Maintaining Critical Food Temperatures in POUCH COOLING

At its central food production facility, Pepe's Mexican Restaurants in Chicago maintains critical cook-and-chill temperature levels utilizing continuous pouch cooling technology.

By Jim McMahon

With 60 full-service and quick-serve franchised Pepe's Mexican Restaurants as well as national distributors that supply universities, hospitals, schools, corporate dining facilities and the United States military, Pepe's Inc. can face sizable demands from its customers for its delicious ready-to-eat food. Fortunately, Pepe's also has the capacity to prepare, cook, chill and freeze 3,000 to 4,000 pounds of Mexican food products every hour to keep up with those demands. Maintaining food safety and quality control standards throughout the entire processing cycle in this fast-moving facility is absolutely critical.

Aside from its many restaurants and far-flung institutional businesses that extend nationwide, Pepe's also provides private label food manufacturing. Every aspect of Pepe's production facility has specific guidelines and procedures to ensure product safety and integrity. This includes the rapid chilling of product that has been cooked and hot-filled into pouches — an area of food production particularly beset with challenging temperature parameters that, if violated, can open the door to product contamination. Pepe's system of automated, continuous pouch chilling, called Chill-Flow, which was developed by Lyco Manufacturing, has enabled the company to keep its product moving through its facility at high volume and zero percent pouch damage, while adhering to the strictest standards of USDA and FDA requirements.

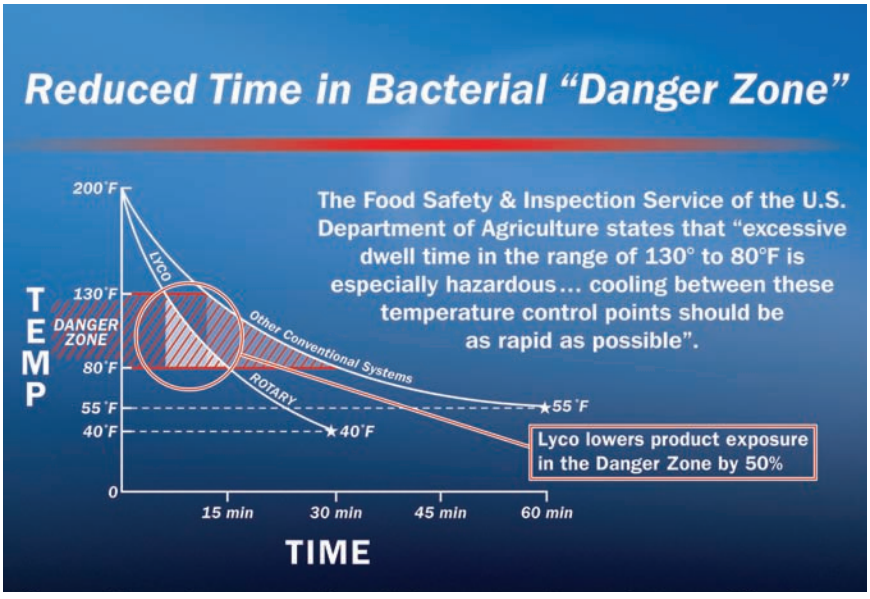
Pepe's has the capacity to prepare, cook, chill and freeze 4,000 lb of Mexican food products every hour to service its restaurants and foodservice customers.

Pouch Production Line

From the beginning, Pepe's 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 restaurants' early days, the company utilized pouch technology for storing and transporting its products. The use of pouches is popular now, but 40 years ago it was not in mainstream use.

Pepe's would cook its food products and pack them into pouches, which were then chilled using cold running water and ice. This process took considerable time and was laborious. They would then freeze the pouches and ship them out to the restaurants, where they would be reheated and assembled into meals. Pepe's cooked and froze soups, stews, beans, rice and various sauces in this manner. As volume increased, this system became impractical, and Pepe's searched for a more efficient means of chilling that maintained key aspects of preparation. As a result, Pepe's still uses a similar process but with much more sophisticated technology.

In the company's 65,000 ft^2 USDA-inspected facility, Pepe's cooks its prod-



Pepe's procedures minimize the time that food is in the danger zone of 40 to 140°F (4 to 60°C).

ucts in large 100 to 500 gal stainless steel kettles at temperatures ranging from 190 to 220°F (88 to 104°C), depending on the requirements of the product type. After cooking is completed, the products go into a filling station where they are packed into five-pound plastic pouches. The pouches then are mechanically sealed and travel by conveyor to a continuous chiller. The products exit the chiller at a significantly reduced temperature, enabling Pepe's to meet USDA guidelines, and then they are conveyed to a drying station before being packed and palletized. The boxes are stacked so there is approximately a 1" space on all sides to allow for cold air circulation. They are then put into a blast freezer at 0°F (-18°C), where the product is frozen. The pouches are kept in cold storage between 0 and 10°F (-18 and -12°C) until needed.

Critical Temperature Controls Needed for Pouch Cooling

Bacteria like to grow in the "danger zone," an environment that is between 40 and 140°F (4 and 60°C). During a commercial cooking process like at Pepe's, the raw ingredients pass from a chilled refrigerator, which is at 40°F or lower, to a cooker, and then brought up past 140°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: reducing the temperature as quickly as possible through the danger zone — to below 40°F — is essential.

In pouch cooling, however, there is a greater chance of bacteria multiplying at the cooling stage than at the heating stage. This is primarily because of a prevalent lack of understanding of the cooling dynamics within pouched food products. When cooling a five-pound pouch, for example, unless that pouch is agitated and manipulated in the cooling process, it may cool on the outside of the pouch to below 40°F, but the inside of the pouch will still be warm or even hot. If the pouch is taken out of the cooler at that point and put directly into a sub-zero freezer, the pouch will develop a hermetic seal of ice — trapping in not only the heat but providing a perfect environment for bacteria to propagate.

Heat transfer is uniform, eliminating pouch hot spots.

"We had conducted and outsourced a significant body of research regarding pouch heating and cooling parameters in an effort to optimize our procedures," says Nalini Kamireddy, quality assurance manager with Pepe's. "In one of these tests where we supplied five-pound pouches of our food products, the product was heated and a temperature probe was placed in each pouch. They were then put in a wind tunnel test chamber, which brought the temperature down to -20°F [-29°C] while being exposed to 100 mph winds."

According to Kamireddy, after two hours, the outside 0.5" of the pouches were frozen solid, but the inside of the pouches remained at more than 100°F for more than 12 hours. "The outside half-inch of ice that encapsulated the hot product acted as an insulator, and kept the heat in."

Pepe's concluded that if the pouch was not manipulated in the cooling cycle so that the hot product in the center of the pouch was brought to the outside surface for exposure to the cold medium, then the inside of the product would remain hot. The company began a search to find some process that would take its five-pound pouches of hot product (32,000 pounds per day) and cool them from 200°F (93°C) to below 40°F (4°C) in a timeframe compliant with USDA and FDA standards. The USDA requires products to be cooled to less than 40°F within six-and-a-half hours.

Fine Mexican Cuisine

Established in 1967, this family owned and operated business has grown from humble beginnings to become a famous chain of Mexican restaurants located throughout the Chicago area and northern Indiana. Pepe's Mexican Restaurants offers a broad selection of traditional favorites like 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 that 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.

Minimizing Risks

With the trust of its customers it its hands each day, Pepe's goes the extra mile to ensure food safety. Aside from maintaining strict temperature parameters, Pepe's further minimizes its product risks by qualifying its suppliers with letters of guarantee and rigorous inspection, including quarantine of incoming ingredients until approved by its in-house quality assurance department.

Pepe's also monitors its environment for various pathogenic bacteria. Food preparation surfaces such as kettles, valves, filling equipment, chilling equipment, utensils, floors, walls, ceilings and drains are all inspected. Pepe's quality assurance laboratory maintains detailed records of its standard operating procedures (SOPs), sanitation standard operating procedures (SSOPs) and good manufacturing practices (GMP). These records are reviewed by USDA inspectors in a daily "pre-op" inspection.

Continuous Pouch Cooling, Uniform Heat Transfer

"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, which 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 chill systems utilizing -20°F propylene glycol. But again, without an agitation function, it was not cooling the inside of these very dense pouches."

The pouch cooling solution that Pepe's selected is called Chill-Flow, developed by Lyco Manufacturing, Columbus, Wis. Its pouch cooler continually and gently agitates each pouch through the cooling process, producing a consistent mix of the contents throughout the pouch. Heat transfer is uniform, eliminating pouch hot spots.

At Pepe's, the pouches are fed into the pouch-cooling equipment by a belt conveyor. The machine utilizes a completely enclosed rotary drum design, 72" in diameter and 28' long, functioning 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. While completely submersed in water that is 33°F (0.5°C), the pouches are carefully turned over and massaged as they advance in the cylinder. Once through the machine — in a first-in/first-out sequence — the pouches are deposited on a belt conveyor for packaging and storage in the freezer.

According to the companies, product damage is zero percent, 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.

Pepe's Chill-Flow pouch cooler brings

Pepe's prepared foods packaged in pouches and stored in boxes are kept at 0 to 10°F (-18 to -12°C) in the company's on-site cold storage freezer.

Pepe's 65,000 ft² USDA-inspected facility utilizes a Chill-Flow continuous pouch cooler system.

the temperature of its five-pound pouches to below 40°F in 60 to 90 minutes. Also, Pepe's pouch chiller provides consistent process parameters for temperatures and recipes, gentle product handling and automatic control of the pouch cooling.

The use of pouches in the food processing industry, serving both consumer and institutional markets, is expected to continue its strong growth at a rate of five to six percent per annum for the next five to six years. Pepe's is one company that has embraced pouch processing fully, well before it was even on the radar as a popular packaging option.

Food processors should take serious heed of this expanding pouch market trend. As they move forward with their own pouch heating and cooling applications, they should assess the benefits and drawbacks of different systems. It is hoped that Pepe's application has helped shed light on critical points that need to be considered in pouch cooling operations. **PH**

Jim McMahon writes on emerging technologies in food processing. For more information on Lyco Manufacturing Inc., Columbus, Wis., and its food processing equipment solutions, call (920) 623-4152; e-mail jeff.zittel@lycomfg.com; or visit www.lycomfg.com. For more information about Pepe's Inc, Chicago, visit www.pepes.com.