

Digi-ACC Control Logic for Air Cooled Chillers

Applications

Chillers: up to four chillers

Water loops: primary loop only, or primary and secondary loops

Technologies

- Enable maximum refrigeration circuits by optimizing the chiller and compressor sequencing.
- Optimize pump speed based on measured water flow (Digi-PFS) to minimize loop resistance.
- Select number of pump operation to maximize the pump efficiency.
- Dynamically reset the chilled water temperature based on the measured building load and weather conditions.

Benefits

- Reduce chiller plant energy consumption 15% to 40% (500 kWh/ton/yr to 1,500 kWh/ton/yr)
- Simple payback 2 to 4 years.
- Reduces and/or eliminates compressor hunting and short cycling to extend chiller life span.
- Reduces operation & maintenance costs.

Control Logic

Pump Staging: Number of pumps in operation is controlled to match the pump system curve and the loop system curve to minimize the loop resistance. If the pump efficiency is less than the design and pump is working on the left side of the pump curve, more pump(s) will be turned on and vice versa.

Pump Speed Control: If the water flow is higher than the minimum flow limit, the pump speed is modulated to maintain required temperature difference of supply and return water temperatures. Otherwise, the minimum flow is maintained. The minimum water flow is determined based on the number of chillers in operation and the chiller characteristics.

Compressor and Chiller Sequence Control: The compressor load is controlled at or higher than 40% (adjustable) to maximize the use of condensers and evaporator. If the compressor load is lower than the low limit 40% (adjustable) plus the control band, Digi-ACC will un-load chillers or compressors, and vice versa.

Condenser fan control: The number of condenser fans and speed are controlled to minimize the condensing pressure set point, which is determined based on the weather, equipment characteristics, and load conditions.(TBA)

Supply Water Temperature Reset: When the chilled water production is at 70% (adjustable) or higher, the supply water base temperature is controlled at the design set point. When the chilled water production is less than 70%, the chilled water base temperature is reset between the design value and the high limit to maintain the chilled water flow at 70% (adjustable). The high limit is set up based on both the return water temperature, building load ratio, and the ambient weather conditions. The actual chilled water temperature set point will be the base set point plus the a correction value, which is used to avoid frequent compressor loading and unloading.