

# The Current State Map

Exercise – TWI Industries

#### Content

- A steering arm is a metal rod with a forged fitting welded to each end.
- TWI's steering arms are available in 20 different lengths, 2 diameters, and with 3 different types of end fittings. (Each end of the steering arm can have a different fitting.) This means there are 240 different steering arm part numbers that TWI supplies.
- Because of the wide variety of product configurations and the fact that customer configuration requirements vary from order to order, steering arms are a "make-to-order" business.
- It currently takes a customer order 27 days to get through TWI's production processes. This long lead time and a significant order backlog have prompted TWI to quote a 60-day lead time to customers.
- However, TWI's customers cannot accurately predict their size requirements more than 2 weeks out, and thus they make adjustments to their orders 2 weeks before shipment. These order adjustments lead to order expediting on the shop floor at TWI.
- Orders are batched by product configuration on the shop floor to reduce the number of time-consuming changeovers.



#### Good to Know

- Always collect current-state information while walking along the actual pathways of material and information flows yourself.

#### Trainer



#### Content

- CUSTOMER REQUIREMENTS :
  - 24,000 pieces per month.
  - A customer order ranges from 25 to 200 pieces, with an average of 50 pieces.
  - Corrugated-box packaging with up to 5 steering arms in a box.
  - Several daily shipments per day by truck to various customers.
  - Each customer's configuration requirements vary greatly from order to order.
  - TWI requires orders to arrive 60 days before shipping date.
  - Customers often adjust their size mix 2 weeks before the shipping date.
- WORK TIME :
  - 20 days in a month.
  - Two shift operation in all production departments.
  - Eight (8) hours every shift, with overtime, if necessary.
  - Two 15 minute breaks during each shift.
  - Manual processes stop during breaks.
  - Unpaid lunch
- TWI PRODUCTION CONTROL DEPARTMENT :
  - Receives customer orders 60 days out and enters them to MRP
  - Generates one "shop order" per customer, which follows the order through the entire production process
  - Releases shop orders to production 6 weeks before shipment to accelerate MRP's procurement of rods and forgings.
  - Issues daily "priority" list to production supervisors. Supervisors sequence shop orders through their departments according to this list.
  - Receives customer size-changes 2 weeks before shipment and advises supervisors to expedite these orders.
  - Issues daily shipping schedule to Shipping Department.

#### Good to Know

- Always collect current-state information while walking along the actual pathways of material and information flows yourself.

#### Trainer



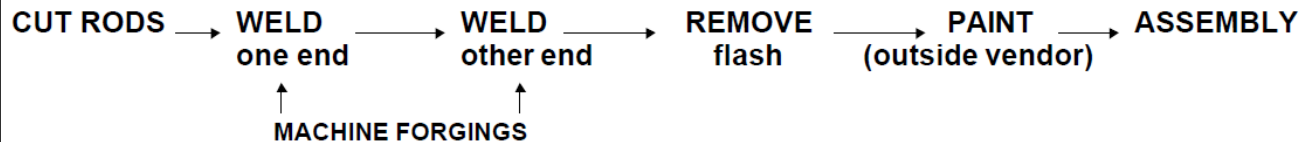
### Exercise Case – TWI Industries

#### Content

#### • Production Processes

- TWI's processes for the steering arm product family involve cutting a metal rod followed by welding end fittings to the rod, deflash (machine removal of excess weldment), painting at an outside vendor, and subsequent assembly of the end fittings. The forged end-fitting sockets are also machined at TWI.
- Finished steering arms are staged and shipped to customers on a daily basis. Switching between rod lengths requires a 15 minute changeover at the cutting, welding, and deflash operations.
- Switching between rod diameters takes a 1 hour changeover at the cutting, welding, and deflash operations.
- This longer diameter changeover is due mostly to an increased quality-control inspection requirement.
- Switching between the three types of forged end fittings takes a 2 hour changeover at the machining operation.

#### TWI Industries Steering Arm Production Steps



#### • Suppliers Data

- Steel rods are supplied by Michigan Steel Co. The lead time for obtaining rods is 16 weeks.
  - There are two shipments per month.
- Raw forgings for the end fittings are supplied by Indiana Castings. The lead time for obtaining forgings is 12 weeks.
  - There are two shipments per month.

#### Good to Know

- Always collect current-state information while walking along the actual pathways of material and information flows yourself.

#### Trainer



#### Content

#### 1. Cutting (The saw cuts rods for many TWI products)

- Manual process with 1 operator.
- Cycle Time: 15 second
- Changeover time: 15 minutes (for length) and 1 hour (for diameter).
- Reliability: 100%
- Observed Inventory:
  - 20 days of uncut rods before the saw.
  - 5 days of cut rod.

#### 2. Welding Workstation I (dedicated to this product family)

- This operation welds the first machined forging to the rod
- Automatic process with operator load & unload external to machine cycle.
- Cycle Time: Operator = 10 seconds, Machine = 30 second.
- Changeover time: 15 minutes (for length) and 1 hour (for diameter).
- Reliability: 90%
- Observed Inventory: 3 days of welded arms

#### 3. Welding Workstation II (dedicated to this product family)

- This operation welds the second machined forging to the rod.
- Automatic process with operator load & unload external to machine cycle.
- Cycle Time: Operator = 10 seconds, Machine = 30 seconds.
- Changeover time: 15 minutes (for length) and 1 hour (for diameter).
- Reliability: 80%.
- Observed Inventory: 3 days of welded arms.

#### 4. Deflash Workstation (dedicated to this product family)

- Automatic process with operator load & unload external to machine cycle.
- Cycle Time: Operator = 10 seconds, Machine = 30 seconds.
- Changeover time: 15 minutes (for length) and 1 hour (for diameter).
- Reliability: 100%.
- Observed Inventory: 5 days of deflashed arms

#### 5. Painting (steering arms are shipped to an outside vendor for painting)

- Painting lead time = 2 days.
- One daily truck pickup of unpainted arms and drop-off of painted arms.
- Observed Inventory: 2 days at the painter 6 days of painted arms at TWI.

#### 6. End-fitting Assembly (dedicated to this product family)

- Manual process with six operators.
- Total Work Time Per Piece: 195 seconds.
- Changeover time: 10-minute fixture swap.
- Reliability: 100%.
- Observed Finished-Goods Inventory in Warehouse:
  - 4 days of finished steering arms.

#### 7. Machining of Forgings (dedicated to this product family)

- Automatic machining process with one machine attendant.
- Cycle Time: 30 seconds
- Changeover time: 2 hours
- Reliability: 100%
- Observed Inventory:
  - 4 weeks of raw forgings from the supplier
  - 4 days of machined forgings

#### 8. Shipping Department

- Removes parts from finished goods warehouse and stages them for truck shipment to customer

#### Good to Know

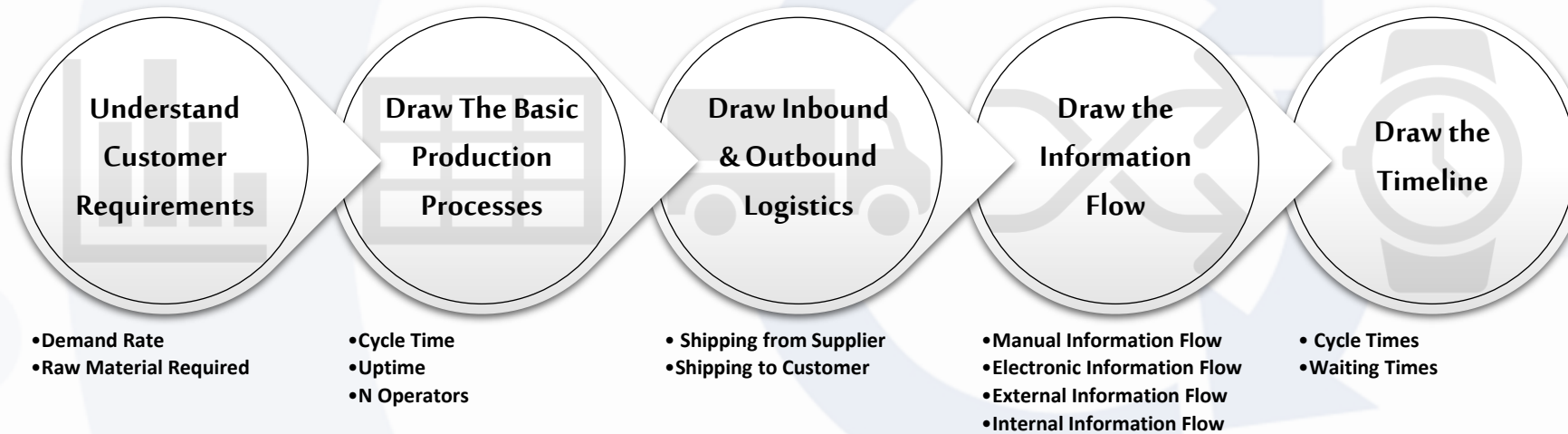
- Always collect current-state information while walking along the actual pathways of material and information flows yourself.

#### Trainer



### Steps for Current State Map

#### Content



#### Good to Know

- Always collect current-state information while walking along the actual pathways of material and information flows yourself.
- Drawing by hand can be done without delay, while you are on the floor. As you draw you will think of further information that you need.

#### Trainer



