

# PROCESS LAYOUT ON ADVANCE CNG CYLINDER MANUFACTURING

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## ABSTRACT

Increasing global competition has evolved a manufacturing environment which gleans vast product configuration, reduced lead times, and increased standards of quality and competitive costs. In parallel with a rising trend toward globalization, these manufacturing facilities must be designed to cater for new challenges to survive and grow in the marketplace. Plant layout is the arrangement of desired machinery and equipment of a plant in a way which will permit the easiest flow of materials, at the lesser cost with minimum handling, in processing the product from the raw materials to the dispatched of the finished product. The research paper presents solving an industrial problem using the principle of string diagram and simulation software.

**Key Words:-**Process layout, Plant layout, Process chart, Check list, String diagram.

## 1. INTRODUCTION

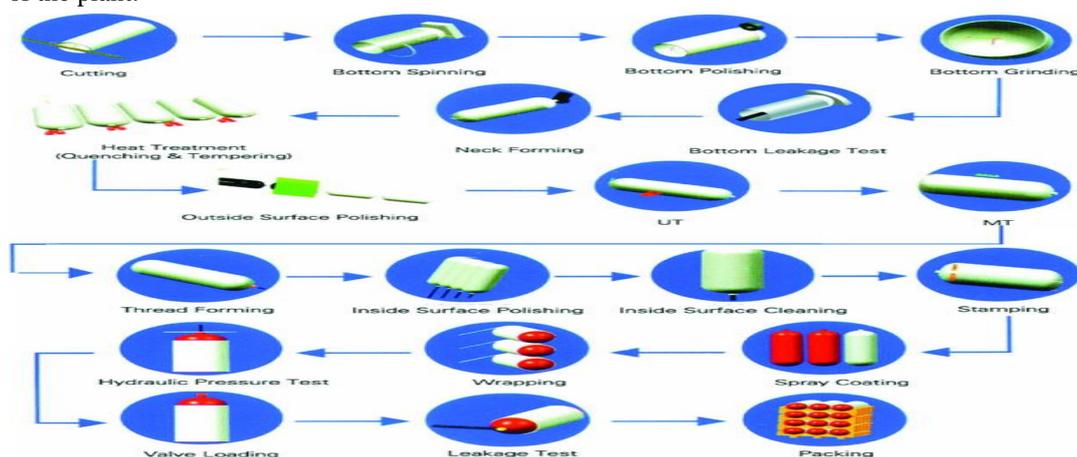
Efficient layout is a systematic and functional arrangement of different departments, machines, equipments and services in a CNG manufacturing industry. It is important to have a well developed plant layout for all the available resources in an optimum manner and get the maximum out of the capacity of the facilities. The efficiency of production depends the various machines ability to work, services production facilities and employee's amenities are located in a plant. This aims to study and improve the ability of the current CNG plant layout are analyzed & designed by using string diagram. An experiment is made to simulate the current and proposed factory layout by using ARENA software. Efficiency of the current & proposed plant layout are calculated within this general context, the specific aim of the sub-project, the results of which are outlined in this article,

**1.1** The string diagram is a simple tool for analyzing and designing work spaces in such a way that the movement of material, men, equipment etc...are minimized.

**1.2** The string diagram is a form of flow diagram, in which a thread is used to measure the distance of material, men movement. It is important that the string diagram drawn to an exact scale.

**1.3** The string diagram is carried out in exactly the same way as all other method studies, by recording all the relevant information and facts from direct observation.

**1.4** A string diagram can be used to plot the movements of equipment, material, and essentially when a work study person wants to find out how far the materials travel. A simulation study was under taken to find out the overall efficiency of the plant.



**Schematic Diagram for Process Layout of CNG Cylinder Manufacturing Process.**

## **2. GENESIS OF PROBLEM**

The plant layout redesign for increase in efficiency was considered necessary because of the following reasons:

- Improper material flow through the shop floor i.e., the current plant layout was not designed according to the process flow given by Directorate General of Civil Aviation (DGCA).
- Extended transportation time for material transfer. The sheet metal section had issues to be handled. Based on the discussion with the manager and supervisors and direct observation by the team, the following problem surface was about non value added operations in the process.

## **3. CONSTRAINTS**

1. Stores and heat treatment sections should not be interchanged or changed.
2. Dimensions of current departments and aisle should not be changed.

## **4. OBJECTIVES**

**The problem genesis led to the formulation of the following objectives:**

1. To study the current flow pattern and relation of overall plant layout and develop a new plant layout.
2. Relocating the workstations for simpler flow and reduction in check points.
3. To improve the efficiency of the plant layout using simulation.

## **5. TOOLS AND TECHNIQUES**

**The various tools and techniques used for plant layout redesign are:**

1. Checklist: The layout evaluation checklist is used to identify the key problem areas in the present layout.
2. String diagram: The string diagram is one of the simplest techniques of method study for recording and examining movement of workers and materials. It is a tool for analyzing and designing work spaces in such a way that the movement of material, men, equipment etc... During a specified sequence of events. The string diagram is thus a form of flow diagram. In this a thread is used to measure distance. Hence, it is necessary that the string diagram be drawn correctly to scale. It is most often used to supplement the flow process chart. A string diagram can be used to plot the movement of material and this is done especially when a work study person wants to find out easily just how far the materials travel. The complete plan containing all the equipment's and doorways, pillars and partitions, which affect path of movement, are drawn to scale. A measured length of thread is then taken and tied round the pins at the string points of movement. Thus the string diagram is a useful aid in explaining proposed changes to company management, production supervisors and employees.
3. Outline process chart: An outline process chart is a process chart giving an overall picture by recording in sequences only the main operations and inspections. In an outline process chart, only the principle operations are carried out and the inspections made to ensure the effectiveness are recorded, irrespective of who does them and where they performed. In preparing such a chart, only the symbols for "operation" and "inspection" are necessary. In addition to the informed given by the symbols and their sequences, a brief note of the nature of each operation or inspection is made beside the symbol, and are allowed to be added.
4. Flow process chart: It is a process chart used for setting out the sequence of the flow of a product or a procedure by recording all events under review using appropriate process chart symbols.

### **Data Collection**

1. Existing layout: The area occupied by the machines, aisles, work-in-progress, storage areas, raw material areas and finished goods area, etc. was measured and scaled drawings of the floor plans for the building were made. MS office and Auto cad was used for the purpose.
2. Outline Process Chart: Outline process chart (OPC) was used to get and overall picture of primary activities OPC for the studied process.
3. Flow Process Chart: Flow Process Chart was used to document the detailed sequence of operations.
4. String Diagrams: String Diagrams are used to trace and measure the path of material. String diagrams were made both by hand and by software, MS office using Auto cad.

### **Analyze**

The cylinders that were manufactured had defects due to the irresponsibility of the worker and operator. The supply of material is not in proper condition so much time is lost during this period. The tube cutting process is not very good in industry because operator cuts the taper by hand which takes very much time in the process. According to tube cutting process, workers are few. Due to improper thermal treatment process, the operator or worker makes mistakes and failure is obtained. Many of the work are done by the manual operation which is not suitable for production. This decreases the production rate and cost of the cylinder increases. All the machines are not working properly due to

which production per capita is less. Due to unavailability of studied and experienced workers, defects are increasing as a result much scrap and wastes are being obtained. The plant layout even does not facilitate fast production due to improper arrangement of working stations. Proper maintenance and repair of machines are being lacked due to which much machines are in overhaul condition.

#### **Improve**

The processing of the cylinders and for improving the production rate should be based upon the modern technology because it is impossible to increase the production rate by manual operation on the machine. Better technique is to be adopted such as modern CNC lathe machines for taper tube cutting and automatic belt conveyors for moving cylinders inside the manufacturing workshop. The production rate will be enhanced by taking these steps. The operator and worker must take great responsibility and care while performing the jobs. The stamping and finishing of the manufacturing product must not be done manually instead it should be replaced by automatic presses and punches to do work faster and economically.

#### **Control**

**The following steps are to be followed to enhancing the production rate and improving quality of the gas cylinders thereby reducing the cost of manufacturing:**

1. The plant layout should be revised.
2. The work floor space should be used economically.
3. Skilled workers are to be employed for doing work.
4. Automatic lathe machines and chain conveyor belts should be adopted.
5. Time saving must be the prime factor.
6. Faster production rate and economic irresponsibility of the products must be considered.
7. Machines should be repaired and maintained as soon as it fails to perform operation.
8. Accuracy and dimensional tolerances of the machine should be checked.

#### **Modeling Rules**

**The modeling rules of process layout system are as follows:**

1. Each device can only conduct one part machining every time;
2. Part machining sequence is in accordance with the equipment number;
3. Part machining time is definitive;
4. Facilities' machining capacity can be adjusted in a certain range;
5. The simulation time of a part entering the production line is predetermined.

#### **Simulation Mathematical Model of the System**

- The simulation mathematical model of the layout system considered in this paper only includes layout in one line model and layout in multi-line model, while the ringlike layout model and U-type layout model are considered as special cases of single-line layout model. The linear double-line layout model is considered as a special case of multi-line layout model. Layout in One Line Model

#### **The assumptions are as follows:**

- A. The shape of the machining machine is square or rectangular and its 3D dimension is known;
- B. The orientation of the equipment is known.
- C. The equipments stand in a line;

## **7.CONCLUSION**

This research paper has provided a good exposure to facility planning and layout designs for the improvement of the efficiency. The choice of which type of facility layout to adopt can have a significant impact on the long-term success of a firm. This decision, therefore, should not be considered lightly, but only after a thorough analysis of the operational requirements has been completed. Due to unavailability of studied and experienced workers, defects are increasing as a result much scrap and wastes are being obtained. Proper maintenance and repair of machines are being lacked due to which much machines are in overhaul condition. A major issue to be addressed in facility layout decisions in manufacturing is: How flexible should the layout be in order to adjust to future changes in product demand and product mix. The operator and worker must take great responsibility and care while performing the jobs. The stamping and finishing of the manufacturing product must not be done manually instead it should be replaced by automatic presses and punches to do work faster and economically. The study of layout has become extremely important. The most common objective of layout design, that is to minimize distance travelled, is not always suitable for all the manufacturing industries.

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