

New Cooler Technology Solves Salt Production Problem

Carrier Vibrating Equipment Inc. was recently approached by a major U.S.-based producer of fine salt to help resolve a problem they had been experiencing. The approach used for the production of salt at this facility uses gas-fired evaporators to generate a salt wet cake from a brine solution. After the evaporators, the wet cake is dried using rotary filter drums with hot process air passing through the wet cake on the filters. This process resulted in a fine grain salt exiting the rotary drum filter dryer at a temperature of approximately 260°F.

At this facility the salt is primarily used for two purposes: the production of water softener pellets

and the production of table salt. In the production of water softener pellets the high temperature of the salt was beneficial to the forming of pellets. However, for the production of table salt, the high temperature caused problems with packaging the final product. The existing method being employed to cool the salt utilized large storage bins to hold the salt while it cooled prior to packaging. The method, however, required significant manpower and floor space in the production facility and resulted in damage to the package labels due to inadequate cooling, adding significantly to the production cost.

The client was considering traditional cooling technologies such as rotary coolers and fluid bed coolers, and even contacted Carrier to inquire about vibrating fluid bed coolers, since the company had recently purchased a vibrating fluid bed drying system for salt from Carrier. In discussions with the client it was determined that the existing floor space available for cooling was severely limited and that the use of coolers utilizing process air to cool the salt - such as rotary coolers or fluid bed coolers - would have made the limited space available an even bigger impediment to using this type of cooling. These types of coolers would also require the use of a process cooling air fan, a dust collector for the exhaust, an exhaust fan, and interconnecting ductwork. All of this ancillary equipment together with the air requirements and a large installation cost would have also made these technologies cost prohibitive.

VibroCool Solution

Carrier instead offered a solution based on new technology that had been recently developed. The new technology was based partially on existing technology used in the foundry industry combined with Carrier's extensive knowledge of indirect heat transfer via immersed heat exchangers. The unit offered was Carrier's VibroCool cooler. The VibroCool cooler is a cylindrical horizontal drum with a horizontal tubular heat exchanger bundle mounted internally, through which cooling tower water or filtered river water is circulated as a heat transfer media. The drum assembly is supported to its foundation via steel coil isolation springs and the unit is vibrated using a gearbox driven eccentric weight drive so as to produce a unique vibratory motion. The vibratory motion causes the salt to move slowly through the machine in a gentle, well-mixed, sub-fluidized state. The heat exchanger is mounted in the unit such that the circulating bed of well mixed salt is in intimate contact with the heat exchanger, resulting in high



The Carrier VibroCool is the full-scale production unit, capable of producing 10 tn/hr of cooled table salt.



Single connection points for the water feed and return lines, and simple drive design

heat transfer with the cooling water.

To demonstrate the VibroCool's ability to process the table salt, a continuous test unit was shipped to the plant. The unit was trialed by pulling a slipstream of material directly from the target process line. Carrier's engineers worked with the plant personnel

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to determine the product quality and efficiency of the unit. The testing proved that utilizing in-bed heat exchangers, as well as the specific vibratory motion, the VibroCool was able to achieve an excellent heat transfer coefficient with no degradation to product quality.

A production unit was then designed to handle the plant's full line capacity, cooling from 260°F



The single-pass heat exchanger is constantly in contact with the product while in production.

to less than 140°F. The size of the unit required was determined to be 3 ft in diameter and 12 ft in length. The unit was constructed of 316L stainless steel with all product contact surfaces polished to a food-grade finish. In order to make the installation process easier, all of the water supply and return lines were close-coupled with a single connection in and out. The only other required connection was a single point electrical connection for the drive motor. The unit was built with a support structure for this particular plant, but is inherently a low-headroom design. This unit could be placed in a building with ceiling heights as low as eight feet. For this application the VibroCool utilizes simple screw conveyors for feed and takeaway conveying, making the entire process both simple and flexible.

The production VibroCool was able to achieve the client's desired cooling capacity with a compact, highly efficient, economical, and easy-to-install design. These benefits, combined with expected years of trouble-free service and the added benefit of eliminating regulatory permitting, made the client's decision to purchase the VibroCool an easy one.

For more information on Carrier Vibrating Equipment Inc. (Louisville, KY), call 502-969-3171 or visit www.carriervibrating.com.

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