Lean Manufacturing - VSM3 – Solution support

Ing. PhD, Federica Costa – Prof. Alberto Portioli Staudacher
Dipartimento Ing. Gestionale
Politecnico di Milano
Dep. Management, Economics and Industrial Engineering
Federica.costa@polimi.it – alberto.portioli@polimi.it

Exercise 1

Q1: Draw the current state map of the company, in all components: material flow, information flow, and timeline.

Q2: Lately, Shirts Spa is having problem in its liquidity. For this reason, the board of directors ask to reduce the fixed capital for catalog shirts at an overall maximum of 525k€. Considering the value of each catalog shirt equal to 25€, propose the improvements for the system without structurally modifying technical data of the system and having a coherent EPE among different stages.

Exercise 1

Shirts Spa

- 5 production stages
- Ta = 900 min/day
- Tailored (infinite variants) and catalog shirts (30 variants)
- D = 1500 p/day
- D std = 1200 p/day
- D spe = 300 p/day

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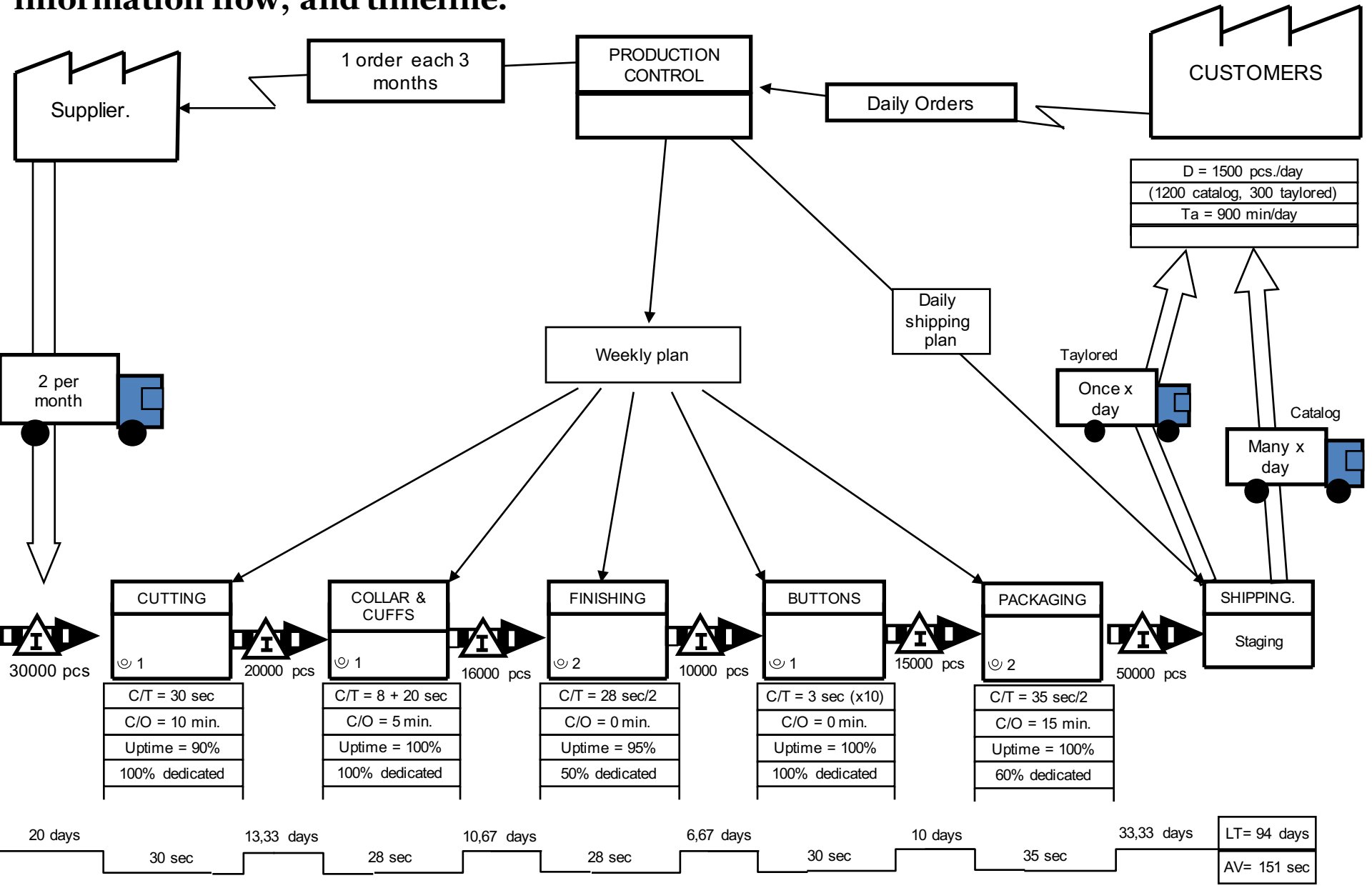


Exercise 1

Q2: Lately, Shirts Spa is having problem in its liquidity. For this reason, the board of directors ask to reduce the fixed capital for catalog shirts at an overall maximum of 525k€. Considering the value of each catalog shirt equal to 25€, propose the improvements for the system without structurally modifying technical data of the system and having a coherent EPE among different stages.

FROM PRESENT STATE TO FUTURE STATE

THE 8 QUESTIONS

Exercise 1

1. What is the takt time of the production family?

TT = 900 minutes / 1500 units = 0,6 min/u = 36 sec/u

2. Produce for supermarkets or for shipping?

First step: Verify the characteristics of the product and of the market.

CATALOG SHIRTS: few variants (30), all required every day, very short delivery times (immediate delivery), size is not critical, costs, perishability, ecc. They are produced for supermarket.

TAILORED SHIRTS: many variants (100 necessary setups per week), greater time allowed. The aim is to produce for shipping (in the text it says they are already produced for shipping)

3. Where to put the flow?

General methodology

- Start from the **final stage and go upstream** thinking stage by stage where to put CONTINUOUS FLOW and where to decouple (with SUPERMARKET or FIFO).
- Verify **DECAF Conditions**.
- Fix intermediate targets (not necessarily all at once in a continuous flow, but also FIFO and supermarket).

Start from Packaging then move upstream

Stages 3 and 5 are not dedicated, but if we consider the capacity dedicated to white shirts:

Packaging: 2 operators*Ta*%dedicated= **1080 min/day**
Finishing: 2 operators*Ta*%dedicated= **900 min/day**

Exercise 1

FINISHING (50% dedicated):

from
- 1 op. →450 min/day
- 1 op. →450 min/day

to
- 1 op. →900 min/day
- 1 op. →0 min/day

Shirts Spa dedicates 1 operator to the white shirts family while the other operator becomes unrelated to this product family.
This does not modify the capacity allocated to white shirts family.

PACKAGING (60% dedicated):

from
- 1 op. →540 min/day
- 1 op. →540 min/day

to
- 1 op. →1080 min/day
- 1 op. →0 min/day

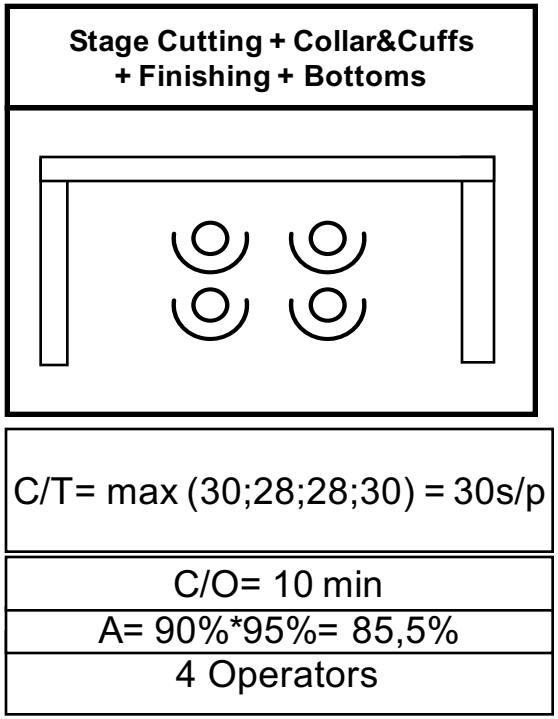
It is impossible for the Packaging stage because a single operator cannot assure the same capacity of 2 60% dedicated operators.

NB: This does not mean that in the long term the same configuration with 1 dedicated operator is impossible to reach

IMPOSSIBLE IN THE SHORT TERM!!

Exercise 1

Stage Cutting + Collar&Cuffs + Finishing + Bottoms



DeCAF condition
Dedicated
Capable
Available
Flexible

- **Dedicated:** yes
- **Capable:** CT<TT
  30 sec/u < 36 sec/u
  yes
- **Available**: CT/A < TT
  30 sec/u/0,855 < 36 sec/u
  yes

Exercise 1

Stage Cutting + Collar&Cuffs + Finishing + Bottoms

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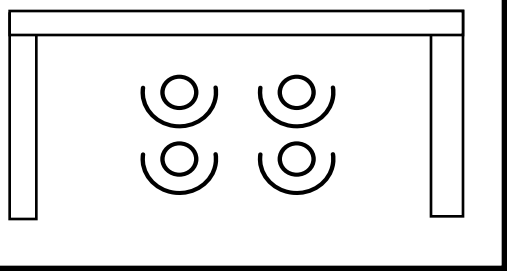

C/T= max (30;28;28;30) = 30s/p
C/O= 10 min
A= 90%*95%= 85,5%
4 Operators

- **Flexible**

1) CO is the max of the single setup times because stages do setups for the same reasons (change of size).
2) 5 possible sizes (catalog pdt).
3) 100 setups per week means 20 setups per day (taylored pdt).

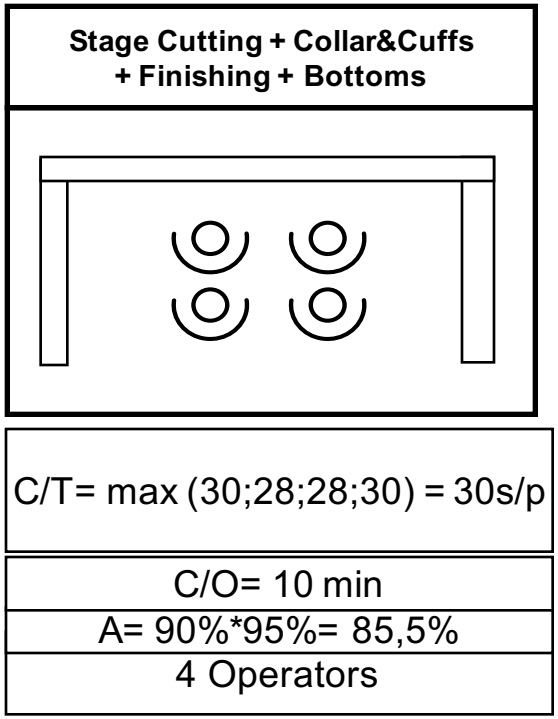
Which is the cell's EPE?

$$EPE\ STD \geq \frac{Ts}{Ta\ STD - Tp\ STD} = \frac{10\ min/setup * 5}{\left(900min - 20*10 - \frac{30*300}{0{,}855*60}\right) - \frac{30*1200}{0{,}855*60}} = \mathbf{-0{,}03}$$

It means that is impossible satisfy mix and VOLUME of customer demand.

Exercise 1

Stage Cutting + Collar&Cuffs + Finishing + Bottoms



- **Flexible**

EPE^{Target} **= ?**

Fixed value of Stocks for catalog shirts = 525000€

525000€ = 25€* $Stock\ size_{Catalog\ shirts}$

$Stock\ size_{Catalog\ shirts}$= External FGW + Internal stocks = **2*** EPE^{Target} ***D + 1,5*** EPE^{Target} ***D = 3,5 *** EPE^{Target} ***D**

$$525000€ = 25€^{*}\ \mathbf{3,5} * EPE^{Target} * D$$

$$EPE^{Target} = 5$$

EPE*Tp + Ts ≤ EPE*Ta

5* (30/85,5%)*1200 +x*60*5 ≤(900*60 -x*20-30*300/85,5)*5

Where x is the setup time

$x \leq$ **1,09 min/setups**

4. Where to put the pull-supermarket?

Catalog products

There is a finished good supermarket. All the upstream stages are decoupled by supermarkets. There are supermarkets between the cell and the close&pack stage and upstream the cell.

Supermarket sizing = **1,5 *EPE* D_{dd}**

Main rule to sizing the supermarket: consider the EPE of the stage upstream of the supermarket. For the raw-materials supermarket take in consideration the interarrival times between two supplier deliveries.

Finished pieces ready on the last supermarket
Dep. 1-2-3-4 are OPF, between dep. 4 and 5 supermarket

Taylored products

From dep. 1 works to order:
Dep. 1-2-3-4 are OPF, between dep. 4 and 5 FIFO

5. Where is the company single scheduling point?

Catalog products

The only scheduling point is dep. 5, that is the dep. upstream of finished goods supermarket.

Taylored production

The only scheduling point is the cell that includes dep. 1-2-3-4

6. How should the company level the product mix to pacemaker process?

Catalog products

According to shipments that are made, the finished goods warehouse sends upstream the kanban. The same it happens from Packaging and the cell. The Heijunka and batching are necessary to level the demand mix to allow the cell to reach customer demand (problems on mix).

Taylored products

You take leveled (volume and mix) from the Pre Shop Pool. The company collects taylored orders for a week and starts to produce them the next week.

It is a Pre-Shop-Pool because it collects the orders and releases them in a levelled mix and volume.

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