running items was noted using videography and further analysed to reduce all non value adding activities and retention time.

After implementation of the changed programming, new toolings and fixtures, the cycle time was finally reduced by 21%. Total estimated benefit calculated was Rs 1,53,400/-.

The company also faced higher number of internal rejections for one of their products namely Aluminum caps. To save machining cost, incoming/outgoing material inspection standards were made. It was decided that whenever a new lot arrives, 50 pcs would be machined first. These 50 pcs were thoroughly checked and if these pieces were O.K, then only machining would be continued. All identified defects were analyzed and brainstormed. After implementation of suggested improvements internal rejections reduced from 30% to 5 %. The company saved approx ₹. 1,10,000/- annually.



Improved Layout

**Overall Benefits**

Improvement in on Time Delivery(OTD)	85%
Reduction in Inventory	83%
Manufacturing Cost Reduction	50%
Total Productive Maintenance(TPM)	70%
Productivity Improvement	54%
Annual Savings	₹ 3.0 Lakhs

# Auto Components

## Cluster

Lucknow & Kanpur,  
Uttar Pradesh

The name of the cluster formed was 'Lucknow & Kanpur Automotive Components Manufactures Association' and had 11 units. The cluster was manufacturer of the Fiber Reinforced Plastics, Fabricated Sheet Metal Parts, Vehicle Components, Cooling pipes ,flexible tubes & hoses, etc. The SPV was promoted by TATA Motors Ltd.



**Shri Bharat Khanna, MD**

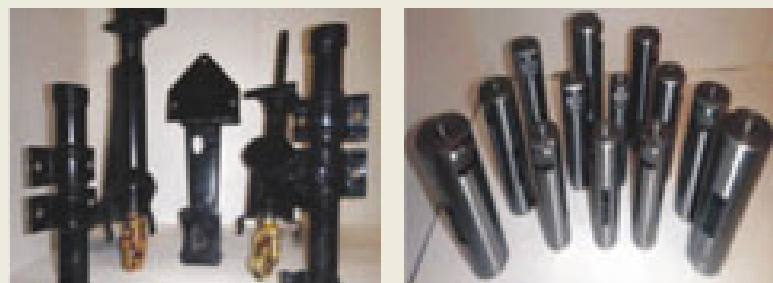
“ The Lean Manufacturing Program left us with a cleaner Shop floor. All waste was identified and reused wherever possible and the remaining was scrapped. This program educated our workmen to reduce waste and our Customer M/s TATA Motors was satisfied with our improved performance on Quality and Delivery. ”

The Unit:

## Stallion Auto Parts Pvt. Ltd.

Type of Unit : Small

The unit was established in the year 1995 and are leading manufacturers & exporters of precision auto components like CNC turned gear blanks, Machined flanges, Valve bodies, Gear shafts, Track rollers, Induction Hardened shafts, Machine spring hanger Brackets, spring pins, Stering Column Assembles etc. The unit is having a turnover of around ₹ 20 crores and has a workforce of 50 employees.



*(Photographs of some of the products)*

### Lean Journey

During the initial diagnostic study, it was found that the setup time of a critical machine was high due to which the capacity was underutilized. Also the workplace was not very well maintained and there was no 5-S concept in organization.

### Lean Tools Used: 5S, SMED

The existing setup time was 73.25 minutes. Dedicated team was formed to monitor the Internal and external elements of setup activity. The setup operation was analyzed and corrective actions were taken wherever required. Non value adding activities e.g.



Before



After

searching tools, blocks etc. were identified. To reduce the setup time setup trolleys were made which carried all the necessary items required for setup. The clamp and nut holding tray were hinged on the machine for use during setup. Die color coding was done operation wise which saved a lot of searching time thereby reducing the entire setup time.

5S implementation was also taken up as a major project. Before working on 5S, training was conducted for the workers and staff on the importance of 5S for the company. The entire floor was divided into several zones and management plan was made for each zone.

The 5S activities were standardized by identifying specific area to store wanted and unwanted items and under each area a defined place was identified for each item. The gang-way at Shop floor was marked appropriately. Shadow boards were designed to store tools & dies through color coding. 5S check points & assessment criteria were standardized.

5S implementation was taken up to bring in a culture of cleanliness and good housekeeping which improved visual appearance of the shop floor. Each zone was audited and assessed for the sustainability of good housekeeping. The zone which scored the maximum was awarded with an appreciation certificate and also with monetary benefits.



Set up trolley

#### Overall Benefits

Setup time reduced by 62%.

Machine availability increased by 37%.

Space saved for around ₹ 1.20 lakhs

Inventory reduction by 10%

Cash flow increased by ₹19 lakhs

# Diamond Processing

## Cluster

Surat, Gujarat

The cluster named 'Surat Diamond processing cluster' was into the business of cutting and polishing of the diamonds. It had a total of 8 units. They were supplying diamonds to diamond merchants and foreign countries.



**Shri Alpesh Shah, MD**

The Unit: Surat

### Facets Polishing Works Private Limited

Type of Unit : Medium

The unit is engaged in manufacturing of high value processed diamond products. It is the diamond manufacturing arm of the 'K. Girdharlal group', most commonly known as 'KG'. The group is a vertically-integrated diamond company that was originally formed in Surat in India as a diamond trading company in the mid-1960s. The unit is engaged in the business of job work based diamond manufacturing activity, providing cut & polished round and fancy shaped diamonds and supporting activities exclusively for the parent company. The unit employs around 1200 people and has a turnover of about ₹38 crores.

“ During the project, considerable benefits have been derived in terms of reduction in process cycle time, increase in productivity of machine/ people, increase in throughput of process/department and better workplace management across the production shop floor. Quantifiable value of benefits derived out of project is approximately 10.50 lacs. ”



*(Photographs of some of the products)*

### Lean Journey

The unit took up the initiative to implement the principles of Lean manufacturing with the objective to improve productivity and profitability. A diagnostic study was carried out at the unit. It was found that there was no proper system to check the losses in manufacturing operations. The company did not have established cycle time for its various production processes. A significant waiting time was observed at almost all stages of manufacturing (e.g. Planning, Laser Cutting, Blade Sawing, Pre polishing, polishing etc). Though, there was a system of proper storage & issuance like FIFO but adherence was lacking, as issuing of the material was not controlled which resulted into high in-process inventory. The layout of the shop floor was not organized which led to unnecessary human movement & efforts (MURI). A large amount of production time was lost in searching the items during production hours. The maintenance was reactive in nature as there was no preventive maintenance system and breakdown was attended as and when it occurred. The unit faced a low inventory turnover, high quality costs, order

loss, high opportunity cost, low labour productivity etc.

**Lean Tools Used:** Pareto analysis, 5-WHY analysis, 5S & Visual management, VSM

The management decided to implement 5S concepts as a precursor, to bring in Lean culture. A baseline survey was done to assess the present status of 5S and the score was found to be 12% on a 100 % scale. Subsequently, the shop floor was divided into zones with each zone represented by a team comprising 2-3 employees.

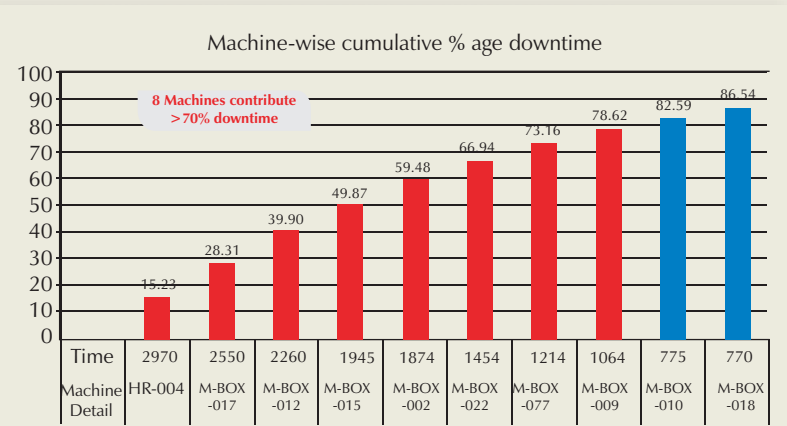
Training was followed by identification and segregation of needed and unneeded items in each zone. PEEP (Place for Everything and Everything in its Place) was implemented for each of the needed items. Gangways and work areas were marked for visual identification. This was followed up by standardization throughout the shop floor. A cleaning schedule was developed for sustenance, appraisal and recognition of 5S activity.

The 5S score of the unit improved from 12% to 83% which also led to considerable reduction in searching time, improvement in space utilization and enhanced Safety on the shop floor.

Since the waiting time (bottleneck) at different manufacturing processes was found to be very high during the diagnostic phase, Value Stream Map (VSM) was drawn and Pareto analysis conducted to identify the processes and machines that contributed to the total waiting time. It was observed that major downtime was caused due to non-availability of machineries used for stone ‘Planning’ and only 8 machines contributed more than 70% of total downtime. Preventive maintenance practices were developed and implemented to improve machine availability. For the purpose, the maintenance of Machine History Sheet was started. Another important reason for high waiting time was found to be improper production planning i.e. mismatching of desired quality goods specific to the machines and operators. Production Planning was improved to make the process flow smoother so as to reduce idle time.

The productivity of the cleaving department was also found to be very low. There was no Visual production control system to monitor and control the processes. It was identified as a major concern as it increased operations’ cost and lead time for delivery. Process mapping and process Controls were established to identify the value-added and non value-added activities. It was observed that about 68% of the time spent by a stone in the cleaving department was non-value added.

The non value added activities was either eliminated or minimized and processes were redesigned. Daily monitoring of stone output & WIP was established. A public announcement system and an “Interactive Information Sharing Meeting” was initiated to save the time consumed in communicating the plan so that any change in plan was displayed on each monitor on real time basis. This resulted in high productivity of the cleaving department.



Overall Benefits	
Savings by removal of Scraps	₹ 29,250
Total process cycle time reducefd	by 4days per lot
Reduction in processing cost	₹ 3,07,288/ per year.
Improved visual control.	
Increase in plotting department productivity:	4.78%
Productivity Improvement in Cleaving process:	35%.
Productivity Improvement in Inclusion plotting:	4.78% .
Process Cycle time reduction:	25%
Savings :	₹ 10,50,000/- per year

# Dyes & Chemicals Cluster

Khambhat, Gujarat

The cluster named 'Khambhat Dyes & Chemical Lean Excellence Cluster' comprised 8 units and manufactures Pigments, Benzoyl Chloride, Acetyl Chloride, Benzoyl tri Chloride, Chloro Acetyl Chloride, Dyes Intermediates, Pyrazolene, SPMAP, and Acid Dyes.



**Shri Raman Ambalal Patel,  
Partner**

The Unit:

## Gujarat Halogen Petrochem Corporation

Type of Unit : Small

The company is engaged in manufacturing of chemicals like Benzoyl chloride and Acetyl chloride and having total manpower of approximately 33 staff and workers. It was established in 1996 and has turnover of Rs. 8 Crores.

### Lean Journey

During the initial diagnostic study it was observed that the shop floor was not having a tidy look as 5S was lacking at several areas of the unit. Also, it was observed that there were several bottlenecks in the manufacturing process. Machine breakdowns were quite high especially in the scrubber section.

“ It has helped us in achieving both tangible and intangible benefits.....we have also been appreciated by a lot by visitors like Govt. officials and vendors on Lean results, especially our shop floor gained lot of appreciation. ”



*(Photographs of some of the products)*

### Lean Tools Used: 5S, TPM

The unit decided to work in the area of improving the up-keep of the shop floor, visual management and improvement in cycle time reduction. The Lean team further decided to implement Preventive/ Autonomous Maintenance through CLIT and adopted a systematic methodology for each of the projects. Under 5S implementation a 5S team was formed for each zone after studying the layout of the plant and the process flow. 5S assessment was done and the current level of the unit was determined. As the score of 5S came out to be very low, training on 5S, Kaizen and Lean was given to workers and staff. Training was also given on problem solving tools to all the Lean coordinators and senior staff. Audit formats for 5S were designed and periodic audits were carried out

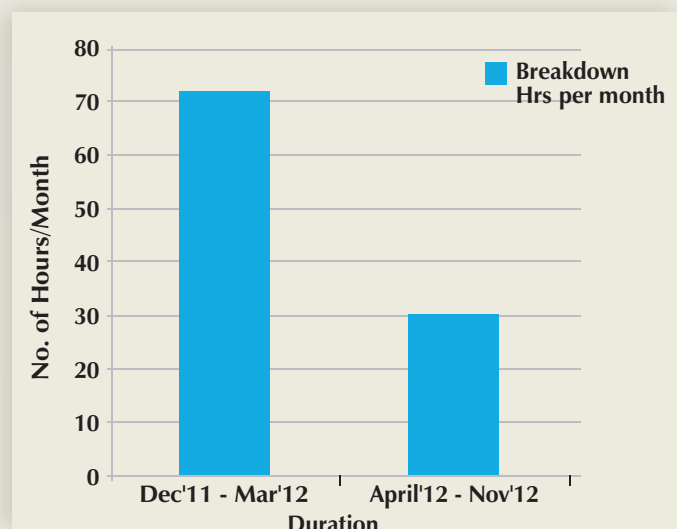
Earlier there was no appropriate method followed to record the cycle time of the BTC process. Two approaches were followed for data collection i.e. data collected from records and by



interviewing the workers and staff. Brainstorming was done to identify the main causes for high cycle time which were as follows:

- › No proper method of recording cycle time of BTC process.
- › High Breakdowns in the next station i.e. Scrubber.
- › Lack of supervision at night.

The SOPs were developed to eliminate the root causes. A Batch record sheet was made for recording the cycle time with reasons for delay, if any. Extra column in the scrubber was installed to prevent hot toluene from going directly to the scrubber. A CLIT (Cleaning, Lubrication, Inspection and Tightening) sheet was made for the scrubber and BTC Production.



Training on the problem solving tools was given to the lean coordinator and unit head. Root-cause analysis was done to determine the reason for breakdown of the scrubber section and the identified causes were found to be:

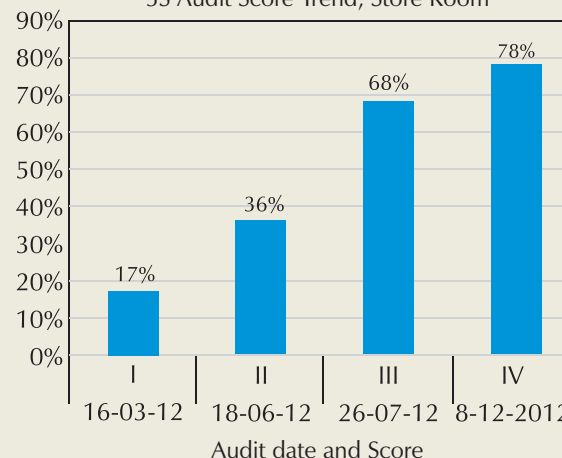
- › Unavailability of Preventive checklist with the Maintenance team, operators/ Supervisors etc.
- › Lack of awareness among Supervisor, fitters towards the importance of CLIT sheet.
- › Lack of awareness towards Spare parts management (Min- Max levels)

Concepts of TPM were brought in and activities covered under TPM were:



### 5S Implementation

#### Gujarat Halogen Petrochem Corp. 5S Audit Score Trend, Store Room



- › Training of operators on Preventive/ Autonomous Maintenance.
- › Making preventive maintenance check sheets for the scrubber area.
- › Identification of Min-max levels for the critical spare parts.

#### Overall Benefits

5S score increased from 32% to more than 70%.

Labour Productivity increased by 10%.

Monthly breakdowns reduced to 10-12 per month .

Plant shutdown hours reduced by around 59%.

Purity of BTC increased from 94-95% to 99.5%.

Savings due to the increased capacity: ₹2,80,000.

# Electrical Cluster

Vadodara, Gujarat

The cluster named Electrical Lean Excellence Scheme, Waghodiya, Vadodara, comprised 11 units. They were engaged in the manufacturing of MCC, PCC, PLC panels, Electrical Insulators, Glass epoxy, fabricated components, manufacturing and designing of brakes, Transformer components, electrical panels and kits, etc.



**Shri Arvind Patel**  
Managing Partner

The Unit:

**Baroda Mould & Dies**

Type of Unit : Medium

Established in the year 1990, the unit is a renowned manufacturer, trader and exporter of terminal plates, epoxy molded components and interrupter housings, used in electrical industry. The unit is spanned over 59000 sq. ft. area in the suburban Vadodara. The unit employs around 250 people in 2 shifts of batch production. The unit has an experienced R & D Department, large product line, large production capacity, as advantages over its peers. The whole range of cost-effective quality products has garnered the unit a huge client base and the list of elite clients includes Areva, BHEL, CGL, Raychem RPG Ltd etc. The unit is an ISO 9001:2008 certified unit and it is due to

“ The scheme has given us more intangible benefits than tangible. Lean tools like 5S, Kaizen, Visual Management etc have benefitted us to an extent. We are thankful to M/o MSME and NPC for their support and guidance. ”



*(Photographs of some of the products)*

the rigid quality control system & Total Quality Management system that the finished products are at par with the international quality standards.

## Lean Journey

The unit was striving hard to further improve quality of products as per customers' satisfaction. The unit didn't have any Lean system to keep the daily operations free of non value added activities. 5S was not implemented in the unit. There were no systems for sorting of wanted materials, disposal of unwanted items, housekeeping, storage, cleansing methods, frequency & standard operating procedure. The moulds were neither

identified with colour coding nor there was any organized way to identify and retrieve the moulds. Raw material inventory was high and there was no fixed location for WIP. The wastage in the form of unnecessary transportation and waiting time was prevalent in many sections.

**Lean Tools Used:** 5S, TPM, Fishbone Diagram, Pareto Chart, WHY-WHY Analysis

The Lean journey in the unit was started with the focused implementation of 5S all over the unit. The unit was divided into 20 zones and 5S teams were formed. The teams were trained on the 5S concepts & implementation. Red tagging was done to remove unwanted materials from the work area and the remaining necessary things were arranged in order. Separate locations for Red bin & finished goods were earmarked. Gangways/Walkways were marked. The boundary around the Machine was marked and responsibility assigned to concerned persons for maintaining and sustaining the 5S practice. The space utilization was optimized and the unit freed up lot of unnecessarily occupied space. Work environment & employees' morale was considerably improved. Salvage of scraps after SIERI activities yielded into monetary benefit to the unit. The unit was appearing visually better after 5S implementation.

A number of Kaizen teams were formed and the teams were encouraged to take up projects for improvement in their respective areas. Through kaizens, 20 Kg of mixing material was saved per batch (around ₹ 2000/-) by introducing a practice of keeping the mixing tank cap into another standby mixing tank instead of putting on floor. Due to this, contamination was also checked. Trolleys were developed for APG process accessories which were kept in wooden box earlier. Searching time was reduced and process efficiency was improved. Retrieval of finished parts became easier. Shadow boards were made for spanners and other tools. Material storage racks were categorized and labeled for easy identification and retrieval. In pre-mixing area, stand was provided for large mixing tank and arrangements

were made to fill the ingredients through individual small tanks instead of filling the large tank manually. Two persons, instead of four persons required earlier, were able to do the same work with lesser material loss & fatigue. Cleaning task also became easier. Material movement was reduced from 60 meters to 3 meters as the layout was changed and mixing tank was brought near to molding section which saved around Rs. 1600 per batch.

SMED was introduced at APG molding Machine (Small). The team was trained to record the data & identify the activities. All the non-essential activities were reduced or eliminated. The activities were classified into external and internal activities. A SMED trolley was introduced. New tools kit was introduced which helped in reducing setup time as well. The changeover time was reduced considerably, as shown below. This resulted into higher machine availability and higher production.

Parameter	Before	After
No of the Steps in Change Over	34	33
Total Setup Time	146 Min	84 Min
Internal setup Time	146 Min	79 Min
External Setup Time	0 Min	5 Min

**Overall Benefits**

Savings of space: 2700 sq.ft. i.e. ₹ 2,70,000.

Removal of scrap yielded ₹ 2 Lakhs

Changeover time reduced by almost 40%

Approx. ₹ 14,000 was realized per changeover

# Electronics Goods

## Cluster

Noida, Uttar Pradesh

The cluster named 'Electronics Goods Cluster' comprised 8 units which were in the manufacturing of Wires & Cables, Wound Magnetic Parts, Wire Harness, Populated Printed Circuit board, Printed Circuit Board, Transformers, Electronics Manufacturing Services etc. The SPV was promoted by Electronic Industries Association of India (ELCINA).



### Shri Pawan Sharma, MD

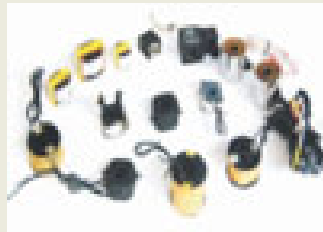
The Unit:

### Victor Components Pvt. Ltd

Type of Unit : Small

M/s Victor Components Pvt. Ltd is an ISO 9001, ISO14001 and UL Safety certified company, which was established in 1989. The company is one of the fastest growing electrical/electronic components manufacturing companies of Northern India. The company mainly produces range of Ferrite core transformers, Torroid coils, EMI filters, inductors, linearity coils, Line Filters, Linear Transformers and LED Drivers etc.

“ We have been benefitted in terms of improved man and machine productivity; better quality of products and reduced rejections. The training given to us on 5S was very beneficial for improving the housekeeping of our shop floor. Our employees are motivated and number of Kaizen are evolved for improvements. ”



(Photographs of some of the products)

### Lean Journey

To start with Lean implementation, the improvement team & LMC chose to first implement 5S for which training was given to all staff & workers. Subsequently, the whole factory was divided into 5 zones and zonal teams were formed to implement 5S in their respective areas. A “TRAIN – DO” model was adopted and “hand-held” implementation was taken up using suitable 5S formats. By the end of implementation, 5S improved from base score of 23.33% to 77%. Photographs on the next page show the implementation of 5S activity at shop floor area.

### Lean Tools Used: 5S, Kaizen SMED

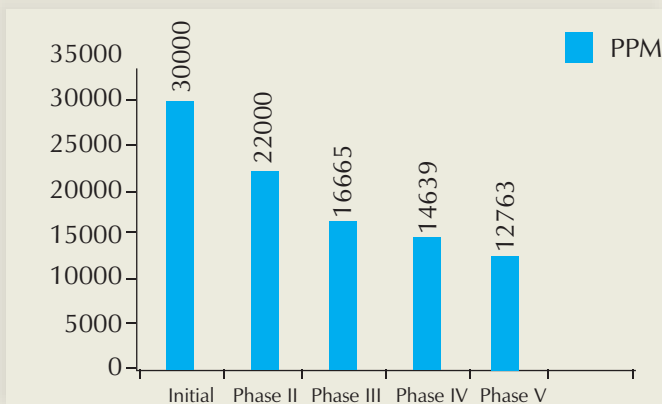
As a second project, it was identified that the rejections of product namely “Lighting coils” was very high (30000 PPM). A group of workers were trained and data was collected which on further analysis revealed that high or low inductance of ferrite cores was



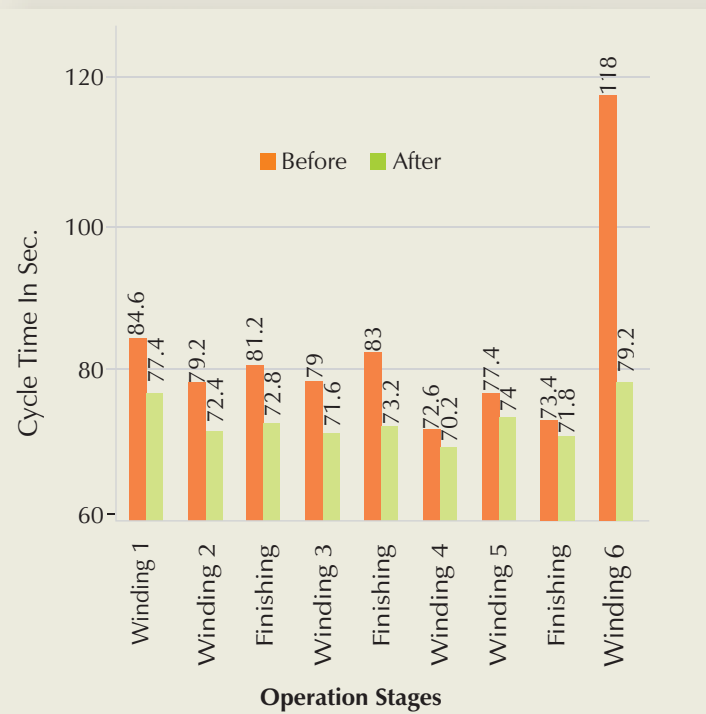
the major cause for rejections, it was further deeply analyzed and discovered that the inductance tolerance of supplied ferrite core was more than specifications and the supplier was unable to supply the ferrite cores with tolerance limit of less than +/- 4% because of manufacturing constraints, whereas the Customer wanted it with +/- 2%. After brainstorming, it was decided to segregate the supplied materials in small lots as per the required inductance value of final product so that the result of the final product could be within +/- 2%. Internal rejection for "Lighting" coils decreased from 30000 to 12763 PPM and 2 workers were removed from re-work station and deputed to other work.

Production lines at shop floor were earlier setup without any prior study and the required manpower for smooth flow of line was also not calculated or known. Therefore, the capacity and output of line was noted through time study which on further examination exposed that the coil winding operation was bottleneck and the time

taken for each operation varied from 79 sec to 118 sec. To overcome above problems, line was balanced, time losses were recorded and the layout was changed for smooth material flow. As a result, average production increased from 535 pcs/hr with 25 men to 803 pcs/hr with 23 men and productivity of line increased by 33.37%. Subsequently, products were grouped for each line to minimize changeover.



Lighting Coil Rejection



Overall Benefits	
5S Score -	from 23.33% to 76.67% on 100% scale
Improvement in Visual Control	
Rejections (in ppm)-	from 30000 to 12763
Number of Kaizens -	20 nos.

# Engineering Goods

## Cluster

Mohali, Punjab

The cluster was involved in the manufacturing of Bathroom Fittings like Gravity Cocks, Angle cock, Concealed valves, Flush valves, Wall Mixer, Flush cock, Basin Mixer etc. Most of the units in the cluster were into export business. The cluster named 'Mohali technology cluster' comprised 9 units.



### Shri B.S. Anand, Director

The Unit:

### Aqua Systems Pvt. Ltd.

Type of Unit : Small

The unit is a leading manufacturer of Bathroom Fittings like Wall Mixer, Flush Cock etc. The unit aims at manufacturing world class products with focus on Quality and ontime delivery to customers. The unit has grown over the last few years and strongly believes in policy of continuous improvement and customer satisfaction.

### Lean Journey

During diagnostic survey, the Lean team observed that layout of unit was not streamlined and there was a lot of backtracking in the material flow. Casting in the unit was done at ground

“ Implementation of Lean Manufacturing Competitiveness Scheme in our unit has significantly changed the people mindset from 'chalta hai' to that of waste elimination & Kaizen oriented. Apart from other benefits like visual controls, team building, search time reduction, the layout of plant was changed which allowed us to achieve 33% reduction in material movement and releasing up to 155 m<sup>2</sup> of floor area. I'm happy to share that we have continued Lean Practices with the LMC for the next phase, at our own cost. ”



(Photographs of some of the products)

floor, the next operations like machining, leakage testing, grinding, buffing were done on first floor followed by electroplating on ground floor and finally assembly, leakage testing and packing were done on first floor.

### Lean Tools Used: Kaizen, 5S, Layout Improvement

The process map of the unit was studied in detail which led to identification of several other issues such as wrong sequencing of machines in machine shop, multiple material handling, disorganized storage / no proper storage space, skilled worker of machine shop spending considerable time in material handling, narrow aisles in machine shop, mixing of items at shop floor etc. In order to address the above issues, the Lean team designed and proposed a new plant layout to make the process streamlined and improve the flow of material. It was proposed to perform operations of core making, casting and machining at the second floor and rest of operations of grinding,

buffing, electroplating, assembly & packaging at 1st floor.

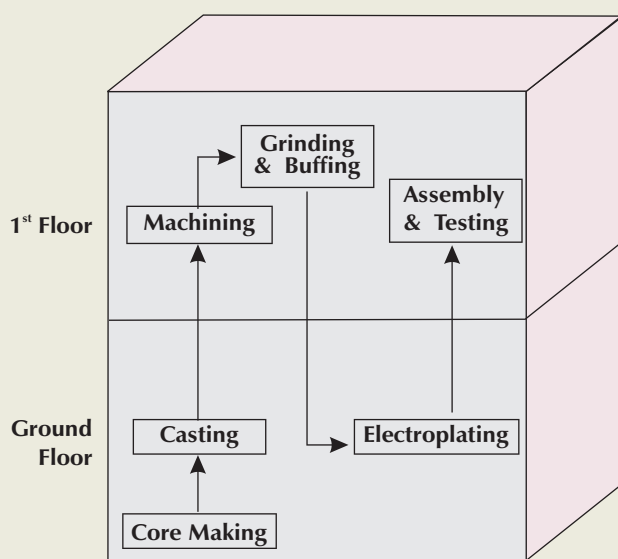
The Lean team also identified the fact that the machine shop was in a highly messy condition. Hand tools in machine shop were kept in a scattered manner and there was no fixed location for placing tools. The instances of tools getting misplaced were also high. The average tool search time was as high as 15 mins. This being a non value adding activity was leading to following problems:

- › High Setup time / Downtime of machines
- › High worker idle time

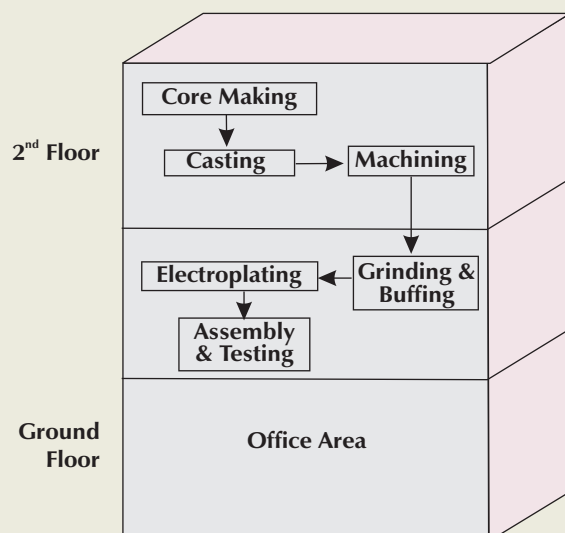
- › Ineffective utilization of machines and equipments
- › Reduced machine output and Productivity

To address the above issues, the Lean team evolved a Kaizen and designed shadow boards for placing tools. This reduced the tool searching time to just 15 secs and also reduced the possibility of tools getting misplaced since their location was fixed.

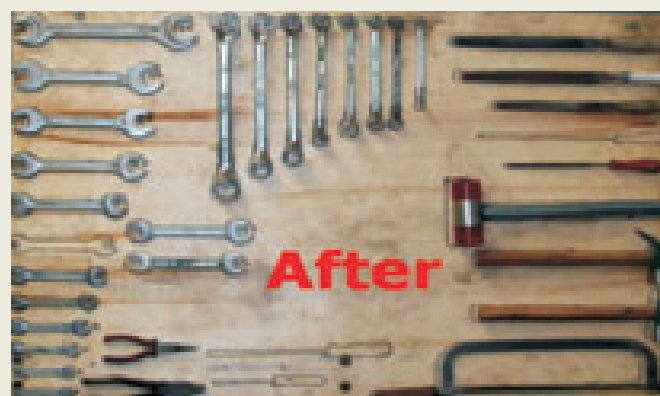
The unit was not having proper production planning and control system. In order to develop the same, the Lean team suggested to implement computing based ERP in due course of time. On temporary basis, it was recommended to develop an Excel based system to prepare the people for working in an ERP environment.



Block Diagram of Existing Layout of Aqua System Pvt. Ltd.



Block Diagram of proposed layout of Aqua System Pvt. Ltd.



### Benefits Achieved

- Distance travelled by the product reduced by 30 mts.
- Tool searching time reduced from 15 min. to 15 sec.
- Financial gains of ₹ 36 lakhs / year
- Increased productivity and better working conditions

# Food Processing Cluster

Vadodara, Gujarat

The cluster named 'Food Processing Lean Excellence' was formed with 9 units involved in food processing business. The units were a major manufacturer of Pickles, Mango pulp, Chutney, Frozen Products, Namkeen, Snacks, etc.



**Shri Chandresh Shah, MD**

The Unit:

## Madhav Agro Foods Pvt. Ltd.

Type of Unit : Medium

The unit was established in 1993 in the green belt of Padra District near Vadodara in Gujarat, where fresh fruits and vegetables are available in abundance. The unit is a manufacturer & supplier of Pickles, Paste & Chutney. The company is among the first in India to implement ISO and HACCP (Hazard Analysis and Critical Control Point) in 2001 and was internationally recognized for Quality & Food Safety Systems. Currently the unit is accredited with ISO 22000:2005. The sales turnover of the company is about Rs. 5 Crores and it employs around 80 people. The unit supplies over 300 recipes to North America, Europe, Australia, Middle East and Africa under various private labels.

“ We highly appreciate your support and experience in implementing Lean projects. We shall sustain these practices. ”



*(Photographs of some of the products)*

### Lean Journey

Keeping in mind the nature of the industry, the unit was requiring a Lean system to avoid losses due to waiting, contamination, transportation etc. The raw material and WIP, being perishable commodities, could not afford any delay in processing. Though the unit was certified with well recognized QMS and it maintained quality assurance practices, yet need was felt to have a system to check quality issues and the losses at source of generation. There was waiting time loss due to lower efficiency of filler machine. Also, the Shrink tunnel and Filling Machines were having breakdowns resulting in lower efficiency. Since the WIP and packing material inventory was high and ITR was low (4.33), it required better production planning. Traditional practices were largely followed all over the unit. There was no schedule followed for cleanliness and housekeeping was done in unplanned manner. Delivery compliance was very low. There was no system of "Suggestions Scheme" or "Shop Floor Meetings" to solicit suggestion or feedback for continuous improvement.

### Lean Tools Used: VSM, 5S, Visual Management, Inventory Turnover

During diagnostic study it was assessed that the plant had a large opportunity to reduce or eliminate many wastes through 5S.



Therefore, Packing and filling section were selected as the pilot areas. Lean awareness training was conducted to the core management group along with training sessions on 5S, Kaizen and Visual control for the Packing and filling sections followed by implementation of 1S (red tagging)-2S (PEEP)-3S (Cleaning). Subsequent audits reflected remarkable improvement in visual management, reduction in loss of production time, reduction in inventory etc.

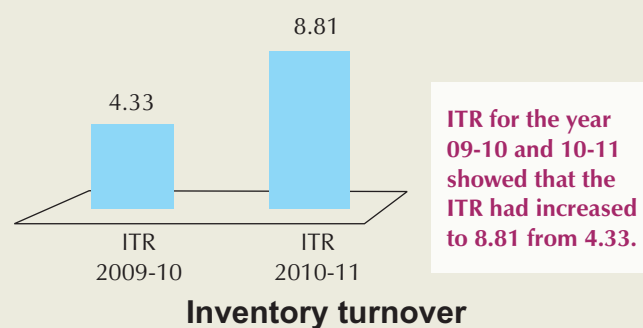
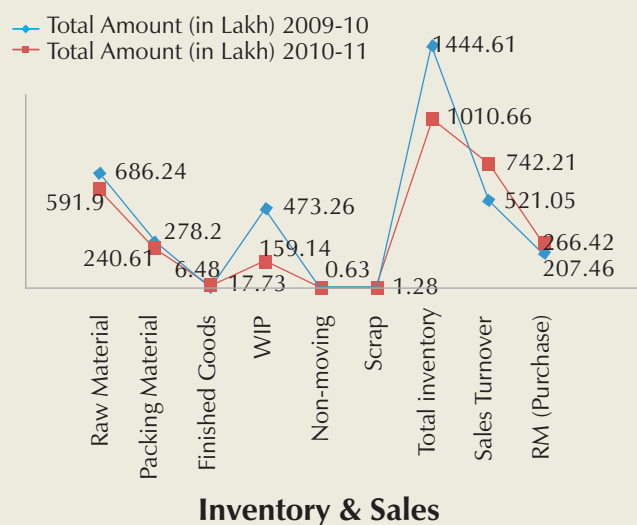
It was found that the unit frequently fell short on delivery compliance. Also, the inventory levels were high for most of the items. The probable reasons identified were as follows:

- › Inadequate raw material received from vendors
- › No min-max defined for most of the items
- › Economic lot quantity not followed
- › Space constraints for stocking RM and FG
- › Packing materials were being procured more than the lot-size

A Value Stream Map was made showing the top level value chain processes for key products. Also, the PPC (Production Planning & Control) process was studied in detail including the dispatch data, supplier lead times, shipment size and production batch size. The min -max levels at RM - WIP -FG level were established. The change over time for the bottleneck processes was reduced. PPC was planned and followed scientifically.

The above activities resulted in remarkable reduction in WIP and total inventory while increasing the delivery performance and sales turnover.

The OEE of pickle filling machine was 27% and it required a deployment of 14 persons instead of 9 persons due to the bottleneck operation of filling process. No CLIT (Clean-Lubricate-Inspect-Tighten) standards were in practice. Therefore, data was collected and analyzed through Why-Why analysis of abnormalities/Breakdown, Fault tree analysis, Cause and Effect Diagram etc and the 'corrective and preventive actions' (CAPA) were incorporated into CLIT sheet. A comprehensive CLIT sheet was prepared and implemented. Through all these measures, the OEE increased from 27% to 47% resulting in an estimated benefit of Rs. 6.6 lacs per annum.



### Overall Benefits

- 5S Score – 90% on 100 % scale
- Increase in Labour productivity – 27%
- Improvement in Inventory Turnover – 103%
- Overall Equipment Efficiency (OEE) improvement – 85%
- Annual savings estimated – ₹ 42, 00,000/- per year

## Foundry

### Cluster

Malwa, Madhya Pradesh

The SPV named 'Malwa Region Foundry Lean Manufacturing cluster' comprised 11 units. The units were involved in the manufacturing of components like Brake Hose, Centrifugal Pumps, Cast Iron Surface Plate, Brake Drum, Axle Box housing etc.



#### Shri Atin Jain, Director

The Unit:

#### Porwal Diesels Pvt. Ltd.

Type of Unit : Small

The unit was established in 1987 and is mainly dealing with the machining of Automobile Components. The unit is supplier to OEMs like Force motors, Volvo, Eicher etc. and has facilities of Conventional machining, CNC Machining, VMC Machining & Diesel Engine Assembly Shop. The major products of the unit are Brake drum for LCV and MCV, Multi Axle, Final Drive Housing, Bearing Blocks, Bolted Trax. The unit has an annual turnover of ₹ 3.37 crores. The unit also supplies its components to its sister concern named Porwal Auto Components Ltd. The total employee strength of the unit is 50.

“ The scheme has helped us in war against the wastes and has boosted our confidence to new heights. 5S project has enabled us to take up customer visits at any time. Our changeover time, travelling time has reduced considerably. New techniques learnt and knowledge sharing under this project has enhanced our productivity and profitability. ”



(Photographs of some of the products)

#### Lean Journey

During Diagnostic study, the Lean team identified various Production and Quality related problems at the shop floor level and on the basis of identified problems, the main projects taken up for improvement by the Lean team were:

- Workplace improvement through 5S and Visual Management
- Reduction in Customer Quality Rejections
- Reduction in Internal Quality Rejections
- Reduction in machine setup time

**Lean Tools Used:** 5S, Kaizen, Visual Management, SMED, Pareto Analysis

The whole unit was divided into 5 zones and a zone leader was assigned in each zone for 5S implementation. Unwanted and

unused material was removed from shop floor to the red tag area. Location for each and every necessary item was decided & accordingly placing of items was done. Visual display of information & instruction was made for safety, do's & don'ts for Quality. Initially, six sides cleaning were done in each zone and cleaning standards as well as check sheet were established. Training on the concept and importance of 5S was given to staff and workmen and periodical audit forms for 5S were also designed for sustenance of improvements achieved through 5S.

To reduce the customer quality rejection as well as internal quality rejection, a list of key Quality issues was prepared and the same was mapped to identify problematic products. The identified products characteristics were linked with respective processes and product-process defect matrix was prepared. Subsequently, root cause analysis of rejections was done and the identified causes were further short listed through brainstorming on basis of impact (I), occurrence (O) and mitigation (M) comfort using IOM matrix. Pareto analysis and trend graph analysis was also used as supportive tool.

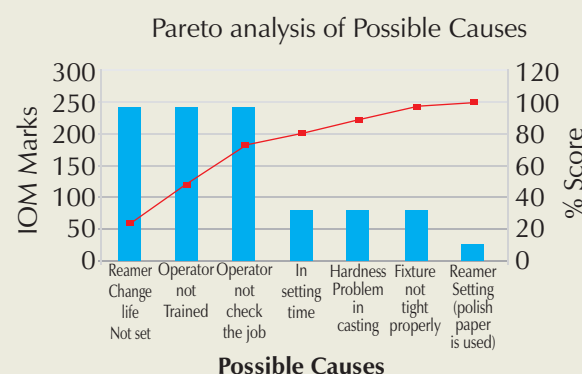
The short listed root causes were further analyzed for developing new systems and procedures along with modification of existing ones so that Quality rejections could be minimized/eliminated. Several kaizens were evolved during the process and work instructions and control points were displayed wherever possible.

Video shoot was conducted for VMC Machine change over. Real time analysis was done with the identified project team to evaluate total elapsed time and elementary time used to carry out all the activities during changeover as per standard format. While calculating the elementary time, only those activities were considered, which were necessary for die change. The project team reviewed all the activities performed to decide internal and external setup activities. Some quick win kaizens were evolved which on implementation, reduced / eliminated waste activities involved; for example a changeover trolley containing the necessary tools and equipments was designed for streamlining the internal changeover activities.



No place for fork lift

Designated place for placing fork lift



Company Name <b>PORWAL DRILLS PVT. LTD.</b> PITHAMPUR	SHOP :- CNC SHOP PART NAME :- Case pinion STARTED ON :- 15.08.2012	<b>KAIZEN IDEA SHEET</b>	
BEFORE IMPROVEMENT		AFTER IMPROVEMENT	
KAIZEN THEME :- TO INCREASE THE PRODUCTIVITY ON CHECKING GAUGE.		IDEA :- INTRODUCE SPECIAL OUTER DIAMETER CHECKING GAUGE.	
<ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Productivity increase</li> <li><input checked="" type="checkbox"/> Quality improved</li> <li><input checked="" type="checkbox"/> Cost Saving</li> <li><input checked="" type="checkbox"/> Delivery Fast</li> <li><input checked="" type="checkbox"/> Safety</li> <li><input checked="" type="checkbox"/> Moral Increase</li> </ul>	<b>RESULT :- INCREASED PRODUCTIVITY</b> <b>          :- INCREASED ACCURACY</b>		<b>TEAM MEMBERS:</b> MR. S. DIVYAN MR. DEVENORA MR. D. S. TONGA

### Overall Benefits

5S score	16% to 64% (100% scale)
Customer Quality Rejection	5000 ppm to 2214 ppm
Internal Quality Rejection	35000 ppm to 18257 ppm
Savings in Change over time	67%

# Foundry

## Cluster

Belgaum, Karnataka

The Foundry cluster of Belgaum region manufactures products like Castings, Rear Axle Carriers, Piston Clutch, bearing Spacers, Valve Assemblies, Machine tools, Brackets, Valve Bodies etc. A total of 8 units came together to form a SPV named 'Belgaum Foundry Lean Cluster'.



**Shri Varun Bogar, MD**

The Unit:

### Trimurti Founders

Type of Unit : Small

The unit, established in the year 1997, is in the manufacturing of Automotive components, Pump Components, Compressor Components, Valve Bodies, Machine tool Components & General Engineering Components. The average turnover of the unit is ₹ 3 crores.

### Lean Journey

The management of the unit decided to participate in Lean project as it was facing various production and quality related problems like high rejection, high breakdown, poor housekeeping, unskilled and

“ Before Lean implementation the things were not in order and aesthetics of shop floor was also not up to the mark. This project has certainly brought about drastic change in our unit. The workers are now aware of the ways to remove the wastes. We have increased our productivity and attained a competitive edge. ”



*(Photographs of some of the products)*

untrained workers. The Lean team did a detailed diagnostic survey and prepared systematic action plan for improvements.

### Lean Tools Used: 5S, kaizen, Layout Improvement, Brainstorming.

On initial study of the shop floor, it was noticed that there were lot of housekeeping problems in the company. The dies were stored without any identification. This led to lot of delays, extra set up time & transportation, safety issues in handling of dies as the operators were needed to search for everything and every time.

The Lean team adopted a systematic approach for 5S implementation starting with identification of zone and team

## Pattern Storage Yard



Before



After

members. Training was given to staff and workmen on concepts and importance of 5S. Scraps and unused items were identified, sorted out and red-tagged. 'Right thing at right place' concept was established. Proper place was identified for storing tools and equipments and standard operating procedures were developed for all the operations. Dies were segregated and colored coded for Fast/Medium/Slow moving die. Fast moving dies were kept near machines only, with specific dies for specific machines. Tools were made available on tool board.

The Lean team along with shop floor team brainstormed and evolved several Kaizens for improving Productivity, Quality, Reducing Cost etc. For example, metal was heated in Cupola process using bed coke for attaining fluidity. Bed coke used was 500 kgs, however there was a mismatch in liquid metal fluidity & tapping hole level. Brainstorming was done to develop remedial measures and it was decided to decrease amount of bed coke & take trials and set the standard amount based on best fluidity obtained. It was observed that best fluidity was obtained at 425 kgs of bed coke and also the tapping time reduced from 1 minute to 45 seconds. This kaizen led to 15% savings in bed coke quantity thereby reducing the manufacturing cost.

The Lean team studied the process flow and the existing layout of the unit in detail and identified various gaps like high transportation of raw material, high movement of workers, improper material handling systems, strenuous activities for workers etc. Based on the identified gaps, new layout was proposed with the following features;

- To reduce labor strain, track was proposed to be laid from Raw Material storage till Cupola charger
- To reduce physical strain and improve material handling systems, Hand carts were designed
- To reduce travel time of workers, old Sand Siever was repaired and placed near Moulding Sand Muller
- To reduce travel time and labour cost, Sand was proposed to be placed near Moulding Sand Muller thereby reducing the travel distance by 50 meters

### Overall Benefits

Rejection reduced from 12% to 9%

Increase in 5S score from 20% to 45%

Average savings of ₹ 5 lakhs per annum

Better Housekeeping and reduced strain on workers

Consumption of bed coke reduced by 15%

# IT & Electronics

## Cluster

Bengaluru, Karnataka

The cluster named 'OCTO electronics Cluster (CLIK)' comprised 8 electronic components manufacturing units in Bangalore. The Product category includes Electronic controller, Electronic & telecom equipment's, transformers, wires, Multi-Layer PCBS, Insulated and Bare Aluminum & copper wire, Embedded Products etc.



**Mrs. R. Rajalakshmi, CEO**

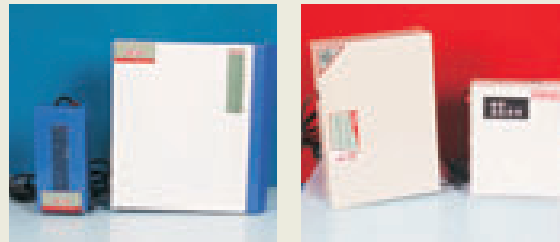
The Unit:

**FON-ESS India Pvt. Ltd**

Type of Unit : Micro

For over two decades since its inception in 1985, Fon-Ess has built a solid reputation by pioneering the manufacture of compact microprocessor based EPABX systems and intercoms. With a fully equipped, state-of-the-art manufacturing facility in a centrally located area of Bangalore, Fon-Ess is an ISO 9001:2008 certified company that has moved from being a design and development center to a comprehensive solutions provider, catering to a wide cross-section of clients that include large industries, MNCs, software majors, call-centers etc. It has an annual turnover of around ₹ 95 Lakhs. It has a total strength of 15 personnel out of which there are 5 officers, 10 staff.

“ With the assistance provided by the cluster and the consultants, we were able to understand fully the importance of implementing Lean practices..... Several kaizens were implemented, thus saving time & money, reducing wastage etc. Work place cleanliness & safety improved greatly . Single line production was implemented; saving manufacturing time, increasing efficiency and output..... Thankful to MSME and NPC for this initiative which made it possible for a micro unit like ourselves to be a part of such a wonderful initiative. ”



*(Photographs of some of the products)*

### Lean Journey

The company had grown over last few years based on the knowledge and experiences of the Top Management but was lacking good manufacturing systems. The unit was carrying out tasks with lot of non-value added activities. On discussion with top management of the organization, it was decided to implement Lean manufacturing systems to reinforce the fundamentals and bring out changes in the organization to improve productivity, quality, delivery, safety and morale with focus on cost reduction.

The initial Diagnostic study identified the following focus areas for Lean intervention;

- KAIZEN through Employee Involvement
- Improving quality by reducing customer complaints and reworks
- Effective inventory management
- Improving delivery performance

## Lean Tools Used: 5S, Kaizen, 7 waste identification & Visual Management

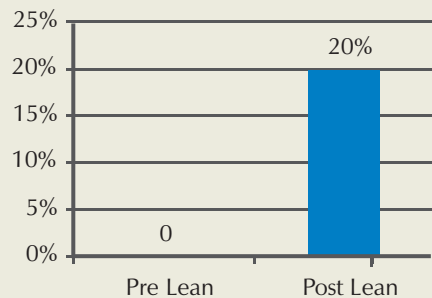
It was observed that there was no formal recording and monitoring of quality results. All problems were rectified by rework within the organization. Huge financial loss was incurred because there was major opportunity loss due to delays in delivery, customer complaints, reworks, internal rejections etc which was not quantified. Since quality needs to be inbuilt in the processes and is a need for survival itself, "Quality Improvement" was selected as a target area. The processes identified for deploying quality improvement included training, establishing documentation, measurement, monitoring and bridging of gaps using the Lean tools such as 5S, Kaizen, 7 Wastes and 3 M. Necessary formats were used by the Lean team, so that there could be a regular monitoring and measurement of these data on a monthly basis. Training followed by structured implementation of quality Improvement tools was taken up. By applying Pareto Principle, quality improvements were quantified.



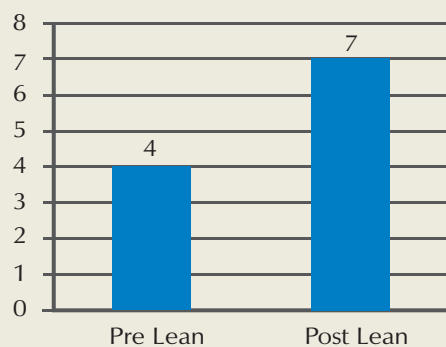
### 5S and Visual Management

This project was a turnaround in the organization as total employee involvement was evidenced and significant changes were observed in the shop floor. The upkeep and housekeeping improved drastically and management was very happy with the improvements made by the employees. Work environment in the organization and enthusiasm of employees were increased drastically to achieve breakthrough results.

Value stream management was done to improve the takt time & on-time Delivery Performance. Since, the inventory system was not in practice, the company had no information on Inventory Turnover, non moving items etc. Basic systems and MIS were put in place for monitoring inventory followed by identification of non-moving inventory and average quantity of inventory maintained. An overall reduction of 20 % inventory was achieved.



**Reduction in Inventory**



**ITR**

#### Overall Benefits

Quality improvement projects saved ₹ 4 lakh

Customer Complaints were reduced

Delivery Compliance was improved

Employees involvement & morale improved

Overall cost savings of ₹ 4.4 lakhs per annum

# Light Engineering

## Cluster

Faridabad, Haryana

The cluster comprised 10 units in Faridabad and was promoted by the SPV named 'Integrated Association of Micro, Small & Medium Enterprises of India' (IamSME of India). They were the manufacturer of sheet metal components, turned components, forging, stators and rotors, etc. and supplier to large industries, OEMs etc.



**Shri Ajay Kr. Singh, MD**

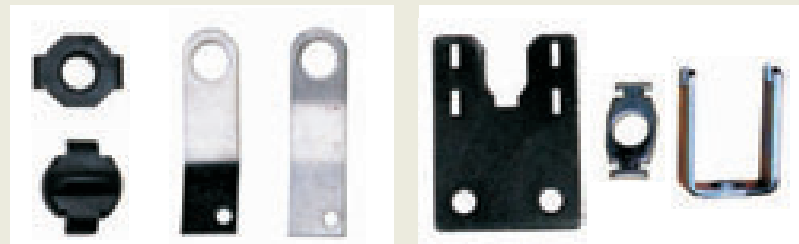
The Unit:

## Ajay Engineering

Type of Unit : Small

M/s Ajay Engg. established in 1987, is an ISO/TS16949:2009 certified company and a leader in manufacturing of Deep Draw Parts, Sheet Metal Components, Spring Steel Components, Furnace Brazed Components, Deep Draw Components, Bracket, Wire Forming Components etc. in India. It has a manpower strength of 40 and its sales turnover during the financial year 11-12 was Rs. 376 lakhs.. Its major clients are Padmini VNA Mechatronics Pvt. Ltd, Hella India Electronics Pvt. Ltd., Senior India Pvt. Ltd., Keihin Fie Pvt. Ltd., Clutch Auto Ltd., Glen Appliances etc.

“ Implementing Lean has not only given us enormous monetary savings but also transformed our capability ”



*(Photographs of some of the products)*

## Lean Journey

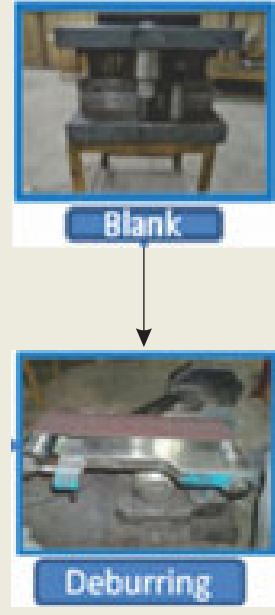
During the diagnostic study the Lean team identified cycle time reduction to be of prime concern as it was a continuously affecting productivity.

### Lean Tools Used: 5S, cycle time reduction, TPM

The unit formed a Lean Implementation Team headed by a Lean coordinator. The team started with implementing 5S as a start-up exercise and divided the plant into 5 zones. 1-S to 5-S was implemented in each of the zones during the various phases while also improving the visual management of the workplace.

As a first step towards practicing Total Productive Maintenance (TPM), the unit started with an initiative called 'my-home-my-machine' under autonomous maintenance. Basic training on topics e.g. about the machines and tools, maintenance of equipment history card, assessing condition and preparation of PM checklist was imparted to the Lean team followed by horizontal deployment to all the workforce.





**Process after Kaizen**

Subsequently, the unit started a productivity improvement initiative and identified the following parts based on criteria e.g. high volume part, involving frequent tool maintenance, heavy rejections etc.

The team did brainstorming, built Fish Bone Diagram and developed ideas (Kaizen) which were then checked and validated for feasibility to be implemented one by one.

A progressive tool was designed and developed for processing the Armature Plate in which 4 operations (Blanking, Punching, Notching and Reaming) were combined. Also to increase the productivity, instead of single cavity the tool was made with two cavity that ensured double production and less lead time.

The processing time came down to 2.5 secs/piece from 25 secs / piece and the productivity increased by 800%. There was a saving of 2 operators and 3 machines with a calculated saving of Rs 165,000/- per year. Similar exercise was carried out for the other two parts also. The unit achieved a WIP reduction of 40%, production increase of 14% and PPM reduction upto 170 PPM.



**Armature Plate**



**U-Armature**



**Contact Spring**

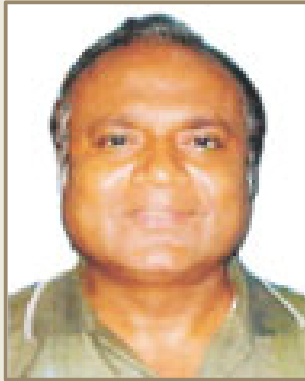
<b>Overall Benefits</b>	
5S Levels	60%
Productivity Improvement	30%
Quality Improvement	30%
Manufacturing Cost Reduction	10%
Reduction in Inventory	10 %
Annual Savings	₹ 5,00,000/-

# Light Engineering

## Cluster

Kolkata, West Bengal

10 suppliers of the Neogi group joined together to form a cluster named 'Neogi Group Suppliers Cluster'. The SPV was the manufacturer of Flow Meters, springs, Rotor Head, Non Ferrous Castings etc. and was also engaged with the job work and machining of various components like Nozzle Body, Valve Tops etc. The cluster was supplier to OEMs like IFB, KBM, Neogi Group etc.



### Shri Susil Kumar Sau, MD

The Unit:

## Maya Engineering Works

Type of Unit : Micro

Maya Engineering Works was established in the year 1985 and is mainly dealing with machining jobs. The unit started with only one conventional lathe machine and was doing job work for only one company with very less volume of production. The unit adopted progressive approach and has grown over the last few years in terms of its production capacity and turnover. At present, the unit is having 3 CNC machines along with old machines and the unit is supplier to OEMs like IFB , KBM and Neogi Group. The unit is having 19 employees and its average turnover is ₹ 40 lakhs / year.

“ We increased our floor space by maintaining 5S and this resulted in installation of two new Machines at the shop floor. Rejection (both in process & customer end) was reduced by Defect Analysis and Autonomous Maintenance systems. ”



(Photographs of some of the products)

### Lean Journey

During Diagnostic study, the Lean team realized that there was no concept of improvement and unit lacked good manufacturing practices. The Lean project was initiated with awareness programme on concepts of Lean for staff and workmen to make them understand that CHANGE is required in their work environment and work process in order to cope up with the changing market scenario and demands of customer.

### Lean Tools Used: 5S, Kaizen, Brainstorming

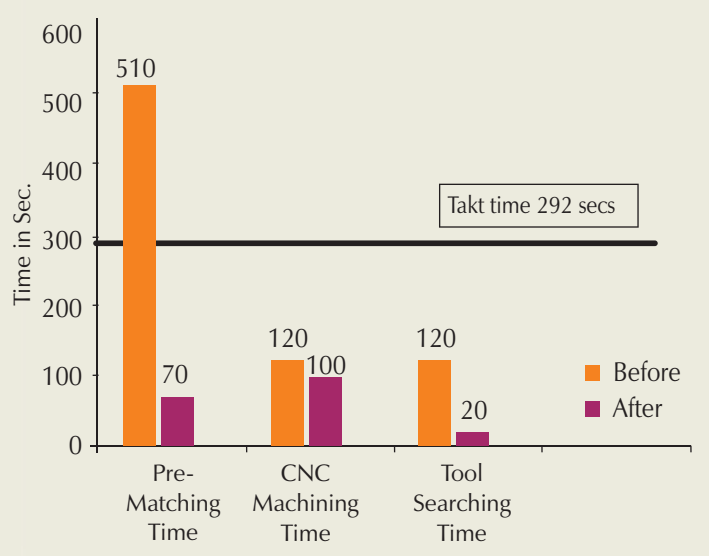
5S implementation was started in the entire unit with the involvement of unit head as the team leader. Unwanted and

unnecessary items were removed from the shopfloor, office area, store area etc followed by systematic and organized arrangement of required / necessary items. A place was fixed for everything and people were trained to keep everything in its proper place. This approach led to improved workplace and better working conditions.

During the discussions with the unit head it was mentioned that the unit was having high demand for Aluminium 805 Base but it failed to achieve 100% delivery compliance. Due to this the unit was almost on the verge of losing business as the delivery compliance for the product was just 54%. The Lean team decided to take up this issue and adopted the following approach for improvement:

- › Based on the Customer demand, Takt time per piece was calculated.
- › The Cycle time for each operation (in the manufacturing of Aluminium 805 Base) was recorded.
- › The operations having high cycle time (Pre Matching, CNC Machining, Tool Searching) were identified for detailed study and analysis.
- › Brainstorming by the Lean team along with shop floor team was done to identify the reasons for high cycle time for the identified processes.
- › Process Wastes and Non Value Adding Activities were identified in the form of Transportation.
- › Waiting and unnecessary operations and steps were taken to eliminate the same.

Once the above activities were completed, the team reviewed the existing data that was collected and designed the revised formats for collection of production data. This helped the unit to exercise a close control on its production planning and delivery schedules, which greatly improved the delivery performance.



The unit was also facing problem of customer complaints and in process rejection in one of its components named 'Ball Catch'. The process mapping of the component was done for all the operations and were sequentially studied in detail.

The major defects occurring were identified and root cause analysis of the defects was done. Improper drilling was identified as the main reason for defects. The process sequence was finally changed with drilling process shifted after CNC Machining for reducing the defects; training was also given to the operators to follow the new process sequence.

The takt time decreased to 292 seconds.

### Overall Benefits

- Delivery Compliance improved to 80%
- Improved Productivity and customer satisfaction
- Improved working conditions and better workplace
- Unit cost of production reduced by 50%
- Defects occurring in Ball Catch were totally eliminated
- Annual Savings of ₹ 1.83 lakhs

# Machine Tools

## Cluster

Bengaluru, Karnataka

The cluster formed was 'Bangalore Machine Tool Manufacturers' Lean Association' (BMTMLA), Bengaluru. There were 9 units in the cluster. The cluster manufactured CNC lathe & vertical machining centers, SPM for Motor Industries and Battery Industries, Test rigs, Load Tester, Four Ball testers & Air jet erosion tester, Friction welding machines, Electrical Metal gathering machines etc.



**Shri N.M. Dube, MD**

The Unit:

**Ducom Instruments Pvt. Ltd.**

Type of Unit : Small

The company is in the business of designing and manufacturing of Test Rig, Load Tester, Four Ball Tester & Air jet erosion tester. The products are made on customer order basis. The company has a strength of 75 employees.

### Lean Journey

The company had grown on the strength of its technical competence in terms of Design and Quality. However the company was facing problems related to late deliveries, high inventory, reworks, customer complaints etc.

Under Lean project, the following activities were taken up;

- › Improvement of Employee Involvement

“ We have been benefitted in terms of reduced rejections, rework and customer complaints. We have also improved our customer delivery compliance to a great extents ”



*(Photographs of some of the products)*

- › Improvement of Quality by reducing Customer Complaints and reworks
- › Effective Inventory Management
- › Improvement of Delivery Performance

**Lean Tools Used:** 5S, Kaizen, 7 waste identification, Visual Management & VSM

All employees were given extensive training with focus on need for change, Lean Concepts & Tools etc. They were encouraged to give Kaizen ideas and in a period of just 8 months, the number of Kaizens per employee increased to 40 and number of improvement teams to 10.

5S implementation was done in the entire unit. The unit was

**Before** **After**



Materials not arranged in a systematic way



Materials sorted and arranged in a systematic way



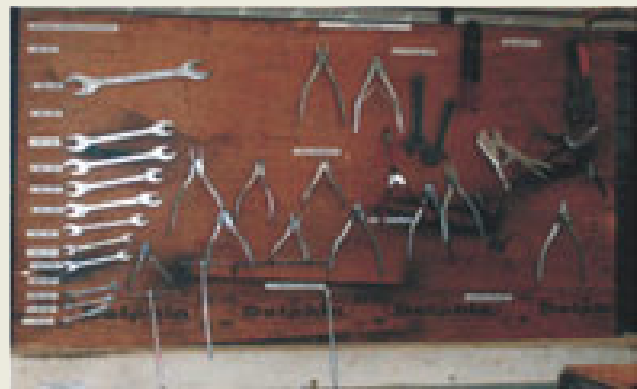
Electrical wires kept without sorting



Sorted and identified location

divided into 14 zones and 5S committee was formed with representation from all levels of employees. Zone Leaders and Members were identified in each zone. Training of 5S was given and 1S, 2S & 3S were implemented. A system for monitoring the implementation and sustenance was established.

An inventory control system improvement was deployed which included training, establishing documentation, measurement, monitoring and bridging of gaps using the Lean tools. The team was trained for inventory Improvement with focus on 7 Waste. The areas for improvement were identified and data was recorded. Bin card system was implemented for each rack. Part wise A,B,C category established and category-wise monitoring system introduced. FIFO System concept was explained and introduced for easy flow of materials. Parts identification & storage location standardized. Color coding system for stock level monitoring introduced like Green, Gray & Red. Safety stock as per requirement was started to be maintained. Based on the safety stock, the stock level was monitored & ITR ratio was calculated. An overall reduction of 8 % inventory was achieved.



Shadow Board designed for easy identification and quick retrieval of tools

**Overall Benefits**

Space saving by 5S: 80 sq. feet

Customer complaints - from 15/month to 4/month

Rework reduced from 30% to 5%

Delivery Performance improved from 28% to 89%

# Machine Tools

## Cluster

Chennai, Tamil Nadu

The cluster named “Machine Tool Components Suppliers Cluster” comprised of 10 units located in Chennai. The units were involved in different business activities (Machining, Fabrication, Hose assembly and Tool & Die manufacture).



**Shri C.R.Suresh Babu,  
Managing Partner**

The Unit:

## Precision Profiles India

Type of Unit : Small

“ We achieved benefits in terms of reduced Rework; reduced products’ lead time, improved employee motivation and improved quality of products. ”



*(Photographs of some of the products)*

M/s Precision Profiles India is a manufacturer of fabricated parts using state of the art CNC profile cutting, CNC boring & Welding machines. The core processes are CNC Profile Cutting, CNC boring & Fabrication. The unit was established in the year 2005 and the number of employees is 40. The Current turnover is about ₹ 12 crores. The major customers are L & T, Win Wind & Komatsu.

### Lean Journey

During the diagnostic study, it was found that the throughput time of Generator Casing, was very high, which resulted in frequent missing of delivery schedule. Also, it was felt that the consumable cost was on higher side.

### Lean Tools Used: Kaizen, 5S, Visual Control

The Lean team formed to implement the scheme, after discussing with the consultant decided to work on the consumable cost reduction as well as on Top Half Steam Box throughput time reduction. In order to systemize Lean improvement, the team started off with implementation of 5S and KAIZEN to inculcate a culture of continuous improvement.

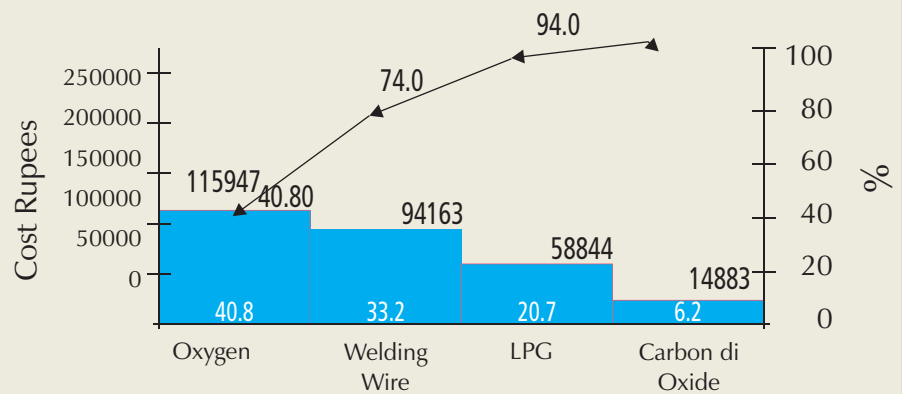
Once the culture was felt to be imbibed into the workforce, the team turned their attention towards the cost reduction of consumables and collected the details to analyze and identify the major contributor towards the total cost of consumables.

A brainstorming session was held among the team members to find out the issues and root causes for high Consumable consumption and thereafter develop an action plan. As a corrective measure an SOP was developed which required the consumption to be discussed in weekly and monthly review meetings. The gas cylinders were checked with pressure gauge and ensured the full quantity of gas at the incoming stage.

Standardization was done by maintaining register for consumable issue controls and the same was reviewed by top management on weekly basis. Concepts of kaizen and visual control were also applied for improvements.

Further, during the analysis of throughput time for Generator Casing, the team observed that it took 94 days for the Top Half Steam Box. Subsequent drilling down of the time revealed the operations taking longer time. Then the brainstorming was done among the team members to find out the root causes for delay and action plans were developed to address the root causes.

Also, the percentage of value added time over total throughput was analyzed using Value Stream Mapping chart. These action plans resulted in the throughput time reduction by 21 days and improvement in value added time by 300%.



Consumable Cost Apr '12 to Sep '12

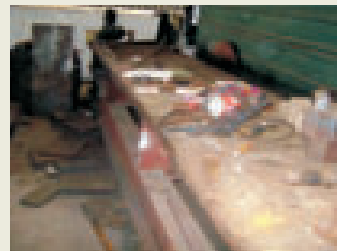
**Before** **After**



Scrap items were accumulated & kept near the entrance



Scrap items were disposed



Unwanted items were kept on the table



Unwanted items were removed & the table was used for inspection of parts

**Overall Benefits**

- 5S level – From 21% to 62 % on 100% scale
- No of kaizens implemented – 8
- Consumable cost reduction - 13%.
- Throughput time reduction - from 94 days to 73 days.
- Percentage of value addition - 16%
- annual Savings – ₹ 4,35,000/- (estimated)

# Metal Works

## Cluster

Chennai, Tamil Nadu

The name of the cluster formed was 'Ambattur Industrial Estate Metal Association'. Ten industries in Ambattur Industrial Estate, involved in Metal Works, had formed a cluster to implement the Lean Manufacturing Practices. All the units of this cluster were involved in Metal Working comprising of Turning, Machining, sheet metal work, moulding and fabrication etc.



**Shri J. Ganesh,  
Managing Partner**

The Unit:

**Geekays Auto  
Components**

Type of Unit : Small

Geekay Auto Components is a manufacturer of turned parts and precision machined parts. The organization specializes in manufacture of turned milled parts, sliding head turned parts, turned parts which require secondary operations like milling, honing, grinding, heat treatment. Its customers include Super Auto Forge, Chennai; Delphi – TVS, Chennai; Jay Engineering, Chennai and ELGI Products, Coimbatore. The total workforce of unit is 52 and they have an annual turnover of Rs. 4 crores (2010-2011).

“ We joined Lean Manufacturing Cluster Scheme and got benefitted by attending programs on Lean Practices, Waste Elimination, SMED, 5S and model factory visits. We reduced number of set-ups, improved layout, established and implemented simpler work flow & Kaizens etc. We were able to save unnecessary movement of goods within organization and also achieved reduced inventory levels and rejections. ”



(Photographs of some of the products)

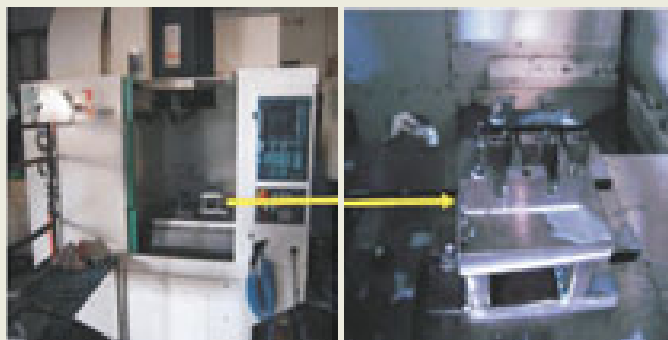
### Lean Journey

During the diagnostic study, it was observed that the workplace was highly disorganized as the useful and non-useful materials could not be identified appropriately. The throughput time for component Bracket was high due to time taken in shifting from CNC to VMC and the distance travelled for body starter clutch was also high. It was also observed that there was inconsistent result in the inspection of the turned component. Also, the accuracy of inspection in Air gauge was unreliable, which led to lower productivity.

**Lean Tools Used:** 5S, Kaizen, Kanban, Poka Yoke, Cellular layout, Visual Control



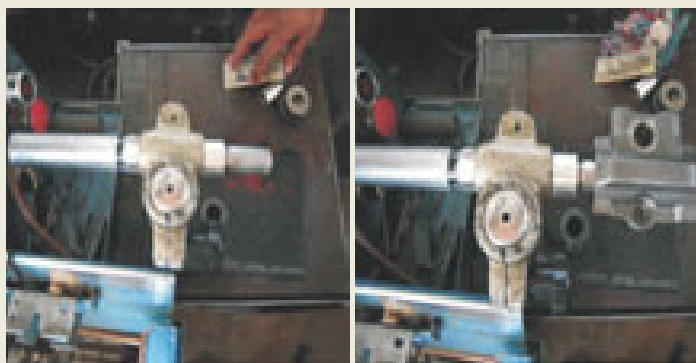
In order to reduce the high travel time taken by the component bracket, from CNC to VMC, the team brainstormed and designed a new jig and fixture, so that both the operations could be combined and done in the VMC. Earlier, it used to take 5 minutes per piece which reduced to only 30 seconds per piece after the design of new fixture.



**New jig and fixture**

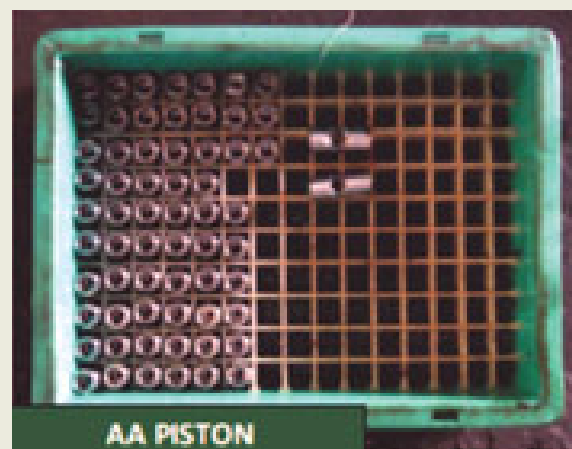
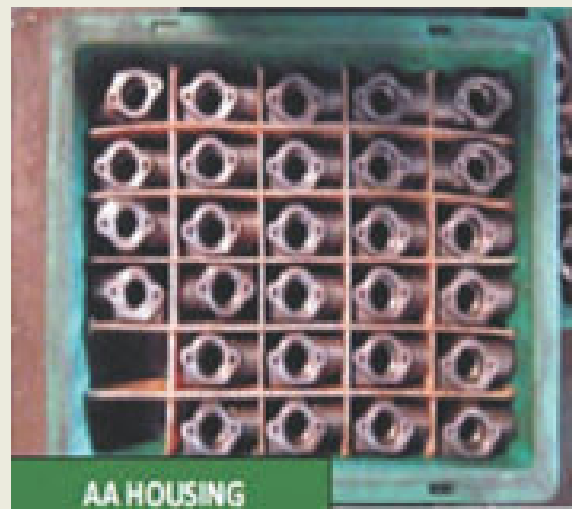
To address the distance travelled by the Body Starter Clutch, which was 30 feet for most of the items, the team analyzed the processes and designed a cellular layout. This drastically reduced the required distance to be travelled by the items to only 10 feet.

The improvement achieved in the component bracket and body starter clutch greatly motivated the Lean team. They took up the challenge to eliminate the re-inspection of the turned component due to fatigue of manual grip and used Poka-Yoke by developing a holding mechanism. The air gauges were held manually earlier and this led to unreliable inspection. However, with the replaced mechanical holding, the re-inspection time which was 25 minutes per day, was totally eliminated.



**New holding mechanism (Poka Yoke)**

Similarly, the individual counting of items consumed 15 minutes of dispatch time daily. To reduce the time of counting, a kanban was implemented by containerization which reduced the counting time drastically to 5 minutes.



**Containerization**

**Overall Benefits**

- Productivity increased by 900%.
- Distance travel for body starter clutch reduced by 1/3rd.
- Re-inspection eliminated for turn components.
- Containerization reduced the counting time to 1/3rd
- Annual savings – ₹ 2,46,000/- (estimated)

# Plastic

## Cluster

Kanpur, Uttar Pradesh

The cluster named 'Kanpur Plastic Productivity Development Trust' comprised a total of 11 units. These units were engaged in the manufacturing of Auto and machine parts, packing material, electrical light fitting, cycle seat cover, plastic bottles and jars. PVC pipes, injection moulding components and assembly, etc.



**Shri Anoop Gupta, Director**

The Unit:

**Maya Polymers Pvt. Ltd.**

Type of Unit : Medium

“ The scheme has benefitted us to a large extent in terms of improved productivity, reduced manpower cost, reduced products’ lead time and enhanced quality. ”



*(Photographs of some of the products)*

The unit was established in 1998 and is in the manufacturing of Plastic Mats. The unit has an Extruder line and Weaving line and mainly supplies its products through distributor network . The average turnover of the unit is ₹ 2 crores.

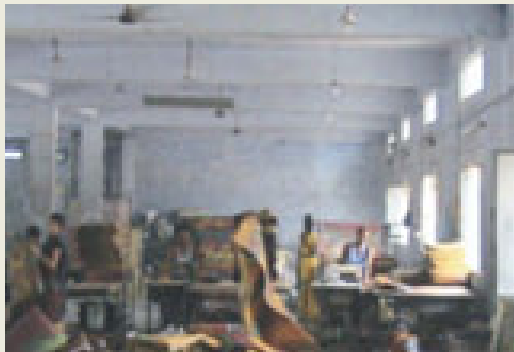
### Lean Journey

During diagnostic study, the Lean team observed that the change over time of Die in Extruder machine and Beam Role in weaving machine was quite high.

**Lean Tools Used:** Kaizen, 5S, SMED, Brainstorming, Layout Improvement

The Lean team took up the project to reduce the change over time of Beam Roll in weaving machine. The entire project was divided into 4 phases and targets were set for each phase. The time study of Beam Roll changeover activity was conducted and real time analysis was done to evaluate total elapsed time and elementary time for all the activities performed during change-over as per standard format. The project team reviewed activities performed to decide internal and external setup

Before



After



### 5S Implementation

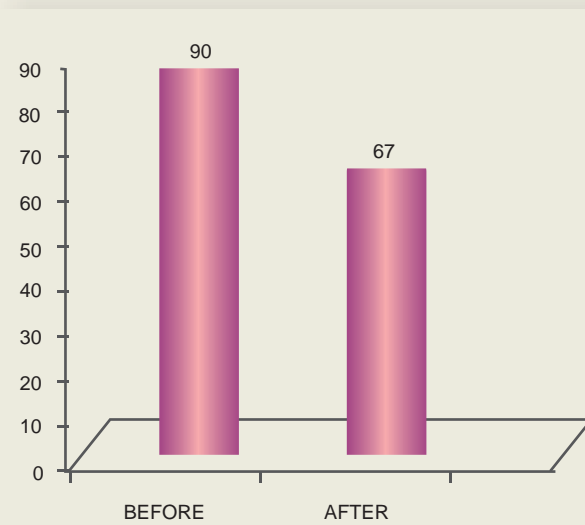
activity. On the basis of data analysis, action plan was made to reduce changeover time by converting internal activities to external and by reducing / eliminating waste activities involved.

The following major actions were taken to reduce the changeover time:

1. Hand tool box was provided for quicker change over
2. Location of production fixtures were identified
3. Changeover instruction was displayed on the shop floor near the weaving machine

The beam roll changeover time reduced from 90 min. to 67 min.

5S project was also implemented in the entire unit in a systematic manner. Training on the concepts and importance of 5S was given to the shop floor team of the unit. Periodical audit formats were also designed and 5S cleaning schedule was prepared for sustenance of 5S culture in the unit.



Beam Changeover Time In Minutes

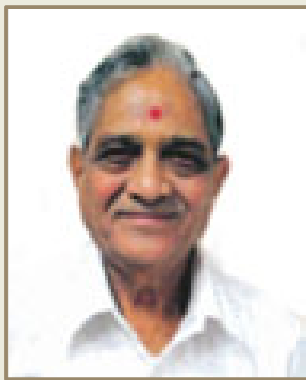
Overall Benefits	
5S Score	From 20% to 75%
Inventory Turnover ratio	From 7 to 9
Reduction in Setup Time	25%
Improvement in Productivity	15%

# Pump & Motor

## Cluster

Ahmedabad, Gujarat

9 units came together to form a SPV named 'Pump and Motor Lean Excellence Cluster' for implementation of Lean Project. The cluster was engaged in the manufacturing of Industrial Pumps, Centrifugal Pumps, Submersible Pumps, High Stage multi Pressure Pumps, Hydraulic Test Pump etc.



**Shri Ambalal Solanki,**  
Manager

The Unit:

### Mira Industries

Type of Unit : Medium

Mira Industries was established in 1970 and has a turnover of around ₹ 34 crore. It has a workforce of 158. The company manufactures monoblock pumps. The unit is certified with ISO 9001 : 2008.

“ Lean journey helped us understand the concepts required for building world class organization. Our performance improved dramatically in terms of productivity, quality and customer satisfaction. ”



*(Photographs of some of the products)*

### Lean Journey

During the diagnostic survey, the Lean team realized that the shop floor was highly unorganized leading to excessive movement of material and men. The company was also lagging far behind in building 5S culture among its employees.

**Lean Tools Used:** 5S, VSM, SMED, Kaizen.

The Lean team worked to reorganize the shop floor layout by using 5S as the basic tool. 5S levels were assessed in the plant and offices. Unwanted materials were identified, recorded and removed from shop. As an identification of shop floor, Gangway marking was done for Machine shop which resulted in space generation and reduced movement of men and material. In order to reduce the setup time, initial observations were taken



Before



After



Before

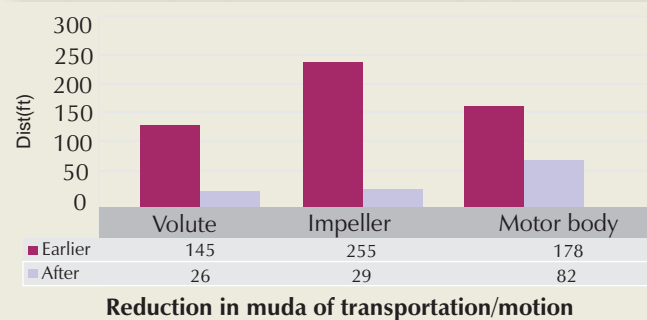


After

for the operation performed on the CNC machine and the internal elements were analysed. Brainstorming and Why-why analysis was done to convert the internal into external elements. Work reduction of 50% was achieved in the first review.

Subsequently, data was collected to identify the problems which frequently appeared on production lines. The area/process with frequent quality related issues was selected for study and data on factors like recurrence, waiting time, process flow etc. were analysed. Brainstorming sessions were held involving the line side operators and staff to develop set of kaizens. After cost benefits analysis the best kaizen was selected and implemented.

With an aim to improve the productivity of the assembly line, unnecessary transportation and motion were reduced by applying VSM and one piece flow was introduced which drastically reduced the lead time.



### Overall Benefits

- Cleanliness and Safety improved
- Improved morale of employees to work in company
- Quality issues dropped by 20%.
- Achieved work reduction by 50%.
- 14% Reduction in Rejection/Rework
- 10% Inventory reduction
- 745 sq. ft space saving

# Readymade Garments

## Cluster

Noida, Uttar Pradesh

The SPV named 'Noida Apparel Lean Manufacturing Society' was proposed by 'Noida Apparel Export Council (NAEC)'. There were a total of 9 units in this cluster into manufacturing of Ladies and Kids garments and exporting to various countries.



**Shri Anil Peshawari, Director**

The Unit:

## Meenu Creation

Type of Unit : Small

The company was started in year 1999 in the NOIDA region of Delhi-NCR. Spread over 140000 sq.ft. production area, the company has a state-of-the-art automated facility. With latest equipment like UBTs, German CAD System, Conceal Elastication etc., it has a production capability of 400,000 garments per month. From an annual export of just \$1.5 million, today the company has touched the milestone of \$ 31 million for the financial year 2009-10. The company employs around 200 people including handpicked team of designers specializing in fashion. Major customers include ZARA (Spain), NEXT (U.K.), KIABI - WOMAN & KIABI CHILDREN (France), ORSAY (Germany) etc.

“ The Lean project has changed the mindset and attitude of our people and has made them aware of the various types of wastes generated during the manufacturing processes. Our people have also realized the importance of concepts like 5S, kaizen and visual management. We look forward for continuous improvement in this Lean journey. ”



(Photographs of some of the products)

## Lean Journey

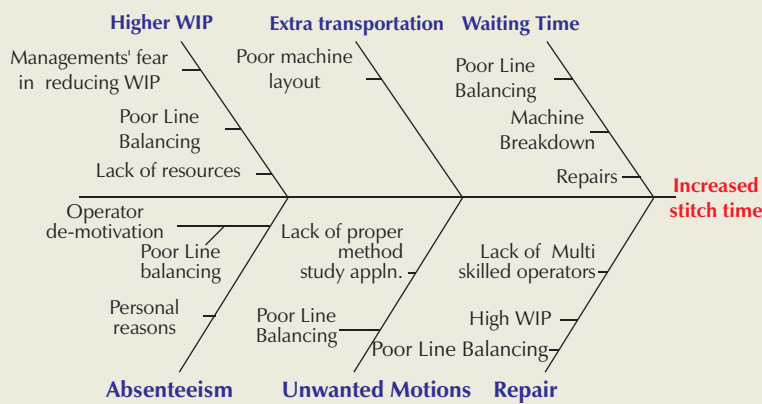
Garment industry is a very labor intensive trade and the unit is no different with its share of labor oriented problems. In the absence of any adequate system in place & high labour turnover, the unit was facing a lot of production related problems. Data recording & analysis was neither standardized nor regular in practise. Housekeeping & visual management was extremely poor in the unit. Rework and Rejection rates were on a higher side. Delivery compliance was very less.

**Lean Tools Used:** VSM, 5S & Visual Management, Pareto Analysis, Fishbone diagram, Brainstorming

In any garment factory, more the time spent on stitching, more is the productivity. The time spent on stitching in the unit was found to be very low. The process of activity sampling was done on a sample range and a chart was drawn highlighting the

activities that took more time which directly or indirectly affected the stitching time. The chart created with the help of activity sampling highlighted that the major bottleneck was material handling (50%).

In order to decrease the handling time and increase the stitching time, brainstorming was done by the team. A root cause analysis was done keeping in mind the 7 wastes according to Lean principles, as shown



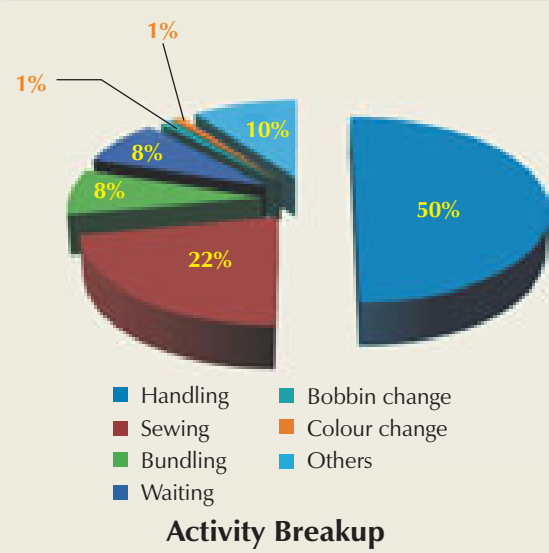
below:

The major problem which needed immediate attention was that of poor line balancing. After analyzing the line layout of a particular style, the following problems were highlighted:

- › Non-availability of technical skills
- › High throughput time
- › High WIP
- › High absenteeism & labor turnover
- › Lack of Innovation and technology up gradation

A structured approach was recommended to solve the problem as follows;

- › Use of double needle lockstitch machine instead of 2 rows of Single needle machine
- › Use of safety stitch machine instead of SN + 3Thread over lock
- › Use of Fuse instead of inserting interlinings to save time
- › Use of Binder instead of attaching and finishing the binding in 2 steps.
- › Use Top and bottom feed over lock to gather and attach simultaneously.



- › Reduce seams by using a single piece of fabric.
- › Cut bindings long so that minimum joints are to be sewn.
- › Eliminating marking operations.
- › Standardization of collar, cuffs, epaulets.
- › Cut to size; need not to cut one size that fits all.
- › Eliminate back tacks where possible.

5S was implemented to bring & maintain the housekeeping activities in order. The unit was divided into a number of zones with each zone having Leader & Members. The teams was trained on the 5S concepts & implementation. Red tagging was done to remove unwanted materials from the work area and the remaining necessary things were arranged in order. Separate locations for Red bin, finished goods were earmarked. Racks were used to increase the vertical space utilization. Gangways/ Walkways were marked. The boundary around the Machine was marked and responsibility assigned to concerned persons for maintaining and sustaining the 5S practice. A check-sheet for 5S was developed and audit was carried out at regular intervals.

Overall Benefits
Cut to ship ratio improved
Cycle Time Reduction
Sewing time improved, production increased
Approximate savings of ₹ 7.17 Lakhs

# Sheet Metal

## Cluster

Nashik, Maharashtra

The cluster named 'Sheet Metal Pressed Components Manufactures Association Lean Cluster' comprised of 9 units manufacturing press components. Mahindra & Mahindra Ltd, Nashik had facilitated the participation of units in the scheme. The units were principal supplier of Mahindra & Mahindra Ltd, Nashik Plant.



**Shri Vivek Singh, CEO**

The Unit:

**Hind Tools, Nashik**

Type of Unit : Small

Hind Tools is a sheet metal part, welded & riveted assemblies manufacturing company supplying to Mahindra Ugain Steel Company Ltd (MUSCO), JBM, JBMA, ALF, Haldex, VIP, Schneider, ABB, Crompton Greaves, Areva, Samsonite, etc. and exporting to France, Germany, Italy and Romania. The unit was established in the year 1988. It has a turnover of Rs. 16.41 crores.

### Lean Journey

During initial survey, it was found that the cycle time was very high, which was mainly due to random location of the machines, improper machines sequence and consequent excess transportation time. It was also observed that the setup time for the machines was quite high.

“ Our Organization has greatly benefitted from this enterprising initiative. The scheme has brought about a significant change in the attitude of all levels of employees. We are thankful for all the inputs and support extended to us during the implementation of scheme. ”



*(Photographs of some of the products)*

### Lean Tools Used: SMED, 5S

A model machine was selected and setup time-study was done after breaking down the activities into external & internal activities. It was observed that the external activities were taking more than 50 % of the setup time. The set up time was 73 minutes which in financial terms means ₹ 800 per day or ₹ 20,000 per month. The setup operations were observed and assessment was done to segregate different phases of the setup. An assessment of the time spent in each of the setup phase revealed high idle time due to lack of coordination among workers involved in the setup, lack of fulfillment of the pre-established procedures for carrying out the setup, lack of knowledge of the procedures for carrying out the setup, delays due to shortage of material/tools near the equipment and lack of coordination of the various setup activities.

The team implemented SMED by shifting tools near the machines and creating a machine specific changeover team. Further, the internal and external operations prior to changeover and during changeover were divided into following four stages:



1. Operations to be accomplished one hour before the machine stops;
2. Operations to be carried out immediately before the machine stops;
3. Operations to be carried out during the setup operation;
4. Operations to be accomplished after the machine got back to normal production.

The operators were called and explained about the changes made. They were made aware of the concept and the advantages of SMED. They were also informed about their role in SMED.

The team conducted the time study after the line became fully functional. There was significant improvement after the SMED.

The tool change time or the set up time reduced to 40 minutes from 73 minutes, an achievement of 45%. The organization gained 1hr 45 minutes of extra production time resulting in increased production.

For the 5S activities, the press shop and assembly area which required improvement in housekeeping were identified. The shop floor was divided into 8 zones. Each area was assigned to a dedicated team leader and team members. It was observed that these were completely disorganized and had many unnecessary tools and equipment that were not needed for daily activities. The red tag event was conducted and unwanted and extra tools were removed.

All the processes were broken down into small work elements, sequenced to ensure safety, quality, and efficiency. The '5S to-do list' was developed for each sub-team and the overall team. It is a simple matrix that lists tasks, responsibilities, timing and percent completion of each item and was used to track implementation progress by percent complete.

Improvements resulting from 5S events are as shown in the following pictures.



**5S Implementation**

The fixed photo points were made on the shop floor. The photographs were taken on monthly basis to monitor the sustainability. Red tag campaign was conducted on every Sunday of the week. The red tag register was maintained to monitor the removal and disposal of red tag items. Self monitoring was carried out on daily basis and marked on 5S monitoring sheet. There was significant reduction of waste which also resulted in workplace safety, cost efficiency, quality, and productivity.

<b>Overall Benefits</b>	
Description	Benefits
Saving through 1S	₹ 2.5 lakhs
Space recovered	128 sq. mts
Saving through Kaizen	₹ 9410/-
Saving through Poke Yoke	₹ 8500/
Annual Savings (for SMED)	₹ 9.70 lakhs

# Textile Machinery Manufacturing

## Cluster

Surat, Gujarat

The units were involved in the manufacturing of Textile machines and machine parts, Casting Components, Electric Motors etc. The cluster named 'Textile Machinery and Accessories Manufacturing Distinct Project Group' comprised 9 units. The SPV was promoted by Surat Engineering Vikas Association (SEVA), an NGO representing engineering industries of Surat.



**Shri D. B. Doctor, GM**

The Unit:

**Bluesky Engineering Company**

Type of Unit : Small

The unit was established in 1992 and is engaged in the manufacturing of Textile machinery and machinery parts. The main processes carried out are Turning, Drilling, Milling and Assembly. The average annual turnover of unit is ₹ 1 crore and its total number of employees is 15.

“ The scheme was useful for effective utilization of available resources as well as waste control management. ”



*(Photographs of some of the products)*

## Lean Journey

During diagnostic survey, the Lean team identified the various production and quality related problems and accordingly prepared action plan for implementation of Lean techniques.

### Lean Tools Used : 5S, Kaizen, Cell Manufacturing

5S implementation was one of the major projects undertaken during the Lean journey in the unit. The unit was divided into 4 zones and a zone leader was assigned for each zone. Red tag was designed for removal of unnecessary items and scraps followed by systematic arrangement of the needed items. Gangway marking was done on the shop floor and posters on 5S were also placed in the entire shop floor area. Training on 5S implementation was given to staff and workmen for sustenance of 5S activities. 5S audit schedule and check sheet was also prepared. 1S activities led to financial benefit of ₹ 18,000.



Before

After

As per the current layout of unit, it was observed that men & material movement from Raw Material Store to Hacksaw Machine & Grinding Machine was high. To reduce this movement, it was proposed to shift Hacksaw Machine & Grinding Machine near Raw Material Store. Accordingly revised layout was also proposed by the Lean team. This layout change led to reduction of men and material movement by about 90%.

The Lean team further observed that the Powder Coating process was carried out in Mounting Bracket at Supplier's end. The Pin holes were also powder coated and due to that, movement of these mounting brackets was not easy. Operator had to remove excess powder coating material with the help of reamers from the pin holes of Mounting Bracket and this process used to take approx. 10 minutes.

The Lean team brainstormed and evolved a kaizen to eliminate the wasteful activity of reaming. The Supplier was informed to fill grease in the holes of

Mounting Brackets to avoid the extra process of reaming. This led to saving of manpower and reamer tool cost.

Visual Management (VM) systems were also implemented in various areas of the unit. The activities carried out under VM were:

- Identification and colour coding of electric panels, switches, equipments, machines etc
- Gangway marking at Shop Floor
- Sign Board for electricity saving
- Sign Boards for using PPEs

#### Overall Benefits

Average annual savings - ₹ 5.5 lakhs

Increase in 5S Score - From 12% to 81%

90% reduction in movement of men and material.

Increased employee involvement and Teamwork

Better workplace and working conditions

# White Goods

## Cluster

Puducherry

This units were manufacturing injection molded plastics, industrial springs manufacturer, corrugated box packing material, vacuum formed extrusion, PCB manufacturing, polymers, flexible pipe and hose manufacturers. The cluster comprised 8 white goods manufacturing units supplying to the M/s Whirlpool, Puducherry. The cluster was promoted by Whirlpool and was named as WOIL—PARAM.



**Shri R. Venkatachalam,  
Chairman & MD**

The Unit:

### **Shree Mother Plastics**

Type of Unit : Medium

The unit was established in 1972 at PIPDIC electronic park, Thriubuvanai, Puducherry. The unit is involved in manufacturing of Plastic Injection Moulded Components. The unit is an ISO: 9001 2008 certified unit and employs around 250 people. The sales turnover of the company is around Rs 10 Crores. Major customers include Whirlpool India, Godrej, Hindustan Lever etc.

### **Lean Journey**

The unit was operating in a spacious plant equipped with latest equipments for production. However, it was felt that proper systems had not been put in place resulting in lower efficiency in its

“ Lean enabled our company to plan and improve our production process as per customer requirement qualitatively and quantitatively leading to achieve higher productivity. We achieved lower wastage. This process brought us recognition from our esteemed customers Whirlpool and Godrej and as a result we started receiving more business from them. ”



*(Photographs of some of the products)*

operations. Although the plant had marked gangways, these were mostly occupied by raw materials and WIP causing unnecessary movements and obstruction. The in-house rejections were quite high but a systematic collection of data and its analysis was not being done. There was no visual display of instructions or visual controls for inspection of finished items. Storing of material was also not in a defined order and the unit relied upon breakdown maintenance as there was no planned system of Maintenance. These inefficiencies were resulting in late deliveries and customer complaints.

### **Lean Tools Used :TPM, OEE, Fishbone Diagram, Pareto Chart, WHY-WHY Analysis**

The Lean intervention was initiated with the 5S implementation in the whole premise. The whole premise was divided into a number of zones with each zone having Leader & Members. The teams were trained on 5S concepts & implementation. Red tagging was

done to remove unwanted materials from the work area and the remaining necessary things were arranged in order. Separate locations were earmarked for Red bin and Finished goods. The Gangways/Walkways and boundaries around the machines were marked and responsibility assigned to concerned persons for maintaining and sustaining the 5S practice. A check-sheet for 5S was developed and audit was carried out at regular intervals. The mould changeover time of SM150 was found to be very high. This machine was selected for data recording & analysis and the following activities were carried out:

- ✓ Training on SMED for the Mould changeover study
- ✓ Classification of activities as Internal and External
- ✓ Identifying the Internal activities which can be converted into External activity
- ✓ Identifying the Series and Parallel activity
- ✓ Identifying the activity potential for elimination and reduction of time taken
- ✓ Analyzing the data and evolving solutions

The external activities were listed (Changeover wise), identified and planned to get completed before the scheduled changeover. The non-value added activities were reduced or eliminated while the serial activities were converted to parallel activities. A Standard Operating Procedure had been prepared for all changeovers & maintained with the SMED team. All these improvements culminated in significant reduction of total changeover time as shown in the table.

Model Machine concept was introduced for Suma 50 in line with TPM practices. Training was given to all Department Heads about the TPM Concepts, steps &

Before	After	Benefits
Mould changeover time was <b>86 minutes</b> per changeover	Mould changeover time was <b>50 minutes</b> per changeover	<b>36 minutes</b> saved per changeover
Timing for mould changeover for the month was <b>516 minutes</b> for 6 changes	Timing for mould changeover for the month was <b>300 minutes</b> for 6 changes	<b>216 minutes</b> saved per month which resulted in more production

importance. The criteria for selection of Model Machine was determined based on low productivity, high rejection, high downtime etc. The operators were trained to identify & record the abnormality. The OEE related data such as Machine availability and its related losses, produced quantity, defective parts, monthly planned quantity vs actual quantity etc. for a period of 3 months was captured and displayed in standard format.

The three components of OEE viz Availability, Quality and Performance were individually analysed to arrive at the focus area for improvement. On analysis, availability of the machine was found to be very low which was having impact on the OEE. Production hours Loss trend was analyzed and the suspected factors were identified through “Fish-bone” diagram and Pareto analysis. “Machine Breakdown” was found to be the major factor and was further brainstormed for suspected factors through pareto analysis. Finally, the “PLC Breakdown” was determined as the root-cause and was improved through a WHY-WHY analysis.

The availability of machine was significantly increased which resulted in higher OEE of 82.5%



### Overall Benefits

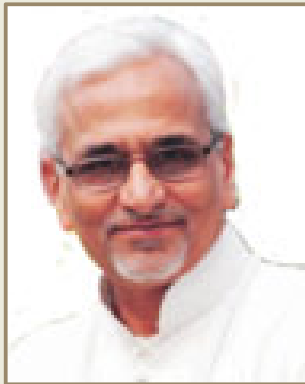
- Improvement in workplace arrangement and Visuals
- Reduction in search time, transportation and rejection
- Elimination of Hazards and Accidents
- Mould changeover time reduced by 36 minutes.
- OEE enhanced from 60% to 82.5% for SUMA
- Reduction in Maintenance cost & breakdown hours

# White Goods

## Cluster

Pune, Maharashtra

10 units came together to form a SPV named 'Pune White Goods Cluster Limited. The units were mainly manufacturer of Enclosures, Pendants, Control desks, ATS glass screens, containers buckets, water tank covers, washing machine & refrigerator parts, brake and accelerator items, corrugated boxes, printed and unprinted accessories etc. The cluster was promoted by MCCIA, Pune



**Shri Shirish Khutale , CMD**

The Unit:

**Khutale Engineering  
Pvt.Ltd., Satara**

Type of Unit : Small

M/s Khutale Engineering established in 1996 is an ISO 9001-2008 & CRISIL rated "SE1B" company and a leading manufacturer of sheet metal pressed components and fabrication assemblies in India. The company has manpower strength of 37 and its sales turnover during the financial year 11-12 was ₹ 7 crores. Their main operations are shearing, forming, punching, blanking, powder, coating, welding etc.

“ Techniques like waste management (Muda) and 5S, Inventory management amongst others have equipped young firms like ours with new found wisdom and expertise to create value through resourcefulness. For our organization Lean has been a continuous journey of growth which has sensitized us towards various facets of world class manufacturing. ”



*(Photographs of some of the products)*

### Lean Journey

The Lean team formed to implement the Lean projects carried out a diagnostic study and identified the areas that would result in quick return to the units. The team observed that the shop floor presented an unorganized look. The setup time was on higher side as much time was lost as changeover time. Also, the machine availability was low due to frequent breakdown of machines.

### Lean Tools Used: 5S, SMED, TPM

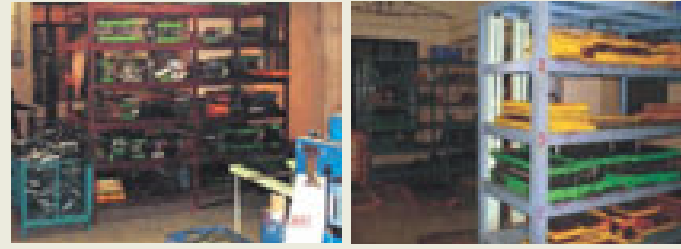
The unit formed Lean Improvement Teams headed by department supervisors as Lean coordinators. The team started with the implementation of 5S as a start-up exercise and divided whole

plant into 11 zones. 1-S to 3-S was implemented in each of the zones during the various phases and achieved the target of 70% implementation.

After commencing implementation of 5S, the LMC trained workers for drawing scaled layout of all present areas. Through brainstorming, equipment and materials were identified for repositioning in accordance to flow of material & sequence of operation. Space freed through above initiative was used to accommodate two more machines which directly increased plant capacity to meet customer's increasing demand.

Die set up & adjustment time was quite high for which a team of operators with LMC conducted videography of whole process for subsequent examination and analysis. Any activity taking major time for setting was analyzed to find main causes and proper countermeasures were taken to remove all non value adding activities followed by trails of improved setup methods which resulted in reduced setup time from into 21.20 to 12.05 mins.

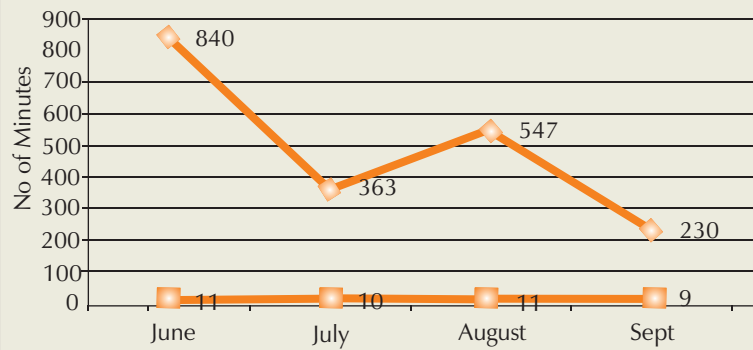
As a first step towards Total Productive Maintenance (TPM), press machines and dies were covered under autonomous maintenance. Basic training on topics e.g. about the machines and tools, maintenance of equipment history card, assessing condition and preparation of PM checklist was imparted to the Lean team initially followed by horizontal deployment to all the workforce. The status of the system at the end of project is as shown below:



Before

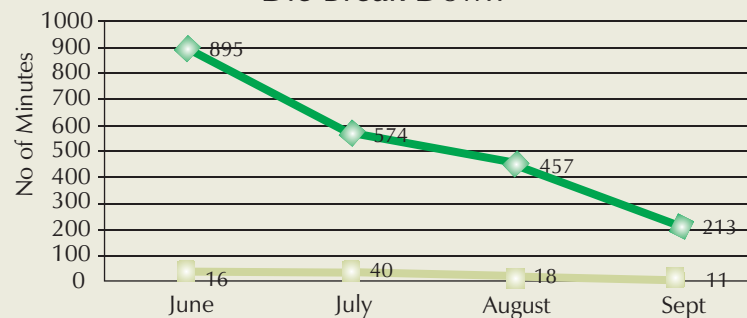
After

### Machine Break Down

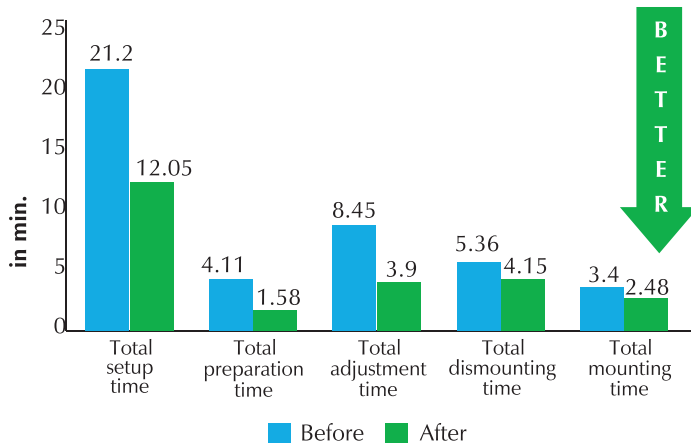


Month	June,11	July,11	August	Sept
Breakdown Minutes	840	363	547	230
No of Breakdown	11	10	11	9

### Die Break Down



Month	May, 1	June, 1	July, 1	Sept
Breakdown Minutes	895	574	457	213
No of Breakdown	16	40	18	11



### Overall Benefits

Productivity Increase	10 to 15 %
Area Saved Sq. Mtrs	159.50
Annual Saving	₹ 127965/-
Salvage value due to 1S (segregation)	₹ 87145/-
Changeover time reduction	24%
Kaizen Poka Yoke related savings	₹ 1144/Shift

## List of Clusters Participated in Pilot Phase

S. No.	State	Location	Cluster Name
1	Andhra Pradesh	Hyderabad	Electrical/ Electric Fans
2	Andhra Pradesh	Hyderabad	Food processing
3	Andhra Pradesh	Kurnool	Rice Mills Cluster
4	Assam	Jorhat	Engg. & Fabrication
5	Assam	Guwahati	Food Processing
6	Delhi	Okhla	Hosiery
7	Gujarat	Rajkot	Ball Bearing
8	Gujarat	Vadodara	Food Processing
9	Gujarat	Vadodara	Electricals
10	Gujarat	Surat	Diamond Processing
11	Gujarat	Ranpur Rajkot	Ball Bearing
12	Gujarat	Ahmedabad	Pumps and Motors
13	Gujarat	Khambhat	Chemical & Dye
14	Gujarat	Surat	Textile Machinery
15	Gujarat	Ahmedabad	Textile Machinery
16	Haryana	Ambala	Scientific Instruments
17	Haryana	Ambala	Scientific Instruments
18	Haryana	Panchkula	Auto components
19	Haryana	Karnal	Rice Mill
20	Haryana	Faridabad	Auto Components
21	Haryana	Faridabad	Auto Components 1
22	Haryana	Faridabad	Light Engineering
23	Haryana	Faridabad	General Engineering 2
24	Haryana	Faridabad	General Engineering 1
25	Haryana	Faridabad	Engineering Goods 1
26	Haryana	Faridabad	Engineering Goods 2
27	Haryana	Gurgaon	Auto Components
28	Haryana	Faridabad	White Goods



## List of Clusters Participated in Pilot Phase

S. No.	State	Location	Cluster Name
29	Haryana	Gurgaon	Auto Components
30	Haryana	Faridabad	CNC and Advance Technology
31	Haryana	Faridabad	Sheet Metal & Turned component
32	Himachal Pradesh	Solan	Pharma
33	Himachal Pradesh	Baddi	Engg. & Fabrication
34	Jharkhand	Jamshedpur	Auto components
35	Jharkhand	Jamshedpur	Auto components 1
36	Jharkhand	Jamshedpur	Auto components 2
37	Karnataka	Bengaluru	Machine Tools
38	Karnataka	Belgaum	Foundry
39	Karnataka	Belgaum	Foundry 1
40	Karnataka	Bengaluru	IT Hardware & Electronics
41	Karnataka	Bengaluru	Plastic moulding
42	Kerala	Kochi	Furniture
43	Kerala	Kalady	Rice Milling
44	Kerala	Angamaly	Ready Made Garments
45	Kerala	Aluva	Plastic
46	Madhya Pradesh	Bhopal	Engg. & Fabrication
47	Madhya Pradesh	Indore	Foundry
48	Maharashtra	Ahmednagar	Auto & Engg. Components
49	Maharashtra	Pune	Auto Components
50	Maharashtra	Aurangabad	Auto Components
51	Maharashtra	Kolhapur	Light Engineering
52	Maharashtra	Pune	White Goods
53	Maharashtra	Aurangabad	Packaging
54	Maharashtra	Aurangabad	Pharma
55	Maharashtra	Pune	Machining & Press Parts
56	Maharashtra	Pune	Light Engineering

## List of Clusters Participated in Pilot Phase

S. No.	State	Location	Cluster Name
57	Maharashtra	Aurangabad	Automotive
58	Maharashtra	Aurangabad	Engineering
59	Maharashtra	Nashik	Automotive
60	Maharashtra	Nashik	Auto Upholstery Parts
61	Maharashtra	Nashik	Stamping Part
62	Maharashtra	Nashik	Sheet Metal Pressed Components
63	Maharashtra	Ahmednagar	Light Engineering
64	Orissa	Khurda	Handicrafts
65	Orissa	Balasure	Plastic goods
66	Orissa	Ganjam Behrampur	Granite
67	Orissa	Bhubaneswar	Engineering Cluster
68	Orissa	Bargarh	Rice Milling Cluster
69	Punjab	Ludhiana	Foundry
70	Punjab	Jalandhar	Hand Tools
71	Punjab	Ludhiana	Hosiery
72	Punjab	Ludhiana	Hand Tool
73	Punjab	Bahadur Ke,Ludhiana	Textile
74	Punjab	Ludhiana	Oil expellers
75	Punjab	Mohali	Engineering Goods
76	Punjab	Ludhiana	Machine Tools
77	Punjab	Ludhiana	Hand Tool 1
78	Punjab	Ludhiana	Hand Tool 2
79	Punjab	Mohali	Light Engineering
80	Puducherry	Puducherry	White Goods
81	Puducherry	Puducherry	White Goods1
82	Rajasthan	Jaipur	Ball-Bearing
83	Rajasthan	Jaipur	Apparels and Garments
84	Tamil Nadu	Hosur	Precision Machined Component

## List of Clusters Participated in Pilot Phase

S. No.	State	Location	Cluster Name
85	Tamil Nadu	Chennai	Auto components (TAFE)
86	Tamil Nadu	Coimbatore	Diesel Engines/ Motor & Pump sets
87	Tamil Nadu	Chennai	Leather Products
88	Tamil Nadu	Chennai	Auto components 1 (AIEMA)
89	Tamil Nadu	Tirupur	Textile
90	Tamil Nadu	Coimbatore	Light Engineering
91	Tamil Nadu	Coimbatore	General Engg.
92	Tamil Nadu	Chennai	Auto components 2 (TAFE)
93	Tamil Nadu	Chennai	Metal Work
94	Tamil Nadu	Chennai	Light Engineering (AIEMA)
95	Tamil Nadu	Namakkal	Lorry Body Building-1
96	Tamil Nadu	Namakkal	Lorry Body Building-2
97	Tamil Nadu	Chennai	Machine Tools
98	Uttar Pradesh	Noida	Ready Made Garments
99	Uttar Pradesh	Noida	Electronic Goods
100	Uttar Pradesh	Agra	Foundry
101	Uttar Pradesh	Kanpur	Leather
102	Uttar Pradesh	Pratapgarh	Fruit & vegetable Processing
103	Uttar Pradesh	Kanpur	Plastic
104	Uttar Pradesh	Lucknow	Auto Components-1
105	Uttar Pradesh	Lucknow & Kanpur	Auto Components-2
106	Uttar Pradesh	Meerut	Engineering
107	Uttarakhand	Roorkee	Packaging
108	West Bengal	Kolkata	Leather Goods
109	West Bengal	Siliguri	Food Processing
110	West Bengal	Kolkata	Light Engineering
111	West Bengal	Siliguri	Tea Processing
112	West Bengal	Kolkata	Readymade Garments

# MEDIA COVERAGE

## Lean Manufacturing Comtitiveness Programme Launched in Faridabad Cluster



Government has decided to introduce Lean Manufacturing Competitiveness (LMC) Program at one thousand clusters across the country. With the criteria of forming a cluster of minimum 10 enterprises to avail the benefits of LMC program, the Government has targetted, in first phase, to make the Lean

have the will, commitment, discipline”, he said.

Akshilesh N. Singh, a veteran in the field, has been selected as Lean Consultant of this cluster. Speaking at launching ceremony of the Program at Faridabad Auto Cluster and signing of the tripartite agreement by SPV, NPC and Singh recently Pal informed that this was the third cluster to launch Lean Cluster Program after Chennai and Ludhiana.

Commitment to Lean Showing their commitment and faith in Lean techniques the President of the cluster, R.K. Bhan said, “We

The Indian Express Journal  
www.indianexpressjournal.com

## ITAMMA moves ahead in Cluster Development Activities



ITAMMA took initiatives under the umbrella of its Cluster Development activities and received an approval 'in principle' on 15th May, 2017 from National Productivity Council for forming DPO in form part of the Lean Manufacturing Competitiveness Scheme (LMCS) for Textile Machinery & Accessories Manufacturing Cluster at Ahmedabad. Thereafter, a letter of intent for award of contract for the Textile Accessories & Machinery Manufacturing Cluster, Ahmedabad for implementing Lean Manufacturing (LM) Competitiveness Scheme on 15th June, 2017 was in India was received from National Monitoring & Implementing Unit (NMU) of NPCL, New Delhi informing about the details of the approved Consultants and the procedures for undergoing Tripartite Agreement. Accordingly, the founder of Tripartite Agreement for implementing Lean Manufacturing (LM) Competitiveness Scheme on 15th June, 2017 was in India was signed by ITAMMA's Ahmedabad, Liaison Office of Ahmedabad. The committee was headed by Mr. July Director

Mr. Anand Patil, Director, IIMAA and Mr. P. S. Bhanu, Assistant Director (Add) on behalf of IIMAA/Management Institute and Mr. Anand Patil, Partner - Principal Consultant on behalf of Add Value Group, Ahmedabad and Mr. Anand Patil, Sr. Consultant on behalf of Add Value Consulting Inc., Ahmedabad, as Consultants and Mr. Anand Patil, President, ITAMMA & Mr. Prakash R. Doshi, Head Office, ITAMMA Lean Manufacturing Forum (Ahmedabad) on behalf of ITAMMA, Mr. Anand Patil in his special address gave the details about the scheme informing that the Government will be making available Rs 17 lakh and 20% will be borne by ITAMMA SPV members. He said that the distribution of the grant from the Government of India will be made available in the required instalments. Mr. Anand Patil, Partner - Principal Consultant, Add Value Group, Ahmedabad and Mr. Anand Patil, Sr. Consultant, Add Value Consulting Inc., Ahmedabad, in 2 phases, 1st Phase after completion of DPO and 2nd Phase after completion of the programme. He also mentioned that the benefit of 20 - 50% in the range of Rs 20 lakh to Rs 2 - 3 crore was recorded by many of the project groups who have implemented the programme. Mr. Anand Patil, Partner - Principal Consultant, Add Value Group, Ahmedabad and Mr. Anand Patil, Sr. Consultant, Add Value Consulting Inc., Ahmedabad gave the brief about the scheme and mentioned that the members of the SPV have to co-operate to achieve the targets. Mr. Anand Patil, Director, IIMAA mentioned that the results will be seen in photographs and in the documents will also be released in photographs manner. There will be an involvement of any distribution of facilities after completion of the programme and so the importance is only given to the results rather than certificate.

**लघुउद्योगांना मदतीचा हात**

सुधी आचार्य यांचे दूर कार्यवाही योजनेत प्रत्येकी सुधारण प्रकल्पाची अंमलबजावणी करणे, याने कार्यक्षमता वाढवण्यास मदत होईल असे आचार्य यांनी म्हणले. लघुउद्योगांना मदतीचा हात देण्यासाठी सरकारने अनेक योजना सुरू केल्या आहेत. त्यातून योजनेत प्रत्येकी सुधारण प्रकल्पाची अंमलबजावणी करणे, याने कार्यक्षमता वाढवण्यास मदत होईल असे आचार्य यांनी म्हणले. लघुउद्योगांना मदतीचा हात देण्यासाठी सरकारने अनेक योजना सुरू केल्या आहेत. त्यातून योजनेत प्रत्येकी सुधारण प्रकल्पाची अंमलबजावणी करणे, याने कार्यक्षमता वाढवण्यास मदत होईल असे आचार्य यांनी म्हणले.

**कम लागत में अधिक उत्पादन के दिख दिए**

कम लागत में अधिक उत्पादन के दिख दिए

# The Indian EXPRESS

## Green Power to MSME growth

In a bid to realise Vision 2023, Micro, Small and Medium Enterprises (MSME) Department principal secretary Hans Raj Varma said lean manufacturing and green power are the keys to MSME growth. Addressing a dissemination meet to study on public-private partnership organised by TFSC here on Monday, Varma said that Small Industries Development Corporations will

**सही मैनेजमेंट से बढ़ेगा उत्पादन**

सही मैनेजमेंट से बढ़ेगा उत्पादन

(Micro and Small Enterprises (MSEs) under the ring competitiveness Programme (NMCIP). The emented in 25 clusters this year with five clusters or manufacturing hubs of Chennai, Coimbatore, pall and Hosur, he said. The scheme envisages manufacturing costs through proper personnel identifc inventory management, improved d reduced engineering time. The main objective activity by 20 per cent. He also said that Tamil would provide support to MSME sector in tapping larlier, Anbu Palani Kumar of Indian Institute of edabad Alumni Association's (IIM-AAA) Chennai |the need for public private participation.



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