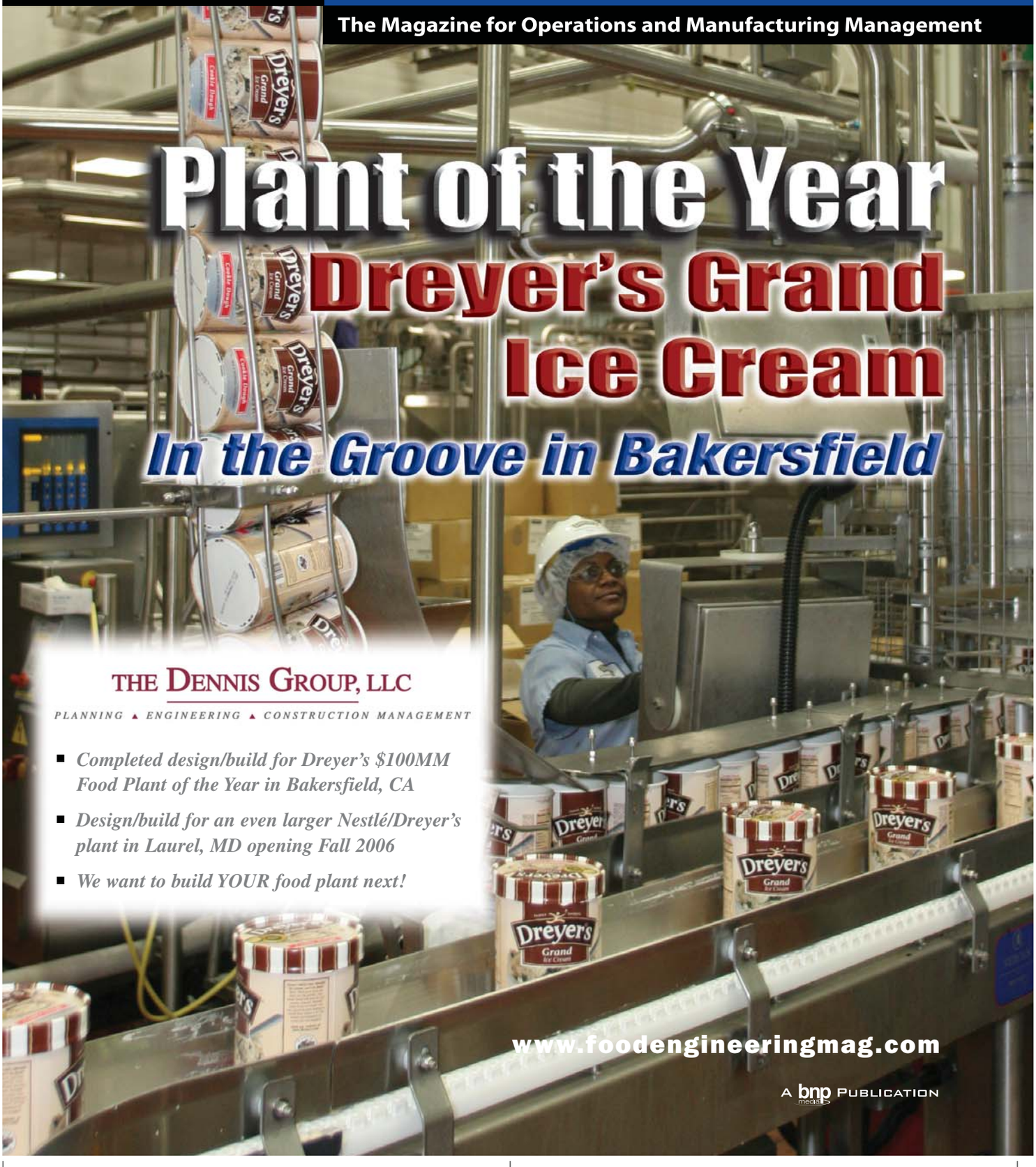
April 2006

Food Engineering

The Magazine for Operations and Manufacturing Management



Plant of the Year
Dreyer's Grand Ice Cream
In the Groove in Bakersfield

www.foodengineeringmag.com

A bnp media PUBLICATION

Plant of the Year

Dreyer's Grand Ice Cream

In the groove in Bakersfield

Nestlé SA didn't just buy an ice cream company when it acquired Dreyer's: it added a management team with a talent for creating a world-class manufacturing facility.

Kevin T. Higgins, Senior Editor

If officials at Dreyer's Grand Ice Cream Inc. and Nestlé SA wanted a symbol of their frozen snacks' merger, they couldn't do better than the expanded Dreyer's plant in Bakersfield, CA.

Since 1983, *Food Engineering* has celebrated outstanding examples of food and beverage facility design and construction from sea to shining sea with the annual Food Plant of the Year award. Nestlé's Carnation plant in Bakersfield was honored in 1989 ("World's largest ice-cream plant," *Food Engineering*, March 1989). When the process of unifying the Nestlé and Dreyer's businesses began in 2003, Dreyer's management recognized the need to consolidate California operations, driving a major expansion at one of the remaining plants. "We considered several sites that initially

did not include Bakersfield," recalls Doug Bame, Dreyer's capital engineering manager. "Then we decided, 'Let's not leave any stone unturned,' and came to look at Bakersfield."

What they found was a 250,000-sq.-ft. ice cream novelties plant on a 47-acre site in a former farming region that has morphed into southern California's fastest growing bedroom community. Los Angeles is two hours away, and affordable housing drew 60,000 new souls since 2000, boosting Bakersfield to No. 60 on America's urban Top 100 list. More importantly, the Bakersfield site had 20 open acres and the infrastructure to accommodate a tripling of plant capacity. The project team realized almost immediately they were standing on the future site of the future center of North American ice cream culture, Nestlé/Dreyer's style.

Formed cartons feed down a wire-guided conveyor to a filling machine in the new production area at Dreyer's Grand Ice Cream's Bakersfield, CA, plant. Photo by Alexander Horvath.

The relationship between Nestlé and Dreyer's traces back to 1994, when the Swiss food giant paid $106 million for three million newly minted Dreyer's shares and an option for two million more. The transition to Nestlé's ownership began in 2002, but in a big-fish-eats-bigger-fish twist, Nestlé consolidated its North American ice cream operations under Dreyer's management. The Oakland, CA, Dreyer's team built an enormously successful sales and distribution system over the previous quarter-century (see related story on page 62), so why argue with success, Nestlé reasoned.

Dreyer's had not built a new plant since the late 1980s. The Bakersfield project gave Dreyer's manufacturing team its first blank canvass to implement design improvements and processing systems in a 332,000 sq. ft., $100 million project. It also was an opportunity to complete the cultural transition to the Dreyer's way in Bakersfield.

"Dreyer's has a unique culture, which is reflected in the 10 grooves of (Chairman) Gary Rogers and (former President) Rick Cronk," explains Bame. "The grooves outline how you conduct yourself with others and what the company is committed to. One principle is to act if you have the majority of the information you need, because we're not afraid to try new things." (See related story on page 60.)

Purity under control

A greater emphasis on food safety and advances in controls technology are the most dramatic changes in food production over the 17 years that separate the two plants under one roof in Bakersfield. As workers enter the

In the groove

Dreyer's Doug Bame (left) and Karl Landgraf of The Dennis Group review engineering specifications for the Bakersfield facility. Landgraf was the A/E firm's project manager, while Bame serves as capital engineering manager.

plant, the new priorities and the operation's new operating philosophy are highlighted on an electronic message board that blinks, "Safety…..Quality….Grooves."

Safety is reflected in building details. Though not dramatic, they are plentiful. "The deck of installation details was 50 pages thick," remembers Bame. A no-compromise approach meant coordinating mechanical, electrical and ceiling-installation workers to avoid slotting of tiles, for example. Flush-mounted metal halide lights are sealed from the bottom to prevent dust and dirt from infiltrating the processing area. "Sanitary design details are an area where we didn't compromise," he emphasizes.

The project was still on the drawing board when the US Congress was debating the Food Allergen Labeling and Consumer Protection Act, heightening sensitivity to allergen cross contamination as a food safety issue. Four of the eight major allergens—milk, eggs, peanuts and tree nuts—are common ingredients in ice cream production, and adopting strict sanitation procedures and controls is critical if manufacturers are to avoid label declarations that discourage millions of consumers from buying their products. In Bakersfield, Dreyer's has taken the lead in allergen control.

Huhtamaki packaging machines form the 56-oz. cartons of Dreyer's Grand Ice Cream produced in the new 119,000-sq.-ft. production area, feeding them down cable-guided conveyors from a mezzanine above the production floor (air conveyors were rejected because of the sanitation procedures that they often require). The potential exists for a carton of a nonallergenic product to be mixed with flats for ice cream containing, for example, eggs. To eliminate the hazard, Dreyer's engineers worked with the machine supplier to develop sensors that read a code adjacent to bar codes on each flat and kick out any incorrect cartons before they are formed.

High-shear mixers for melting product for rework featured a troublesome seal. At Dreyer's urging, the manufacturer, Breddo Likwifier, reengineered the component for flush

New Age industrial engineering

Self-directed work teams are an industrial engineering concept to achieve continuous improvement, and dozens of present day workers at Dreyer's Bakersfield plant were indoctrinated in the work-team concept when the plant opened in 1988 as a Carnation facility. Those same workers now are being indoctrinated in the Grooves, 10 organizational principles of the Dreyer's corporate culture.

The Grooves cover more ground than continuous improvement, though that is certainly part of the underlying message. The 10 principles are:

- **Respect for the individual**
- **Management is people**
- **Hire smart**
- **Ownership**
- **Learn, learn, learn**
- **Upside down organization**
- **People involvement**
- **Ready, fire, aim**
- **Hoopla**
- **Face-to-face communication.**

mounting. "We've always believed in loyalty and a two-way relationship with key suppliers," says Bame. "We get good-quality equipment and help them take their equipment to a higher level."

The most visible symbols of the allergen-control program are the clusters of mix-proof valves to regulate CIP cycles and product flow through a dozen pasteurized mix tanks. The tanks are grouped in fours, with 34 mix-proof valves regulating flow through each group "for ultimate protection" against any nicked valve seats and other unseen harborage points, Bame says.

Sequencing product and CIP flow patterns through those valves was the responsibility of The Dennis Group's Steve Guericke, who also designed the integrated controls network. Whereas production lines in the plant's older section draw mix from a central location, "each line is its own work center" in the new area, Guericke says. "They know when every tank was cleaned, inspected and signed off on, they know which mix tanks have the oldest inventory, and they know what is going on in all the other lines." Programming work stretched over six months and involved custom codes written in house and proprietary programming developed for Dreyer's by Carlson Engineering.

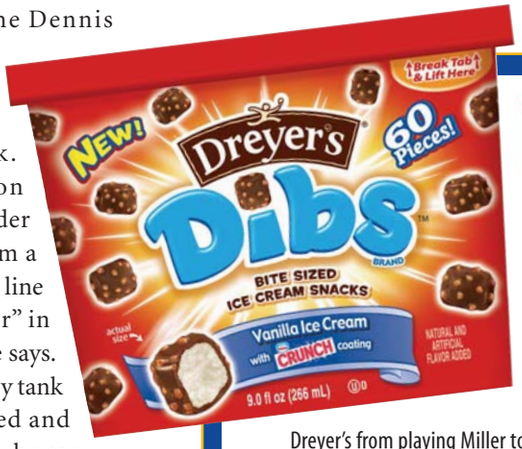
The controls architecture extends to the three 25-ft.-diameter spiral freezers where ice cream is hardened. Variable frequency drives adjust residence time depending on product load. Product temperatures are reduced to 0°F in half the time of standard hardening systems. "In terms of mechanical reliability and speed of hardening, it's made a huge difference for us," says Bame.

With prodding from Dreyer's, Osgood Industries engineers improved the design of its servo-controlled rotary fillers to permit continuous carton filling. Servo technology is used to gradually raise each container, creating a vertical drop to the next carton when filling is complete. No waste is generated in the seamless exchange.

Utilities wish list

While the original facility was hailed for its sanitary design, the demand for food safety is magnitudes greater today. "The existing side of the plant needed better air," notes Karl Landgraf, project manager and a principal with The Dennis Group. His firm won the architectural design and engineering contract at Bakersfield after a rigorous A/E review process. Dennis Group also is directing a 600,000-sq.-ft. expansion at Dreyer's Laurel, MD, facility, slated for completion this spring.

Instead of using rotary or piston compressors for the compressed air system, Landgraf opted for large centrifugal compressors, each capable of generating more than 1,500 cubic feet of filtered air a minute. Centrifugal compressors are common in petrochemical plants, says Landgraf, and are much more energy efficient. The units also require less space than the



This Dibs® for you

When T. Gary Rogers and William Cronk III were dueling Unilever for leadership of America's ice cream business in the 1990s, their goal was to do in frozen treats what Anheuser-Busch did in beer. Dreyer's Grand Ice Cream now is under the Nestlé umbrella, and the one-time University of California-Berkeley classmates hope the new company can elevate Dreyer's from playing Miller to Unilever's Bud.

Rogers and Cronk acquired Oakland, CA-based Dreyer's in 1977 and presided over a growth trajectory that took them from $6 million to $792 million in 20 years. Along the way they built a direct store delivery system that enabled Dreyer's to achieve national distribution (products are sold under the Edy's brand East of the Rockies). Marketing also was a priority: after selling a minority stake to Nestlé for $106 million in 1994, Dreyer's plowed $50 million in trade discounts and $50 million for consumer ads and promotions the following year—a remarkable investment, given that total industry ad spending for ice cream at the time was pegged at $26 million.

Rogers and Cronk also prided themselves in product innovation, and the latest Dreyer's breakthrough is Dibs® snacks, bite-size ice cream morsels enrobed in chocolate and cryogenically frozen. The line rang up supermarket sales of almost $40 million in its first six months, according to Information Resources Inc. "The next little thing in ice cream" is the tagline for a $25 million ad campaign being launched for Dibs this month, reports *Brandweek*. Until those ads bear fruit, Dibs and Dreyer's will have to settle for being less filling, tastes great: 2005's total sales were $1.7 billion, trailing Unilever's combined Ben & Jerry's and Good Humor Breyers gross by approximately $400 million.

half-dozen rotary compressors that would have been needed, and the capital cost is less.

In ice cream production, air is an ingredient, Bame points out, and most plants rely on dedicated air-purification units for each ice cream freezer. With 15 freezers, Bakersfield's 85 maintenance workers would have faced a big challenge. Instead, air from the compressors is siphoned through a series of cartridge filters to deliver sterile air for overrun. A desiccant unit must be maintained, Landgraf allows, but the tradeoff beats the alternative.

Adequate amounts of process water can be a problem in a plant with 28 production lines. Municipal water runs through an activated carbon filtration system en route to storage in a 15,000-gallon tank. UV technology subjects water leaving the tank to antimicrobial treatment. One stream carries the treated water past a heat exchanger and to a secondary hot-water holding tank. The result is an on-demand hot-and-cold water system that easily meets usage spikes of up to 200 gallons per minute.

Dreyer's-Bakersfield sits in uneasy proximity to the San Andreas Fault. Earthquake protection was part of the facility's original design, and the same considerations are reflected in the expansion. Disaster-control helped drive the installation of a flow-down refrigeration system, a design that reduces the quantity of ammonia stored on site and offers built-in safeguards against accidental ammonia release. Instead of storing liquid ammonia at 125-160 psi, Bakersfield's flow-down system stores 73,000 lbs. in a slight vacuum in a massive tank capable of holding up to 103,000 lbs. The tank's –35˚F refrigerant constantly trickles ammonia downstream to higher pressure points. The refrigeration charge is one-fourth that of a conventional system, estimates Chuck Taylor, senior vice president of Jacksonville, FL-based The Stellar Group, which served as the refrigeration contractor.

A sea of control tops on mix-proof valves attests to the serious approach to fail-safe programming to ensure allergens are removed in CIP cycles between production runs in Bakersfield. Photo by Alexander Horvath.

Sticking with the tried and true works against flow down's use in North America, but the technology offers several advantages, points out system designer Ekle Small, senior refrigeration engineer with Stellar. The possibility of a leak through a faulty downstream valve is eliminated, flow rates can be modulated without hammering, and the system is simpler to operate and maintain than a conventional design. "Plant managers brought the refrigeration technicians into the discussions early on, and when they recognized the benefits, their eyes lit up," recalls Small. "That helped sell the system." Originally designed for the plant's new 5.25 million-cu. ft. cold storage warehouse and processing area, the system was expanded to cool the original AS/RS warehouse, without adding to the 10 compressors. "They're taking advantage of the diversity of the system," he says.

Leading-edge processes

In adding a second processing room, engineers extended a service corridor in the existing plant an additional 300 feet, modifying tilt-up panels installed in 1988 to create a unified processing area. While ice cream novelties are manufactured in the older section, 56-

R&D Director Don Birnbaum inspects an ice cream freezer in a small-scale pilot line. As development projects move closer to production, work shifts to a larger line with throughput capacity 20 times greater. Photo by Alexander Horvath.

oz. cartons are the focus in the new area. Designed for five high-volume carton lines, the room also hosts a line producing Dreyer's popular Dibs® novelties, and a seventh production line soon will be installed. Throughput is projected to be 90 million gallons a year.

Several lines produce the company's Slow Churned® ice cream, a product with a creamy texture despite its lower fat content. Dreyer's food scientists began work on the process, generically referred to as low temperature freezing, a decade ago, says Don Birnbaum, the company's R&D director. "Others have approached texture from an ingredient angle; this is truly a process innovation," he says.

Whether it is shear, pressure or some other variable, the same mouthfeel change has been noted with fluid milk subjected to ultrafiltration. Adding cream as an ingredient with low temperature freezing would be overkill. "Using normal levels of milkfat would be like putting a stick of butter on a piece of toast," says Mark McLenithan, plant manager and head of the Dreyer's team on the expansion project. "It's too much."

The 25-ft. ceilings in the new processing area make the older building's 12-ft. clearances seem claustrophobic. The height was necessary to accommodate mezzanine levels on either side of the main floor. Carton forming is done on one side, with windows overlooking the production floor. "We think there's a lot of value in having that line of sight between operators on the mezzanine and the floor," says Bame.

The opposite mezzanine receives cartons as they exit hardening spirals. After being case-packed or bundled and shrink-wrapped, cartons descend to a palletizing area. The temperature gradient between these two areas is approximately 40°F. Any ice buildup in the 2-ft. floor-joist gap between the mezzanine's floor and the palletizing room's ceiling would be virtually impossible to remove, Landgraf points out. He designed a circulation system in which fans blow dry air through the gap and back through a vent in the mezzanine, removing any moisture. "It's belts and suspenders," he says simply.

While Bakersfield is a showcase of contemporary technology, spaces were designed to accept technology that isn't quite ready for prime time. Unable to find installations where articulated-arm robots were palletizing in a -20°F room without maintenance issues, designers set up the plant for manual palletizing. When the technology catches up with the application, automation systems will fit into the available space with room to spare.

Maintenance issues also exist with high-volume AS/RS systems in harsh environments. Slow-moving items are consigned to the facility's original freezer; in the new cold storage area, specially designed forklifts equipped with mast-mounted cameras give drivers a clear view of the fifth tier of the racks. The warehouse, with a combination of push-back and flow-through racks, has a capacity in excess of 14,000 pallets, more than double the original freezer's capacity.

The third element of the expansion project is a 68,000-sq.-ft. R&D center. Besides labs with benchtop equipment, the center has a mini-pilot plant that can output up to 15 gallons of product an hour and a pilot plant that makes

commercial scalability a nonissue: throughput of 300 gallons an hour is possible. Fully staffed, the R&D center will house 70 researchers and specialists, including a seven-member team of process engineers, technical experts and food scientists serving Nestlé operations throughout the Americas.

"Ice cream is a treat and must taste good, but that doesn't mean we can't make it as healthy as we can," says Birnbaum. Added calcium, vitamin C and other nutritional benefits that make sense in a premium-quality product are a priority. Slow-churned ice cream with its reduced fat content also plays to the healthier-products trend.

Dreyer's has a tradition of ice cream innovation, beginning with the development of Rocky Road in 1929. Nestlé dominates the frozen novelties segment, with many of its category-leading brands created in the Nestlé R&D Center in Marysville, OH. Moving forward, Bakersfield will be the center of ice cream innovation for Nestlé/Dreyer's in North America.

Fully staffed, Bakersfield will employ 1,100 operators, maintenance workers, food scientists and other professionals, McLenithan estimates. "This plant is designed to be our innovation engine for the next several decades," he says. If the R&D team designs a product, "whether it's extruded, molded, you name it, we can make it." It's simply a matter of finding the right groove.

A 103,000-lb. capacity anhydrous ammonia storage tank stores liquid ammonia in Bakersfield's flow-down refrigeration system. Photo by Alexander Horvath.

"The grooves are how we leverage each person to make a positive difference," McLenithan explains. "It's about staying within parameters and not putting people and products at risk." In order to foster the mantra of "One Plant, One Culture," all team members will have to embrace the grooves philosophy. While Landgraf and his engineering team were erecting physical walls, McLenithan and his colleagues were building organiza-

A mechanic inspects ice cream cartons as they emerge from a shrink-wrap bundling machine. From here, product descends to a palletizing area. Photo by Alexander Horvath.

tional bridges between those workers. "We're probably more in line with the original operating principles than the plant has been in a long time," he assures.

When Dreyer's $180 million Laurel expansion is complete, Bakersfield will be edged out as the company's largest ice cream plant. But sheer size isn't the measure of an outstanding food-production facility, and it is the sum of the food safety upgrades, infrastructure improvements and production innovations that distinguish Bakersfield as *Food Engineering*'s 2006 Food Plant of the Year. ◆

For more information:
Karl Landgraf, The Dennis Group,
858-847-9633,
landgraf@dennisgrp.com

Dreyer's employee Jim Lontz inspects an ice cream carton on a kickoff table. Photo by Alexander Horvath.

THE DENNIS GROUP

The Proof is in the Process

www.dennisgrp.com