IBM

Boosting fresh dairy production with IBM ILOG Plant PowerOps

Overview

Danone is one of the world's largest food and beverage companies, with 88,000 employees and worldwide sales of over US$18 billion in 2006. Based in Paris, Danone is the world's leading manufacturer of dairy products and bottled water, and the second largest of biscuits and cereal products. The group's portfolio of brand names includes Danone, Evian and LU.

■ *Business need:*

Danone's main goal was to implement a flexible solution capable of improving key operational performance metrics such as inventory coverage, operational efficiency, equipment utilization, product waste, and changeover and cleaning costs. Important secondary goals included giving planners a better tool for performing what-if analysis and rescheduling, and implementing a solution that complemented the major investment Danone was making in SAP APO for supply chain management.

■ *Solution:*

IBM® ILOG Plant PowerOps extends SAP PP/DS for the requirements of fresh dairy production planning and detailed scheduling. ILOG Professional Services and Danone Themis collaborate to meet Danone business requirements.

■ *Benefits:*

The ILOG (ILOG is now a part of IBM) solution increased Danone's service levels and operational efficiency, while reducing inventory and production costs. The plant replaced a home-grown system, *which took two days to generate an imperfectly optimized plan, with a system that generated a far better schedule in under 15 minutes.*

Approximately 56 percent of Danone's revenue comes from its fresh dairy product division, which has more than 40 plants worldwide. The division grew over 9 percent in 2006, and experienced year-on-year growth rates exceeding 20 percent in many emerging markets, including Russia, Turkey, Argentina and Mexico.

Challenge

The fresh dairy division has multiple product lines, including solid yogurt, liquid yogurt, desserts and fresh cheese. The individual products are made through a complex, multistep process. This case study focuses on the yogurt-making process. In order to make yogurt, milk has to be pasteurized and fermented to create batches of "white mass," which are then placed in containers of various sizes, sometimes with fruit or other ingredients. A fresh dairy plant may make more than 10 types of white mass that differ, for example, in percentage of cream and type of yeast. A typical plant produces more than 100 finished products on 10 to 20 packaging lines. Between pasteurization, fermentation and storage, as many as 100 tanks can be used. And because the plant produces food, extra care must be taken to ensure high standards of sanitation, control of allergens, batch traceability and maximum product freshness.

The plant must closely coordinate the two primary production steps: the transformation of raw materials such as milk, milk powders and yeast, into white mass, and the filling and packaging of the final product. The right amount of white mass has to be scheduled, and it has to be used as quickly as possible.
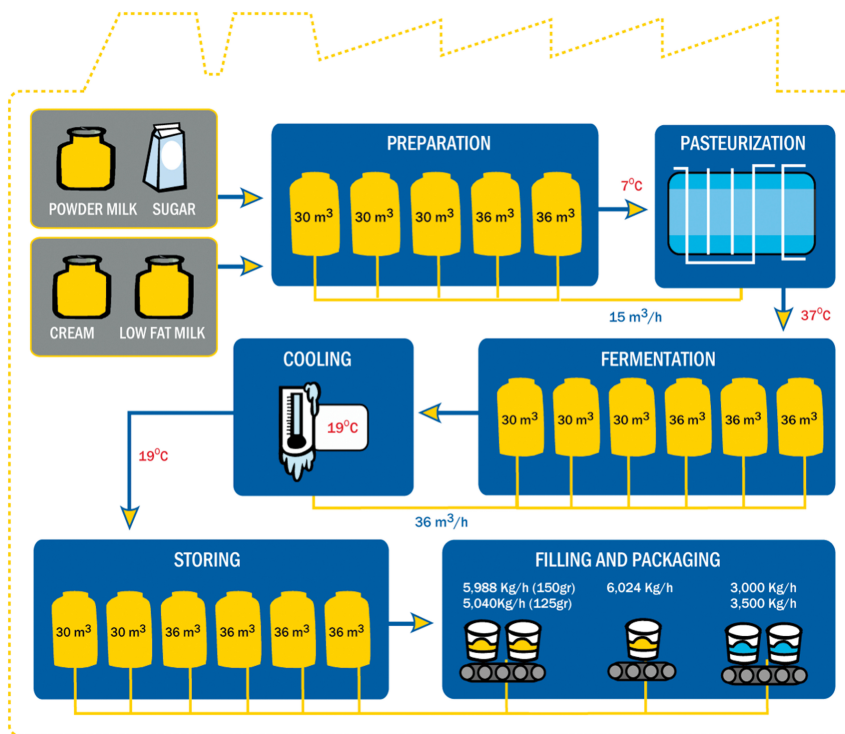
Diagram of yogurt production process

> *"We have compared production plans generated with and without IBM ILOG Plant PowerOps. We have been extremely happy to see that IBM ILOG's application generates plans that improve every single one of our key performance indicators. Our plant in Irapuato is now equipped with an excellent planning and scheduling tool providing the best possible plans, while improving our operational flexibility and our ability to react quickly to unexpected events. This pilot project was delivered on time and on budget. Within Danone, the news is spreading quickly. We already have more requests for implementation in the next two years than we can satisfy. We are currently implementing the solution in Russia, with Argentina next in line."*
>
> *– Jean-Michel Egu,*
> *Director Business Solution, Danone*

Operational scheduling challenges include:

- Deciding which and how much white mass to produce in each tank given the available connections to the filling and packaging lines
- Finding the best time to clean the tanks and the filling lines given health and nutrition labeling requirements, and the availability of cleaning equipment
- Synchronizing material consumption with white mass availability and freshness
- Respecting batching policies for compliance with traceability regulations
- Maintaining a steady supply of finished goods within a minimum and maximum inventory corridor

To these production challenges must be added those for high demand variability. Fresh dairy products are consumer goods with significant promotional marketing and a steady introduction of new products. Demand is often uncertain. New products may steal sales from old products or simply contribute to market share, and marketing campaigns can result in sales that are higher or lower than forecasted. And in the fresh dairy industry, the challenges associated with demand variability are compounded by the short shelf life of the finished products and relatively long production lead times—three to four days from milk

pasteurization to final product. Poor production plans lead to both product waste and stock shortages, making agility and regular rescheduling critical.

Solution

Danone knew that IBM ILOG was the leader in optimization technology, and that IBM ILOG optimization engines executed the models in SAP APO. When the company heard that IBM ILOG had developed an integrated production planning and detailed scheduling application for the special challenges faced by process manufacturers, it wanted to learn more. And when the company realized the application was a purely analytic application designed to perfectly complement their SAP software, it wanted to try it out.

To make sure IBM ILOG Plant PowerOps (PPO) could safely meet the expectations of Danone's business units, Danone and IBM ILOG created a team composed of production planners and business and IT managers from Danone, and optimization and detailed scheduling consultants from ILOG Professional Services. This task force analyzed the needs of four different Danone fresh dairy plants before formally evaluating IBM ILOG's application as a solution. Since IBM ILOG PPO meets the very operational complexities that Danone deemed most important, discussion focused primarily on ease of use for the planners, required metrics, and integration

with SAP. Once the team felt all the requirements were well understood and addressed, Danone decided to proceed with a pilot project in Irapuato, Mexico, at one of the largest fresh dairy production facilities serving a market growing at 25 percent per year. The plant's capacity was constrained, so any improvement in scheduling efficiency would result in significant benefits.

Benefits

Danone moved from planning once a week with mixed scheduling quality to high-quality planning and rescheduling whenever necessary. The planners appreciate the ease of use, plan feasibility, schedule quality, greater amount of information on production orders, activities and resources at their finger tips, and availability of new operational and financial metrics. IBM ILOG PPO's integrated planning and scheduling approach delivers value beyond plan feasibility and schedule optimization. It also serves as a tool for negotiations between the manufacturing and supply chain departments, allowing them to collaborate more easily to find the best balance between inventory levels and operational efficiency. Now, everyone involved can see the impact of unexpected changes in demand on the manufacturing process, as well as those of production scheduling decisions on inventory levels and order fulfillment rates.

"The product knowledge, experience and dedication of the IBM consultants have been remarkable during all phases of the project, from project planning to SAP integration to user acceptance testing and go-live. Team experience allowed us to quickly solve difficult situations that always arise during critical phases of such projects. It is in these situations that you can fully appreciate the value of working with a first-class team."

– Krzysztof Kaziow,
  Danone Project Manager,
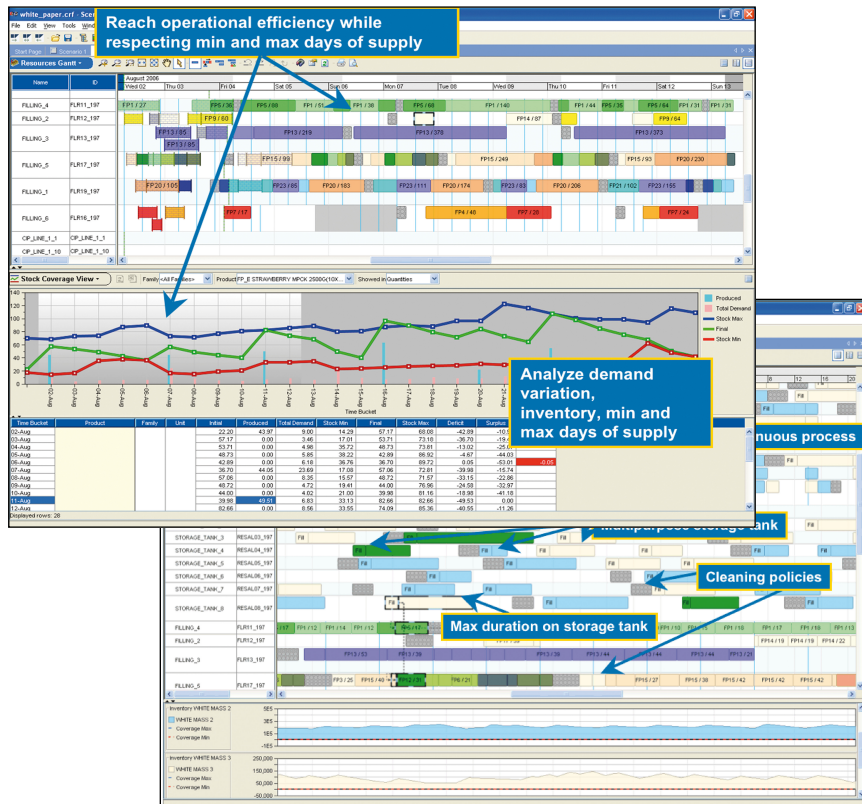
IBM ILOG PPO serves as a powerful tool for analyzing plant production
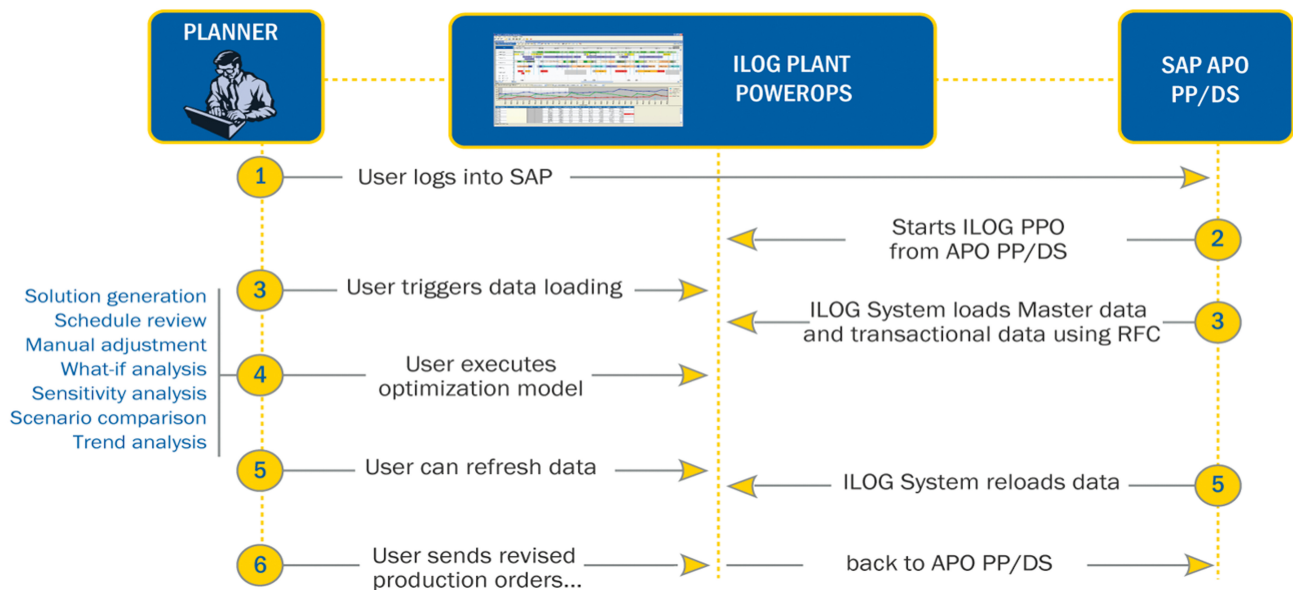
With the Irapuato plant's constrained capacity and Danone's rapid market growth in Mexico, the efficiency resulting from the IBM ILOG PPO solution has contributed greatly to the company's profitability. And while asset utilization gains have certainly translated into lower operating costs and higher margins, the biggest financial benefits have come from increased sales and market share.

ILOG Professional Services and SAP integration

Consultants from ILOG Professional Services played an important role in the Danone project. With many years of experience in optimization and detailed scheduling, they worked side by side with the Danone team to ensure the success of the project.

The consultants' experience with SAP was as critical as their expertise in optimization. SAP is the single repository of both master data and transaction data. Changes in master data, such as resources to schedule or products to make, are done only in SAP. This data, along with expected inbound shipments of raw materials, current inventories and production orders, all need to be easily available to the IBM ILOG planning and scheduling application without any special effort. This is accomplished by having IBM ILOG PPO launched directly from inside the SAP PP/DS environment, eliminating the need for planners to log out of one environment and into another. For the planners, who manage production orders in PP/DS and planning and scheduling in IBM ILOG PPO, this ease of use is critical to the practical use of this analytic extension to SAP APO PP/DS.

	PLANNER		ILOG PLANT POWEROPS		SAP APO PP/DS

1 User logs into SAP →

2 Starts ILOG PPO from APO PP/DS ←

Solution generation
Schedule review
Manual adjustment
What-if analysis
Sensitivity analysis
Scenario comparison
Trend analysis

3 User triggers data loading →

3 ILOG System loads Master data and transactional data using RFC ←

4 User executes optimization model →

5 User can refresh data →   **5** ILOG System reloads data ←

6 User sends revised production orders...   back to APO PP/DS →

Control flow example

Key features

IBM ILOG PPO gives companies an application:

- Designed as a decision-support system—IBM ILOG PPO provides a planner-friendly interactive interface that can help users analyze plans and schedules, run what-if analysis, compare scenarios, balance the optimization of multiple goals, modify the recommended solution, and determine whether a modification violates any constraints.

- Based on IBM ILOG's state-of-the-art optimization technology—IBM ILOG PPO generates the best possible plans and schedules to maximize profitability and customer service, while taking into account the full set of operating costs and constraints, from inventory carrying and changeover costs to equipment management and maintenance requirements.

- Based on integrated production planning and scheduling—with one model for both planning and scheduling, planners can use IBM ILOG PPO to immediately analyze the impact of new production plans on manufacturing efficiency, and scheduling decisions on inventory levels and demand satisfaction.

- Capable of managing the real operational constraints of process manufacturing—IBM ILOG PPO generates production plans that are executable on the plant floor. IBM ILOG PPO models tanks, tank-line connections, batching and cleaning policies, and setups and changeovers. Production plans are no longer limited to finished products, but include full support for the production and scheduling of intermediate products and the special equipment associated with pasteurization, cooling, fermentation and cleanup.

Recyclable, please recycle.

DANONE

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