CHAPTER 5

CELLULAR MANUFACTURING LAYOUTS

5.1 INTRODUCTION

CM layout uses a number of techniques to understand the current layout and its limitations and to design an improved layout. CM layouts may be evaluated using weighted criteria matrix with team input, material and information closeness or separation needs, extent of material transported, and distances traveled are significant criteria. Transition to the new layout requires specifying equipment needs (hookups, access, alignment...) and locations with effective move coordination to minimize downtime. CM layouts are typically organized by functional groups of equipment and support staff. To effectively accomplish flow, these functional groupings must be broken down into cells or natural work-teams focused on product families. Equipment is positioned according to the sequence of operations. Work content must be distributed and balanced for line-balanced workflow within Takt time for the “beat” of customer demand. Through creative design and material handling methods, lot-sizes can be reduced toward the ultimate goal of handling one piece at a time. The process must be stabilized with consistently high quality, well maintained reliable equipment, and predictable throughput times. Lead-time may be improved by a number of techniques moving operations closer together through cellular manufacturing, mixed model level load scheduling, controlling queues with kanban / pull systems or other limits, reducing lot-sizes with setup reduction, and better information sharing through such approaches.
5.1.1 Key Benefits of CM Layout

- Layout gives arrangement for optimal material flow and passing localized information
- Active team involvement gives better ideation, ownership and coordination
- Cellular manufacturing for responsiveness, optimum methods and quality at the source
- Reduced lead-times cashed through inventory reductions and increased sales from customers responding to newfound responsiveness and on-time delivery

5.1.2 CM Layout Activities

- Define and redesign the plant layout using CAD software.
- Facilitate teams to generate ideas and evaluate alternative layout solutions
- Call upon design and implementation expertise gained through extensive industrial engineering background and experience with major plant reconfigurations
- Plan, coordinate and support implementation to accomplish the layout change
- Use design concepts and best practices to accomplish lean cellular production flow
- Apply several tools and breadth of experience to control queues, reduce lead-time and improve responsiveness
5.1.3 **CM Layout Design Goals**

- Flexibility in usage of people, process, tools and equipments
- Lot size of small batches during production
- Point of using storage flow racks.
- Mixed model production scheduling
- Visual management for local information flow
- Quality at the source of process control, source inspection, mistake-proofing
- Use of standard work tools

5.2 **CM LAYOUT TYPES**

CM layouts are manufacturing station in an organized, flow oriented structure to produce a family of products within a single line of machines or workstations with dedicated operators. It provides link to manual and machine operations into the most efficient combination to maximize the value-added content to minimize the waste. Many manufacturing facilities present a combination of two layout types. For example, the production area may be laid out by process, while another area may be laid out by product. It is also common to find an entire plant arranged...
i) **Process flow layout**

Process flow layout is a world class manufacturing layout. Here the jobs are in a process flow direction. Multi skilled operators can work in that cell. The cellular flow is in counter clockwise direction. A model process flow layout is shown in Figure 4.1

![Figure 5.1 Process flow layout](image)

ii) **U – Shaped Layouts**

In assembly-line balances frequently result in unequal workstation times. Flexible line layouts are a common way of dealing with this problem. So the U-shaped line with work sharing as shown in Figure 4.2 could help to resolve the imbalances.

![Figure 5.2 Process flow layout](image)

iii) **Mixed – model line balancing**

This approach is used by JIT manufacturers such as Toyota. Its objective is to meet the demand for a variety of products and to avoid building high inventories. Mixed-model line balancing involves scheduling several different models to be produced over a given day or week on the same line in a cyclical fashion.
iv) **Group Technology layout**

Group technology a cellular layout allocates dissimilar machines into cells to work on products that have similar shapes and processing requirements. GT layouts are now widely used in metal fabricating, computer chip manufacture, and assembly work. The overall objective is to gain the benefits of product layout in job shop kind of production. The benefits show better human relations, improved operator expertise, less in-process inventory and material handling and faster production setup.

### 5.3 SUMMARY

A good factory or office layout can provide real competitive advantage by facilitating material and information flow processes. It can also enhance employees’ work life. From this section the benefits of “U” shaped layout and GT layout can be an effective one for the implementation of NCM. So the NCM design stages are explained in chapter 6.