

## SIMULATING ICECREAMS PRODUCTION, RECOGNIZING YOUR CONSTRAINS AND OPTIMIZING YOUR PRODUCTION PLAN AND REVENUE



### Problem

**Conaprole**, the biggest **Diary Production Company** in Uruguay, produces more than 150 SKUs in their **IceCream Plant**, using 5 production lines and up to 5 different packaging configurations for each line.

Their Ice-cream production is planned on a 12 month rolling basis, as part of a Sales & Operations Planning process, and the demand plan has a huge variation as it's seasonality (due to summer season), so they need to anticipate the production for the peak season during the low season, taking in account the product life shelf, the warehouse capacity and cost (freezing cameras), as they are unable to meet the high season demand, generating stock-outs; and finding very difficult to quickly reschedule their detail plan according to their production capacity, to meet their goals.

Bottle necks and constraints in their production lines process, variations in human resources availability (stochastic events), make the planning analyses even more difficult.

Their **challenge** is to be able to reformulate their long term planning, balancing supply and demand, being sure they will not give stock out in the future in key products, and optimize the use of their production capacity.

### Goals in mind:

How to schedule their ice-cream production, considering **restrictions** related to production such us batch size, flavors dependency, priorities, warehouse capacity, warehouse costs, inventory cost, and considering **variations** such as overall equipment efficiency, forecast error, human resources, etc.

### Project Goals

- Simulate and analyze different production scenarios, for the following twelve moving months of demand, open by SKUs and production lines. The simulator will let them know production needs in units and batches, according to demand, initial inventory, and "real production" estimated month by month, using periodization criteria and minimum production policies, defined by the user.
- Optimize the production and preproduction needed to avoid Stock-Outs for all SKUs. Within 100 automatic runs, the simulator will reproduce all the necessary production within the available capacity, prioritizing the products shelf life and minimizing warehouse costs.

- Optimize the use of production lines, starting with an optimized production plan, without stock-outs. CAPACITY OPTIMIZER output will be used as input of this third experiment. Within this simulation, the analytical engine will look to complete the use of monthly available capacities.

## **SOLUTION**

Based on Anylogic, with a discrete event approach, we have designed and developed a solution interconnected with their S&OP planning platform and with SAP Material Management and Production Planning, which includes three different experiments.

The simulation will first show the proposed plan, according to demand, detecting stock-outs and backorders that can be expected if production follows forecast and priority proposals. The first experiment allow user to explore the impact of different situations such as: the need of closing lines during certain periods, modify equipment efficiency, modify resources availability and human resources schedules. He may manually change SKU's priorities, and analyze expected impact on revenue ( due to stock out valorization)

Multiple runs experiment searches, threw iteration, free capacities, keeping life shelf product as maximum as possible, and anticipates production until stock outs reaches its lowest value.

Last experiment frees capacity, pushing production to the beginning of the planning period, to leave free capacity in all lines as a buffer.

The input data includes:

- Demand per SKU
- Inventory levels per SKU
- Batch size, priorities, life shelf, warehouse cubic occupancy
- Overall Efficiency ( if desired) and MAPE ( if desired)
- Costs

The system considers the following:

- SKU's mapping lines and sublines
- Lines and Sublines capacities
- Lines and packaging restrictions
- Warehouse limitations
- Production times

## **OUTCOME**

The Production Planning model exports to excel the annual plan achieved, after running each of the experiments. The data is open by SKU, and it shows the monthly plan on an annual basis.

Users will have at a first glance, an output where they will see in a histogram, variations in inventory levels, demand, warehouse and stock outs.

They will be able to explore what is happening in each production line, and also refer to any specific SKU, to to understand its proposed production (when and the proposed batches)

