software from Wonderware® Corporation in Irvine, Calif., as the system of choice for reinventing operations. They purchased a development toolkit from Wonderware distributor Futuristix and began designing systems that would include InTouch® process visualization software, InBatch™ flexible batch management system and IndustrialSQL Server™ real-time relational database. This latter module was intended to provide historical data on each product batch and facilitate easy-to-use structured queries into that data for process optimization. Conceptual project design was launched in

The only problem with being an industry leader for so many decades is the tendency to continue with success formulas for too long. At the Boksburg plant here in suburban Johannesburg, this meant that many operations were still too labor-intensive and often too decentralized for efficient production. In the early 1990s, management studied all operations to find ways of optimizing production both to reduce cost and increase efficiency. The Boksburg plant was chosen as the test facility for a complete renovation of the Kitchen Plant where jams, brines and sauces are made that are intermediate ingredients in a broad range of end use products.

As part of the Boksburg Plant upgrade, the company and its system integrators, Hatch Africa (Pty) Ltd., researched software-based-production systems and selected modules from the Windows-based FactorySuite™


“Our overriding goal was to have a modern, integrated Kitchen Plant with real-time control,” explained Evert de Vries, Langeberg Project Manager. “We wanted to have a Plant
that could run at least 10 different products simultaneously, coordinated with production of at least 17 different recipes that result in the intermediate ingredients for those products. Our goals were to reduce the labor content of each product, reduce the cost to make each product, to reduce production waste and to raise the quality of all our products to the highest attainable in the market. We felt that, in combination, these elements would make us more strategically competitive in the marketplace.

“Our new Kitchen Plant meets all of those criteria and, in fact, it’s so productive that we now need to renovate our Filling and Seaming lines so that we can package food products as efficiently and in the high volumes at which we now can make them,” de Vries added. “The Kitchen Plant is so efficient that it’s no longer the bottleneck in our production.”

World Class Batch Production

The new Kitchen Plant has several batch preparation areas that include a wide range of tanks, vessels, pipes, manifolds, valves, mixers and other equipment – all controlled automatically using Siemens Programmable Logic Controllers (PLCs) and InTouch operator workstations. Part of the batch management task is to make sure that this equipment is available in a timely fashion for use in production of each batch.

“All recipes are initiated by the system and we tend to make one product at a time in each area because we want consistency of throughput for each product,” said Sean Elton, Kitchen Plant Production Manager. “We need flexibility to handle various products according to seasonal growing patterns. The Kitchen Plant staff know in advance what product batches to initialize in order to adapt to the fresh produce as well as the jam concentrates coming in. Once launched, the production supervisors in the control room work closely with floor operators to monitor the automated production.”

Many of the most commonly used raw ingredients are supplied to the Kitchen Plant via seven piping systems that help automate addition of starch, tomato puree, vinegar, brown syrup, white syrup, oil and hot water to the appropriate batch. These ingredients are discharged automatically via manifolds into the tanks, autoclaves and mixers appropriate to the particular recipe. Langeberg and Hatch Africa set up approximately 125 product recipes and another 30 Clean-In-Place (CIP) recipes in standard sets of production “trains.”

The Cook Plant includes three autoclaves that are used to make products such as bean soup, asparagus soup, pea soup, etc., which require a combination of temperature and pressure in the process. Tomato soups are made in cook pots under no pressure. Piccalilli relish, milk and starch are all made in the Kitchen Plant, and dry starch is added in a special TPM mixer that turns it into liquid form for distribution through the piping.

The Brine Plant manufactures clear brine and other brines that are pumped to the filler section in the packaging plant, where they are added to most of the products in the canning process. In the Brine Plant, three high speed brine tanks (each having three mixing and three buffer tanks) plus normal mixing tanks are controlled for feeding the batch processes. The Jam Plant has six open cookers and two sets of vacuum cookers, which are used to prevent jam discoloration in the cooking process while providing faster throughput.

Production priorities are set within the system and each batch is scheduled on a per-shift basis, with InBatch providing the ability to schedule as many as 16 recipes for processing at any given time.

All ingredients arrive in tanker trucks or in drums and are diluted or mixed in preparation areas to produce the correct sugar concentrates (brix levels) for delivery to the batching areas. For example, concentrated fruit pulps other Langeberg Branches are diluted with water and sugars to make up pre-mixes.
Dry beans and peas are pumped to soaking tanks, where they are softened for up to eight hours before being piped into the autoclaves in the Cook Plant. Tomato puree, as another example, is received in a 40 brix solution and must be diluted to a 12 or 24 brix solution, depending on the requirement for the final product. Even white and brown sugar are diluted to a 12 or 24 brix solution before being pumped through the piping for use in all recipes.

A separate Spice Room is used to store all the dry ingredients that are added by hand at specific phases during a batch. Langeberg staff pre-batch the proper weights and combinations of spices for particular product batches so that they can be added simultaneously by the floor operators. These ingredients might include everything from salt and pepper to colorants, etc.

Each batch run uses a similar procedure in which the first ingredient is typically 90% of the water required for the product, followed by the other ingredients and then the final 10% of the required water. This not only insures a good mix of ingredients but having the final 10% of the water added last simultaneously flushes the inlet pipes. InBatch checks for equipment availability and starts those batches that can be started immediately.

Each product recipe includes a number of phases and these are run in sequence, issuing instructions to the PLC for specific actions to be controlled at every phase. Certain phases require operator intervention—such as the hand addition of small amounts of spices or other ingredients and operator verification that a manual phase has been completed—and the process is halted until the operator has accomplished the task and entered feedback data on a nearby operator interface panel. This data entry step verifies that every step of the recipe has been completed.

The operator messages are stored locally in the operator workstations and are also sent to the InBatch Server where the process controller can view the messages that are queued for each of the workstations. In the event of a workstation failure on the Kitchen Plant floor, the process controller is still able to instruct the operator verbally of the next step to ensure that the batch continues without interruption. At the end of each batch the recipe is updated to “Done” status and InBatch proceeds to the next production batch.

Complete Product Genealogy

All historical data on each batch run is maintained in an IndustrialSQL Server database. Batch record logs provide traceability from the finished products all the way back through the production process to the ingredients consumed. These logs include information such as start/stop times, quantities, ingredients and even operator details for use in maintaining product genealogies as well as for historical analysis to optimize system performance using standard structured query statements. Both the InBatch and database systems utilize dual hard drives so that all data is 100% backed up. The SQL machine also has a DAT tape backup.

Langeberg has an off-line laboratory that tests samples of every batch for pH and Total Dissolved Solids (TDS). If either of these is too high or too low then the operators are prompted to take corrective action. In the case of certain brine batches, the InBatch system makes the adjustments automatically and then prompts the Kitchen Plant operator to resample. All test results are recorded in the IndustrialSQL Server database for traceability purposes.
The integrated nature of the FactorySuite software also permits management to add new capabilities easily.

“Based on the successes we’ve had in the Kitchen Plant using the FactorySuite software, we’ve decided to standardize on Wonderware software at all five of our major manufacturing plants in South Africa,” de Vries noted.

“All PLC data is acquired by InTouch and then passed through to IndustrialSQL Server for logging,” Elton said. “We record approximately 1,950 real I/O points, of which roughly 30% are analog and 70% are digital.”

All Clean-In-Place operations are managed by InBatch as well, to optimize efficiency and throughput. CIP operations can take place at two levels, either in tanks or in the pipe lines, so that either can be cleaned while the other is in use. Fresh water, caustic and recovered water are used to clean the lines and tanks in the most efficient and environmentally friendly manner possible.

“One of the significant benefits of using the InSQL database module is that it makes it easier to optimize our processes and better integrate other systems, such as computer-aided maintenance and time and attendance,” Elton said. “We can go back and look at real production data and pick up fine details off-line that we can use in continuously fine tuning our processes. It also gives us production-based reports, either in real-time or at the end of each shift, so that we know exactly how we’re doing on any given day. We’ve never had this kind of information before so we can achieve far better control.”