



Operations Management

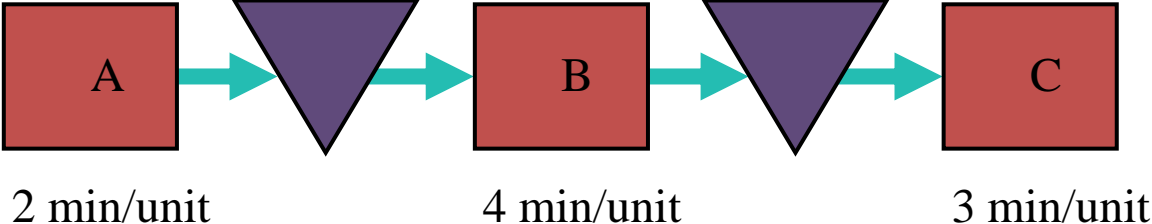
Theory of Constraints - Bottleneck Management

Dr. Ramesh Krishnan

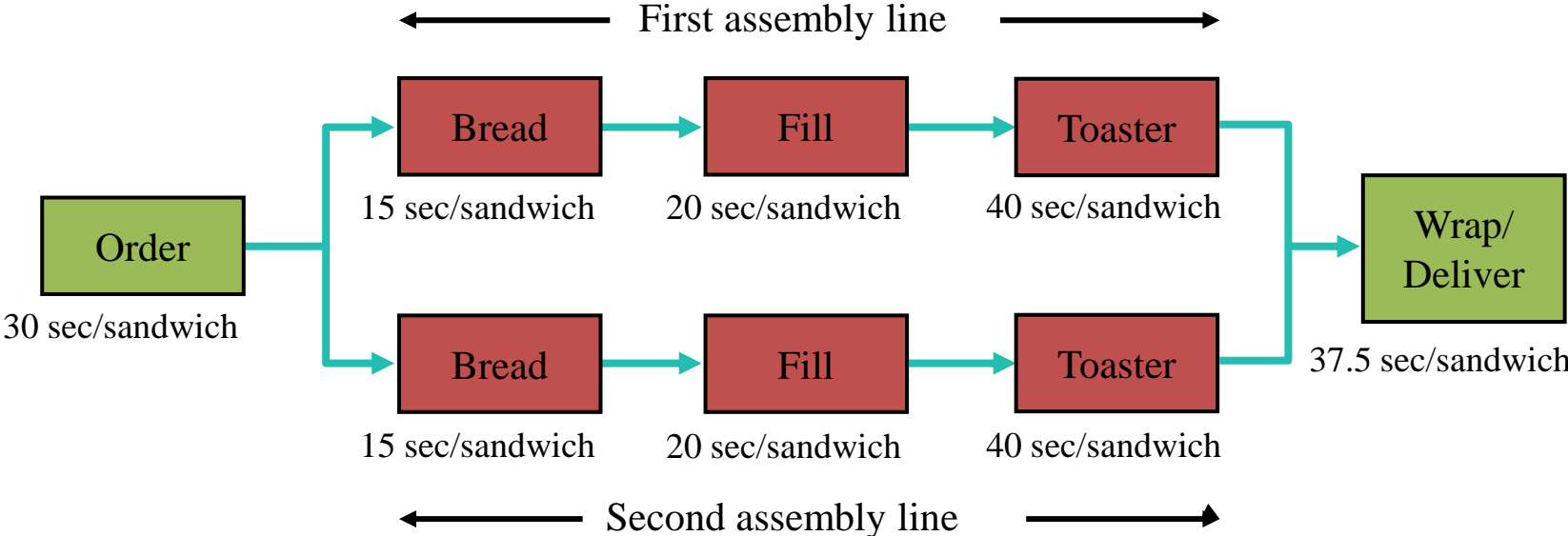
IIM Kozhikode

Ramesh.Krishnan@iimk.ac.in

Example 1:



Example 2:



Bottleneck Analysis and the Theory of Constraints

- Each work area can have its own unique capacity
- **Capacity analysis** determines the throughput capacity of workstations in a system
- A **bottleneck** is a limiting factor or constraint
 - A bottleneck has the lowest effective capacity in a system
- The time to produce a unit or a specified batch size is the **process time**

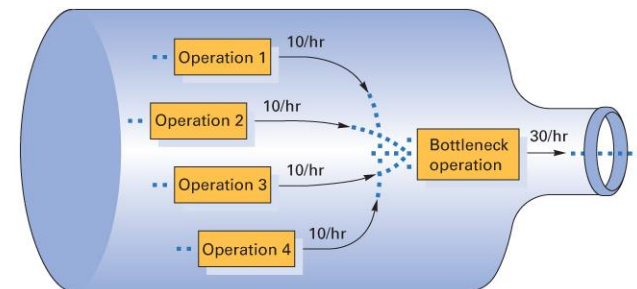
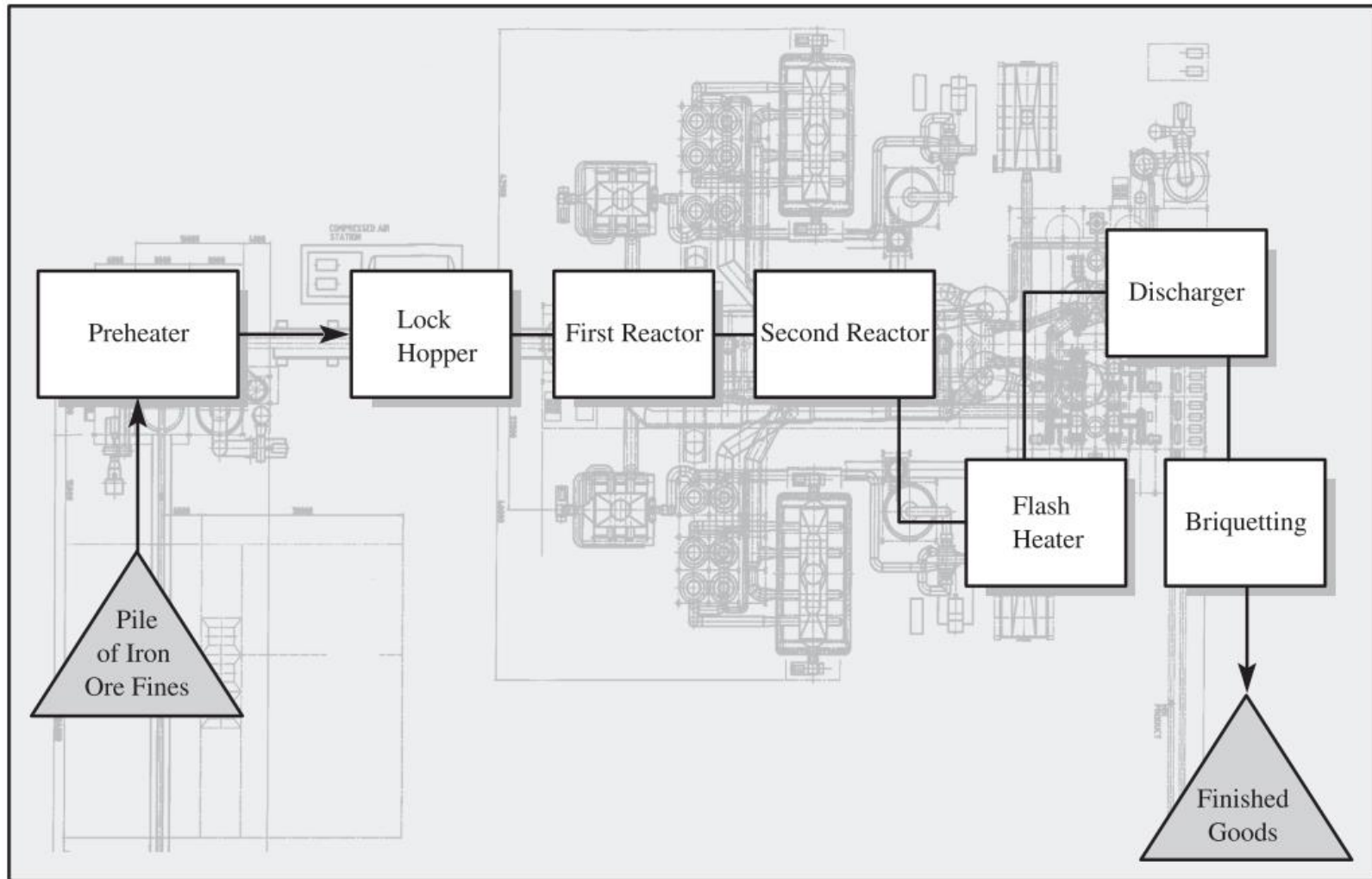


FIGURE 3.7 Completed Process Flow Diagram for the Circored Process



Theory of Constraints by Goldratt and Cox

Thinking Processes

- What needs to be changed?
- What should it be changed to?
- What actions will cause the change?

STEP	OBJECTIVE
Identify	Identify the current constraint (the single part of the process that limits the rate at which the goal is achieved).
Exploit	Make quick improvements to the throughput of the constraint using existing resources (i.e., make the most of what you have).
Subordinate	Review all other activities in the process to ensure that they are aligned with and truly support the needs of the constraint.
Elevate	If the constraint still exists (i.e., it has not moved), consider what further actions can be taken to eliminate it from being the constraint. Normally, actions are continued at this step until the constraint has been “broken” (until it has moved somewhere else). In some cases, capital investment may be required.
Repeat	The Five Focusing Steps are a continuous improvement cycle. Therefore, once a constraint is resolved the next constraint should immediately be addressed. This step is a reminder to never become complacent – aggressively improve the current constraint...and then immediately move on to the next constraint.

Principles of Bottleneck Management

- 1. Release work orders to the system at the pace of set by the bottleneck's capacity**
 - *Drum* – constraint; the “beat” for the process and determines total throughput
 - *Buffer* – inventory required to maintain consistent production at constraint
 - *Rope* – signal generated by the constraint indicating that some amount of inventory has been consumed
- 2. Lost time at the bottleneck represents lost capacity for the whole system – *keep it busy***
- 3. Increasing the capacity of a **non-**bottleneck station is a mirage – *extra inventory***
- 4. Increasing the capacity of a bottleneck increases the capacity of the whole system**

Benefits of Theory of Constraints

- **Increased Profit:** the primary goal of TOC for most companies
- **Fast Improvement:** a result of focusing all attention on one critical area – the system constraint
- **Improved Capacity:** optimizing the constraint enables more product to be manufactured
- **Reduced Lead Times:** optimizing the constraint results in smoother and faster product flow
- **Reduced Inventory:** eliminating bottlenecks means there will be less work-in-process