

LEAN MANUFACTURING, VSM1

EXERCISE 1

Demand

- The company works on two shifts, each of eight hours, with a 30 minutes break for each shift.
- The production family A is made by a range of 68 different products, from A1 to A68 (products with low volume/high variety).
- The total demand of the production family A is on average 450 pieces per day.

Processes

- There are three main production stages (machining, heat treatment, assembly, in this sequence). In each of these stages, there are one machine and one operator fully dedicated to this product family. Downstream of the assembly, the piece goes to a warehouse, ready for shipment. Before each stage there is a stock where pieces wait to be processed.

Stage	Cycle Time (sec/pc)	Set-up (min/setup)	Availability (%)	Stock (n° of pc. downstream)
Machining	95	10	95	1500
Heat treatment	80	0	95	3200
Assembly	105	0	100	10430

- Cycle times and setups are very similar for each product.
- Upstream of the machining stage there are stocks of raw material for a requirement of 10 days.

Information flow

- Customers make a forecast (to 30/60/90 days) and send it monthly to the Production Planning department (PP).
- Customers send orders to Sales daily, with agreed shipping dates, generally equal to 15 days. The demand of the various products of the family is quite similar.
- PP tracks in the system the orders received from Sales and develops a weekly production plan for each production process and a daily scheduling plan for deliveries to Shipment. Company is indeed working with daily shipments.
- PP sends a forecast (30/60 days) to the supplier and confirms orders weekly. The supplier delivers weekly.

Q1: Using icons and criteria seen in class, draw the Current State Map of the company based on the data provided.

Q2: The general manager defines as internal target that each stage of the company must be flexible enough to produce all the variants each day. Which improvement should the company implement?

EXERCISE 2

Demand

- The company works on two 8-hour shifts. Each shift has a 30 minutes break.
- The production family B is made by a range of 6 different products, from B1 to B6 (all high volume products, sold every day).
- The total demand for the production family B is on average of 1800 units per day.
- Twice per day products are delivered to customers.

Process

- The company has 5 production stages + shipping department. Press and cutter are parallel stages. Afterwards component coming from press and cutter are welded together (welding stage). Then there is drilling and finishing stages.
- The press and cutter are shared resources with other production families. The press is dedicated to this production family for 60% of its time. The cutter for 70% of its time. All other resources are instead fully dedicated to this family.
- The press and cutter are technologically advanced machines, others are quite simple manual machines.
- The press works 6 different types of product for the concerned production family.
- The cutter produces 6 different types of components, one for each of the six finished products offered by the company. On each piece (metal foil) of the press must be welded two identical cut components (pipes).
- One operator conducts each production stage.
- The raw material supplier delivery weekly metal sheets that feed the press and pipes that the cutting needs. There are 13 days of supply for raw material: respectively 13 days of metal foil in front of the press and 13 days of pipes in front of the cutter.

Stages	Cycle Time	Changeover (min.)	Availability (%)	Stock (n° pc downstream)
Press	4 sec/pc	120	80	20000
Cutting	10 sec/component	15	100	21600
Welding	10 sec/pc	0	100	4000
Drilling	12 sec/pc	100	95	5000
Finishing	23 sec/pc	0	100	30000

- Cycle times and changeover times are very similar for all products.

Information flow

- Customers make a forecast (to 30/60/90 days) they send to the Production Planning (PP).
- Customers issues orders daily to Sales, with expected delivery date the following day.
- PP tracks orders received from Sales in the system and generates a weekly production plan for each process and a daily dispatch plan for Shipment.
- PP sends a forecast (30/60 days) to the supplier and confirms orders weekly.

Q1: Using icons and criteria seen in class, draw the Current State Map of the Company based on the data provided.

Q2: In the current situation, which is the EPE of the company to fulfill the requirements of demand (volume and mix)?

Q3: The new plant manager decided to decrease warehouse costs. Therefore, she decided that it is possible to stock at maximum the WIP required for the production of 3600 final products. Draw the Future State of the company, highlighting all suggested improvements in order to ensure the target achievement.