CALZATECNIA-2009 - http://www.calzatecnia.com.mx/2009

Lean Manufacturing - A Blue Print for Leather Industry (Draft)

M Raja Chidambaram
Director
URS Productively
3C , Prasanth Castle , 51 , 10th Avenue , Ashok Nagar
Chennai , India – 600 083
ursraja@vsnl.com

Executive Summary :

Lean manufacturing is a very effective technique that can be adapted by the footwear industry to respond to the changing business scenario in terms of low volume and high variety market needs. Basically lean is a concept where by the Non Value Added activities of an organization are promptly identified and removed .This paper presents various concepts and tools that are part of Lean manufacturing and also discusses about two case exercises of lean implementation in footwear factories.

.

Lean Manufacturing - A Blue Print for Leather Industry

M. Raja Chidambaram
Director

Introduction:

The present day leather industry is facing new requirements form customers necessitating new business models. The customers will need more variety of styles and less volume and delivery requirements will also be complex. Added to this is the fact, that the labor cost in India will also go up steadily. Also the management has to set aside resources for regulatory requirements such as environmental responsibility and societal responsibility.

Lean Manufacturing can be an effective operational strategy to combat this challenge.

The paper presents concepts and practical application of lean Manufacturing principles in Leather Industry.

What Is Lean Manufacturing:

Lean manufacturing which has its origin in Japanese Management Systems such as Toyota Production System – is centered around one simple concept.

- **ELIMINATION OF WASTE OF ALL FORMS –**

Lean Manufacturing focuses on minimizing the **TIME LINE** of business. Time line of business is defined as the time between the customer order and the shipment of order. This is achieved by aligning manufacturing process and the customer process.

.

What Lean Can Achieve

In 2-3 years, Lean can achieve following:

- Increased capacity / throughput – Can possibly reduce lead time by more than 50 %
- Higher inventory turns – Reduce inventory by more than by 50%
- Practice of Takt Time – Align production plan with customer schedule
- More available floor space – Reduce floor space by 25%
- Improved workplace organization
- Improved quality : reduced scrap / re-work by more than 20%
- Reduced inventories : Raw, WIP, Finished Goods– Reduce WIP more than 50%
- Reduced lead times
- Greater gross margin
- Improved participation & morale

Concepts and Tools of Lean Manufacturing :

- Standardized Factory
- 5-S
- Balanced Work Flow through cell Manufacturing
- TAKT Control : (Production Rate based on customer)
- Value Stream Mapping
- Continuous Improvement
- Quick Chang Over (QCE)
- Visual factory
- Error – Proofing (POKA - YOKE)

Standardized Factory

Here various Production Cells within a factory will be standardized. with respect to terminology, flow, batch size and control mechanism. Usually a product process customer mapping will be done to arrive at this

House Keeping -5S

The is a Japanese technique known as House Keeping tools but actually by reducing search element of the work .The key components of 5S technique are as follows

SEIRI - SORT- Remove the unnecessary things from work place

SEITON - SYSTEMATIZE- Organize the items in specific places such that the search reduces

SEISO - SHINE (CLEAN) - Clean the work place and machine daily. Do inspection simultaneously

SEIKETSU- STANDARDIZE - Use color codes and shapes and numbers to standardize operations

SHITSUKE-SELF DISCIPLINE - Practice all above in letter and spirit

A sustained implementation of 5 S leads to better productivity in the shop floor.

Balanced Work Flow through cell Manufacturing

This technique follows Work Break- Down Structure (WBS) for a product manufacturing and create work stations and production cells such that the waiting time for the product and the operations are minimized .This works in conjunction with the TAKT concept . A work break down structure normally throws light on what elements of work needs to be done in sequence and what work can be done in parallel.

TAKT Control : (Production Rate based on customer)

This technique helps in aligning production resources to customer needs enabling a full system as opposed to a push system . The TAKT time is differentiated from cycle as follows
Cycle Time = Actual time required for a worker to complete one cycle time of the process
TAKT Time = Time(actual seconds per working day) / Volume
Production Cell to be designed such a way that the TAKT time is maintained uniformly in all the stations .

Value Stream Mapping

This technique is used to determine whether every operation in the present sequence adds values or only cost .Typical analysis done here will be
RVA : Real Value Adding - Those operations where material conversion and material joining takes place , adding to the functional requirement of the product , for which customer will be willing to pay .
Eg : Stiching
BVA : Business Value Adding - Those operations which are not required for functional requirement of the product but are needed for business control.
Eg : Store keeping , stock updating
NVA : Non Value adding – those operations which neither add real value , nor business value but are present as a part of wrong process design
Eg : Counting , Inspection

Continuous Improvement(Kobetsu Kaizen)

This component of Lean is Worker driven structured kaizen activities (continuous improvement) contributing to Productivity , Quality, Delivery Time ,Safety and Motivation. (PQDSM) projects. Typically tools like OEE (Overall Equipments Analysis) , Analysis of 16 Losses , Why Why analysis are used here

Quick Change Over.

Quick change over is a concept in Lean , which attempts to minimize the setup time losses when changing the production from one style to another . This done in two ways :

- Minimize the number of setups
- Reduce the time taken per setup

Minimizing the number of set-ups is achieved through reducing the conveyor lengths and formulation of production cells .

Reducing the time taken for set-ups is done through analyzing all the elements involved in set up , and classifying those elements as Internal and external .. The external elements are to done in advance , and cycle time for internal elements have to be reduced by method study and kaizen

Visual factory
Instead of going through paper reporting information on Productivity , Quality these data are made visible and transparent as much as possible

Error – Proofing (POKA - YOKE)

Here the main theme is to make sure that non-conformities is not repeated by using fool-proof systems

Approach plan or Blueprint for Footwear Industry

An exercise of implementing lean manufacturing has been carried out in Indian footwear manufacturing facilities , with a view of evolving a blue print for implementing lean in footwear industries. Given the conditions working of shoe industry, it is not possible to implement all concepts and tools of lean all at once. This study was focused in identifying the best approach in which the company getting into lean will benefit and total lean implementation can be done progressively in a sustainable way.

The steps that were involved in the Lean implementation are : .

The Specific Objectives of the study are:

- Productivity Diagnosis Study
- Identify Non Value Adding activities
- Identify Appropriate lean initiatives to improve Productivity
- Develop a blue print for a standard lean factory
- Prepare an audit tool to periodically evaluate the lean implementation

Case Study 1 : Company FW1

Productivity Diagnosis:

- Based on the diagnostic study , one of the major reasons affecting productivity at FW1 is number of set ups. This is more due to the fact the company was doing about 18 styles on the average per month , based on the last seasons data.
- Since each set up takes on the average 2 days, we lose effectively 36 conveyor days, per month.
- With the present no of 4 conveyors it comes to about 4.5 setups per conveyor per month.

Lean Initiatives :

- To address this issue , a two pronged approach was suggested: that is to reduce the number of set ups , and also reduce the time taken for set ups.
- **To reduce the setups**, re-engineering the conveyor was considered . The work has been reorganized such that we are able to structure 6-8 conveyors , with the existing strength.

Present and Proposed Method:

:

Results of the Lean Implementation :

Parameter	Before Lean Manufacturing			In Lean Manufacturing
	Max Production Level	Min Production Level	Average	
PRODUCTION FOR MONTH	18501	7953	12493	689
AVERAGE /DAY	661	265	416	138
NO OF WORKERS	221	217	218	29
PRODUCTIVITY	2.99	1.22	1.91	4.75

Case Study 2: Company FW2

Productivity Diagnosis:

The existing system of the factory had following departments for the upper manufacturing unit.
Cutting
Preparation
Closing Assembly line

The diagnosis of existing system with the help of a detailed time study pointed out the following:

- The WIP need was 2- 3 days production.
- The closing assembly line was laid out with each worker doing a specified operation with sub optimum balancing.
- There are many non value adding activities that need to be critically looked at , before the start of the style
- The overall equipment efficiency (OEE) was not optimum.

Lean Initiatives :

- Reduce the Non-Value added operations
- Introduce lean / Cell concepts for optimum line balancing.
- A work break down structure was used instead of simply assigning the operations.
- Sub assembly cellos were formulated in the closing assembly line to facilitate and control flow.

Present and Proposed Method:

The above cell concept was used in the closing assembly line only. To enable and support the lean implementation following action plans were suggested.

- A process engineering function was to be set up, with the responsibility of quick time study, Value Stream Mapping, Work Breakdown Structure (WBS). It was insisted that the WBS - would have to be done by the design team, in the commercialization phase
- The concept of Standard Products and Equivalents Factors to be established to account for the difference in work content of different styles. This can be based on the estimated standard man-hours for each style. (SMH)
- One pair input system must be followed from Cutting section followed by Marking, skiving, Quality inspection and, then to the production line.
- Another variation - Cell Layout (Ring Systems) with 8 to 10 persons to be implemented- to handle small orders.
- No of closing assembly and size of closing assembly lines should be based on customer schedule. A TAKT time must be set for each style.
- Workers have to be empowered to plan and control theirs and be provided with tools such us TAKT Control Sheets.
- House Keeping with good visual controls to be established.
- The planning activities need to be improved by way aggregate planning, detailed planning at conveyor level. For each conveyor planning run length and no of setups to be planned in advance.

The Results of Lean Implementation

The results of lean manufacturing systems are as follows:

The productivity before the lean system for one season for 6 months (In upper closing)	2.80 pairs/man shift
Productivity with the introduction of lean system	> 4(up to 5.5) pairs / man shift
Impact	Lean system was introduced in other conveyors and also in other factories of the company.

.

Phased Implementation of Full Blown Lean

A full blown lean is when we achieve the lean concepts in all processes right from order receipt till shipping. (Including processes like design, procurement, etc). This would mean realigning the entire company right from cutting till packing, with focus on customer on needs. For the company, the following phased approach was suggested.