CASE STUDY

Shop Floor Reengineering Using Cell Manufacturing - A Case Study

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SHOP FLOOR REENGINEERING USING CELL MANUFACTURING - A CASE STUDY

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ABSTRACT

Effective Operations Management is a key strategy for any manufacturing organization to successfully maintain a competitive edge and profitability. For labor intensive industry such as leather, which is characterized by many complex operational variables, efforts to improve operational effectiveness will certainly result in lesser product cost and more value addition from resources.

The key performance measures of operations management are throughput time, quicker turnaround of inventory, less WIP, and quick response to customers. This can be achieved by identifying and removing non value added activities and aligning the value added activities toward clearly stated business goals. Business Process Reengineering (BPR) is a powerful tool which helps in organizational restructuring to achieve this. Out of many themes proposed by BPR , Cell manufacturing is particularly effective in improving operation efficiency in shop floor.

This paper discusses about the implementation of cell manufacturing systems in a leather glove manufacturing in India.

1. INTRODUCTION

Throughput Time is one of the critical performance measures of effective manufacturing. Healthy throughput time ensures quicker turnaround of inventory, less WIP, and quick response to customers. Cell Manufacturing is a powerful technique, which enables this. The fundamental concepts of cell manufacturing are

1. Design of holistic Manufacturing processes
2. End To End Process Design
3. Fewer handing overs
4. Employee empowerment

This paper presents the implementation of cellular manufacturing system for leather gloves manufacturing factory. The factory manufactures about 1.5 million pairs of gloves with about 1200 employees.

2. MANUFACTURING PROCESS

The basic processes involved in the manufacturing are clicking, sewing, and finishing. The throughput times of the processes are

Process	Throughput Time
Clicking	1 day
Sewing	12 days
Finishing	1day

The cell manufacturing concept has been applied to the sewing department with 600 persons.

2.1 SEWING PROCESS

The basic requirement of the sewing process is to stitch together the cut components through seven specific stages of stitching. The stitching requirements would vary depending on the style. The sequence of stitching and inspection processes is shown in Figure 1. Transportation is also involved between these processes. In the existing process each of those stitching operations were done as specialized operations in a batch model. After completion of each stitching stage a production batch would pass to an inspection table and after inspection the batch would move to the next production stage. On the average there were 150 production batches per day. The manufacturing system of existing process is shown in Figure 2. The unit layout indicates the arrangement of operations in one work center. The total layout indicates the arrangement of work centers in the shop floor.

3. PROPOSED PROCESS

The proposed reengineered process envisaged completion of all stitching stages in one table itself. This would mean the input from the cutting would be received at one end of the table and output would be obtained on the other end. The different stitching machines required for performing different stitching operation would be mounted on one table itself. The cell configuration for the operation , taking into consideration line balancing is given in Figure 3. Figure 4 shows the manufacturing system of proposed layout.

CODE	OPERATION	TIME
OP01	DRAW	2.66
OP02	THUMBING	4.16
OP03	JOIN FOURCHETTE	1.16
OP04	FOURCHETTE	4.10
OP05	FOURCHETTE TRIMMING	1.60
OP06	PULL AND KNOT	2.91
OP07	CLOSING	4.25
IP01	THUMB REVISING	1.50
IP02	FOURCHETTE REVISING	1.50
IP03	CLOSING REVISING	1.33

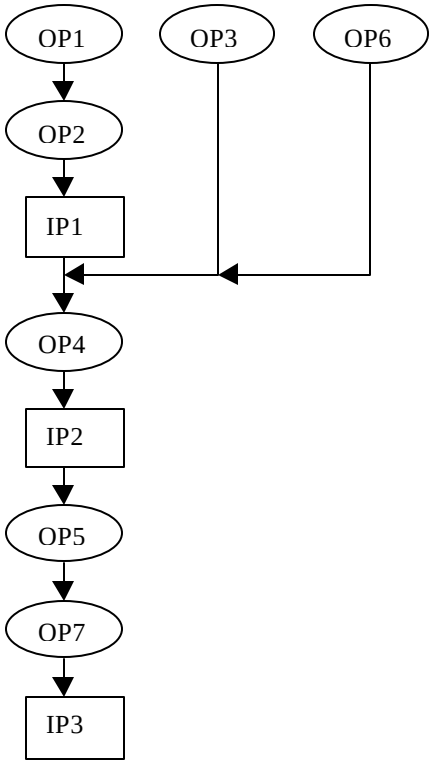


Figure 1:Existing Process

UNIT LAYOUT

OP1	OP1	OP1	OP1	OP1	OP1	OP1	OP1	OP1	OP1	OP1	OP1
OP1	OP1	OP1	OP1	OP1	OP1	OP1	OP1	OP1	OP1	OP1	OP1

WORK CONTENT = 17.6 MINUTES
THROUGH PUT TIME = 12 DAYS
RESPONSE RATIO = 229

TOTAL LAYOUT

OP1	OP4
OP1	OP4
OP1	OP4
OP2	IP2
OP2	IP2
OP2	OP5
OP2	OP5
IP1	OP7
IP1	OP7
OP3	OP7
OP3	OP7
OP4	I P3

Figure 2: Manufacturing Process - Existing

CODE	OPERATION	TIME	MAN POWER	PROD'N/ PE RSON	PROD'N /SHIFT	UTLI'N
OP01	DRAW	2.66	4.00	15.04	60.16	83.13
OP02	THUMBING	4.16	6.00	9.62	57.72	86.67
OP03	JOIN FOURCHETTE	1.16	2.00	34.48	68.96	72.50
OP04	FOURCHETTE	4.10	6.00	9.76	58.56	85.42
OP05	FOURCHETTE TRIMMING	1.60	2.00	25.00	50.00	100.00
OP06	PULL AND KNOT	2.91	4.00	13.75	55.00	90.94
OP07	CLOSING	4.25	6.00	9.41	56.46	88.54
IP01	THUMB REVISING	1.50	2.00	26.67	53.34	93.75
IP02	FOURCHETTE REVISING	1.50	2.00	26.67	53.34	93.75
IP03	"CLOSING REVISING"	1.33	2.00	30.08	60.16	83.13

Figure 3: Cell Configuration

4. IMPLEMENTATION STRATEGY

4.1 ORGANIZATION STRUCTURE

The existing organization structure had department head and supervisors for various operation. (Functional)

The proposed organization structure for cell manufacturing is as follows:

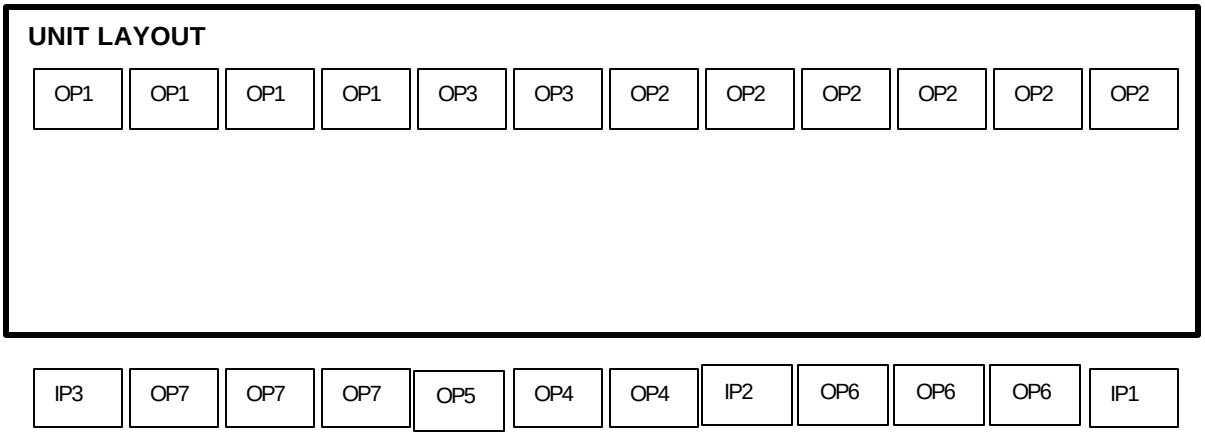
Department Head
Supervisors – Product Type Wise
Supervisors – Support Systems
Table Leaders

4.2 EMPOWERMENT

One of the critical requirements for successful implementation of cell manufacturing is empowerment , where decision making and control is taken to lower levels.

Following are the measures taken:

- The table leaders are selected from operator level.
- They are trained in basic supervisory skills like understanding production schedule, Material Planning, Production accounting and quality control.
- Since the cells are balanced any absenteeism would result in production hold up. This can be overcome by cross training.



WORK CONTENT = 17.6 MINUTES
THROUGH PUT TIME = 1 DAY
RESPONSE RATIO = 19

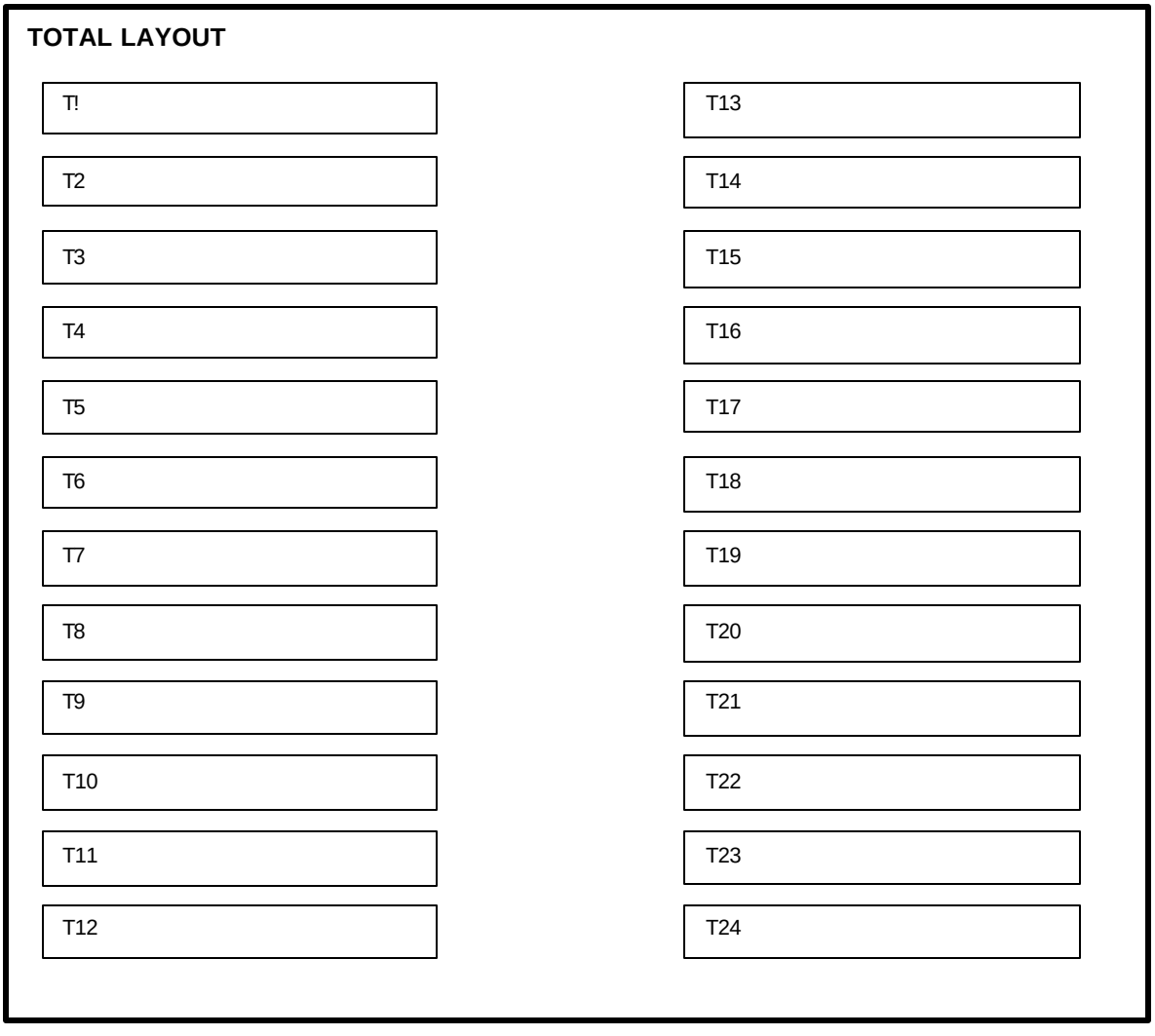


Figure 4: Manufacturing Process - Proposed

4.3 TRAINING REQUIREMENT

- The supervisors need to be trained in departmental production planning and material requirement planning.

- The table leaders need be trained in production loading, Basic Productivity concepts, production reporting and quality reporting.

- The table leaders have to be trained in simple SQC tools like check sheets, trend charts and control chart.

4.4 INFORMATION REQUIREMENT

- Introduction of cell systems would necessitate critical review of information systems.
- In fact a well designed cell system must result in simplified and effective information system and less cost of information processing.
- The data would be captured at product / part level , not at operation level.
- The handling and accounting of rejections , should also be simplified**.**

4.5 OTHER IMPLEMENTATION REQUIREMENTS

- For each cells (Tables) the products have to be standardized to enable easy training and better quality.
- The production measurements have to be set at cell (table) level and the rewards have to be set up at table levels.
- Recognition of performance at table levels to be introduced to encourage healthy competition,

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