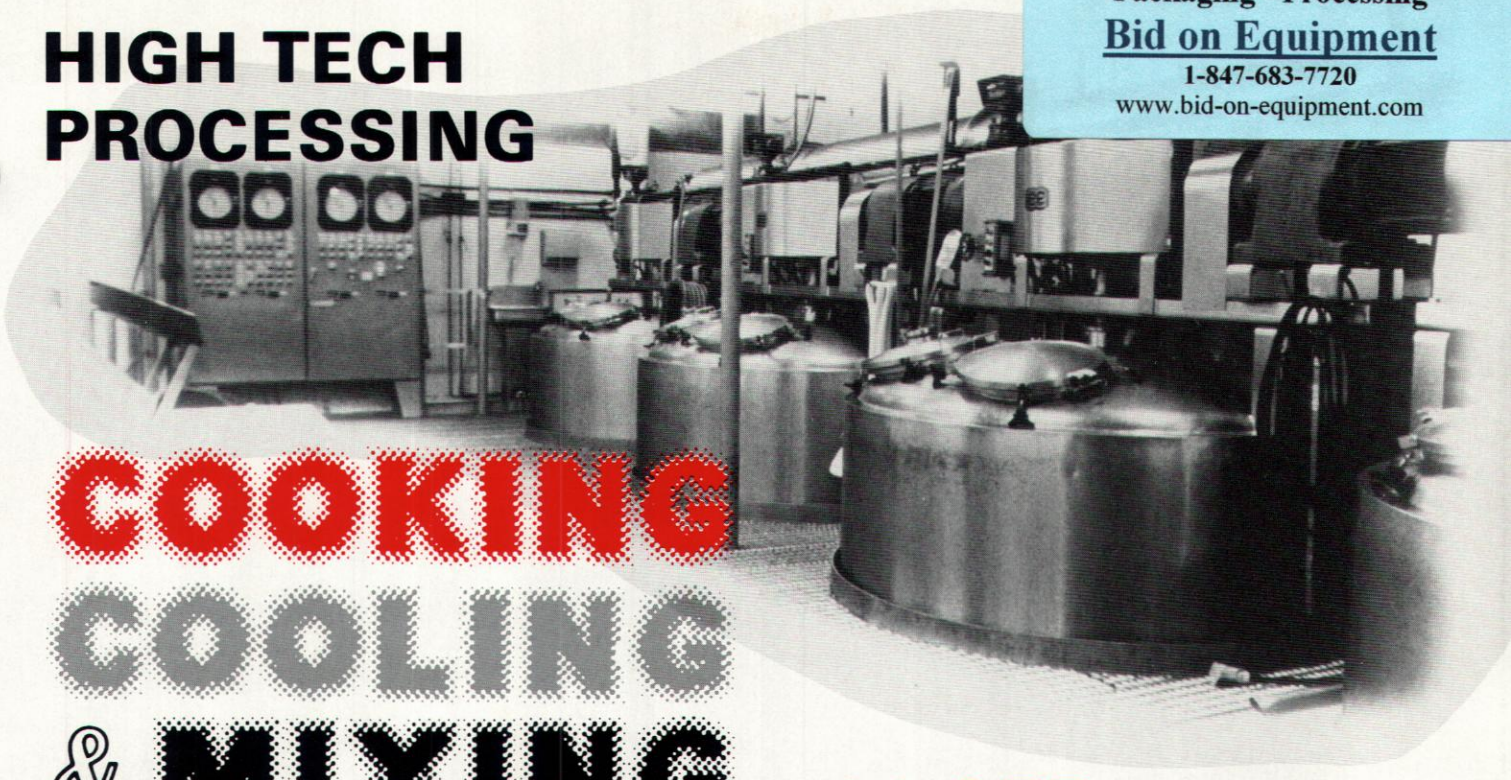
HIGH TECH PROCESSING



COOKING COOLING & MIXING with LEE UNIFLOW VACUUM SYSTEM

Vacuum cooling is not a new concept in the food industry. It is typically applied in the cooling and concentrating of fruit juices and for cooling cooked vegetables. The process utilizes excess water and removes dissolved air, which destroys the shelf life of some products. Freezing temperatures can be reached using the vacuum technique.

Each system must be carefully designed to meet the processors' criteria. The initial temperature, the cooling rate, and the final temperature set the criteria for sizing the vacuum unit. The volume of the product and the type of agitation are primary considerations.

If high-pressure steam is readily available, a three-stage ejector system with condensers can be utilized. If only low-pressure steam is available, two of the ejectors and condensers can be replaced with liquid ring vacuum pumps. For lower temperatures, five-stage systems can also be provided. To determine which is best, you must evaluate the type and amount of available utilities (boiler size, water capacity).

The advantages of using vacuum cooling include time and cost reduction, especially if the end product is frozen. For example: if meat is being processed, the USDA (section 8.55) requires cooling of the product from 120° to below 40° within two hours. This time requirement can easily be met using a properly sized vacuum system.

If you are having problems meeting the USDA cooling requirements, are tired of increases in liquid nitrogen costs or need an efficient method of removing heat from your product, you may want to consider vacuum cooling.

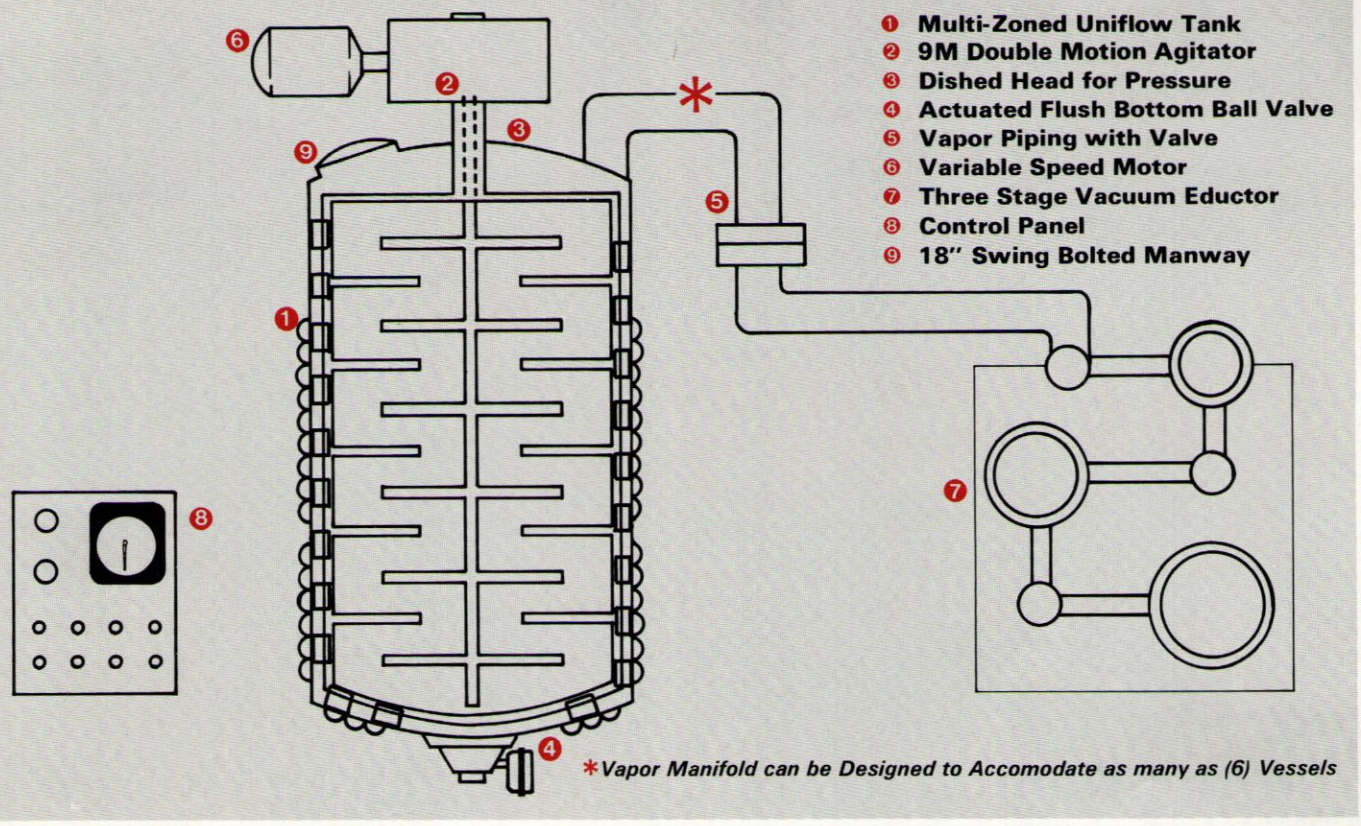
HEATING/COOLING CYCLE

The graph (to the right) illustrates the effective heat transfer capability of a scraped surface, Uniflow jacketed vessel and the rapid cooling rate accomplished by vacuum cooling. This heating/cooling cycle is typical for many cream or tomato base sauces. The particular application as shown here processed 1,000 gallons of red sauce with vegetables.

Maximized heat transfer area, a double motion scraped surface agitator, and 100 PSI steam account for the rapid heating of the product from 45°F to 200°F. The product was then cooled to 45°F by means of a three-stage eductor system. Additional water was added during the heating phase to replace the vapor loss during cooling. If desired, lower temperatures can be obtained. Product taste, color and consistency were found to be superior to conventional heating/cooling methods.

Control Panel with Temperature Recorder

VACUUM SYSTEM



CASE STUDY

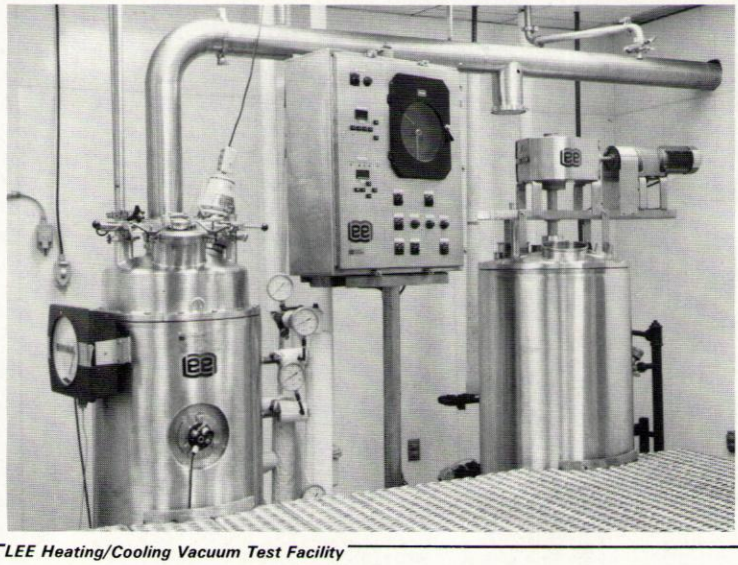
In this unique application of a LEE 50 gallon 'U9MS' tank with pressure and vacuum capabilities, a special pinto bean recipe was processed for product evaluation by the customer.

Using continuous double motion agitation (25 RPM), a batch recipe of beans (100 lbs.), oil, spices and 45 gallons of water (300 lbs. for processing and 75 lbs. for evaporation) was brought to a boil, pressurized and cooked for 45 minutes at 245°F (12 PSIG). After this cooking cycle, the pressure was released and sauce added to the recipe.

The system was then placed under a vacuum using a three-stage eductor that gradually lowered the temperature of the batch 55°F in 25 minutes.

The evaluation of the resultant product batch revealed a consistently thick, pasty base with only a small percentage of whole beans that proved to be thoroughly cooked as were the bean pieces that made up the majority of the final batch. Further, a very favorable maintenance of flavor and spice integrity was retained through the processing cycles.

The consistency of the product is controlled by varied cooking times and/or agitation intensity. This process can be scaled-up to 1,000 gallon batches with the same cooking and cooling times.



LEE Heating/Cooling Vacuum Test Facility

PROCESS SYSTEMS & EQUIPMENT

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