

Making Every Inch Count

New technologies for proofing, baking, cooling and freezing improve efficiencies to extend production runs and reduce maintenance.

by Shane Whitaker

When you've got a long way to go, but a short space to get there, you still have an option: go vertical, and go around and around. If bakery layouts are tight and you require additional linear feet for proofing, baking, cooling or freezing baked foods, then spiral belt conveyors can be the answer.

Consequently, manufacturers of spiral systems and belting are continually engineering better designs and technologies so bakers can operate them more efficiently and clean and maintain them more effectively.

"When you look at spiral oven applications, most of the time it's done for one of two reasons," said Doug Kozenski, sales manager, processing systems, Heat and Control, Hayward, CA. "If you have something that has a long cook time and you have extremely high volumes of product, you need a lot of linear footage. A spiral provides that in a relatively small footprint."

Many bakers take the same approach and apply spirals to additional processes.

Today's spiral belt conveyors often use direct drives that eliminate chains, oiling, sprockets, chain segments and guarding. Direct-drive systems require less maintenance and provide enhanced sanitation over drum or cage systems. IJ White Systems, Farmingdale, NY, uses this style of drive to eliminate chains and the maintenance associated with them, according to Peter White, the company's president.

When adapting its Heli-Matic coolers to use plastic modular belts, Stewart Systems Baking LLC, Plano, TX, redesigned the drum that drives the edge of the belt. Because plastic modular belting has a smooth edge, the company had to change the teeth that engage at the

Because each conveyor is in its own separate enclosure, bakeries can set different heat, moisture and airflow levels for each drum of this twin spiral system.

Heat and Control



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drum to a flat friction style, noted Scott McCally, Stewart's mechanical engineer, thermal systems.

Endless proofing and baking

Final spiral proofers require uniform temperature and humidity in a vertical space. For this reason, IJ White developed its Accu-Proof systems, designed to reduce stratifica-

tion, a condition that Mr. White said caused spiral proofers in the past to vary in internal temperatures and humidity levels.

Recently, the company developed spiral systems for proofing flatbreads directly on the belt, using specially designed belts that support the dough pieces without letting them sink through belt open-

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Simplifying sanitation on spirals

Many spiral system innovations such as reducing sprockets and drive chains provide opportunities for easier sanitation and maintenance.

IJ White Systems, Farmingdale, NY, offers belt washing systems including its Typhoon and PowerWash 2000, which not only improve sanitation but also help reduce friction and wear, according to Mr. White. "We can bring full rinse, wash, sanitize and clean-in-place (CIP) sanitation into the center of the system, and before you could not do that," he said.

Bakers today want hygienic upgrades to spiral freezing systems such as stainless-steel enclosure panels, hygienic evaporator coils, self-stacking belt technology, CIP wash-down systems and other elements of sanitary design, according to Andrew Knowles, freezer sales support manager, JBT FoodTech, Chicago. Because bakeries run their freezers longer between cleanings than do meat or poultry plants, there's more product debris and frost to remove from the system, he observed.

This need led to improvements in the hygienic design of JBT FoodTech's Northfield and FrigoScandia spiral freezers. "The Northfield SuperTrak features an all stainless-steel cage-and-frame design along with a hygienic center direct-drive drum to eliminate the need for a traditional chain drive," Mr. Knowles said.

The company's GyroCompact features a self-stacking stainless-steel belt and internal CIP system to make sanitation automatic and efficient.

Alit srl, Marsango, Italy, introduced Aliwash, a two-part belt washing system. Washing, rinsing and blowing stations are integrated on the belt while pumps, the water heater and detergent dispenser are in a mobile station that connect to the other stations. To minimize cost, one mobile unit can serve multiple fixed stations.

Heat and Control, Hayward, CA, offers fully automated CIP systems on its spiral ovens that reduce cleaning times and costs. Also, its cylindrical enclosures eliminate hard-to-clean corners, according to Doug Kozenski, the company's processing systems sales manager.

ings. These systems also feature belts as wide as 60 in. to reduce product vibration.

Flatbreads take only a short time to bake, which presented a challenge to engineers working on the spiral flatbread proofer. They were able to increase belt speeds to up to 240 ft per minute — speeds previously only possible with narrower belting systems, according to Mr. White. The belts need to be that fast to match the output rate of today's flatbread ovens.

The airflow design in a GyroCompact (GC) proofer from JBT FoodTech, Chicago, also enables running products directly on the belt. Used for making croissants, Danishes, coffee cakes, biscuits and cinnamon rolls, the GC proofer features increased capacity, improved uniformity and enhanced hygiene characteristics, according to Andrew Knowles, the company's freezer sales support manager.

"By eliminating the need for support tracks at each tier of belt, processors can run higher throughputs and/or operate at longer proofer times with cooler air temperature and lower humidity," he observed.

By always providing upflow air, a cooling coil and a heating coil or element, Mr. Knowles noted that JBT FoodTech can provide consistent air temperatures and humid-

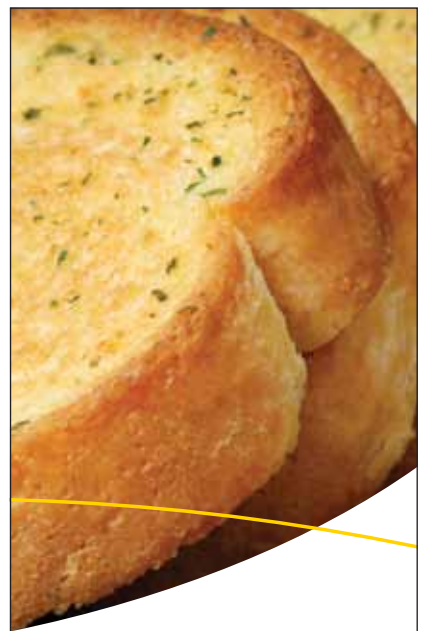
ity throughout the spiral stack or stacks. Additionally, he pointed out that the proofer uses ultrasonic humidity nozzles to improve the sanitary design.

Products that travel through spiral proofers typically require trays or pans, but the upflow air design used by the GC spiral proofer permits many foods to run directly on the belt. The upward flow of air makes proofed products less likely to stick to the conveyor belt. For particular raw dough applications, Mr. Knowles recommended adding JBT FoodTech ProBake bottom heating plate technology to lightly treat the lower surface of products before they reach the spiral. This can allow a plant to eliminate the need for heavy aluminum and steel pans, he said.

Proofing systems from Alit srl, Marsango, Italy, are designed to handle products directly on belts as well as pans and trays. Alit offers standard configurations for its proofers such as double spirals and racetrack-styles with inversion, but the company custom-builds all its systems, offering step proofers with elevators and de-elevators, vertical and horizontal switches, and oven-

Spiral proofing system designs reduce stratification and ensure uniform temperature and humidity levels throughout the enclosure.

LJ White Systems



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loaders and unloaders as needed.

Most bakery ovens are long and narrow, occupying a lot of floor space. Spiral ovens, however, make smart use of vertical space. They can accommodate extremely long bake times by using relatively narrow 40-in.-wide belts to maximize capacity.

Generally, restrictions on maximum linear length inside a spiral relate to belt speed. "Belting in spiral ovens is typically limited to about 75 ft per minute in linear speed," Mr. Kozenski said. "If product requirements dictate a spiral system with 400 linear ft of belt, you must be sure cook times for the other product do not exceed the

Designed to maintain product orientation, this new plastic modular belting can be retrofitted onto existing systems or designed for new spirals.

Intralox

technology's allowable speeds."

He calculated an example of a system with 400 ft of belt and an allowable speed of 75 ft per minute. "The fastest cook time that you can run is 5.33 minutes," he said.

Heat and Control's spiral ovens use convection airflow with air traveling at about 1,000 ft per minute and distributed evenly in a 360° pattern. "It's gentle on the product and bakes uniformly," Mr. Kozenski said. "You don't have to worry about burning or overbaking some products to ensure others are fully baked."

To give bakeries greater flexibility, Heat and Control spiral ovens are available in either single- or twin-drum configurations. The oven enclosure includes a hood section that raises with screw jacks. If the bakery has ceiling-height limitations, the en-

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closures can include doors for access, Mr. Kozenski said.

The exit points of these ovens can be configured to fit bakery needs, another aspect of their flexibility. "Because we have a round enclosure, we can enter and exit anywhere around the circumference," Mr. Kozenski noted.

The company's twin-drum ovens can offer two distinct zones. Each spiral conveyor is in a separate enclosure, allowing bakers to set different heat, moisture and airflow levels for each drum or chamber. The system uses a single belt that traverses both zones.

Custom-designed pitches for the spirals are based on the worst-case scenarios for the products that the bakery intends to run through the oven.

Improvements for extending runtime

Updated technologies permit bakeries to do more with their spiral systems. For example, JBT FoodTech launched 42-in.-wide GC self-stacking belt coolers, proofers and freezers with descending layouts. The design breakthrough combines the company's latest wide-belt and M-Drive technologies, according to Mr. Knowles.

For raw dough or pizza lines, a GC 42-in.-wide-belt cooler or freezer operates at speeds up to 130 ft per minute. The GC's downward vertical airflow has proven effective for disk-shaped products such as topped pizzas, pizza crusts, topped pies and cakes as well as donuts, Mr. Knowles said.

JBT FoodTech also manufactures SuperTrak (ST) spiral freezers and coolers for topped pizzas, pies, cakes, cinnamon rolls, donuts, raw dough loaves, raw pizza crusts, raw cookie dough and proofed croissants. Particularly important in plants that run 24/7 schedules, ST freezers feature the company's F.A.S.T. sequential defrost system that has no moving parts or louvers. Further, the company's highest capacity system uses a 60-in.-wide structure-supported belt.

The F.A.S.T. sequential defrost system can be operated on timed intervals or triggered by monitoring the pressure differential across the coil. "This system uses hot gas to defrost coil banks and has a redundant coil and fan so that capacity and/or outfeed temperatures are maintained during periods of sequential defrosting," Mr. Knowles said.

IJ White offers its own sequential defrost systems on the company's blast freezers. This technology allows bakeries to run their freezers "for days-on-end into weeks-on-end by defrosting coils on the fly," Mr. White explained.

The company's Auto Pressurization System (APS) further reduces the need for defrosting cycles in its spiral blast freezers by dramatically reducing infiltration of warm moist air from the outside to the interior of the freezer at entrance and exit points. APS maintains



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Designed for increased food safety demands, this link-and-rod-style belt conveyor features 360° welds.

Ashworth

freezer temperatures more evenly, and bakeries use less energy because coils don't lose effectiveness, caused when insulated by ice and snow, Mr. White added.

Similarly, JBT FoodTech optimized its fan-driven air balance tunnel for GC spiral freezers to minimize moisture entering the spiral through the infeed and outfeed openings.

"Many bakeries run six days per week or longer before defrosting and cleaning freezers," Mr. Knowles said. "Therefore, freezers need an effective air-balance system, sufficiently large coils and measures to continuously keep the coils relative-



ly free of thick frost and ice accumulation."

For optimum performance

All food processors want to get maximum life from their spiral conveyors and belting. Proper monitoring and maintenance makes that possible.

IJ White developed its patented Automatic Belt Tensioning (ABT) system that can automatically adjust the force applied to belts when the spiral conveyor is running. PLCs monitor belts to prevent overtensioning that could lead to breakage,

Mr. White said.

Spiral system reliability in food processing plants is essential. "The cost of unexpected downtime can be crippling to the bottom line," said Kenneth King, commercial support manager, Ashworth Bros, Winchester, VA. "At Ashworth, we provide continuous monitoring of belt tension, observation of system performance and predictive and preventive maintenance programs designed to keep spirals fully operational."

A downside to spiral conveying systems is loss of product orientation as items go round and round, noted Don Osborne, snack team

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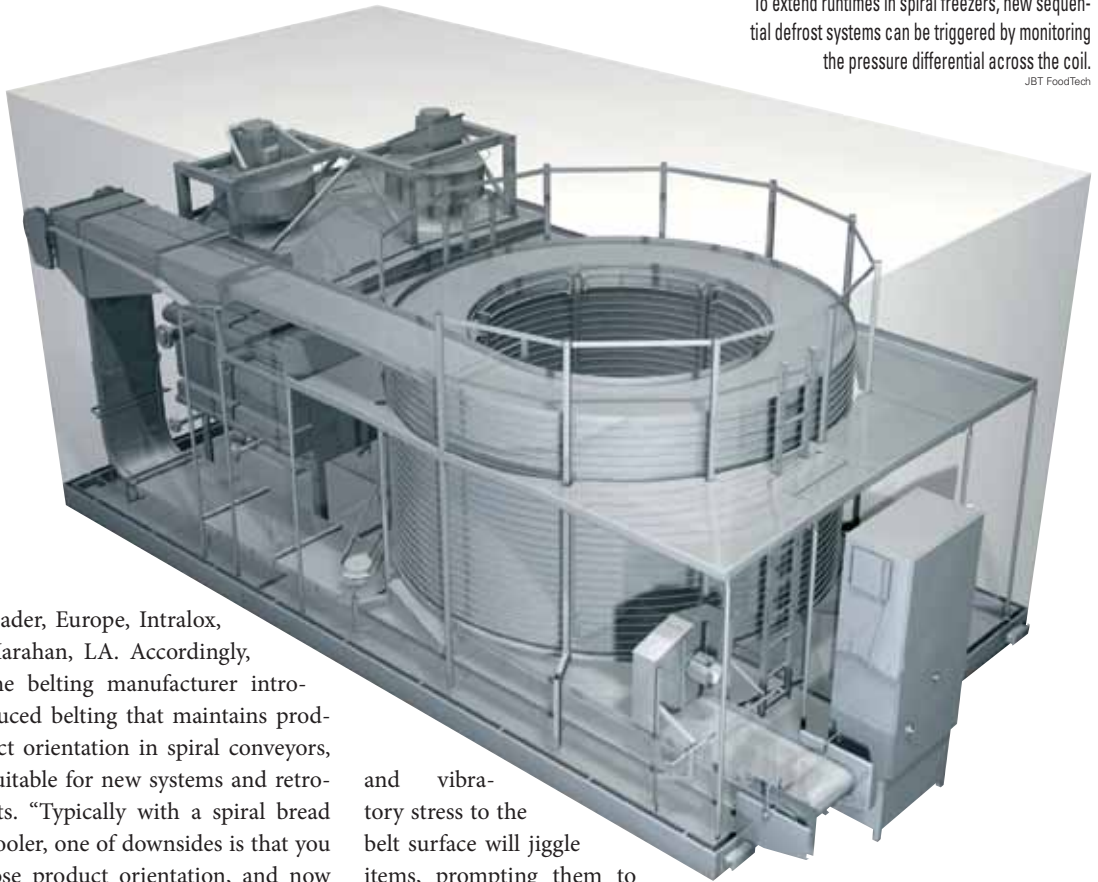
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To extend runtimes in spiral freezers, new sequential defrost systems can be triggered by monitoring the pressure differential across the coil.

JBT FoodTech



leader, Europe, Intralox, Harahan, LA. Accordingly, the belting manufacturer introduced belting that maintains product orientation in spiral conveyors, suitable for new systems and retrofits. “Typically with a spiral bread cooler, one of downsides is that you lose product orientation, and now we have a spiral belt and spiral design for existing equipment that will hold orientation so that product will not move,” Mr. Osborne said.

The basic idea behind all conveyors is that the carrier belt travels but individual items stay put. Any transfer can disturb that positioning,

and vibratory stress to the belt surface will jiggle items, prompting them to “walk” out of place. Traditional spiral conveyor designs power the belt’s travel by engaging its edge using a rotating drum installed in the center of the structure. These drums would run a little faster than the conveyor, thus introducing vibration that can displace products.

New direct drives, described by Mr. White, move the drum at the same speed as the belt. “We mechanically tie the belt to the drum so you don’t have any more slippage or vibration and can guarantee product orientation,” he said.

Ashworth developed several new belt designs to meet ever-expanding requirements faced by food processors, Mr. King noted. “Each application is unique, and understanding the requirements of processors is very important,” he said. The company’s factory service team helps food processors select, install and commission the proper spiral belts.

“Our products and services are designed to improve product throughput, limit downtime and increase processors’ profitability,” he added.

The conveyor belting manufacturer introduced its Omni-Pro belts to address food safety regulations while maximizing efficiency. Mr. King specifically noted 360° welds featured on the link-and-rod-style belts, describing the smooth welds as not only stronger than previous designs but also more sanitary because they eliminate nooks or crevices. Additionally, the company expanded its standard radius belting to include tight-turning, small-radius belting as well as mid-range reduced-radius belt for those systems designed with oversized cages.

Both spiral conveyor systems and belting offer new features to lengthen runtimes and reduce maintenance while improving overall operations for bakeries.

To adapt this cooling conveyor to use plastic modular belting, the drum was altered.

Stewart Systems Baking

