Stock reduction analysis for the Hamburg factory:
study of feasibility for the Rhythm Wheel planning method

Objectives:
• Switch to a demand-driven planning method in order to have a Pull Supply chain, “abandoning” forecast and planning based on sales order only
• Optimize production planning current method reducing inventory and cost while keeping service level
• Fight Bullwhip effect

Rhythm Wheel Concept:
• The Rhythm Wheel is, on a certain production line, the periodically repeating sequence of production for the SKUs manufactured on this line: this sequence will have a certain length (wheel cycle time). Each SKU will be produced with a certain frequency, and in a certain quantity range, only if sales order until next wheel confirm the need (based on replenishment reorder point)

• It is a decoupling point placed at the DC level, between production and client demand. It will reduce nervousness by applying 3 buffers: limits of production (capacity buffer), limits of frequency (time buffer) and by allowing the DC inventory to fluctuate, absorbing the shock of variation, instead of the production schedule (inventory buffer)

Rhythm Wheel Construction:
• Main steps:
  1. Demand & variability analysis
  2. Determination of optimal production quantity range and frequency based on changeovers costs, inventory costs, freshness costs and quality costs.
  3. Determination of changeovers matrix
  4. Computing optimal sequence
  5. Computing final Rhythm Wheel per production lines (4 production lines in our case)
  6. Replenishment reorder point is calculated dynamically every wheel

Simulation construction:
• A VBA simulation was created in order to compare real data with what would happened if we had implemented a Rhythm Wheel
• Available years to compare: 2017, 2018
• Simulation creates randomness of demand, capacity constraints, dynamical prioritization of productions, while following Rhythm Wheel concept and constraints.
• Main graphical outputs: Planned productions per line, Equation of stock in cases, Equation of stock in days of cover, OOS and average stock, Capacity utilization

KPI results:
• Inventory ➔ Drastic reduction of stock cover: in 2017 and 2018, an average of -57%
• Production stability & predictability ➔ Production more stable and predictable, reduction of planned production standard deviation of -17%
• Capacity utilization ➔ Capacity utilization not as smooth as expected, as we produce only what is really needed
• Average Production quantity ➔ Little reduction of average production quantity of -5%, but some SKUs hat increased quantity ➔ no improvement
• Production frequency and freshness ➔ Reduction of freshness linked to increase of frequency of production of 7% ➔ linked to OPQ tool calculations for 2 SKUs
• Case failure rate (OOS) ➔ Big increase in OOS, linked to lack of pre-productions mixed with capacity constraints ➔ an adaptation of the Rhythm Wheel is necessary

Recommendation & conclusions
➔ The Rhythm Wheel is confirmed to be a strong inventory reducer, while optimizing production cost and stability (Bullwhip effect reduced)
➔ Rhythm Wheel allow to effectively bypass forecast, focusing only on sales order until next wheel ➔ demand driven production planning
➔ The theoretical Rhythm Wheel tested must be adapted to avoid OOS: by reducing production volumes (costs>5%), the frequency increase, cycle time is reduced, capacity utilization can be better adapted.

For promotions, we recommend pre-production based on forecast, if sales department provides visibility.

Author
Andrea Sestini
Supervisor Nesté Deutschland
Oliver Haeckel
Supervisor EPFL
Philippe Wieser