Cool It: Reducing Cooling Time for Adhesives

Reducing hot melt adhesive products' time-to-cool period prior to forming has always been a desired productivity goal for adhesives manufacturers. It can often take up to six to 18 hours to form and package a standard batch of adhesives depending on the client's finished product form. Every minute of cooling time reduction results in increased productivity as well as process cost reduction. The Kenics® Heat Exchanger has proven to be highly effective in reducing time-to-cool when handling viscous, hot melt adhesives, providing short-term ROI and long-term contribution to the bottom line.

The Situation

The hot melt adhesives manufacturer was experiencing excessive forming/packaging time. To reduce the cooling time, this company incorporated scraped surface devices and vertical tanks in an attempt to speed cooling of the hot melt adhesive products. Unfortunately, this approach still did not cool the hot melt adhesive quick enough and production cost was unacceptable.

The Solution

Chemineer, in conjunction with The DEN Group, recommended the Kenics heat exchanger for efficient, cost-effective handling of the hot melt adhesive product. At the heart of the Kenics heat exchanger is Kenics static mixer technology which exclusively offers the highest available heat transfer coefficients for fast, uniform heat transfer. Chemineer engineered and installed a custom, jacketed Kenics heat exchanger system to effectively cool the product in less time than previous heat transfer devices.

The Kenics Heat Exchanger consists of a continuous string of static mixer elements within each heat exchanger tube. Fluid flow is directed radially toward the pipe walls and back to the element, regardless of velocity. Additionally, momentum reversal and flow division also contributes to the mixing efficiency. All processed material is continuously and completely intermixed to eliminate radial gradients in temperature, velocity and material composition. As a result, Kenics Heat Exchangers provide predictable, controlled mixing, and the most efficient form of thermal transfer available today.

By using Kenics Static Mixer elements in each heat exchanger tube, the film build-up commonly associated with empty tubes is significantly reduced. Process fluid is continuously pushed from the center of each tube, to the wall and back to the center, eliminating thermal gradients and boosting the inside film coefficient.

Kenics Static Mixer elements produce a more uniform, consistent transfer process, with three to seven times greater heat transfer rates than empty tubes alone. Other

characteristics include the following:

- Mixer elements create self-cleaning wiping action
- Plug flow characteristics produce uniform heat history
- Temperature gradients are blended out
- Minimal fouling
- Surface renewal at tube wall reduces chance of thermal degradation
- Viscous materials can cool to near freezing

Kenics Static Mixer elements are furnace brazed to the pipe walls. The resultant enhanced surface area and internal fin effect augment the mixing action to dramatically enhance transfer rates. Removable elements are also available for applications requiring periodic cleaning during product change-overs.

The Result

In the evolution of continuous process engineering improvements, this manufacturer reduced the time to form and package a batch of hot melt adhesive from 18 hours to less than 2 hours — that's over an 88 percent improvement. The Kenics heat exchanger system was designed to remove 100°F from molten materials at 4,000 pounds per hour. The Kenics system solution required 20 percent less floor space. It also used less energy than the previous heat transfer device since the only power needed was a small horsepower pump to move the coolant through the shell side of the Kenics static mixer. The Kenics static mixer itself uses no outside power source.

The reduction in forming/packaging time increased productivity and optimized existing manufacturing capacity. The reduced heat history also improved the quality of the finished product, resulting in greater product consistency. The manufacturer also realized an improvement in employee safety since the incidence of burns caused by impatience in handling the hot melt too soon was reduced.

Chemineer, Inc., a unit of Robbins & Myers, Inc., is dedicated exclusively to mixing technology and the manufacture of quality equipment for fluid agitation applications. Chemineer has operations in Dayton, OH; North Andover, MA; Derby, England; Mexico, D.F.; Singapore, China and India. For more information, visit, www.chemineer.com *[1].*

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