DeeZee Manufacturing T1XX Layout Restructure & Standardization

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DeeZee Manufacturing T1XX Layout Restructure & Standardization

Problem Statement
Improve Layout, Material/Process Flow, and Throughput of G.M. Sidestep (Running Board) Assembly Cells.

DeeZee Manufacturing is a medium-sized truck accessory and fabrication company located in central Iowa. Established in 1977, DeeZee is committed to building durable, functional, and stylish products with the consumer in mind. The company is always promoting a cleaner tomorrow by using eco-friendly manufacturing processes and lean practices to reduce emissions and energy use. DeeZee is contracted by most of the large car manufacturers such as Chrysler, Ford, GM, Honda, and Toyota to produce parts for their vehicles. DeeZee has a significant presence in Iowa, with seven large industrial buildings located in central Iowa totaling over one million in combined square feet. These buildings are dedicated to the manufacturing, packaging, warehousing, and shipping of DeeZee products.

Our client, DeeZee, was experiencing several problems with their 3 G.M. running board assembly cells.

1. The current layout around the 3 cells did not have designated floor markings for where materials go.
2. DeeZee’s current automated process was producing a large number of defects, thus reducing the Overall Equipment Efficiency (Refer to Appendix).
3. There was little enforcement of the Standard of Work (rules for employees to do their job-specific).

Disciplines
Bioresource and Agricultural Engineering | Industrial Technology

Authors
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1 PROBLEM STATEMENT

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1. The current layout around the 3 cells did not have designated floor markings for where materials go.
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3. There was little enforcement of the Standard of Work (rules for employees to do their job-specific).
● **Business Case Statement**

DeeZee’s main issue was the lack of layout standardization and product placement, which led to poor Overall Equipment Efficiency (OEE) on three cells of their G.M. running board line. There was no layout control or Standard of Work (SOW) in place for those three cells causing disorganization of process’s supplies, trash, finished products, and defects. Our plan was to implement lean principles (Refer to Appendix) for the process of the three cells.

We measured different data sets to locate where the waste and lag was happening in their process. Fortunately, our group pinpointed the areas that needed the most attention. Thanks to our previous internship experiences and the learned material of our Lean Manufacturing course, we were able to apply these standards to DeeZee’s workspace.

The disorganization was spread throughout the three workstations and trickled into the surrounding staging areas. This created issues with traffic, product placement, lack of access to material, and safety concerns.

A messy workplace can create dysfunction in several ways. It was our job to use the standards of a lean work environment and apply them to the G.M. running board cells. This not only cleaned the operator’s workstations but also created an even flow for material to pass through, be delivered, removed, or accessed.

DeeZee has benefitted from the outcome of this project, not only in terms of safety and product flow, but the visual appeal of the workplace makes for a more productive work shift by the floor operators and for the leadership roles in managing. By applying lean principles to their process, it will save the company time, money, and waste. Being mindful of those three areas is key to a profitable business. To be a successful company with lean principles must be used and strictly followed; by applying them, DeeZee will be able to learn from the experience and apply those ideas to future processes.

2 **MAIN OBJECTIVE**

Our project goal with DeeZee was to create and sustain a well-organized workspace for the G.M. Running Board production cells. The process that is in place was not to be changed, but the layout needed organization and waste reduction. By applying a lean strategy and 6S standards, our group found the reason for inventory displacement and wasted motion was a result of non-standardized work procedures.

● **Specific Objectives:**
  ○ Design a floor layout that benefits workers and meets the client’s process criteria
    ■ Apply floor markings in three work cells
    ■ Create a standard training for the Lean Manufacturing department to promote
    ■ To ensure workers have an ergonomically-sound workplace
  ○ Abide by client constraints and follow a work project plan
    ■ To not interfere with Automation in the process
    ■ To not interfere with **Quality Rework** *(Reference appendix)* station

● **Rationale:**
  ○ DeeZee will be able to keep visual management of inventory and product flow
  ○ Part location and retrieval will be standardized

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● **Project Scope:**
  - The initial project scope was defined to Improve OEE, Product Flow, Standardize work of cell personnel
  - Adjustments to scope were necessary after the initial solution that was proposed had been declined due to quality procedure conflicts
  - The final scope of the project became layout organization and color-coding standardization; 6S training was given to floor employees, shift managers, and inventory drivers

3 **METHODS/Approach**

● **Reference Material(s):**
  The reference material we used throughout the project included 3 different aspects that helped our group to approach the problem. These 3 aspects are weekly time studies of the 3 identical T1XX GM board lines (Newest board for 2020 Chevy truck), Layout of AutoCAD drawing of DeeZee Facility, and Production data collection of %OEE daily.

● **Data collection:**
The data that we collected that helped discover the root cause of wasted time in each cell includes using a Spaghetti Diagram, Production Flow Diagram, Times Studies, Waste Walk, and Visual inspections (Refer to Appendix).

● **Skills:**
The skills that we needed to develop and be able to use to solve and understand how the running boards run through the cell come from two main classes in the major of Industrial Technology. These classes included Lean manufacturing (TSM 440) and AutoCAD (ABE 273), which helped us understand the terminology of information and data that was given during the beginning of the project. To perform well as a group, we all needed to communicate with each other on different platforms, have leadership in different aspects of the project, and keep professional by being reliable with each other.

● **Solutions:**
The proposed solution was developed by collaborating as a team and agreeing on what issues in each cell we should be focused on to satisfy the client by fixing organization and process flow problems. The solutions that were developed had inputs and constraints from the client and our group ideas that can improve each cell. These solutions that we as a group and our client wanted to apply in each cell were lean standards, floor markings, and 6s taping to have standardization and neatness (Refer to abstract for chart colors of tape). By applying standardization, it will decrease time in the process and increase OEE% by 15%. This was measured by calculations in the abstract. Also, visual measurements of success were added by comparing the current and future states of AutoCAD. By doing these solutions, it will align with every objective our clients wanted to improve their OEE% by 15%. Besides the client’s objectives, it has also increased safety and the quality of the environment within each cell.

● **Organization:**
As a group, we met with DeeZee every week by driving to the factory and getting visual inspections on how, when, where we will implement our solutions. We then used the approach of who has the best skills for that area of work and adapted them as the leader in that area.
The milestones for our project were figuring out what the client needed, collecting data, developing a solution, and then proposing the solution. We conquered setbacks by continuously thinking of new ideas and solutions to the client that worked in their vision for the scope of our project.

- **Timeline:**
  
  Defined scope of project | Collected data | Developed proposed solutions | Picked the best solution | Presented the solution | Implement the solution

## 4 RESULTS

- **Results/Deliverables:**
  
  Our goal was to improve the OEE, as Manufacturing Industry goes there are constant setbacks dealt with and cross-departmental communication where we had to be aware and flexible to change and ready to adjust to what new demands may be. We were successful in standardizing the work cell layouts so that operators had a steadier workflow even during constant changes in management demand. The production data shows at least a 15% OEE increase.

- **Recommendations:**
  
  After our implementation, we recommend having a 30/60/90 day check in to assure floor markings are still there, and any new employees are trained to know the reason behind standardization. We also recommend that operators be offered the ability to provide recommendations or feedback on how the floor markings are helpful or can be more helpful. A next phase project could be that with the future of the company moving into conveyor belts that standardization and Standard operating procedures are updated and understood.

## 5 BROADER OPPORTUNITY STATEMENT

1. Given that our project is organizing cellular workstations, our appeal is visual, and the color coordination and geometry allow anyone to see if something may be out of place.
2. Our project addresses the global need for improving the workplace organization and, therefore, efficiency. For any industry noticing their problems and things that may be out of reach or process flow, that is average. This project will help them see that their process may be inconsistent and needs a new set of standards.
3. Truly any work environment can use this technique of having a place for everything and noticing easier when something is wrong or missing.
4. Trends affecting this Broader Opportunity is the increasing positive effect with Lean Production.
5. Competitors are always focused on cutting costs in manufacturing, but it will cost more money and more time by shutting down a line and allowing all employees to address issues and seek process improvement before attempting to produce more. Problems should be dealt with before they become too big.
6 GRAPHICAL ABSTRACT

Calculations of OEE%

OEE – Summary (Actual Calculation)

\[
OEE = \frac{\text{Availability} \times \text{Performance} \times \text{Quality}}{\text{Total Parts Produced}}
\]

\[
= \frac{136.6 \text{ minutes} / 187 \text{ minutes}}{73\%} \times \frac{148 \text{ parts} / 210 \text{ parts}}{74\%} \times \frac{108 \text{ parts} / 148 \text{ parts}}{73\%} = 39\%
\]

\[
OEE = \frac{147 \text{ minutes} / 168 \text{ minutes}}{87.5\%} \times \frac{191 \text{ parts} / 252 \text{ parts}}{75.8\%} \times \frac{163 \text{ parts} / 191 \text{ parts}}{85.3\%} = 56.6\%
\]

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Standard Colors for Operations area:

<table>
<thead>
<tr>
<th>Operation</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>End Caps/Scanner Safety Zone</td>
<td>Yellow</td>
</tr>
<tr>
<td>Step Pads/Empty Step Pads Pallet</td>
<td>Blue</td>
</tr>
<tr>
<td>Finished Totes/In Process</td>
<td>Green</td>
</tr>
<tr>
<td>Trash/Donage</td>
<td>Black</td>
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<tr>
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<tr>
<td>Braces</td>
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</tbody>
</table>

7 Appendix

**Spaghetti Diagram:** A visual representation using a continuous flow line tracing the path of an item or activity through a process.

**Production Flow Diagram:** Representation of the order by which a sequence of products is created according to product-based planning principles.

**Times Studies of parts on production line:** Calculating the amount of time a G.M. Board gets through a step of the process.

**Waste Walk:** A given sheet that helps an employer to evaluate where different parts of the process are lacking efficiency for time that is allowed for the activity.

**Visual:** Looking at the process and evaluating where misplaced items are in the cell.

**Muda:** Japanese word for wastefulness or uselessness, which is a key concept of lean process thinking.

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