PROCESS CHILLER REDESIGN INCREASES EFFICIENCY

SAVES MAJOR MANUFACTURER ON ENERGY COSTS

A manufacturer of polystyrene foam sheet utilizes 40°F chilled water for barrel temperature control in two extruders. The chilled water system utilized a common 10,000 gal chilled water tank with separate pumps to supply each extruder and each of two (2) chillers. The two air cooled chillers were 60 tons and 80 tons capacity respectively.

PROBLEM STATEMENT

The system, as installed, was unable to supply chilled water at a constant 40°F. Variations in chilled water temperature resulted in dimensional insatiability and variations in cell (bubble) size in the sheet, resulting in quality complaints from the end user.

In warm weather, the plant was forced to keep both chillers on line, leaving the plant without a viable back-up machine.

CORRECTIVE MEASURES

A new 130 ton chiller had been ordered and was on site. This chiller had been purchased as a primary machine with the two older machines to be used as back up.

A project was executed which implemented the following changes to the chilled water system:

1. The 10,000 gal common tank was removed. The "thermal flywheel" effect was not needed for a constant load process.

2. The new chiller was installed with a dedicated chiller circulation pump (primary loop pump) with the supply flow set to the specific requirement of the chiller.

3. A chilled water header pump (secondary loop pump) was installed supplying chilled water to users via a new distribution header. A "common pipe" arrangement was installed to allow variable flow in the chilled water header and constant flow in the chiller. This arrangement allows warmer water to be returned to the chiller and allows the chiller compressors to load more efficiently with increasing system demand.

IMPROVEMENTS NOTED

By allowing warm water to return to the chiller, the chiller ran more efficiently and seldom loaded beyond 4 of 6 available stages. Chilled water was supplied to the users at a more constant temperature, and extrusion process variability was reduced significantly. Reductions in energy consumption, while not the major reason for the project, resulted in monetary savings that recovered the project cost in approximately two (2) years.