Operations & Logistics Management in Air Transportation

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Air Transportation Management
M.Sc. Program

Air Transportation Systems and Infrastructure
Strategic Planning

Case Study: 9 June 2014
Case Study:
Kristen Cookies
LEARNING OBJECTIVES

• Primary:
  – Introductory activity to the basics of process analysis:
    • Set-up times
    • Throughput times
    • Cycle time
    • …

• Secondary:
  – Gantt charts
OVERVIEW

• You are about to open a two-person midnight cookie baking operation which involves several stages:

  - Mixing (6min – up to 3 dozens)
  - Spoon (2min/doz)
  - Load & Bake (1+9min/doz)
  - Packing (2min)
  - Payment (1min)
  - Cool off (5min)
  - Unload
KRİSTEN’S COOKIE DISCUSSIONS

1. How long will it take to fill a rush order?
2. How many orders can you fill in a night (4 hours)?
3. How much of your own and your roommate’s time will it take to fill each order?
4. Any discount for two-dozen orders? Will it take you any longer to fill a two-dozen order than a one-dozen order?
5. How many food processors? Baking trays?
6. Any change to the production plans? Bottleneck? Another oven?

- Use the Gantt chart template
KRİSTEN’S COOKIE LINEAR FLOW CHART

Answer

Mix & Spoon

Load oven, set timer and begin bake

9 min

1 min

Continue to bake

5 min

Cool

2 min

Pack

Hold

Pay

| total baking time = 10 min|
KRİSTEN’S COOKIE
SWİM-LANE (DEPLOYMENT) FLOW CHART

<table>
<thead>
<tr>
<th>Resources</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>You</td>
<td>Mix &gt; Spoon</td>
</tr>
<tr>
<td>Roommate Oven</td>
<td>Load &gt; Bake</td>
</tr>
<tr>
<td>Oven</td>
<td>Cool &gt; Pack</td>
</tr>
<tr>
<td>Roommate</td>
<td>Pay</td>
</tr>
</tbody>
</table>
**KRİSTEN’S COOKIE GANTT CHART**

<table>
<thead>
<tr>
<th>Tasks</th>
<th>Time (min):</th>
<th>Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wash &amp; Mix</td>
<td>1 2 3 4 5 6</td>
<td>You 1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>Spoon</td>
<td>1 2 3 4 5 6</td>
<td>Roommate 1 2 3 4 5</td>
</tr>
<tr>
<td>Load</td>
<td>1 2 3 4 5 6</td>
<td>Oven 1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>Bake</td>
<td>1 2 3 4 5 6</td>
<td></td>
</tr>
<tr>
<td>Unload</td>
<td>1 2 3 4 5 6</td>
<td></td>
</tr>
<tr>
<td>Cool</td>
<td>1 2 3 4 5 6</td>
<td></td>
</tr>
<tr>
<td>Pack</td>
<td>1 2 3 4 5 6</td>
<td></td>
</tr>
<tr>
<td>Pay</td>
<td>1 2 3 4 5 6</td>
<td></td>
</tr>
</tbody>
</table>

**Time (min):**

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46
1. How long will it take to fill a rush order?

This is **throughput** time and equals 26 minutes

2. How many orders can you fill in a night (4 hours)?

What are you looking for to determine the answer?

**Capacity**! Capacity is the bottleneck (slowest stage) = baking time = 10 minutes

Cycle time for system is = cycle time for bottleneck

In 4 hours can make **24 orders** (6 per hour (since 10 minutes each) and 4 hrs)

**BUT** may need time for set up and clean up therefore conservatively 22 dozen (concept of effective capacity)
3. How much of your own and your roommate’s time will it take to fill each order?

This is labour time: baking is bottleneck, therefore other activities have excess capacity (idle time)

For a 1 dozen cookie order total Labour time = \(12 \text{ min}\)

In each cycle you are working 8 minutes and you roommate works 4 minutes
4. Any discount for two-dozen orders? Will it take you any longer to fill a two-dozen order than a one-dozen order?

No discounts, why? **Bottleneck operations capacity is independent of order size.**

For example, 2 orders: mixing takes 10 minutes (6 min mix, 4 min for spooning out to 2 trays), **Baking still takes 10 min per dozen.**

5. How many food processors? Baking trays?

1 processor since baking is bottleneck

but

**several trays:** 1 in oven, 1 being prepared for oven, 1 cooling
6. Any change to improve the production plans? Bottleneck? Another oven?

To remove bottleneck: add an oven (therefore now 2 ovens)
Thus, capacity increases from 6 doz per hour to 12 doz per hour.

Mix and spoon 7.5 per hour
Bake 12 per hour
Cool 5 minutes
Pack 30 per hour
Receive $60 per hour

Where is bottleneck now??
Mix & spoon therefore capacity is 7.5 doz cookies per hour