Final presentation at Becton Dickinson
Group members for Assembly

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Group Members for Warehouse

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Group member for Filling and Formulating

• Omar Alwasmi
Final Update of Project

- Documentation of material handlers’ performances and wastes at different shifts.
- Time Study Research
- Efficient Material Handling Alternatives
- Metrology
- Standardization of work
Layout division

Assembly

Offices

Formulating & Filling

Warehouse
Spaghetti diagram
Yellow – 26#6
Green – K9
Blue – 26#4
Brown – 26#5
Black – 10.5 #2
Grey – 10.5 Manual
Light Blue – 3 ml
Pink – 1.5 ml
Purple – Frappe
Turquoise – Packing
Time keeping for 1 machine at assembly 10.5 #2

<table>
<thead>
<tr>
<th>Task</th>
<th>Time taken</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goes to warehouse</td>
<td>54 sec</td>
</tr>
<tr>
<td>Organizes the tunnel</td>
<td>6 sec</td>
</tr>
<tr>
<td>Back from warehouse to the tunnel</td>
<td>128 sec</td>
</tr>
<tr>
<td>Move from tunnel to 10.5 #1</td>
<td>78 sec</td>
</tr>
<tr>
<td>Unloads rack</td>
<td>38 sec</td>
</tr>
<tr>
<td>Goes to warehouse</td>
<td>64 sec</td>
</tr>
<tr>
<td>Waits to go to the warehouse</td>
<td>53 sec</td>
</tr>
<tr>
<td>Takes load and come back</td>
<td>168 sec</td>
</tr>
<tr>
<td>Waits tunnel to open</td>
<td>30 sec</td>
</tr>
<tr>
<td>Goes back from WH to 10.5 #1</td>
<td>75 sec</td>
</tr>
<tr>
<td>Unloads it</td>
<td>42 sec</td>
</tr>
<tr>
<td>Organized parts in rack</td>
<td>25 sec</td>
</tr>
<tr>
<td>Unloads from 1 rack to another</td>
<td>60 sec</td>
</tr>
<tr>
<td>Change label</td>
<td>30 sec</td>
</tr>
<tr>
<td>Organized station</td>
<td>50 sec</td>
</tr>
<tr>
<td>Goes to warehouse</td>
<td>46 sec</td>
</tr>
<tr>
<td>Comes back empty</td>
<td>50 sec</td>
</tr>
<tr>
<td>Goes to 26#4 with another MH</td>
<td>85 sec</td>
</tr>
<tr>
<td>Organizes racks</td>
<td>17 sec</td>
</tr>
<tr>
<td>Changes label</td>
<td>8 sec</td>
</tr>
<tr>
<td>Goes to WH empty</td>
<td>75 sec</td>
</tr>
</tbody>
</table>

Wastes Observed in Red
## Warehouse

<table>
<thead>
<tr>
<th>Ivan Villareal</th>
<th>Fred</th>
<th>Vicente</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>26 mL #6 Pack:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 1:28:36 to get the cart</td>
<td>• 0:6:35 to get the cart</td>
<td></td>
</tr>
<tr>
<td>• 0:13:51 to open the job</td>
<td>• 0:19:12 to open the job</td>
<td>• 0:8:17 to get the cart</td>
</tr>
<tr>
<td>• 0:18:22 to collect the boxes</td>
<td>• 0:5:46 to collect boxes</td>
<td>• 0:12:30 to open the job</td>
</tr>
<tr>
<td>• 0:3:38 to move it to the location</td>
<td>• 0:5:10 to move it to the location</td>
<td>• 0:4:19 to collect the boxes</td>
</tr>
<tr>
<td>• 0:2:28 to put it on the system</td>
<td>• 0:1:59 to put it on the system</td>
<td>• 0:3:45 to move it to the location</td>
</tr>
<tr>
<td><strong># 1 mL:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 0:6:35 to get the cart</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 0:19:12 to open the job</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 0:5:46 to collect boxes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 0:5:10 to move it to the location</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 0:1:59 to put it on the system</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong># Ampules:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 0:8:17 to get the cart</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 0:12:30 to open the job</td>
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<tr>
<td>• 0:3:45 to move it to the location</td>
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<td></td>
</tr>
</tbody>
</table>
Formulating and filling

Tank new and wait for call 0:58:16
Cleaning 0:5:36
Take the cart to warehouse and it wasn’t received 1:5:93
The warehouse fills the cart 2:28:68
He takes the carts 1:00:36
Move struck #9 1:2:93
Cleaning of the cart 2:58:62
Moving cart out of warehouse 8:31:83
Take cart from warehouse 00:53:43
Move fall of pallet empty pallet 1:28:83
Take paper to racks 0:52:29
Move and cover strunk 5:11:19
Get the new rack room 7 1:39:01
Do inventory 8:13:72
Bath #2 need an empty rack 5:31:97
Do stretching 10:00:00
Cleaning 4:14:31
Wastes observed

- Unnecessary handling of parts
- Unnecessary move of people
- Unnecessary ergonomic effort
- Workers waiting (Idle time)
Suggestions for Material Handling optimization

• MH is present in Warehouse, Assembly and Formulating and Filling when dealing with:
  • Movement
  • Protection
  • Storage
  • Control of materials
10 principles of Material Handling:

- Planning
- **Standardization**
- Work
- Ergonomics
- **Unit load**
- Space utilization
- System
- Environment
- **Automation**
- Life cycle cost
Suggested ways to improve performance

• Standardize the components involved
• Optimize the human factor
• Automate material handling
Automated Storage and Retrieval System (AR/RS)
AR/RS description

• Composed of a variation of computer-controlled systems
• Automatically places and retrieves loads from set storage locations in a facility with precision, accuracy and speed.
• Increases ergonomics by delivering items to the operator at a convenient height, eliminating time lost to walking, searching, lifting, bending and twisting activities.
• Enables to totally integrate material handling storage
AR/RS benefits

- High Durability and low maintenance cost
- Reduces wastes related to the human factor
- Standardize the flow of products
- Easier to control and correct mistakes
- Saves floor space
- Provides highest possible storage density
- Increases labor productivity up to 85%
- Enhances product security
- Provides real-time inventory control
Automatic Guided Vehicles (VHC)
AVG benefits:

• Eliminate Damage to Structures and Product
• Increase Workplace Safety and Lower Costs
• Less Expensive more flexible than Fixed Automation Systems (conveyor systems)
  • Does not impact the work flow during implementation, like conveyors do
  • Flexibility to change locations and functions
• Reduce Utility Costs
  • Operate in higher or lower temperatures, saving AC and ventilation cost
• Increase Inventory Efficiency and Accuracy
  • Automatically track inventory, removing the need to have a professional doing it
Best option between AR/RS and AGV

• Using AVG’s saves companies money in both direct and indirect ways.
  • Low installation cost
  • Lowers labor costs
  • Cheaper utility bill
  • Lower insurance premiums
  • Allows you to keep more of your revenue as profit.
Measures imperfections in the surface of an ampoule
Measures the disparity of solutions inside recipients
Metrology considers:

• Reliability

• Accuracy of production

• Ensure that there is little waste. Where the measurement is carried out in the process will be dependent upon the type of industry that is using it.
Importance of metrology

• Metrology ensures the quality of the product.
• Getting the initial drawing right will also ensure that the project stays within budget, thereby saving money.
• Precision of measurements are crucial to comply with the safety and quality requirements for public use or consumption
Metrology at BD

• When applied at BD, Metrology contributes with:
  • Better control of the dosage of solutions inside products
  • Reduction of waste by avoiding the manufacture of non-functional parts
  • Safety for customers (Hospitals)
  • Facilitates to follow Regulations from Agencies
  • Better enables BD to design, conduct and analyze results, providing an internal feedback and evaluation about the level of accuracy when producing this product
  • Even higher reliability of the product when used in the Hospital, contributing to its high reputation
Standardization of Work

The Framework of Standardization

- **Standardization**
  - The practice of setting, communicating, following, and improving standards and standard work

- **Standard Work**
  - A set of work procedures that establish the best and most reliable methods and sequences for each process and each worker

- **Standards**
  - A rule or example that provides clear explanations
Benefits of standardizing work

• One of the most powerful but least used lean tools.
• By documenting the current best practice, standardized work forms the baseline for kaizen or continuous improvement.
• Reductions in variability
• Easier training of new operators
• Reductions in injuries and strain
• Standardizing the work adds discipline to the culture, essential for lean to take root.
Parts of Standardization of work

• Takt time, which is the rate at which products must be made in a process to meet customer demand.
• The precise work sequence in which an operator performs tasks within takt time.
• The standard inventory, including units in machines, required to keep the process operating smoothly.
Standardization of work related to BD

• Based on the features of BD, the most recommended tools for establishing a standard operation are:
  • Production capacity sheet
  • Standard work combination sheet
  • Standard work sheet
Production capacity sheet

- Determines a given process’ capacity for a shift, and thus its ability to meet takt time
- Based on the calculation of each process step’s capacity, considering the available time per shift, completion time, and tool change time
- The process’ overall capacity is defined by the bottleneck step by:
  - Changeover time reduction and machine and/or operator cycle time reduction address this step
STANDARDIZED WORK COMBINATION TABLE

• This chart shows the combination of manual work time, walk time, and machine processing time for each operation in a production sequence.

• This form is considered a more precise process design tool than the Production capacity sheet.

• It can be very helpful to identify the waste of waiting and overburden, and to confirm standard work—in—process
Standard Work Sheet

• The lines should show a general flow, not every step the person takes
• It provides a graphical view of the workstation, the path of the operator and the amount of standard work-in-process required to keep the process flowing smoothly
Journal Sources


• STANDARDIZED WORK: THE FOUNDATION FOR KAIZEN.https://www.lean.org/workshops/WorkshopDescription.cfm?WorkshopId=20;  
