Final presentation at Becton Dickinson

Group members for Assembly

- Leonardo Foligne
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Group Members for Warehouse

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Group member for Filling and Formulating

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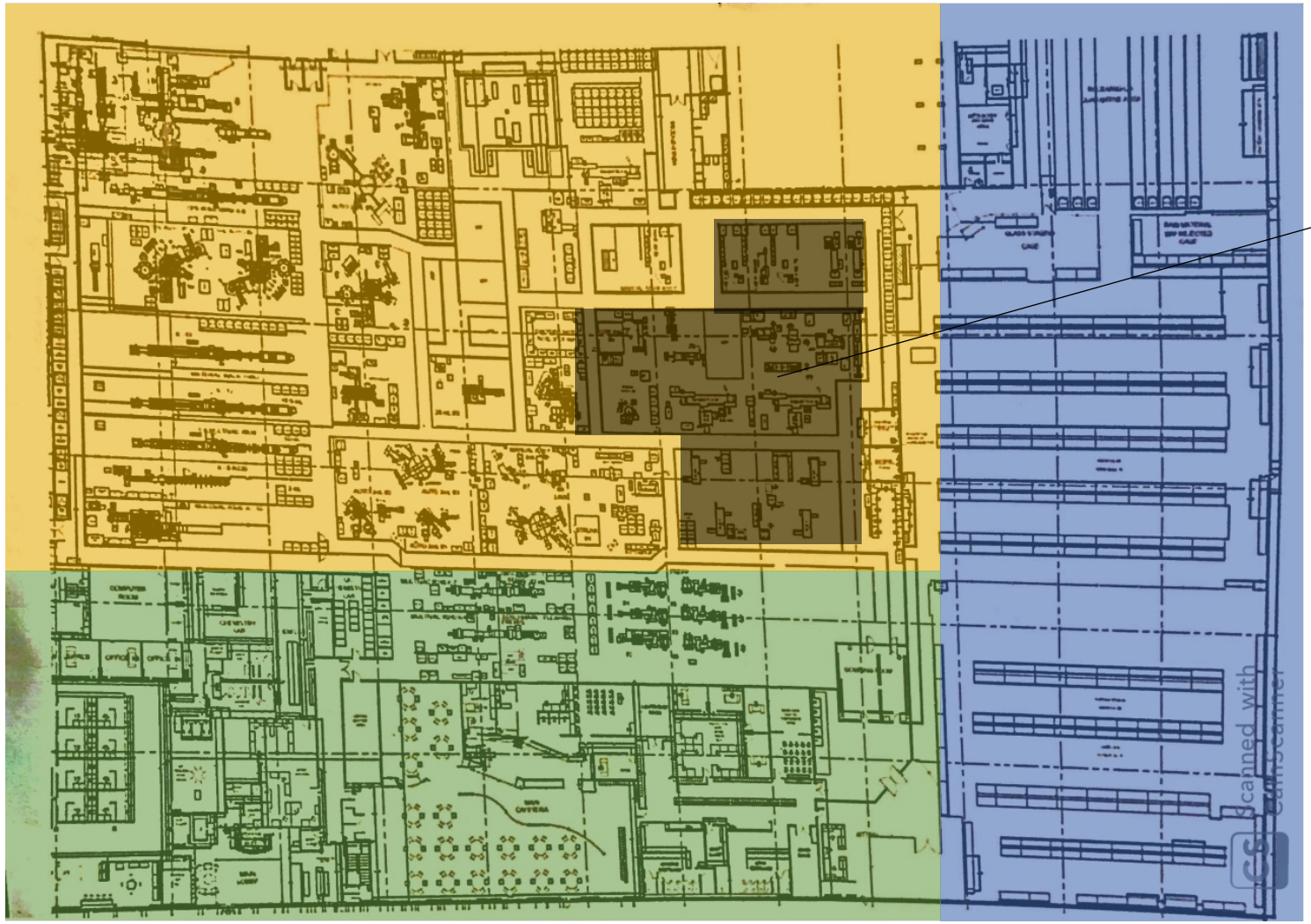
Final Update of Project

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

Layout division



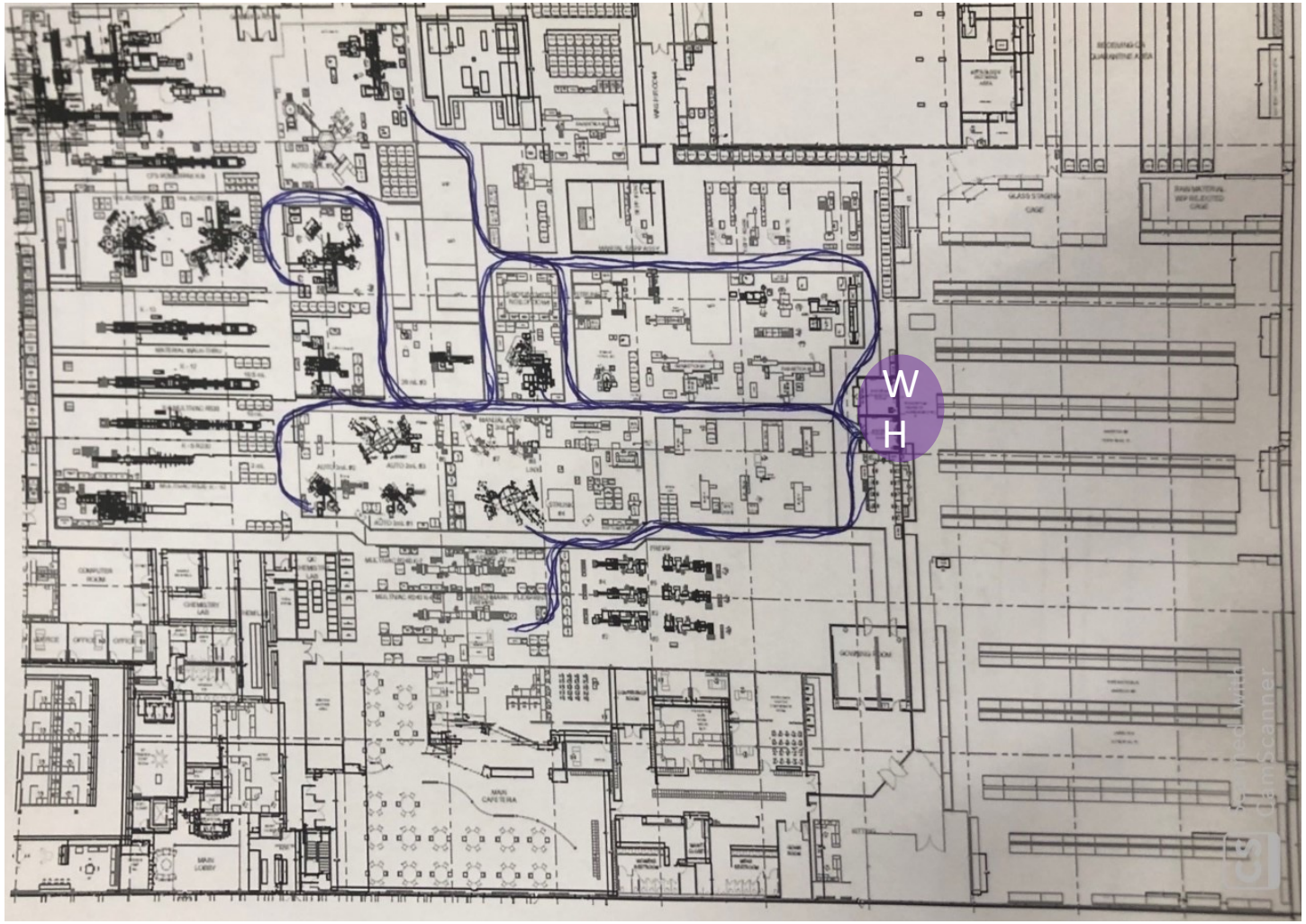
Assembly

Formulating & Filling

Warehouse

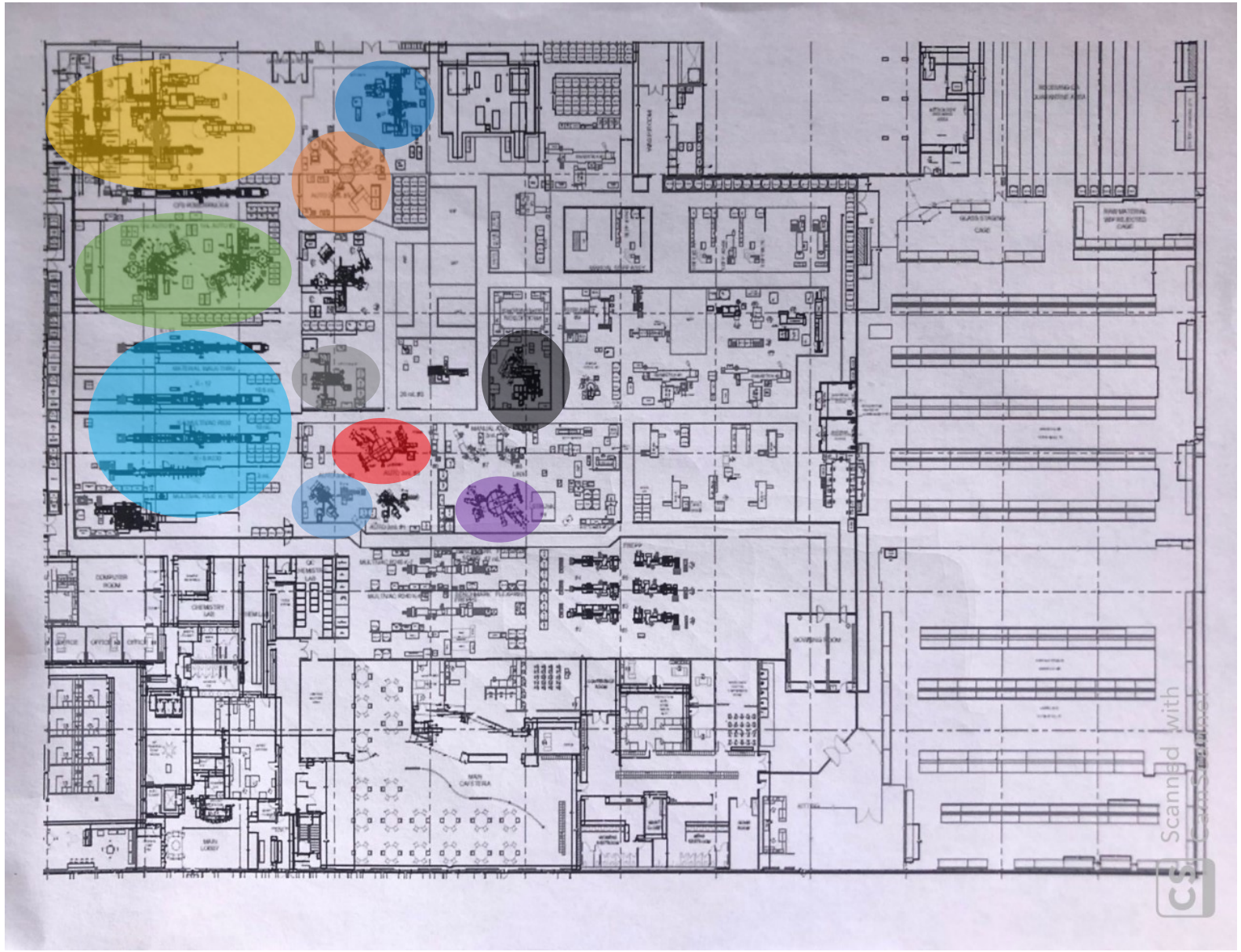
Offices

Spaghetti diagram



Machines

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

Wastes Observed in Red

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

Warehouse

Ivan Villareal	Fred	Vicente
26 mL #6 Pack: • 1:28:36 to get the cart • 0:13:51 to open the job • 0:18:22 to collect the boxes • 0:3:38 to move it to the location • 0:2:28 to put it on the system	# 1 mL: • 0:6:35 to get the cart • 0:19:12 to open the job • 0:5:46 to collect boxes • 0:5:10 to move it to the location • 0:1:59 to put it on the system	#Ampules : • 0:8:17 to get the cart • 0:12:30 to open the job • 0:4:19 to collect the boxes • 0:3:45 to move it to the location

Formulating and filling

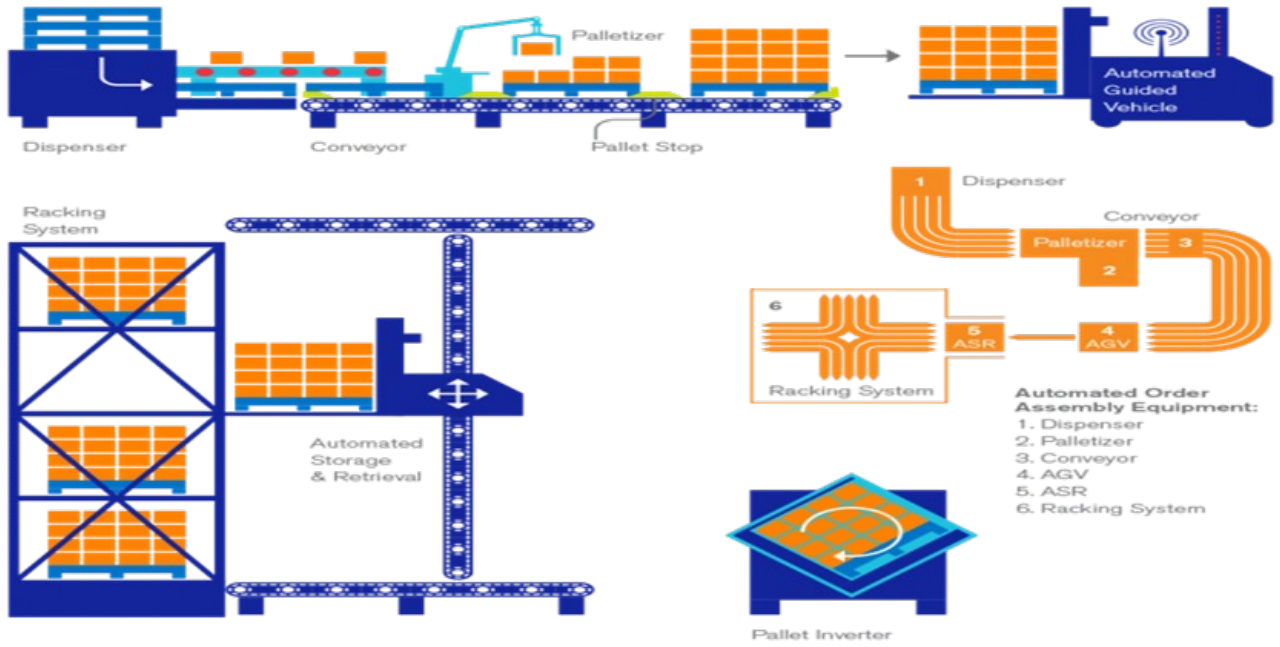
Tank new and wait for call	0:58:16
Cleaning	0:5:36
Take the cart to warehouse and it wasn't received	1:5:93
The warehouse fills the cart	2:28:68
He takes the carts	1:00:36
Move struck#9	1:2:93
Cleaning of the cart	2:58:62
Moving cart out of warehouse	8:31:83
Take cart from warehouse	00:53:43
Move fall 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

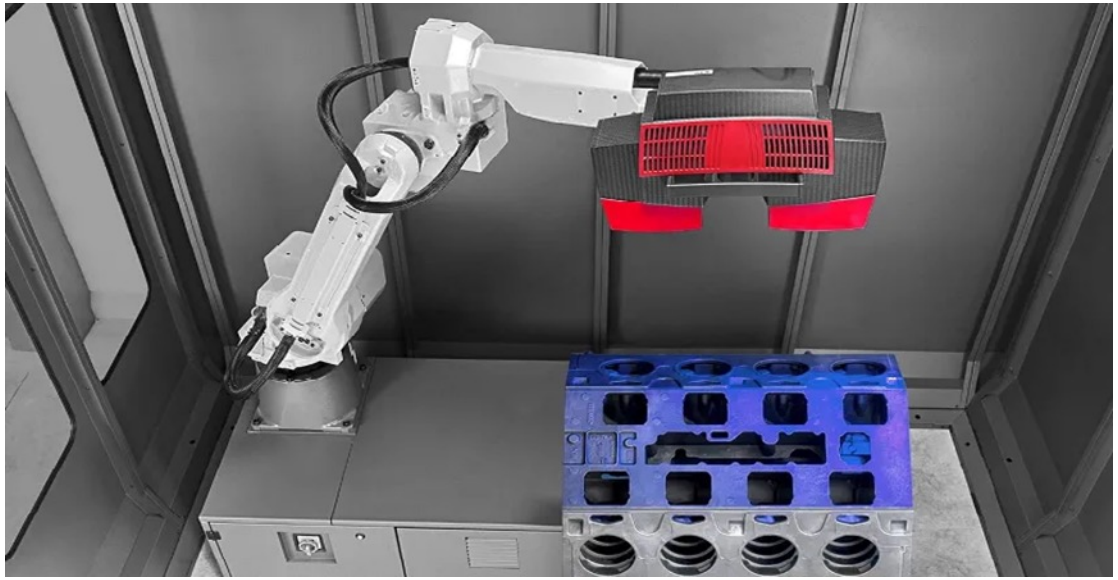
Best option between AR/RS and AGV

- 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.

Metrology

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.

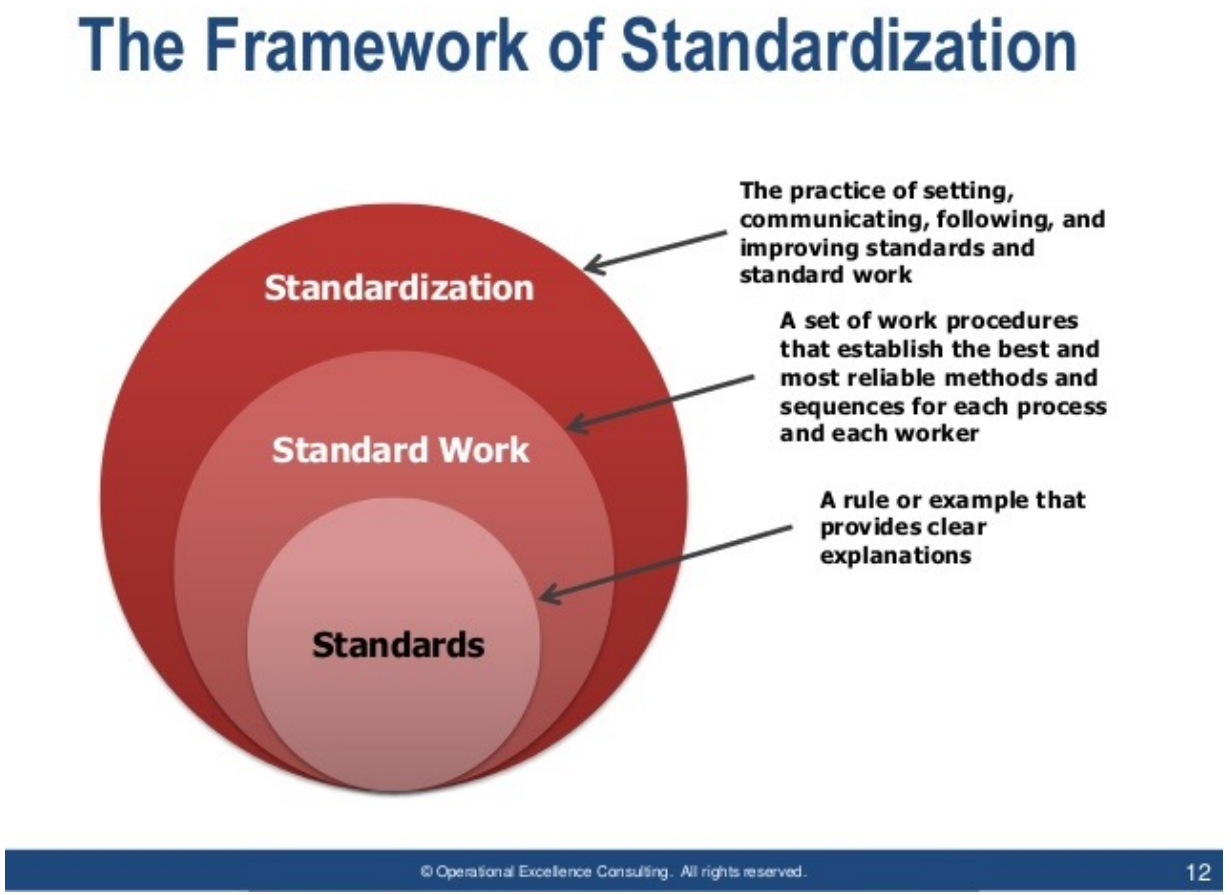
Importance of metrology

- 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



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

Production Capacity Sheet

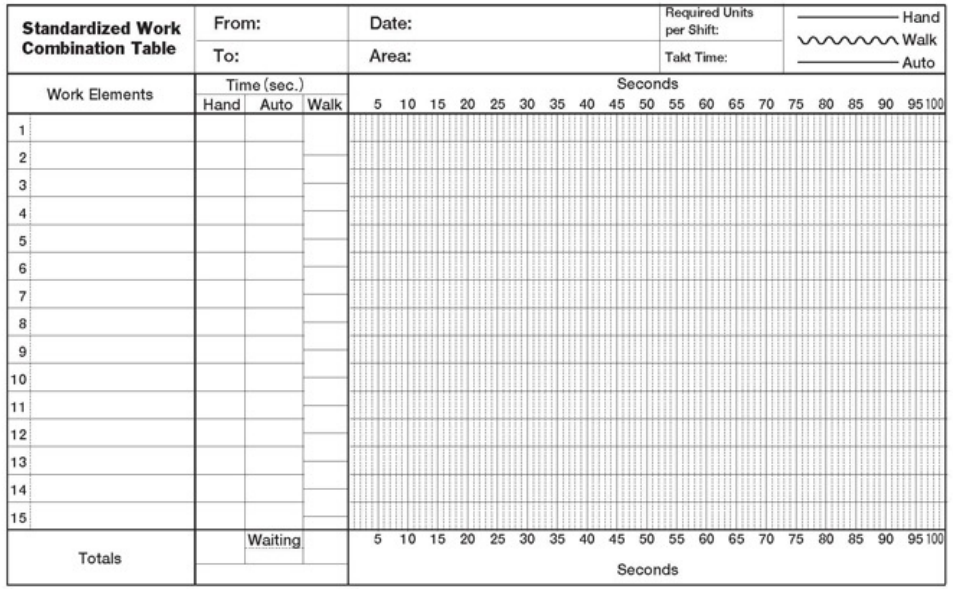
Part Name		Part Nr.		Date		Manager		Section	

Sequence	Process Name	Machine Nr.	Manual Time		Machine Time		Total Time		Lot Size	Change Over Time		Process Capacity		Comments
			Min.	Sec.	Min.	Sec.	Min.	Sec.		Min.	Sec.	7	hours	
1	Welding Nut 1	WN2001	0	3	0	25	0	28	100	1	0	881		
2	Welding Nut 2	WN2014	0	5	0	21	0	26	1000	0	30	968		
3	Riveting Flange	RMx-20	0	7	0	27	0	34	1000	0	30	741		
4	Riveting Cover	RMx-12	0	6	0	36	0	42	500	0	15	600		
5	Quality Check	n/a	0	20	0	0	0	20	1	0	0	1260		
							0	0				#DIV/0!		
							0	0				#DIV/0!		
							0	0				#DIV/0!		
		Total	0	41										

- 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

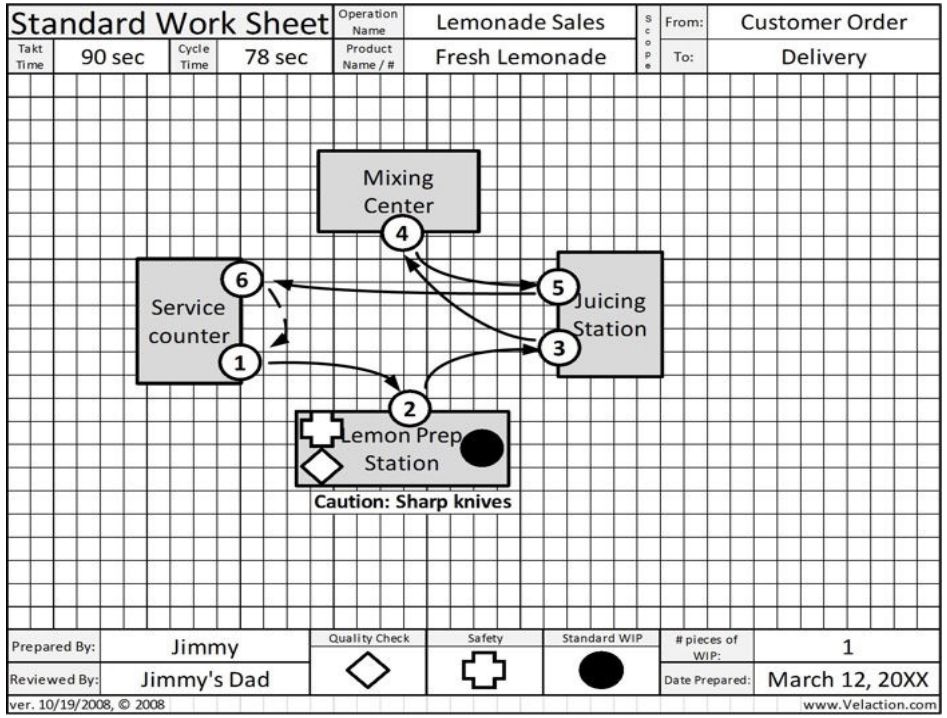
STANDARDIZED WORK COMBINATION TABLE

- 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



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