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Lean Manufacturing

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Abstract: ***The history of Lean Manufacturing goes back many centuries, well before Ford's famous production lines for the model T ford; however it really starts to begin to be the philosophy that we know today with Toyota and the development of the Toyota Production System (TPS). Toyota set out to be far better than Ford and the rest of the US Automobile Industry, an ambition that they quickly achieved despite a lack of resources and infrastructure. They achieved this through the application of Lean Principles and the many Lean Manufacturing Tools. Toyota are far from perfect by their own admission, they are only part way on their never ending journey of Lean Manufacturing. To understand what lean is it is helpful to understand why it developed; if you can understand the purpose of lean then you can better grasp exactly what it is. Lean (and the Toyota Production System) have two main purposes; Provide Customer Satisfaction Do so Profitably Everything within Lean focuses on these two main points, with customer satisfaction taking the fore at all times. Everything that you do should provide value to the customer, anything else is waste. If the customer does not explicitly want it why are you doing it? This is why when you look at any process your first question should always be "WHY?" Too many practitioners of lean jump straight into applying principles to a process without even questioning why the process exists; often they make a wasteful process more efficient and you end up getting better at doing something the customer does not even want.***

Keywords: Blow Moulding, Injection Moulding, Polypropylene, Ergonomical

1. Problems Identified

The following observations have been made so far:

1) The two types of raw material in use have no proper location for their storage. They are placed wherever space is available and in an unorganized manner.
2) The caps as well as preforms are transported from unit A to unit B at irregular intervals and in varied means of transport like trucks and auto rickshaws.
3) At unit B, the preforms are not stacked in an ergonomical manner near the machinery.
4) There is a lot of unnecessary movement between processes in the layout.
5) In spite of a lot of space available, the cartons for dispatch are stacked very close to each other and are not easily accessible.
6) The industry is also affected by insufficient manpower.

2. Skypet Polymers

Unit A layout

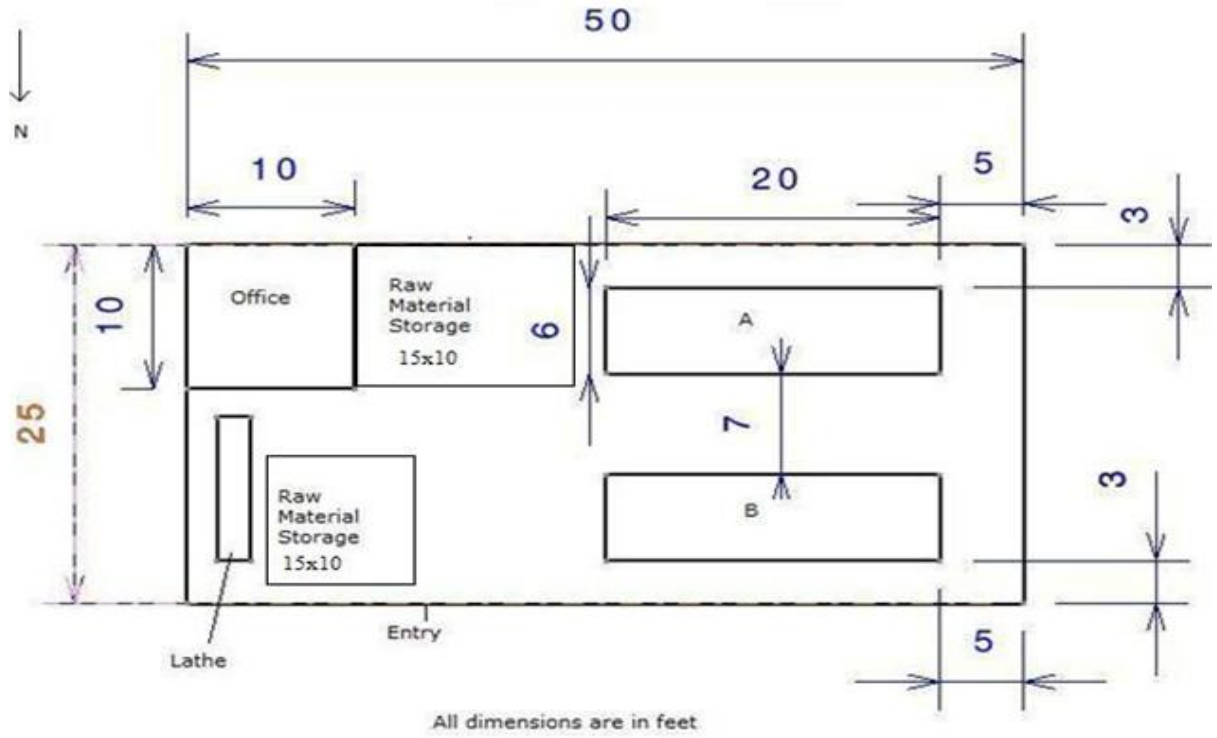


Figure 3.1: Layout of Unit A

Unit B layout

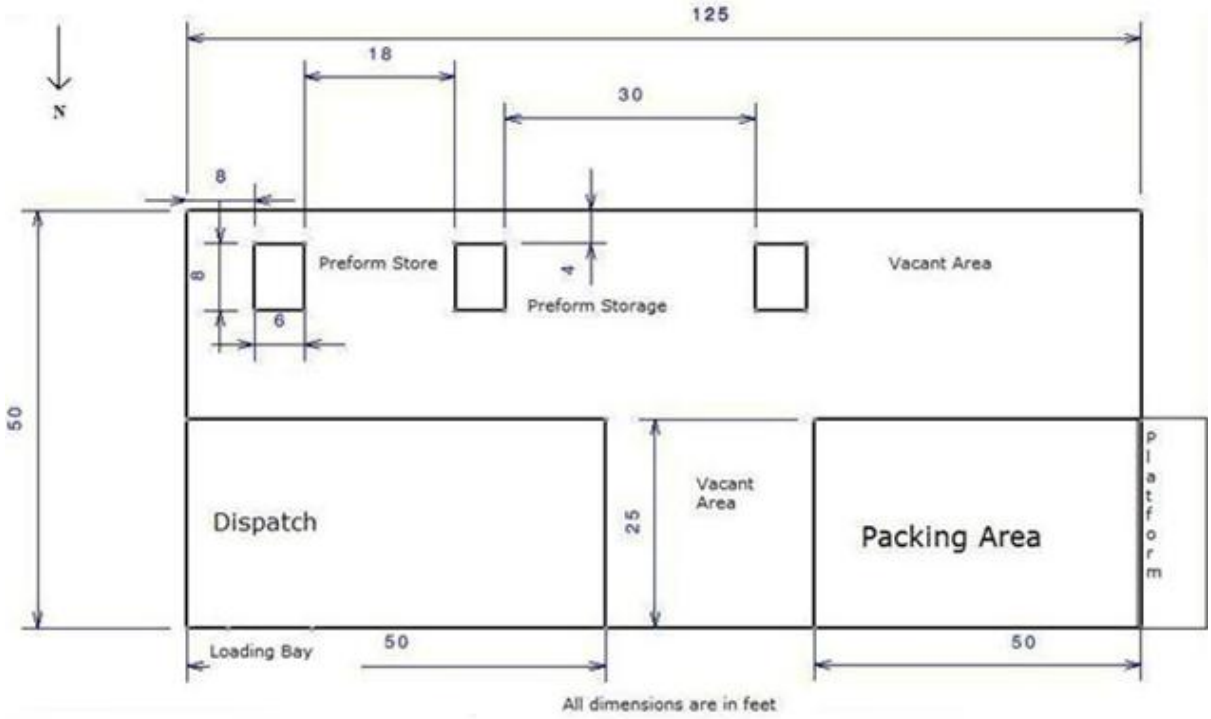


Figure 3.2: Layout of Unit B

The following are the processes carried out:

1) Raw Material Storage :
   The raw plastics (Polypropylene and PET) are unloaded from trucks and stored in Unit A.
2) Injection Moulding :
   These raw materials are fed periodically into the automated injection moulding machines where they are converted to preforms or bottle caps.
3) Fettling (Only for Bottle Caps) :
   The bottle caps which are produced in the machines are accompanied by flash since six bottle caps are produced per cycle. This is removed manually.
4) Packing :
   The preforms and bottle caps are then packed in cartons which are transported to Unit B.
5) Transport :
   The cartons from Unit A are delivered usually by a minivan to Unit B which is located 9 km. away.
6) Storage :
   The preforms delivered to Unit B are usually stored for some time since the firm obtains different types of preforms and hence, die changing is required.
7) Blow Moulding :
   The preforms from the carton are fed into the blow moulding machine after passing through a preheating circuit. The operator feeds two preforms per cycle, usually, and the bottles form from the preforms.
8) Inspection :
   Blow Moulded components usually form without any defects and hence, only a simple visual inspection is carried out to identify any non-conformities.
9) Packing :
   The bottles are stacked in plastic bags manually after the caps are screwed onto them. They are then moved to the storage.
10) Storage :
    Another storage area is present for the finished product and it is stored there until the customer arranges appropriate transport to collect the same.

3. Problems Identified

The following observations have been made so far:

- The two types of raw material in use have no proper location for their storage. They are placed wherever space is available and in an unorganized manner.
- The caps as well as preforms are transported from unit A to unit B at irregular intervals and in varied means of transport like trucks and auto rickshaws.
- At unit B, the preforms are not stacked in an ergonomical manner near the machinery.
- There is a lot of unnecessary movement between processes in the layout.
- In spite of a lot of space available, the cartons for dispatch are stacked very close to each other and are not easily accessible.
- The industry is also affected by insufficient manpower.

Improvements in Unit A

- In Unit A, the raw material, i.e., PET and Polypropylene were not stored in an organized manner.
- Once storage near the Office wall was filled, material would be stored near the lathe.
- Such a setup will result in confusion since the different materials are mixed and no proper stock of material can be maintained.

Improved Layout

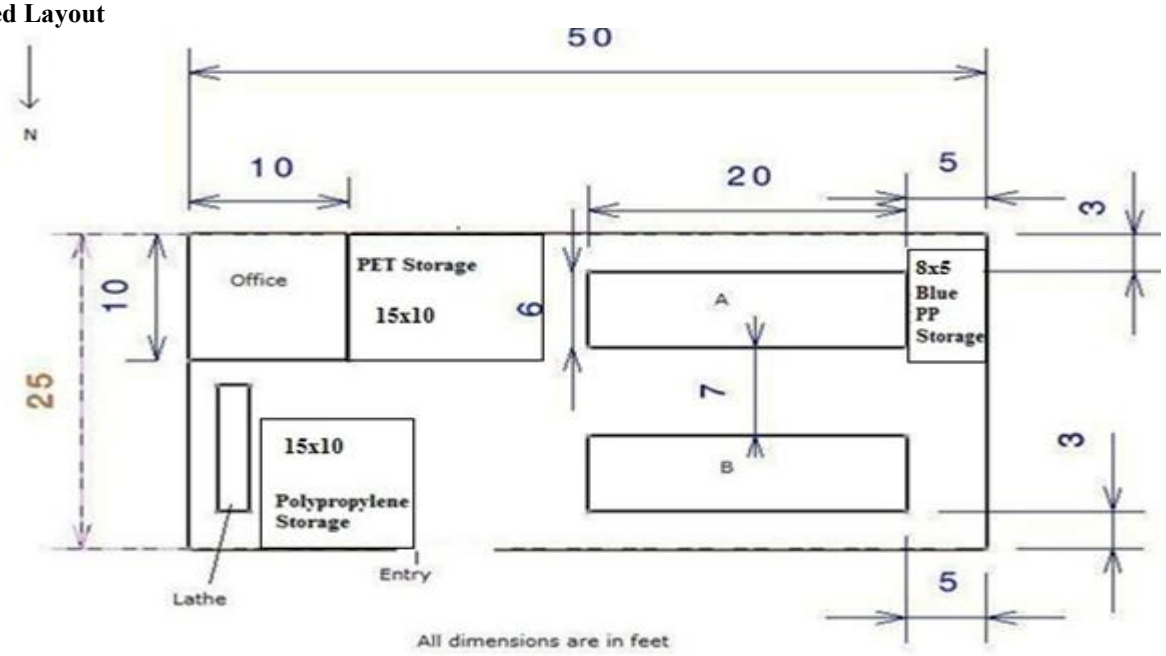


Figure 4.2: Unit A after layout improvement

Points taken into consideration

- In the improved layout, PET storage is made near the office and Polypropylene is stored near the lathe.
- Also, bags containing blue coloured pellets of Polypropylene (1 bag of blue pellets is mixed with every 5 bags of white coloured ones for bottle caps) is assigned a separate storage near the west wall.
- Hence, such a change provides pre-defined storage space and also helps avoid confusion and keep stock of material with ease.

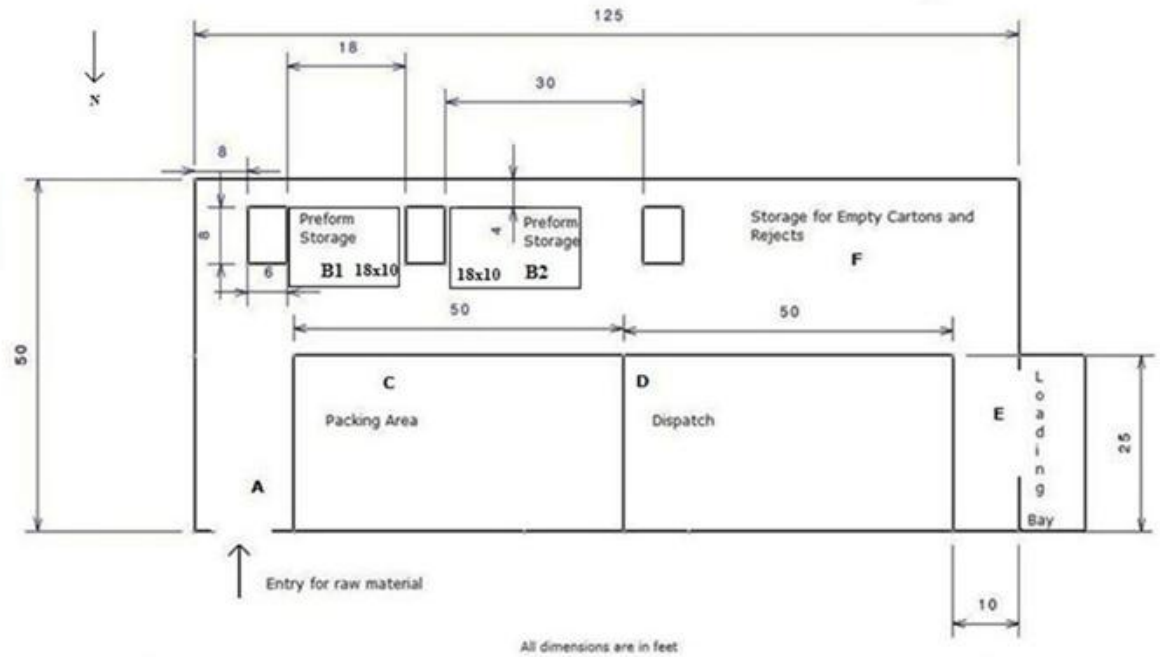
Improvements in Unit B

- Preform is unloaded at platform A.
- It is then transported manually from A to the storage areas B.
- From there, it passes through the pre-heater and into the machine at C.
- The finished bottles are moved to D where they are visually examined and packed.
- The packed containers are stacked at E.
- Once, the customer's collection vehicle arrives, it is delivered through the loading bay F.

Problems in this practice

- There is a lot of cross movement of material, i.e., preform moves through packing area, and also unnecessary movement of material for comparatively long distances. This creates confusion as well as takes a lot of time.
- A lot of space is also left unused.

4. Intermediate Modification



Layout of Unit B Intermediate Modification

Sequence of operations

- The raw material now enters through the entry at A (Previously F).
- It is then transported to the preform storage at B.
- The preform is then blow moulded and transferred to the packing area at C.
- It then moves to the dispatch area D.
- It is stored here temporarily until the customer's collection vehicle arrives and is loaded into the vehicle at E.
- The empty cartons as well as rejects are stored at F from where they are disposed.

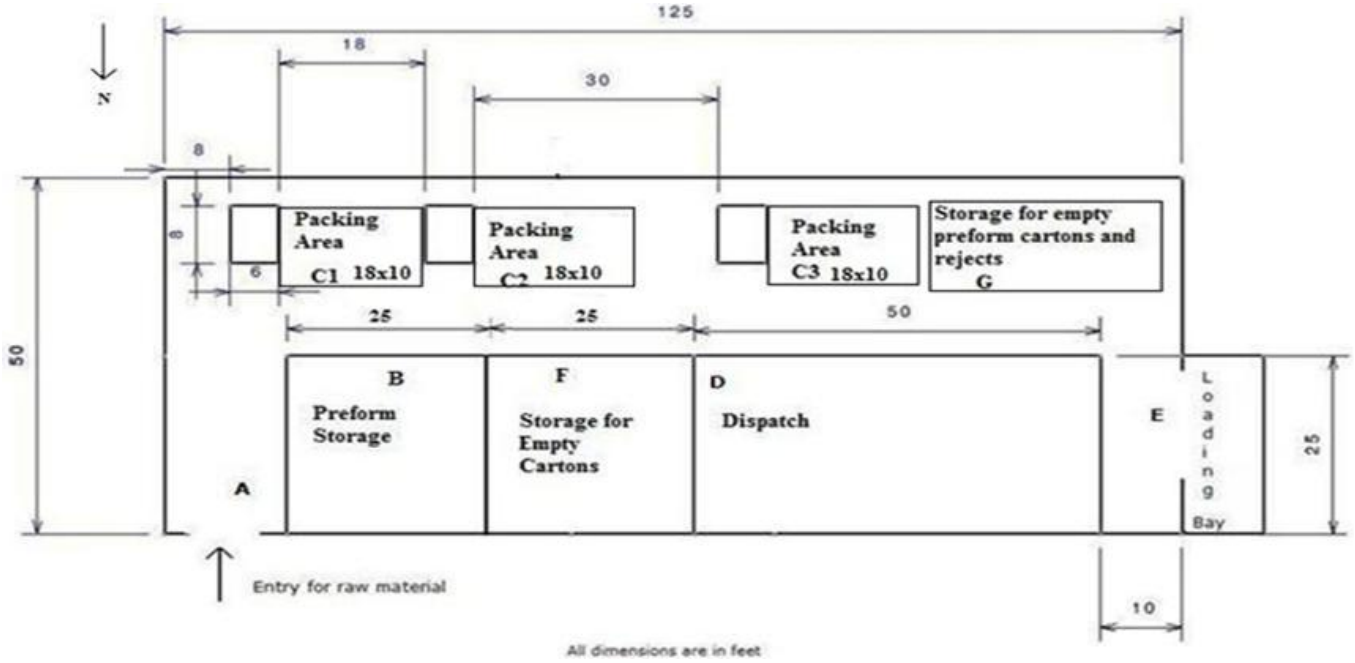
Objectives Accomplished:

- Unnecessary movement of material is avoided.
- The time taken to carry out the processes has reduced.

Scope for improvement in proposed layout :

After the implementation of the first layout change and observing the results, a few discrepancies were identified:

- The storage of preform near the machinery was unnecessary since each machine would consume only a carton of preform per hour.
- Hence, the space can be used for more productive work.
- Secondly, the packing area was away from the machines so movement of material became necessary and it was very inefficient to move the bottles.
- So, a layout change was made and implemented and this helped to increase the productivity further.



Layout of Unit B Final modification

Sequence of operations :

- The preform enters through A.
- It is stored temporarily at preform storage B.
- The preform cartons are then moved to where the machines are located.
- The bottles pass through a pre-heater and are blow moulded.
- The bottles are then packed at C.
- Each machine has a separate packing area exclusively for it.
- The packed bottles are then stored at dispatch D.
- A space F is also provided to store polythene bags and cartons used for packing purpose.
- Once the customer's collection vehicle arrives, it is loaded into it at E.
- The cartons, rejects and other unwanted material is placed at G from where is disposed periodically.

Objectives Accomplished:

- The layout has been optimized further.
- Space has been utilized to the maximum.