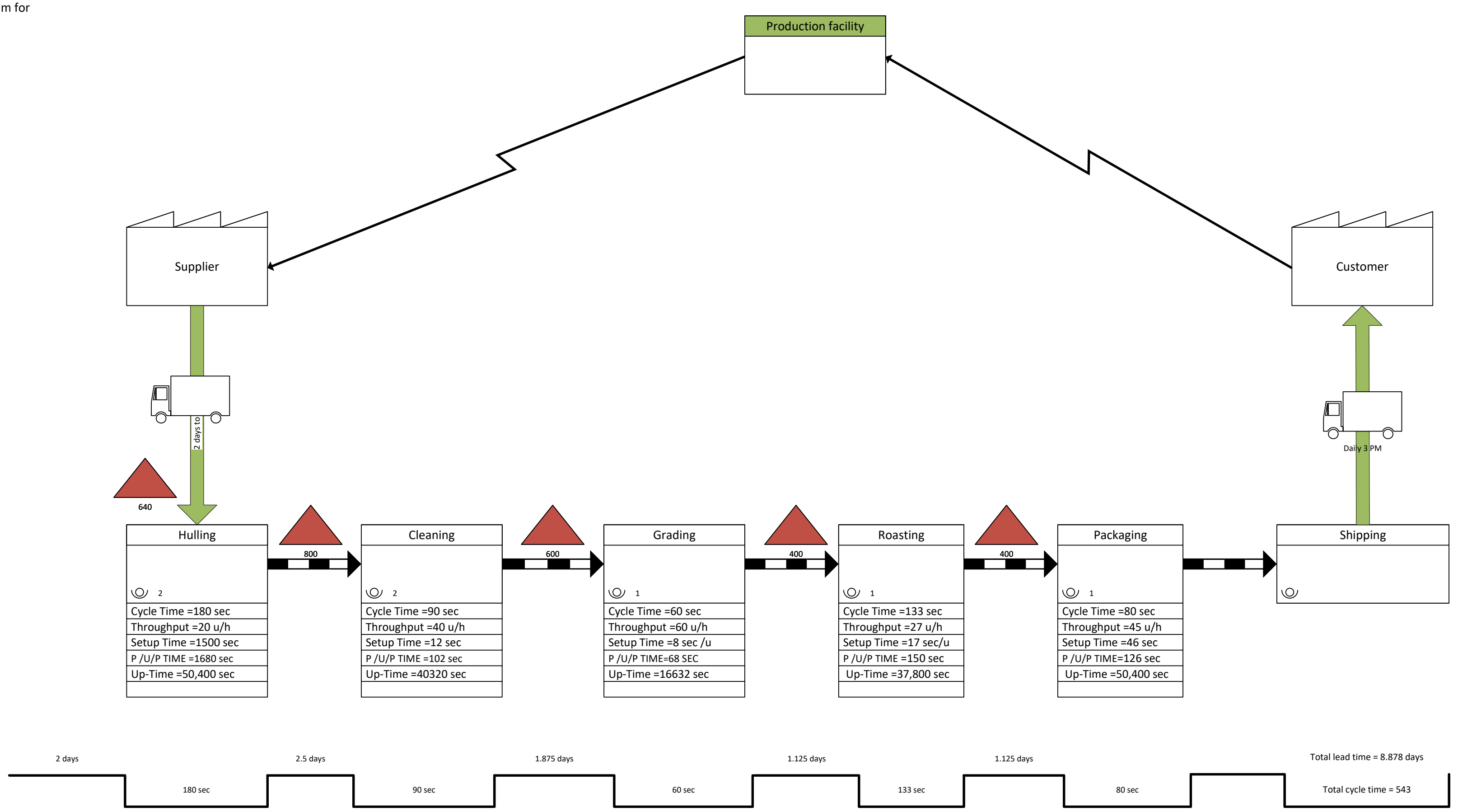
Title :- Value stream diagram for
coffee beans process
Date :- 31/03/2024
Version :- 2


Production facility
Supplier
Customer
2 days to
Daily 3 PM
640
Hulling
2
Cycle Time =180 sec
Throughput =20 u/h
Setup Time =1500 sec
P /U/P TIME =1680 sec
Up-Time =50,400 sec
800
Cleaning
2
Cycle Time =90 sec
Throughput =40 u/h
Setup Time =12 sec
P /U/P TIME =102 sec
Up-Time =40320 sec
600
Grading
1
Cycle Time =60 sec
Throughput =60 u/h
Setup Time =8 sec /u
P /U/P TIME=68 SEC
Up-Time =16632 sec
400
Roasting
1
Cycle Time =133 sec
Throughput =27 u/h
Setup Time =17 sec/u
P /U/P TIME =150 sec
Up-Time =37,800 sec
400
Packaging
1
Cycle Time =80 sec
Throughput =45 u/h
Setup Time =46 sec
P /U/P TIME=126 sec
Up-Time =50,400 sec
Shipping
2 days
180 sec
2.5 days
90 sec
1.875 days
60 sec
1.125 days
133 sec
1.125 days
80 sec
Total lead time = 8.878 days
Total cycle time = 543

Process description.
1 unit: - **20kg** of coffee
Number of units per day = **2**
Availability: - **8 hour** per shift (60 minute minus per shift)
so, actual availability = 16 hours – 2 hours (break)
= **14** hours
Batch size: - **220** units.
Average units: - **320** units/ day
Weekly demand: - **1600** (320 units/day *5 days)
Shipping time to manufacturing facility = **2** days

PROCESS 1 HULLING

1) Cycle time = 1hour /produced time
= 60*60/20units
= 180 sec.

2) Set up time = as given in process the set-up time is 25 minutes
so, = 25*60
= 1500 sec.

3) per minute process time = cycle time + set up time
= 180 sec + 1500sec
=1680 sec.

4) Operator: - 2

5) Inventory (WIP) =

- Shipping time to manufacturing facility = 2 days

- Average Demand: 320 units /day

So, WIP = 320 * 2
= 640 units (before passing to process 2)

6) Up time: - 100%
= 100 % (100 eff *14 hours * 3600)
= 50,400 sec.

7) Throughput
= as given in the process
= 20 unites / hour

2) PROCESS 2: Cleaning

1) Throughput: as given in the process
= **40** units / hour

2) Set up time: - it is given in the process
= 12 sec

3) Cycle Time :- 1hour /produced time
= 60*60 / 40 units
=3600 / 40
= 90 sec.

4) Per unit processing time :- Cycle time + set up time
= 90 + 12
= 102 sec

5) Up time = 80 % (14 hours @ 80 % eff)
= 0.8 * 14 hours * 3600
Eff = 40,320 sec

6) Operators :- 2

7) WIP :- Total weight / 1 unit weight
= 1200 KG / 20 KG
= 800 Units

3) Process step 3 :- Grading

1) Set up time: - 8 sec / unit
2) Per unit process time = cycle time + set up time
= 60 sec + 8 sec
= 68 sec.

3) Cycle time: - 1 minute

= 60 sec.

4) WIP = Total weight / 1 unit weight

= 8000KG / 20KG
= 400 unit

5) Up-time:- 33 %
= 14 hours * 0.33 * 3600
= 16,632 sec

6) No. of operators: - 1
7) Throughput = 1 minute / cycle time
= 60 minutes

4) Process step 4 :- Roasting

1. **Cycle Time** = 133 Seconds per unit
2. **Throughput** = 60 seconds per min/133 seconds per unit = 0.45 units per minute so, 0.45 * 60 = 27 units / hour
3. **Setup Time** = 17 Seconds per unit
4. **Per unit processing time** = 133 seconds + 17 seconds = 150 seconds
5. **Up-Time** = 75% (14 hours @ 75% eff = 37, 800 seconds)
6. **Operator** = 1
7. **WIP** = 400 units

3) Process step 5 :- Packaging

1) **Cycle time =**

the entire process of filling 20 bags as one unit without breaking down the per-bag cycle time for our calculations. Since each of the 20, 1Kg bags takes 4 seconds to fill, and we are treating these 20 bags as one unit, the total fill time per unit is

- 20×4=80 seconds.

2) **Set up time :-**

For setup, each bag requires 2.3 seconds. Since there are 20 bags in one unit and we're subdividing the setup time in the same manner as the fill time, the total setup time per unit is

- 20×2.3 = 46 sec

3) **Per unit processing time** = cycle time + set up time
= 80 + 46
= 126

4) **Throughput:** - 60 sec per unit / Cycle time
= 60 / 80
= 0.75 sec

Now we need it in hour so
= 0.75* 60
= 45 unit / hour

5) **WIP** = 400 units it is already given in process
6) **Operator** :- 1
7) **Up-time** :- 100%
=14 *1*3600
= 50,400 sec

2) Answer the following group of questions: -

1) What is the TAKT time for this manufacturing cell?

➢ TAKT time = net available time per day / customer demand / day
= 14* 60 * 60 / 320
= 157.5 sec

2) What is the total production Lead Time?

➢ **Total production lead time** = process 1 WIP/Average Demand+ process 2 WIP/Average Demand+ process 3 WIP/Average Demand+ process 4 WIP/Average Demand+ process 5 WIP/ Average Demand

= 640/320 + 800/320 + 600/320 + 400/320 + 400/320
=2days + 2.5 days + 1.8 days + 1.25 days + 1.25 days
= 8.87 days

So, now

=8.875 * 14 * 60 * 60
=447,300 sec

3) What is the total throughput and cycle times for this manufacturing cell?

➢ **Total throughput** = step 1 throughput + step 2 throughput + step 3 throughput + step 4 throughput + step 5 throughput
= 20 u / h + 40 u/h + 60 u/h + 27 u/h + 45 u/h
=192 unit

➢ **Total cycle times = process** 1 cycle time + process 2 cycle time + process 3 cycle time + process 4 cycle time + process 5 cycle time

= 180 sec + 90 sec + 60 sec + 133 sec + 80 sec
= 543 sec total cycle time

4) What is the maximum manufacturing capacity per week? Are we able to meet customer

requirements? If we are unable to meet demand, which process failed to meet requirements?

- CAPICITY / WEEK we need to first calculate for all process

- For 1st process = 14 * 60 * 60 / per unit process time
  = 14 * 60 * 60 / 1680 sec
  = 30 sec

We need for 5 days.
Now , 30 sec * 5 days / up time
= 30 * 5 / 50,400
= 150 unit / week

- for 2nd process = 14 * 60 * 60 / per unit process time
  = 14* 60 * 60 / 102 sec
  = 494.11 sec

Now for 5 days
= 494.11 sec * 5 days / up time
= 494.11 * 5 / 0.8
=3088.18 unit per week

- for 3rd process = 14 * 60 * 60 / per unit process time

= 14* 60* 60 / 68
= 741.17sec

Now for 5 days
= **741**.17 sec * 5 days / up time
=741.17 * 5 / 0.3
=12,352.94 unit / week

- for 4th process = 14 * 60 * 60 / per unit process time

=14* 60* 60 / 150sec
=336 sec

Now for 5 days
= **336** sec * 5 days / up time
=336*5/ 0.7
= 2400 unit / week

- for 5th process = 14 * 60 * 60 / per unit process time
  = 14*60*60 /60 sec
  = 840 sec

Now for 5 days
= 840* 5 / 1
= 4200 unit / week

So, we are not able to meet customer requirements.
Because of process 1 (hulling) failed to meet requirements.

5. What is the process cycle efficiency (PCE)?

= total cycle time / total lead time + total cycle time

= 543 / 447300 + 543

= 0.001212

6. In under 250 words, clearly describe the purpose of VSM mapping and provide a brief explanation as to how it would help an organization control processes and capacity manufacturing.

VSM is a powerful tool that helps visualize, analyse, and improve the flow of materials, information, and activities within a process or system. It is widely used in manufacturing, services, and software development to find waste, optimize processes, and boost efficiency. The main goal of VSM is to provide a clear and comprehensive picture of the entire value chain - from creating a product or service to delivering it to the customer. By mapping out each process step, stakeholders can quickly understand how value is generated and identify bottlenecks, delays, or redundancies that limit productivity.

VSM offers a straightforward way to visualize the sequence of processes involved in creating a product or delivering a service. It breaks down complex operations into more manageable parts, making it easier to quickly grasp the full system. This approach allows you to gain an overview of the complete process in a concise manner.

Identifying wasted resources is a key aim of value stream mapping (VSM). This includes spotting issues like overproducing, having too much inventory, downtime, unnecessary motion, and defects. By pinpointing and evaluating these wasteful areas, organizations can cut costs and boost productivity by taking targeted action to eliminate or minimize them.

Streamlining Operations: VSM enables organizations to simplify their processes by examining the flow of materials and information. To enhance workflow efficiency, tasks may be reorganized, handoffs minimized, or work sequences optimized for a more seamless operation.

Improving Lead Time: Understanding Lead Times Organizations can minimize lead times by focusing on reducing delays and unnecessary activities. This can be crucial in meeting customer demands and gaining a competitive advantage. Value Stream Mapping (VSM) helps to understand lead times, which are the time it takes from the start of a process to its completion.