

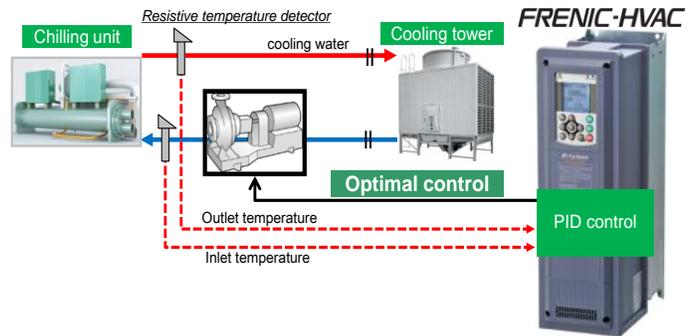
Sales Application Note

# Cooling Water Pumping Systems

## APPLICATION

In big refrigeration equipment, a water system is used to extract heat from the condenser (in the refrigerator cycle, the refrigerator gas is liquefied in the condenser) and send this heat to a cooling tower.

The key parameter to control in this cooling water system is the differential of temperature between inlet and outlet water.



Using Fuji Electric frequency inverters for controlling the speed of the cooling water pump allows the system integrator to keep the differential of temperature constant regardless of the system conditions. Additionally, temperature sensors can be easily used thanks to optional equipment, thus it is not necessary to use external controllers.

## APPLICATION REQUIREMENTS

Basic control strategy is based on an inverse PID control of the temperature differential between inlet and outlet water. Fast control response for keeping the temperature differential constant regardless of operating conditions is mandatory. Proper interface for connecting to temperature sensors is highly appreciated. Multi-pump control might be a must in some applications.

## FUJI ELECTRIC SOLUTION

Basic Fuji Electric solution for one pump systems is based on FRENIC-HVAC inverter, using the inverter built-in PID control. Temperature sensors can be easily connected by using OPC-PT optional card, and the temperature differential can be calculated in the inverter.





For more complex applications, where multi-pump schematics are implemented, recommended Fuji Electric solution is based on FRENIC-AQUA inverter, using the inverter built-in PID control (several multi-pump strategies available). Temperature sensors can be connected by using OPC-PT option card.

### ADVANTAGES OF FUJI ELECTRIC SOLUTION

- Powerful PID control is built in the inverter (1 main PID, 2 gains set and 3 auxiliary PID). Multi-pump complete controls and compressor working time balancing functions are available in FRENIC AQUA inverter.
- OPC-PT optional card for connecting 2 temperature sensors: 2 channels are available for JPt100, Pt100, Ni100, Pt1000 or Ni1000 sensor types
- Analog Customizable Logic built-in: mathematical operations allow the inverter to calculate the difference between two analog signals. This can simplify the system and it is not necessary to use external controllers.
- Mutual operation (multi-master operation) is available in FRENIC AQUA inverters.
- Automatic energy savings function which allows reaching higher energy savings' rates at low speeds.
- DC Reactor and EMC filter are built in up to 90kW (C2 supported, 2<sup>nd</sup> environment supported); EMC filter is built in from 110kW to 710kW (C3 supported, 2<sup>nd</sup> environment).
- Protective structure IP21 or IP55 can be selected with the model up to 90kW.