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Tools for lean re-engineering

Decoupling: Buffer and supermarket

Production control: the pacemaker

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Re-engineering for Lean

1. Calculating the production rate required by the market (**takt time**)
2. Creating a **continuous flow** (where possible)
3. Using "**supermarkets**" to control production where it is impossible to extend the flow
4. Trying to send the customer demand signal to a specific process in the system (**pacemaker**)
5. **Levelling** the production mix and volume: balancing the workload in the system by alternating small batches of products according to a mix that reflects customer demand

PUSH vs PULL

PUSH

- Manages processes in advance of customer requirements; materials enter the system in advance to ensure the delivery time required by the market
- Uses forecasts; wrong forecasts generate stocks, lengthening the production time instead of shortening the delivery time
- Forecasts of what consumption will be and the consequent plan to synchronise the cascading activities regulate the progress of the production

PUSH vs PULL

- In a PUSH system, entities (materials, components, semi-finished products) are **transferred** to the downstream phase **regardless** of whether the latter is ready to receive them
- This immediately generates **WIP** (work in progress)

PUSH vs PULL

PULL

- The customers "pull" the production; customer consumption triggers production, so this is regulated downstream of the production process
- Therefore, the product does not go into production to anticipate the customer's actual demand but following his explicit request
- In a pull system, therefore, no one upstream process should produce goods or services until the downstream customer requests them

rather than "pushing" material through the system based on weekly schedules generated by production control, the entire process should be converted to a pull system that is operated directly in response to customer demand

Pull Systems: decoupling

- Decoupling by **material flow** (FIFO lane, supermarket)
- Decoupling by **information flow** (lot size formation, leveling)
- Decoupling by **staff** (workforce)
  (short term increase/reduction in capacity)
- Decoupling by **POT** (planned operation time)
  (decoupled shifts, running through breaks, shift models, special shifts)

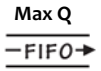
Buffers

Stock

- Undefined rule

FIFO Line

- FIFO picking logic
- Max Inventory defined
- Stop signal upstream and downstream (full/empty)



Supermarket (SM)

- Assigned position per part/code
- FIFO picking logic per part/code
- Max Inventory defined per part/code
- Unique control signal (kanban)

Supermarket - Features

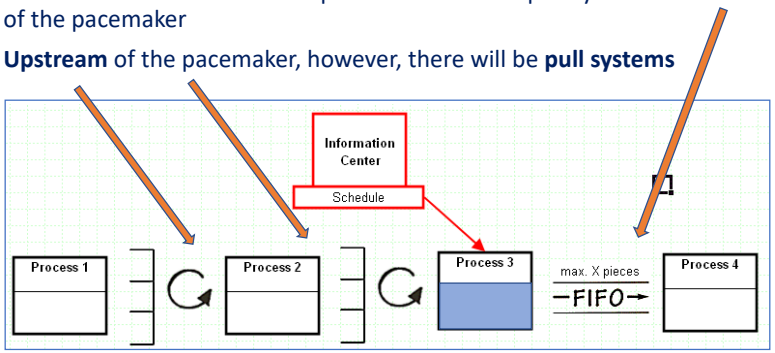
- Products that the downstream process may require are present in **specified quantities**
- Products are stocked in such a way that you can choose **exactly the code** you want
- The production of the process upstream of the supermarket is regulated by a **kanban** system
- The supermarket is the **pull tool** that allows the upstream stage to **follow** the production of the downstream station
- They are positioned in close **proximity to the supplier** process to help that process maintain **visual contact** with customer demand

Supermarket

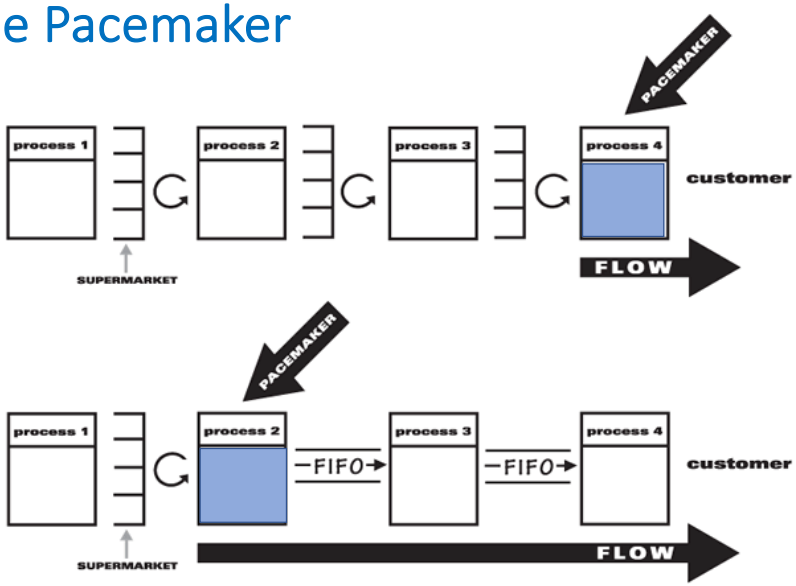
BOSCH REXROTH Solutions

Production Control: the Pacemaker

- The Production stage in which a Lean system plan the production. It is, therefore, the point at which you set the "**pace**" of production
- The decision as to where to insert the pacemaker is essential because this is the point that can **control the entire system**
- There must be a **continuous flow downstream** of the pacemaker, which means that there can be no supermarket or other pull systems downstream of the pacemaker
- **Upstream** of the pacemaker, however, there will be **pull systems**



The Pacemaker



The Pacemaker

- is the only point in the entire value stream where the external customer enters the customer's signal
- controls the entire value stream
- indicates the cycle time for the whole value stream
- *has nothing to do with the bottleneck process (it can be, but not necessarily)*

What are the requirements for the pacemaker process?

- Delivery capability
- Stability