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PROCESS TO PACKAGING SPECIAL REPORT

Jam Plant Integrates Packaging & Processing

Integrating the packaging and processing areas of manufacturing proves to be anything but a sticky situation at this Oregon jam and jelly plant.

[Gary Mintchell](#), Editor In Chief, Automation World

Flexible recipe management is increasingly important in batch food processing applications, as the market evolves to favor smaller batch sizes and requires increased operator productivity. Integrating the packaging line with processing operations is also becoming more important as manufacturers seek to streamline operations.

"The packaging line in food processing operations consists of various machines from different manufacturers that don't talk to each other—or anything else," says Michael Gurney, co-owner of Concept Systems, a systems integrator hired recently to implement a recipe management system and integrate the packaging line at Trailblazer Foods.

The history of the Gresham, Ore., manufacturer of jams, jellies and preserves is a story in itself.

Forebears of company founder Gary Walls settled in the Willamette Valley of Oregon in the 1850s and began farming and developing recipes still used at Trailblazer. Walls grew up farming, picking berries as a child and still working his fourteen-acre field of blueberries. Kidney failure drove him from his original career as a teacher and coach, but a timely transplant with his sister as a donor gave him a new outlook on life. Walls and his wife incorporated Trailblazer Foods in 1985.

Growing company

By the early nineties, Trailblazer Foods had more than doubled its workforce and its product lines. In 1993, a licensing agreement with the restaurant and franchise chain McCormick & Schmicks greatly expanded the company's product mix. In addition to jams and jellies, the firm took on McCormick & Schmick's Jake's Famous Products line, including clam chowder, smoked salmon, specialty sauces and a chocolate truffle cake.

With such expansion, a 40,000 square foot facility was built in Gresham to house not only manufacturing but also the corporate and distribution functions of Trailblazer Foods.

Expansion breeds thoughts of process improvements. Maintaining recipes on legal pads or their equivalent just doesn't make it in today's fast-paced manufacturing environment. A recipe in batch manufacturing is not simply a list of ingredients. It also contains the "step" information or instructions for each step of the process, from mixing to heating to finished product.

Traditional automated recipe management systems have primarily been data base managers that download tables of values to a programmable controller (PLC), which sequences these to manage the process. Typically, the steps aren't easily configurable by the operator. For example, canned recipe management systems usually don't allow pauses for user intervention and don't allow tweaking of the recipe while the process is being run. Canned packages also typically don't support transfer of product between processing stations, and there's no facility for verifying the machine configuration when new recipes are first run.

Engineers at Trailblazer Foods were looking for a more flexible solution for recipe management than off-the-shelf automation solutions could provide. Trailblazer hired Concept Systems to develop an upgrade to its plant "cook deck" control system. Concept's challenge was to preserve the recipes and results of the existing manufacturing process while

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maintaining or increasing product quality, increasing productivity, and reducing costs and waste.

Recipe solutions

Trailblazer's cook decks contain multiple kettles, each about five feet wide by four feet tall, where the ingredients of their preserves are mixed and cooked. Different kettles are used to hold ingredients at different stages of processing. While one kettle cooks one recipe, a different recipe could be run in the mixing kettle.

Trailblazer Foods' previous recipe management system relied on the use of paper recipe sheets that specified how much of each ingredient the operator should weigh out and put in the kettle. In addition to replacing the paper recipes with an electronic system, Concept's approach toward automating this process was to make the underlying design as generic as possible, allowing the operator to define each step.

In the new system, the operator can select and modify cooking recipes via a graphical operator interface screen. Then, the recipe management system measures out ingredients, tracking the weight of each using load cells (electronic weigh scales) mounted under the mixing kettles. The outputs of the system's three load cells go back to a scale indicator that is readable via the PLC. The PLC can run multiple recipes at the same time, plus control kettle cleanout via water flush and mixing. With the new operator interface, recipe changeover times have been significantly decreased, and one cook can operate and monitor the entire process.

As an integrator, Control Systems uses the control platform specified by its customer. In this case, the customer used PLCs from Rockwell Automation. The control platform, in addition to the custom code, included an Allen-Bradley ControlLogix PLC and RSView SE human-machine interface from Rockwell Software.

"We took the customer's paper-based recipe system and came up with a scheme to enter their recipes in RSView," reports Gurney. "The software links to the operator interface. Trailblazer has a bunch of different products, so we developed a custom recipe manager and made a call to RS View to do the operator interface. The operator enters batch information into the system via this operator interface. The recipe is a series of steps. Each step enables a series of options specific to their system. They can set up every step including an end-of-step type that the operator can enter and acknowledge. This makes for a very flexible and interactive system."

Initial setup consisted of entering the recipes and saving to a master recipe list with a unique number. The system handles routing and control programs that need to be set. Although some manual process set-up still exists, such as loading material, when the manual step is activated, a photo of the right set-up pops up on the screen.

Too many cooks

Too many cooks can spoil the broth, they say, and one way they spoil it is by contributing to unwanted variability. Batch processors that have traditionally used manually intensive production systems involving too many operators can benefit by installing computerized controls to yield:

- A decrease in recipe changeover times
- An increase in product consistency and quality across a range of operators and operator skill levels
- Increased productivity for one cook via automation of mixing and material handling operations.

These are among the benefits Trailblazer Foods now takes advantage of since it implemented the process improvement strategy recommended by Concept Systems.

Once the batch recipe system was in place, attention turned to the packaging line. Here the problem was that each machine on the line was built by a different original equipment manufacturer. As Concept Systems' Gurney explains, each machine has its own control system distinct from the others, and the various control systems do not communicate with each other or anything else. "Our goal," states Gurney, "was the integration of the various systems such that the packaging line would know what products were in the process of manufacture and could be automatically set up. For example, there are different bottling processes for jams versus jellies."

Since the packaging side of the business was not fully integrated with itself or with the processing side, Control Systems used an Ethernet network to tie the conveyor system to the supervisory system built for the batch process. The network system uses EtherNet/IP, an industrial network using the common industrial protocol (CIP) standard of ControlNet International. The network is supervised by an Allen-Bradley ControlLogix platform.

Although some of the packaging machines are tied to the system in order to obtain a minimum level of integration, the main part of the integration is achieved through the conveyor system. Absolutely critical is careful control of the amount of time product spends in the cooling tunnel. This system contains about 25 Rockwell Automation Powerflex 70 variable frequency drives—all speed coordinated. “One of the keys to the system,” states Gurney, “is that we can control the backlog of product into the packaging stations to assure maximum throughput.”

Some might be leery of using Ethernet in a manufacturing setting, but Gurney says that Concept Systems has had a lot of success with it. “We know how to take advantage of EtherNet/IP, and have been using it even down to the Remote I/O level,” he adds. “The biggest feature right now is the huge bandwidth. It is high enough that the non-deterministic nature of the network is not an issue any longer. Another benefit is the ease of access to components. Many are commercial, and therefore, easier to find and maintain—not to mention less expensive than fieldbus components from ControlNet or Profibus.”

The biggest benefit to Trailblazer after implementation of this system is decreased set-up time, according to Gurney. Set-up is automatic in many cases. An additional benefit is the elimination of the necessity of “tweaking” set-up parameters that often leads to a loss of product during this process.

Improvements like these have positioned Trailblazer Foods to compete more effectively in a marketplace that continues to put more and more emphasis on flexible recipe management and smaller batch sizes.

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