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Cooling pouches through the "Danger Zone" with continuous chilling

Pepe's Mexican Restaurants maintains critical cook-and-chill temperature levels at its central food production facility, utilizing state-of-the-art, continuous, rotary pouch-cooling technology.

Jack Mans, Plant Operations Editor -- Packaging Digest, 11/1/2009 1:00:00 AM



Pouches are fed into the rotary chiller by a belt conveyor, after which an internal auger moves them through the unit. The pouches are carefully turned over and massaged as they advance in the cylinder and are totally submersed in 33-deg F water, producing a consistent mix of the contents throughout the pouch. Heat transfer is uniform, eliminating pouch hot spots.

famous chain of Mexican restaurants located throughout the Chicago area and northern Indiana. Pepe's Mexican Restaurants offers a broad selection of traditional favorites, such as tacos, burritos, tostadas and enchiladas, as well as authentic Mexican-style dishes, such as picadillos, pollo en salsa ranchera, carnitas, menudo, pollo en mol'e and guisados frijoles a la charra.

Aside from its many restaurants and far-flung institutional businesses, which extend nationwide, Pepe's also provides private-label food manufacturing. Every aspect of the company's business has been influenced by its family values for quality products and service to its customers.

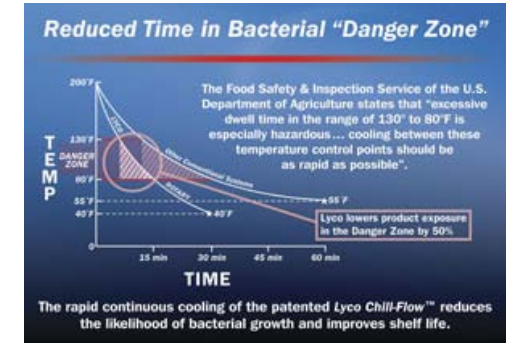
Pouch production line

Pepe's says its production facility has specific guidelines and procedures to ensure product safety and integrity. These include the rapid chilling of product that has been cooked and hot-filled into pouches, an area of food production that is particularly beset with challenging temperature parameters, which if violated, can open the door to product contamination. Pepe's uses a pouch-chilling system, called Chill-Flow™, that was developed by **Lycó Mfg.** (www.lycomfg.com).

From the very beginning, Pepe's has made all of the food for its restaurants in one location to keep a better grip on production costs, quality control and uniformity. Even in the restaurant's early days, the company utilized pouch technology for storing and transporting its products. The use of pouches is popular now, but 40 years ago they were not in mainstream use.

Pepe's would cook its products and pack them into pouches that were then chilled using cold, running water and ice. This process took considerable time and was very labor-intensive. Pepe's would then freeze the pouches and ship them out to its restaurants, where they would be reheated and assembled into meals. Pepe's was cooking and freezing soups, stews, beans, rice and various sauces in this manner.

As volume increased, this system became impractical, and Pepe's researched more efficient means of chilling. Pepe's still follows a very similar production format today, but with much more sophisticated technology.



conveyed to a drying station and then put into boxes and palletized.

The boxes are stacked so there is approximately a 1-in. space on all sides to allow for cold air circulation. The boxes are then put into a blast freezer at 0 deg F where the product is frozen. The pouches are kept in cold storage between 0 and 10 deg F until needed.

"Bacteria like to grow in the 'Danger Zone,' a temperature between 40 and 140 deg F," says Nalini Kamireddy, Pepe's quality assurance manager. During a commercial cooking process, like that at Pepe's, the raw ingredients pass from a chilled refrigerator, which is at 40 deg F or lower, to a cooker, and are then heated past 140 deg F as quickly as possible to the final cooking temperature, thus minimizing the time that food products are kept in the Danger Zone. The same is true on the other end of the product line. The temperature is reduced as quickly as possible to below 40 deg F.

Pouch agitation required

In pouch processing, however, there is more of a chance of bacteria multiplying at the cooling stage than at the heating stage, according to Kamireddy. If the pouch is taken out of the cooler at this point and put directly into a subzero freezer, the pouch will develop a layer of ice that not only retains the heat, but provides a perfect environment for bacteria to propagate.

"We have conducted and outsourced a significant body of research regarding pouch heating and cooling parameters in an effort to optimize our procedures," says Kamireddy.

In one of these tests on 5-lb pouches of Pepe's food products, the product was heated and a temperature probe was placed in each pouch. The pouches were then put in a wind-tunnel test chamber, where 100-mph winds brought the temperature down to -20 deg F.

After two hours, the outer half-inch of the pouches was frozen solid, but the inside of the pouches remained at more than 100 deg F for more than 12 hr. The outside half-inch of ice that encapsulated the hot product acted as an insulator that kept the heat in.

Pepe's concluded that if the pouch is not manipulated in the cooling cycle, so that the hot product in the center of the pouch comes to the outside surface for exposure to the cooling medium, the inside product will remain hot. The company began to search for a system that would take its 5-lb pouches of hot product (32,000 lb/day) and cool them from 200 deg F to below 40 deg F in a time-frame compliant with USDA and FDA standards. The USDA requires products to be cooled to less than 40 deg F within 6.5 hr.

Rotary chiller

"We began a search for a chiller that could handle our needs," Kamireddy explains. "Some systems utilized mechanized buckets. The pouches were placed into them and moved through a series of cold water showers that chilled them. We tested these, but because there was no agitation of the pouches, they were cold on the surface, but the inside remained warm. We also tested chilling systems utilizing -20 deg F propylene glycol. But without agitation, they did not cool the inside of these very dense pouches."

Pepe's finally selected the pouch-cooling solution developed by Lycó Mfg., a pioneer in the development of equipment for the heating, pasteurization and cooling of flexible pouches. Its pouch cooler continually and gently agitates each pouch throughout the cooling process, producing a consistent mix of the contents throughout the pouch. Heat transfer is uniform, eliminating pouch hot spots.

The pouches are fed into the Chill-Flow machine by a belt conveyor. The machine utilizes a completely enclosed rotary-drum design, 6 ft in dia and 28 ft long, that functions like an auger. The drum has a perforated skin sheet wrapped around it that is fixed to the auger flights, eliminating pinch points. These flights gently move the pouches through the system.

The pouches are carefully turned over and massaged as they advance in the cylinder, while being totally submerged in 33 deg F water. Once through the machine, in a first-in/first-out sequence, the pouches are gently deposited on a belt conveyor for packaging and storage in the freezer.

Fastest cooling system

"Pepe's Chill-Flow pouch cooler reduces the temperature of its 5-lb pouches to below 40 deg F in 60 to 90 min, making it the fastest pouch-cooling system commercially available," says Kamireddy. It is 30-percent faster and 15-percent cooler than conventional belt systems, which can only cool to 55 deg F.

Pepe's pouch chiller provides consistent process parameters for temperatures and recipes, gentle product handling and automatic control of the pouch cooling. Product damage is zero percent, which is significantly lower than what is typical with other chilling methods. Pepe's has run hundreds of thousands of pouches through the chiller with no bag failures caused by the system.

More information is available:
Lycó Mfg. Inc. 920/623-4152. www.lycomfg.com.

A unique system of automated, continuous pouch-chilling at Pepe's Inc., Chicago, enables the company to keep product moving through its facility at high volume and maintain zero-percent pouch damage while adhering to the strictest standards of USDA and FDA requirements.

With 60 full-service and quick-serve franchised Pepe's Mexican Restaurants and national distributors that supply universities, hospitals, schools, corporate dining facilities and the U.S. military, Pepe's Inc. prepares, cooks, chills and freezes 3,000 to 4,000 lb of Mexican food products/hr to keep up with its customers' demands. Maintaining food-safety and quality-control standards throughout the entire processing cycle in this fast-moving facility is absolutely critical.

Established in 1967, this family-owned and operated business has grown to become a



Critical temperature control
In its 65,000-sq-ft USDA-inspected facility, Pepe's cooks its products in 100 to 500-gal stainless-steel kettles at temperatures ranging from 190 to 220 deg F.

After cooking is completed, the products go to a filling station where they are packed into 5-lb plastic pouches. The pouches are mechanically sealed and are conveyed to a continuous chiller. Coming out of the chiller at a significantly reduced temperature that enables Pepe's to meet USDA guidelines, they are

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