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Standard Time Study

Vibhor Gupta[1], Ayush Yajnik[2], Rahul Kadian[3], Vishal Sharma[4]

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, an ything 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. This research is based on the mathematical solution to the given problem.***

Keywords: Intermediate, Preform Storages, Carton, Labor, Efficiency

1. Unit B: Skypet Polymers

Data Collected for Time Study in Original Layout

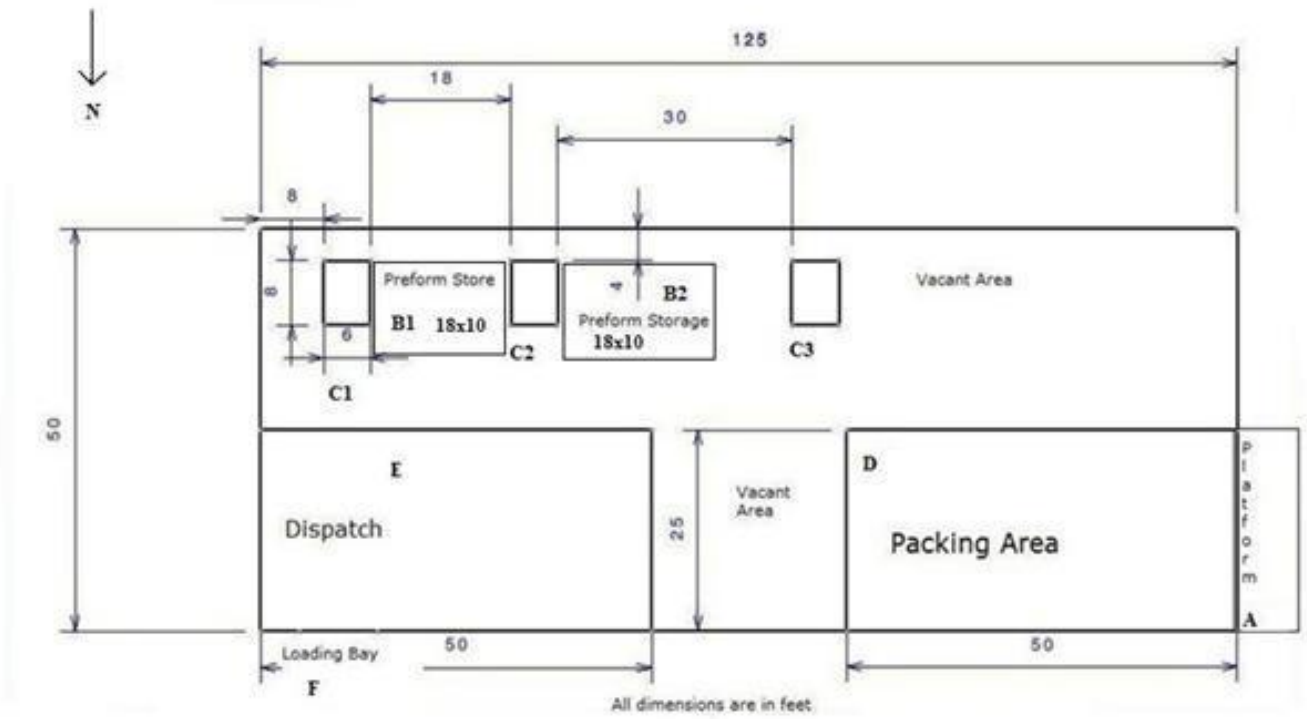

Figure 4.6: Time study – Layout B original

- Distance covered for movement of cartons to Preform Storages
  A – B1 = 120 ft.
  A – B2 = 90 ft.
- Time taken for movement,
  A – B1 = 33s.
  A – B2 = 25s
- Amount of preform which the unit consumes every 8 hrs. = 27 cartons (i.e., 1 carton of preform/machine per hour x 8 hrs. x 3 machines + bottle caps, i.e., 3 cartons)
- Time taken to move this load from A,
- To B1, where 8 carto ns are stored, 33*8 + 25*7 = 439s. Since manual labor is involved, let us assume 130% of theoretical time is taken = 439*1.3 = 571s = 9min. 30s.
- To B2, where 16 cartons are stored, 25*16 + 20*15 = 700s
- Since manual labor is involved, assuming 130% of theoretical time = 700*1.3 = 910s = 15min. 10s.
- Time taken to move the load = 9min 30s + 15min 10s = 24min 40s.
- Time taken for blow moulding = 14s for every 2 bottles.
- No. of bottles produced/hr. = 3600/14 = 500 bottles approx.

- Time taken for packing = 15 min. for every package containing 50 bottles.
- Distance to packing area, from C1 – D = 60 ft.
  From C2 – D = 35 ft.
  From C3 – D = 10 ft.
- No. of bottles packed/person per hour = 60/15*50 = 200 bottles
- But, practically, assuming only 80% efficiency, = 160 bottles.
- Distance to be travelled to move bottles to loading bay = 50ft. max
- Time taken to move 1 package = 20s.
- Assuming 500 bottles to be shipped, = 20*10 = 200s = 3min 20s.
- But, practically time taken = 5 min. since bottles stacked irregularly.

2. Data Collected for Time Study in Intermediate Layout

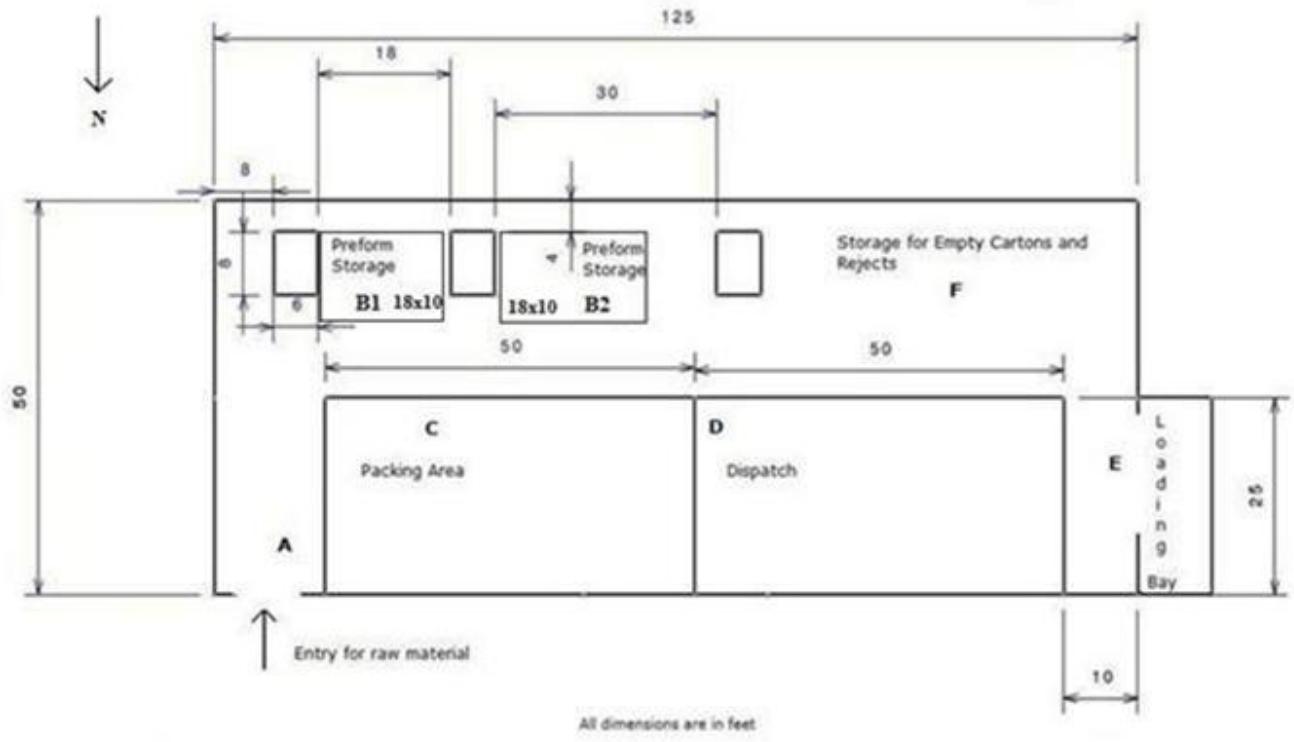

Figure 4.7: Time study – Layout B intermediate

- Distance covered for movement of cartons to Perform Storages
  A – B1 = 40 ft.
  A – B2 = 70 ft.
- Time taken for movement,
  A – B1 = 12s.
  A – B2 = 20s
- Amount of preform which the unit consumes every 8 hrs. = 27 cartons (i.e., 1 carton of preform/machine per hour x 8 hrs. x 3 machines + bottle caps, i.e., 3 cartons)
- Time taken to move this load from A,
  To B1, where 8 cartons are stored, 12*8 + 9*7 = 159s.
  Since manual labor is involved, let us assume 130% of theoretical time is taken = 439*1.3 = 207s = 3min. 30s.
- To B2, where 16 cartons are stored, 20*16 + 16*15 = 560s
- Since manual labor is involved, assuming 130% of theoretical time = 560*1.3 = 728s = 12min. 10s.
- Time taken to move the load = 3min 30s + 12 min. 10s = 15min.40.
- Time taken for blow moulding = 14s for every 2 bottles.
- No. of bottles produced/hr. = 3600/14 = 500 bottles approx.
- Time taken for packing = 12 min. for every package containing 50 bottles.
- Distance to packing area,
  From machines – D = 10 ft.
- No. of bottles packed/person per hour = 60/12*50 = 250 bottles
  But, practically, assuming only 80% efficiency, = 200 bottles.
- Distance to be travelled to move bottles to loading bay = 50ft. max
  Time taken to move 1 package = 20s.
- Assuming 500 bottles to be shipped, = 20*10 = 200s = 3min 20s.
  (No time losses since bottles are accessible easily).

3. Data Collected for Time Study in Final Layout

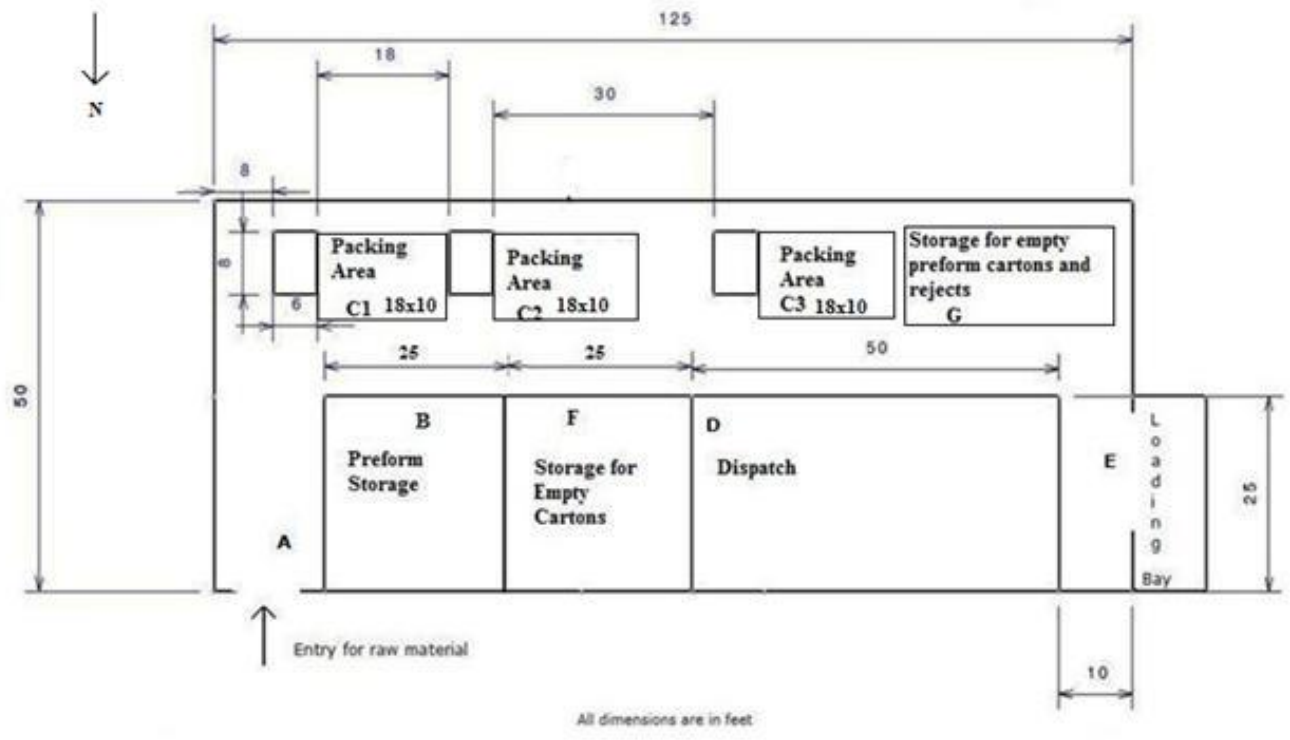

Figure 4.8: Time study – Layout B final

- Distance covered for movement of cartons to Preform Storages
  A – B = 25ft.
- Time taken for movement,
  A – B = 7s.
- Amount of preform which the unit consumes every 8 hrs. = 27 cartons (i.e., 1 carton of preform/machine per hour x 8 hrs. x 3 machines + bottle caps, i.e., 3 cartons)
- Time taken to move this load from A,
- To B = 24*12 + 23*9 = 495s.
  Since manual labor is involved, let us assume 130% of theoretical time is taken = 495*1.3 = 644s. = 11min. approximate
- Time taken for blow moulding = 14s for every 2 bottles.
- No. of bottles produced/hr. = 3600/14 = 500 bottles approx.
- Time taken for packing = 10 min. for every package containing 50 bottles.(No movement to packing area necessary).
- No. of bottles packed/person per hour = 60/10*50 = 300 bottles
  But, practically, assuming only 80% efficiency, = 240 bottles.
- Distance to be travelled to move bottles to loading bay = 50ft. max
- Time taken to move 1 package = 20s.
- Assuming 500 bottles to be shipped, = 20*10 = 200s = 3min 20s.
  (No time losses since bottles are accessible easily).

4. Result

4.1 Changes in Productivity

Table 4.1: Time Study conclusion

Operation	Original Layout	Intermediate Layout	Final Layout
Preform Movement			
Per Carton	50s approx.	30s approx.	11s
Per Load	24 min.	15min. 40s.	11 min.
Efficiency Improvement	Nil	35% improvement	54% improvement
Packing			
Per Package	15 min.	12 min.	10 min.
Per Hour	160 bottles	200 bottles	240 bottles
Efficiency Improvement	Nil.	25% improvement	50% improvement.
Movement To Loading Bay			
Per Load of 10 Packages	5 min.	3min. 20s.	3min. 20s.
Efficiency Improvement	Nil	33% improvement	33% improvement

References

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