

# Now, That's A Bakery!

Pepperidge Farm's new \$72 million, 265,000-sq-ft plant at Bloomfield, Conn., streamlines manufacturing to drive down costs.



BY LAURIE GORTON

**R**ight on time, Pepperidge Farms' newest facility baked its first loaf of bread on May 1. Construction started just 12 months earlier, and nothing stopped progress during construction, installation and commissioning of the Bloomfield, Conn., bakery. Not a financial crisis at a key vendor. Not even the winter's record 82 in. of snow.

"We never hit a bump," said R. Glenn Wright, project manager for the Bloomfield plant.

Preparing a new plant is no easy task, especially when it replaces the headquarters facility that serves the company's original and still biggest market. Through phase-out of Pepperidge Farm's Norwalk plant and startup of Bloomfield, 75 miles to the north, customers never saw a glitch, thanks to the company's planning process that gave a single construction and manufacturing team responsibility for both facilities.

Bloomfield is the third "greenfield" plant built by Pepperidge Farm in the past 15 years. When the bun line comes onstream early next year, the bakery will make 32 sorts of bread,

eight types of rolls, 11 varieties of croutons and nine styles of stuffing. It covers 265,000 sq ft on 42 acres of a former tobacco field north of Hartford, Conn., and represents a capital investment of \$72 million.

**SIMPLE AND ADVANCED.** "As our plants go, this is a relatively simple one, especially in contrast with the mega-plant at Denver, Pa.," said Dean Moll, vice-president, manufacturing, bakery/frozen, Pepperidge Farm, Norwalk, Conn.

Bloomfield is a baker's bakery, engineered to drive out costs through automation and state-of-the-art controls. For this fresh bakery plant, Pepperidge Farm returned to conventional horizontal mixing, and baking takes place in conventional tunnel ovens. But engineers packed in plenty of new technology as well. It uses an integrated formula control, a new-design brew system and manages pans robotically. Its new generation proofers feed the longest bread and bun ovens yet installed companywide. There's a first-of-its-kind triple-lane Swirl bread system and

a new approach to the company's signature dual-wrap package: flow-wrapping. Innovative fuel cell technology makes the new bakery less vulnerable to utility cost spikes.

"Bloomfield has the technology to keep things simple and, by design, operates more cleanly and more safely," stated Richard A. Ferguson, senior vice-president, operations, Pepperidge Farm, Norwalk, Conn.

The new facility, which serves the New England and Middle Atlantic regions, houses four major lines. Bread line No. 1 produces the company's signature Swirl bread at the rate of 160 loaves per minute. Bread line No. 2 bakes pan bread, also running 160 loaves per minute. Line No. 3, rated at 800 rolls per minute, is being designed to act as a combination line, capable of baking either buns or bread. It is targeted for completion late this year and in time for 2004's bun season. The plant's fourth line outputs stuffing and croutons, rated at 10,000 lb per hour.

**TEAM APPROACH.** At 54 years old, the Norwalk bakery was the oldest in

the Pepperidge Farm system. Despite upgrades, its lines relied heavily on manual methods, and the multistory layout was not compatible with the new automated technology responsible for the big gains in productivity at the company's other bakeries. Faced with deteriorating infrastructure and potential safety issues, management reluctantly made the decision to replace the bakery.

David Watson, vice-president of corporate engineering, described how Pepperidge Farm evaluated the existing facility and considered co-packing and retrofitting options. The

▼ New tunnel ovens, the longest yet installed by Pepperidge Farm in a fresh bakery, can bake 160 loaves of pan bread per minute.

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decision, however, went to building a new greenfield bakery. "Our target areas included New York and New Jersey as well as Connecticut," he said. In all, more than 60 sites were considered, with Bloomfield earning the nod. It offered not only good transport access and future expansion capabilities but also was just 75 miles away from Norwalk, the old plant and the company's headquarters offices.

Mr. Moll and his staff put together the startup teams, taking a cross-functional approach that blended engineering, formulation, personnel, installation and production skills. Four teams were created. The engineering team was tasked with building and process design plus facility construction and equipment

installation. The product transition team provided product contingency planning. The people transition team managed training, employee communications plans and hiring. And the startup and commissioning team was responsible for startup coordination planning with vendors, as well as R&D, QA, engineering and plant operations.

Pepperidge Farm also benefited from the expertise of outside sources it chose for the bakery. The Facility Group, Smyrna, Ga., took care of preliminary engineering design services and final engineering services for the base building, and it used Suitt Construction, Greenville, S.C., for construction services for the base building. The Dennis Group, Springfield, Mass., assisted with control system integration services, and The Henry Group, Greenville, Texas, managed bakery equipment installation services.

**CRITICAL DATES.** The bakery was fast-tracked. Pepperidge Farm announced plans for the new site in October 2001, and by February 2002, all equipment had been ordered. The company closed on the Bloomfield site April 30, 2002. Construction started the next day.

"The plant went up very quickly and was under roof by October, right before the bad weather set in," Mr. Ferguson said. "And we hit all our construction and process milestones."

Installation of processing equipment took place during the winter months.

"At one point, we had 270 people on site doing construction and equipment installation," said Mr. Wright. "The building proceeded from ingredient handling through packaging. The silos were the first to come in, then the mixers and the oven room. The severe winter of 2002 was a big challenge, but the contractors and vendors handled it well.

In all, Mr. Wright described the new bakery as a "fantastic team effort."

The first bread line started up in May, followed by line No. 2 in June, "as scheduled," according to Mr.



▲ The recipe management system (RMS) delivers bulk dry and liquid ingredients automatically to mixers.

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Wright. The crouton line followed in mid-June.

Pepperidge Farm assembled the Bloomfield management team before breaking ground for the new plant and brought its members into the Norwalk facility. Plans also called for simultaneous production at both locations during an overlap period of five months. To manage both bakeries, Mr. Moll tapped William (Bill) Livingstone who started his career at Norwalk before transferring to Lakeland, Fla.

“The Bloomfield operations team participated as decision makers for the new facility, what it would look like, what speeds it would run, what staffing it would have,” Mr. Ferguson explained. “Corporately, we laid out the plant and then gave the plans to the staff to fine-tune.”

Pepperidge Farm explained skill requirements for the new bakery to the company’s Norwalk hourly workers. It offered training and skill improvement classes. Mr. Moll described the results: “It’s a point of pride with us that many of our people from the oldest plant in our system were able to accept the challenge of coming to our newest one.”

**QUALITY START.** Because the Bloomfield startup was so smooth, Norwalk shut down July 26, earlier than scheduled.

“We knew we had quality from day No. 1 at Bloomfield because of the system we put in,” Mr. Moll said. “We ran every SKU and got agreement on all of them.”

“The second hurdle was customer service,” he continued. “By the first week of August, we were at 97% on our customer service ratings; in September, it was 98%, and by October, it was 99.5%. And we grew in sales by 7.5%, too. This is our largest service

area, and we were able to accomplish our quality and service goals in a very short period of time.”

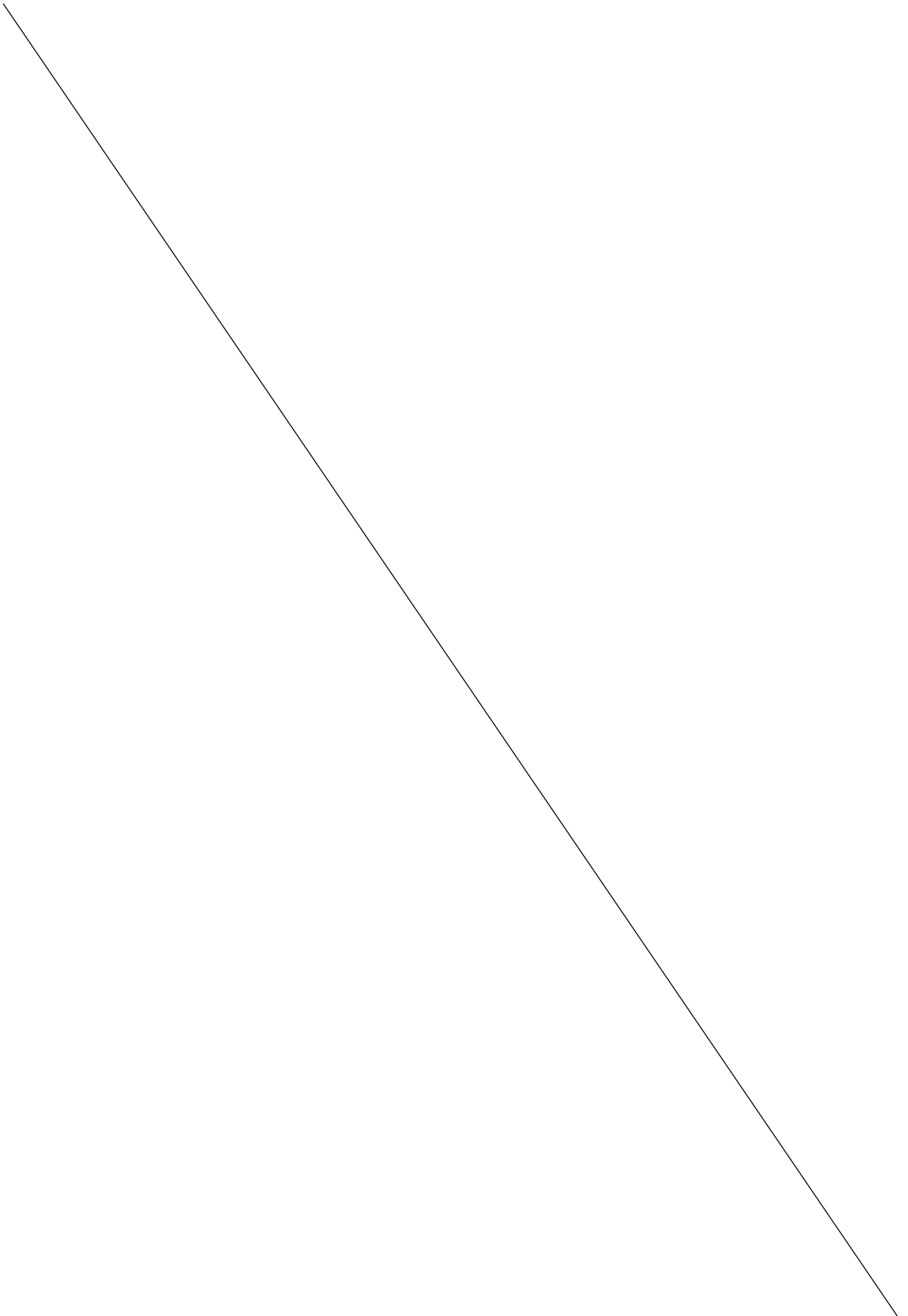
The third aspect of the project, Mr. Moll observed, was commitment to corporate goals. “We knew we had to be fast on the uptake here,” he explained. “This is our No. 1 service area, from the standpoint of history as well as product. We had to provide top-notch service during a growth quarter for our company.”

“The Norwalk bakery had three bread lines, and here there are only two,” observed Bill Livingstone, plant manager. “Yet now six months into the new plant, and running two, not three, shifts, we already outproduce the old bakery by 25%.”

**WALLS AND LAYOUT.** As at Lakeland and Denver, plant construction at Bloomfield used precast concrete and an open structure design. All three plants feature straight-line layouts, with ingredients entering at one end and finished product exiting at the other. Expansion can take place along the northern wall because the only piece of critical equipment that would have to move is the catalytic oxidizer.

Experience with the previous plants prompted improvements for this project, according to Mr. Wright. For example, a wide corridor runs the length of the plant, isolating office areas from the production floor. It’s actually there to provide access for forklift trucks so they need not move through critical processing zones. Another difference is the canopy over the ingredient delivery dock, sheltering this operation during rainy or inclement weather.

**THE RIGHT MIX.** Bloomfield’s bulk flour and minor/micro system, a Shick Tube-Veyor installation, consists of six 175,000-lb flour silos — two for standard patent, two for short patent, one for whole-wheat and one for multi use. The flour unloading station employs primary sifting capable of processing 40,000





lb per hour. Entolators and Great Western Tru-Balance sifters safeguard flour supplies.

Six 7,000-lb bins are assigned to minor ingredients and a dump station supplies them with wheat gluten, rye flour, rye meal, rolled oats, granulated sugar and rye sour. The design will accommodate a future super-sack system. Because the bakery handles some allergenic ingredients, its layout isolates these raw materials to a separate hand dump station and sifter.

Liquid handling is equally well automated. Three 10,000-gal bulk tanks manage supplies of shortening, corn syrup and canola oil (for seasoning stuffing products). Cream yeast stores are handled by a temperature-controlled, recirculating system with two 6,000-gal tanks.

A new-design brew system, also from Shick, allows operators to “dial in” the desired flour percentage. At peak capacity, it will generate 16,000 lb of brew per hour. Two 9,000-lb tanks hold brew.

“We had experience with a smaller brew system for rolls at the Lakeland plant,” Mr. Wright reported, noting that Denver also uses brew for its rolls and bread. “The brew system was a major decision because Norwalk used straight dough methods. We did look at sponge-and-dough, trough fermentation, including high-rise systems, and continuous mix.”

“Brew is a quality improvement we implemented here,” Mr. Livingstone noted. “It provides nice texture and flavor to our products.”

“We went with horizontal mixers, as we had at Norwalk,” Mr. Wright continued. “And some products need a bit of floor time. This style of mixing provided that flexibility.” The bakery currently uses four Peerless 2,500-lb mixers, two on each bread line. Buns will be mixed in Benier Diosna mixers, equipped with carbon-dioxide bowl cooling systems.

Peerless also supplied the ram-and-knife divider for line No. 2.

Ram-and-knife dividers supply

the Swirl bread line. It feeds dough into the Moline three-lane system, a first-of-its-kind system. Other Pepperidge Farm plants use two-lane designs. Bread dough travels along the makeup line as thick strings to be sheeted, coated with flavored toppings and curled before being cut into single-loaf lengths and dropped into baking pans.

Dough for conventional pan breads runs through APV Baker intermediate proofers and is shaped on APV Baker straight-grain moulders. Buns will be made up on an AMF Bakery Systems 6-pocket Pan-O-Mat. The bun line will include a Burford pan oiler and pan shaker, while each of the bread lines has a Burford seeder/topper/water splitter.

**PAN ROBOTS.** “Pan handling at Bloomfield is substantially different from anything we have elsewhere,” Mr. Wright noted. The bakery uses

12 different pans, totaling 25,000 in all, supplied by American Pan and stacked within a 3-tier rack. Bakery engineers laid out a robotic pan storage and handling system using five ABB robots. All three lines share the same system. Magnetic end effectors pick up pans, stored upside-down to minimize contact damage, and insert or remove them from the system at rates up to 33 per minute. The pan system also handles lids.

“This system gives us enormous labor productivity,” Mr. Ferguson said, noting that only one operator is needed to manage all three lines. It also materially improves worker safety.

**CONVEYORIZED.** Two APV Baker new-generation conveyORIZED proofers handle bread doughs, the first

▼ The liquid brew system at Bloomfield launches a new technology for the baker and vendor alike.  
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▲ To keep up with oven speeds, Pepperidge Farm turned to flow-wrapping for its signature inner wrap on sliced bread. Loaves then feed into a dual-lane bagger.

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time Pepperidge Farm has used this method. “This is another big difference for Bloomfield, since we use rack or tray proofers at our other plants,” Mr. Wright said. The conveyorized systems, which Pepperidge Farm terms “racetrack-style” designs, are married to APV Baker tunnel ovens, and at 13-ft wide and 122-ft long, these are the longest ovens yet used for bread by the company. Each bread oven will bake 12,000 lb per hour at peak output.

“The racetrack proofers are more predictable than the old rack-style proofers,” Mr. Livingstone stated. “They are also easier to access and to maintain. Consistency in proofing means consistency in baking. And conditions are right where they should be.”

When the bun line is installed, the bakery will add a third conveyorized proofer. It already has the tunnel oven in place, the same size as the

bread ovens and capable of baking 6,000 to 9,000 lb of buns per hour. Exhaust systems for all three ovens and the dry product line’s dehydrator link to the bakery’s catalytic incineration system.

Bakery engineers also adopted a conveyorized method for bread cooling, housing three I.J. White spiral cooling systems inside temperature- and-humidity-controlled enclosures.

**FLOW-WRAPPING.** Because bread lines would output 160 loaves an hour, engineers faced a quandary in designing the packaging system. Pepperidge Farm spotlights the premium quality of its breads by giving them a protective inner wrap, but the over-wrappers normally used would be too slow.

“That 160-loaf-per-minute rate drove us to look at other options,” Mr. Wright said. “We opted for new technology: the flow-wrapper. This was quite a large departure from our previous technologies.”

Bloomfield features four Cavanna flow-wrappers, two per bread line and each operating at 80 loaves per minute. They are fed by UBE dual-

loaf slicers, a new design for the manufacturer. “We wanted to keep the blade speed at Bloomfield consistent with our other bakeries,” Mr. Wright explained, which cutting two loaves at a time accomplishes.

Loaves enter the flow-wrapper, a horizontal *f/f/s* packaging system, and are enveloped by a continuous sheet of polypropylene film. The machine forms a fin seal along the bottom and at each end. The technology is new not only to Pepperidge Farm but also marks its first-ever U.S. application for pan bread.

“We were able to achieve the speeds we needed,” Mr. Wright noted. “Also, the fin seals offer an easy-open feature that our marketing people and customers really like.”

The over-wrapped loaves speed along to four Formost Packaging dual-lane baggers, two per oven line, where the outer polyethylene bag is added. Mettler Toledo checkweighers verify bag weight, and Markem package coding systems add sell-by and lot information.

**CONTROL SCHEME.** Pepperidge Farm managers described the Bloomfield bakery’s system of computer controls as much simpler than those used by the company’s previous new plants. In fact, this is more a function of a vastly improved interface than the actual hardware employed. Bloomfield uses some of the most sophisticated process control equipment available and features the most extensive network design of any Pepperidge Farm plant, according to Harry S. Pettit, manager of systems engineering for the company’s corporate engineering group.

As he outlined, control communications take place through an Ethernet fiber optic backbone. “We chose fiber optics because of the sheer length of the plant,” he noted.

Variable-frequency drives are standard, and Allen-Bradley PLCs operate some plant-floor machinery. A Rockwell Automation DeviceNet manages drives and motors,







while its ControlNet coordinates plant floor distributed I/O. Strong-Arm Technologies flat, touch-screen displays throughout the plant are the standard operator interface. But one of the key differences in the control scheme here is the bakery's use of Advantech MBPC-5820 Thin Client PCs on floor equipment.

"We first tested 'thin client' technology at Lakeland," Mr. Pettit said. "A thin client PC is essentially a small PC with no moving parts. It's cheap and easy to maintain. All programs reside in the servers we keep in an environ-

mentally controlled room. If one of the PCs on the floor goes bad, we just pull it out, throw it away and plug in a new one. Changeover is a matter of a few minutes instead of an hour."

The bakery operates five primary servers: one for each line, one for the energy system and one to handle licenses and backup. "Redundancy is something we did to eliminate the potential for a catastrophic failure," Mr. Pettit explained. "With automatic backup, the operators don't even notice a switchover.

To promote better in-plant com-

munications, Bloomfield equipped plant-floor operators and managers alike with Nextel walkie-talkie systems, even though the plant floor is equipped with phones. "This is the first plant where the hourly staff has this equipment," Mr. Moll said. "We are so spread out here, and these are much easier to hear than the usual loudspeaker paging systems."

**FUEL CELL FIRST.** The new bakery achieved another milestone: It is the first manufacturing plant in Connecticut to adopt fuel cell technology to manage its utility costs.

"Because of the relatively old utility infrastructure here in Connecticut, we pay rates somewhat higher than elsewhere in the country," Mr. Pettit explained. "And these costs continue to rise, so we looked at alternative energy sources. One day, while we worked on this problem, we received

three phone calls, all about a new fuel cell program being offered by the Connecticut Clean Energy Fund.”

Connecticut leads the country in the manufacture of fuel cells, but the technology is expensive. The state set up a grant program to help overcome this hurdle. Pepperidge Farm engineers put together an application and was one of eight companies out of the 32 that applied to be approved. It became the first processing plant to use fuel cell technology.

The system consists of two Fuel-Cell Energy 250-kw fuel cells, operated by Pennsylvania Power & Light. These provide the base power for the plant, operating the 24-hour systems, according to Mr. Pettit.

“The fuel cell will provide baseline power to the plant, and everything we buy from the utility will sit on top of that,” he elaborated. “We should see a 20 to 25% drop in cost per KWH on those pieces of equipment tied to the fuel cell.”

And because the bakery also uses energy-efficient systems — occupancy sensors, variable-frequency drives, Energy Star-rated motors, lights, transformers and computer monitors — it received a rebate from its electric utility.

**PRESENT AND FUTURE.** Bloomfield was clearly designed for the future. In addition to expandability features, it already has room on the exterior silo pad for two more silos. Layout of equipment is generously spaced, with easy access to all critical points on the processing lines.

“Consider the situation at Bloomfield,” Mr. Ferguson observed, “there is nothing like being in a new plant. It’s like moving into a new house: It really changes your mental outlook. The building is uncongested. It’s very exciting to be involved in something new. It gives a new lease on life for the staff; it increases the self-worth and self-value of every individual involved.

“I’ve been through three of these new plant projects,” he continued. “And Bloomfield, by far, is the best

startup I’ve ever experienced.”

The new bakery is already the talk-of-the-town inside Pepperidge Farm and out. “We hosted the Pepperidge Farm leadership team meetings here during August,” Mr. Moll reported. “Then there was the ribbon cutting in September. The region’s sales and

distribution associates were invited to a November meeting. And the Campbell Soup shareholders board toured the plant later that month.”

Bloomfield is a destination that provides a clear view of Pepperidge Farm’s future manufacturing operations. It’s a baker’s bakery. ■