One of the 20th Century's closing acts was the shuttering of Sara Lee Corp.'s massive bakery in New Hampton, Iowa. It was a brawny, high-volume facility capable of turning out more cheesecake than Americans were willing to buy. Therein was the problem: The plant only excelled at making cheesecake.

It was a one-trick pony. It was vanilla in a spumoni world.

Mainstream America had an appetite for mass-produced products 40 years ago when Sara Lee set up shop in New Hampton, but not anymore. Today's market is fragmented, and even iconic food brands come in variations of the basic recipe. Throughput still determines cost of production, but optimum has replaced maximum in establishing throughput rates. Production and packaging lines can't simply be high speed; they must be sufficiently flexible to produce multiple products in a growing assortment of container options.

This is especially true for copackers, the manufacturers whose production schedules are dictated by incoming orders from private label and branded-product customers, as well as their own brands. How quickly they can switch from one product formulation, or one label or package format, to another can determine if they turn a profit or operate at a loss.

"The key to survival and cost control is keeping our ovens running," believes Steven Huggins, CEO of Pretzels Inc. in Bluffton, Ind. "Changeovers are killers."

Multiple production facilities can spread risk and ease site-specific changeovers, although the philosophy at tomato processor Red Gold, Elwood, Ind., favors a product-specific focus at its three plants. "It adds manufacturing complexity, but it also allows the plant management team to sharpen its focus" and be the best at its assigned products, explains Mike Crooks, vice president of manufacturing.
"You could probably buy your way into flexibility with completely automated changeover," muses Bill Schiel, director of global business development-food and beverage for Invensys Plc, a London technology firm with offices in Houston, Texas. As a practical matter, food processors don't operate with an open-wallet policy, so the challenge is to balance throughput requirements with the ability to produce multiple products. "Copackers have the ultimate need, because their plants must produce the orders their salespeople can get," adds Schiel.

Toolless machine modifications are helping manufacturers tame the changeover beast. "Machinery has come a long way in terms of simple set-ups," suggests Bob Kolodziej, senior project engineer-food and beverage at Stellar Group Inc., Jacksonville, Fla. "Most companies are targeting a return to full production in less than 30 minutes. I think that is reasonable."

**Pretzel logic**

Pretzels Inc.'s facility was built in 1998, replacing a plant destroyed by fire. As its business-to-business and private label sales grew, ownership invested in automation that integrates raw materials delivery to high-speed mixers that feed eight ovens and two extruded corn lines. About 900 products are made, requiring about 20 die changes a week for different shapes and sizes. Each change means oven downtime, and Huggins compares the mechanics' choreography to "a race team during a pit stop."

Changeover complexity increases in packaging. The original 23 packaging lines, which integrated Heat and Control conveyors with Ishida scales and Hayssen form/fill/seal (f/f/s) machines with intermittent sealers, have expanded to 32. Robotic palletizing also was added.

Hayward, Calif.-based Heat and Control Inc. has served as Ishida's North American distribution partner for decades, and that relationship helped it deliver a system that more easily adapts to multiple package changeovers every day, believes Jeff Almond, Heat and Control's snack food industry manager for packaging. "The collaboration between Ishida's and Heat and Control's engineers becomes even more important when you want to make a seamless system, from front to back," he continues. But unless a snack food manufacturer is engaged in mass production with minimal changeovers, front-to-end automation results in lost flexibility, he concedes.

Ishida is gradually pushing its engineering expertise further into secondary packaging. The company recently introduced its Total Packaging System for snack foods, integrating the scales and f/f/s machines with downstream checkweighers and seal checkers.
"Manufacturers want more data and information, and using equipment from a single vendor means those units can easily communicate with each other and provide real-time data," says Almond. But Pretzels Inc. is unlikely to automate casepacking that straddles those downstream functions and the f/f/s machines, and the reason is not simply economics, Huggins emphasizes.

"Because of the flexibility we need to have, we have found that it doesn't make sense to automate casepacking," he explains. "It would just be another machine that has to be changed four times a day, when we change packaging films. And we like having the operator look at the bags. It allows that final opportunity to detect any deficiencies."

Riding the rails
Lean manufacturing principles have been front and center in many food companies' continuous improvement efforts, and some lean adherents denounce accumulation zones on packaging lines "as a crutch," notes Stellar's Kolodziej. He is not among them: "You have to build in accumulation or you're shooting yourself in the foot."

Mike Weikert concurs. As director of applications engineering at Nercon Engineering and Manufacturing Inc., Oshkosh, Wis., Weikert recommends various packaging line accumulation options, including Nercon's buffering solution that incorporates a movable carriage attachment to expand container travel paths as needed. "People often have a wish list of what they want accumulation to accomplish," he says, "but if they want to buffer 10 minutes of production, we listen but then show them they don't have the floor space to sustain that."

Inevitably, the conversation turns to minimizing changeover time, and that provokes an examination of alternatives to guardrail adjustments. From slotted brackets with carriage bolts requiring tools to fully automated, one-button solutions that activate pneumatic air cylinders or electric actuated cylinders, manufacturers crunch the numbers for time required, labor costs and changeover frequency. If extended changeover times result in upstream production interruptions, "the cost justification is a lot lower," Weikert understates.
Red Gold employs a quick set-point method that uses color-coded spacers to position railing for the next run. "The simpler you can make it, the fewer mistakes you're going to have," says Rick Jones, director of quality. If fine tuning is needed, operators are empowered to tweak the set-up when the line is running.

Cooked batches can flow to multiple packaging lines, lowering the likelihood of a processing interruption. While three changeovers in an hour constitute "an extreme event, it can happen and it does happen," says Jones.

To minimize downtime, the types of products being manufactured determine equipment selections. For example, PD pumps drive CIP systems in the Elwood plant, where ketchup is produced, while progressive cavity pumps are used in the Geneva, Ind., facility, because they shorten CIP cycles to evacuate products with particulates.

Both Red Gold and Pretzels Inc. underwent upgrades to their data management systems in recent years, an often painful but necessary process if manufacturing flexibility is to be maintained. "Supervisory control software enforces the production rules that give you flexibility," Invensys' Schiel suggests. The accuracy and accessibility of the information it yields determines how productive shift change meetings will be, he says.

Rules enforcement is important, Jones allows, but off-the-shelf software must be modified to meet the specific requirements for a plant's line flexibility. "The integrator or the software company can't define the problems you're trying to solve; you must do it," he emphasizes. "Because of our continuous improvement focus, we've become a lot better at narrowing the gap between what the system delivers and what we need."

Thanks to Red Gold's focus on lean, managers have become more adept at querying the database about the true impact of changeovers and other metrics beyond turns and line efficiency, adds Crooks.

Pretzel's legacy ERP no longer was supported, forcing a new installation. "It's always a challenge to go through that process, but I'm very confident in the numbers we're getting now," says Huggins. "We're always looking to increase the amount of usable information that we get, and the new systems give you much more information."

**Spaghetti schedules**
Production scheduling has become more complex in the past 20 years as manufacturers have sought to minimize inventories while meeting more diverse customer needs. "We're
always responding to customers' needs to be slightly different than the leading brand," says Red Gold's Crooks. Besides managing a growing selection of package formats, his colleagues must respond to requests for "a special twist" to help customers' products stand out.

Allergens add another layer of complexity, and the conventional approach is to run those products at the end of the schedule. Dedicated lines would add flexibility, though most reject that as an unattainable extravagance. However, Pretzel Inc.'s purchase in 2011 of the Philly Soft Pretzel factory in Canonsburg, Pa., effectively is adding that flexibility.

Acquiring sales and customers drove the original purchase, but recently a process for peanut butter-filled pretzels was perfected. The new item did well in market tests, and the Pennsylvania plant is being dedicated to its production. "We wouldn't do that product (in Bluffton) because all are other products' packaging would have to say, 'Made in a bakery that uses tree nuts,'" Huggins explains. If additional allergen-bearing products are developed, Canonsburg is the logical production point.

Managing multiple facilities adds complexity, but added flexibility is an attractive offset. And whether a food company is dedicated to its own brands or processes for multiple clients, more flexibility is a good thing.