IPC 11550

ARMSTRONG

Ultra-Efficient Chilled Water Integrated Plant Control

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The new integrated plant control system from Armstrong:

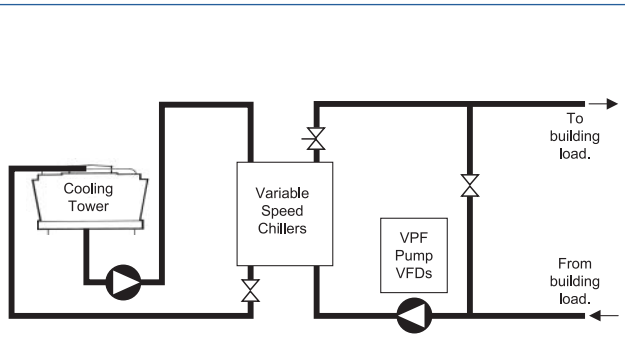
- ***Improved energy efficiency***
- ***Longer equipment life and lower noise***
- ***Inherently stable control algorithm***
- ***All at little to no additional cost***

System designers face an ever-growing need to address the global demand for reliable, energy-efficient and cost-effective solutions.

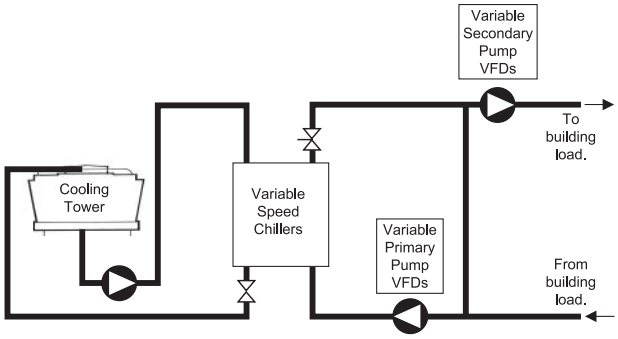
With this in mind the Armstrong IPC 11550 ultra-efficient chilled water plant control system ushers in a new era of efficiency. Aimed at achieving better than 0.5 kW/ton operating efficiency on an annual average basis, it dramatically exceeds today's best-in-class levels of 0.7 kW/ton.

Employing the Hartman LOOP™ methodology of chilled water plant control, the IPC 11550 Control System maximizes the benefits of all variable speed plant design. This is a proven control method that employs a patented technique for operating variable speed chilled water plants. Hartman LOOP™ technology has been installed in several major facilities for over 5 years and continues to produce energy savings over other control methodologies.

The IPC 11550 works equally well on variable primary flow (VPF), and variable primary - variable secondary (VPVS) system configurations, as illustrated below. VPVS systems have two sets of pumps on the load side of the chillers, one set for distribution and a second set for chiller flow. In contrast, a VPF system combines both pump loads onto one pump set. Both solutions have



Variable Primary Flow (VPF) System

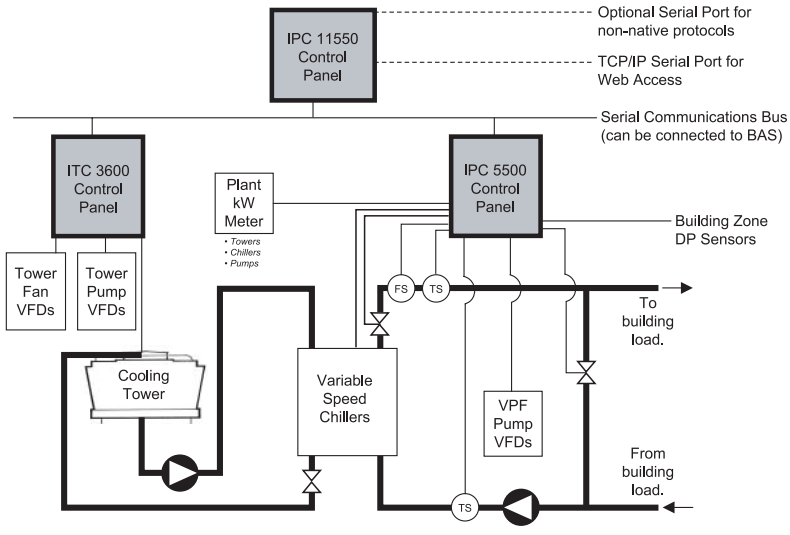


Variable Primary - Variable Secondary Flow (VPVS) System

strengths to match specific applications, and the IPC 11550 can optimize either.

The IPC 11550 system architecture is based on high-level serial communication between a network of three control panels: The IPC 11550 master panel, the IPC 5500 chiller and pump control panel, and the ITC 3600 integrated tower control panel.

The IPC 11550 system produces dramatic energy savings. In addition, in most cases the IPC 11550 system does not increase the total equipment costs of the plant. Optimizing the plant design for the HVAC characteristics of a part load application produces hardware savings to offset the small increase in technology and control costs.

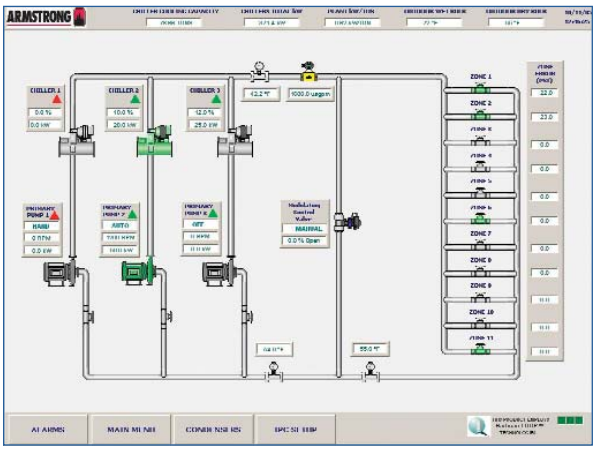


Plant architecture of an IPC 11550 control system for a variable primary plant

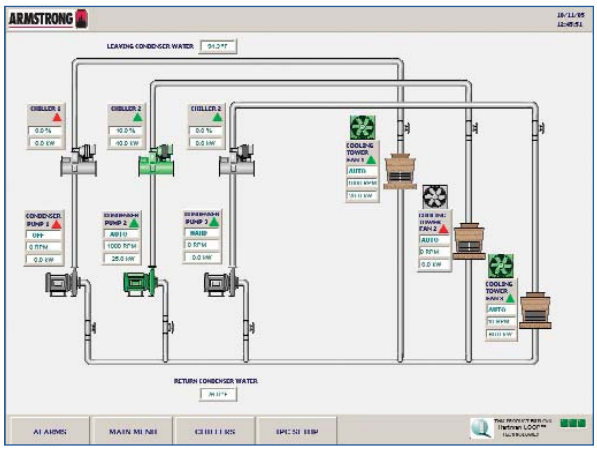
IPC 11550 System

The IPC 11550 system creates a new standard for HVAC system communications, with full remote control capabilities through web-based interfaces. Imagine being able to access your plant from anywhere in the world and being able to trouble shoot, rotate duty status of equipment, or switch out suspect hardware from service. In addition to helping predict equipment failures, a plant using the all variable speed IPC 11550 system is less likely to suffer any failures, as operating at a lower speed will extend equipment life and dramatically lower noise levels.

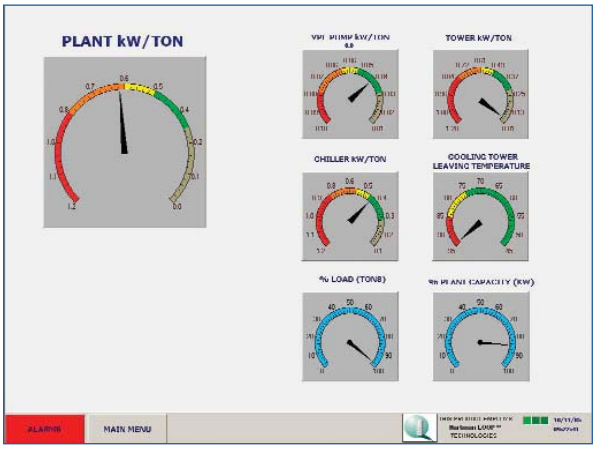
The IPC offers a number of dynamic user interface screens that lead the user to the desired information or action commands. All systems include 2 GB of memory for trending data. Also included are factory preset, and field adjustable warning and alarm limits on over 20 plant parameters. When these occur, the IPC can send an e-mail, send a message to the building management system and/or sound a local audible alarm.



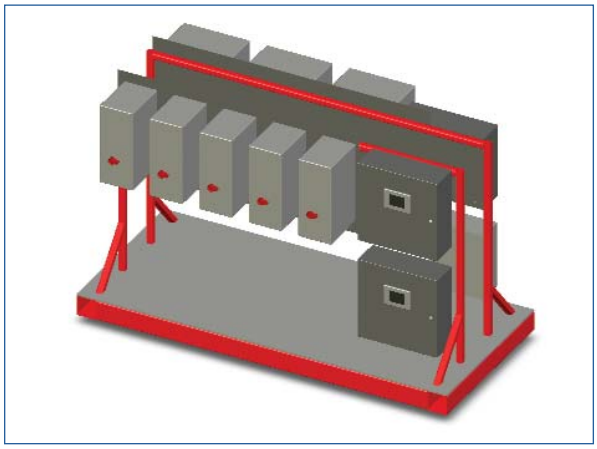
Chiller Plant Overview Screen



Condenser Water Circuit Screen



Plant Performance Meter Screen

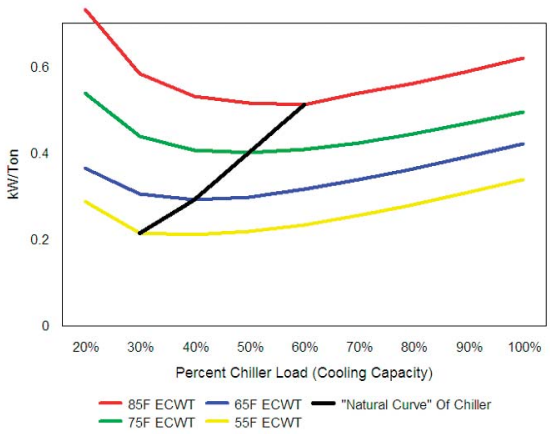


Typical Assembly

The IPC 11550 system employs the Hartman LOOP™ Natural Curve sequencing logic to ensure that the variable speed chillers are always operating as close as possible to their maximum efficiency for a given entering condenser water temperature (ECWT). To reach the optimum ECWT, the IPC 11550 maintains the greatest active surface area on the cooling towers by slowing down the condenser water pump and tower fan, as opposed to staging off cooling towers.

Combining this with the Hartman LOOP™ patented demand-based control algorithm results in one of the most stable systems conceivable.

To learn more, visit us at www.armstrongpumps.com, or The Hartman Co. at www.hartmanco.com.



▶Typical Specifications - Chilled Water Plant Control (Section 15900)

The chilled water plant shall be a water cooled all variable speed plant with centrifugal variable flow and variable speed chillers, variable speed cooling towers (variable fans and pumps), and variable speed distribution pumps. The system design shall be either variable flow primary system or variable flow primary/variable flow secondary system.

Chilled Water Plant Control System Description

The chilled water plant control system shall be an all variable speed plant control system that executes the following control sequences:

- ▶ Sequencing of the centrifugal chillers
- ▶ Variable speed control instruction to the cooling tower pumps and fans
- ▶ Control of the variable primary [and/or secondary] chilled water distribution pumps in response to process variable from the load (DP signal sensors, flow meters, valve positions and/or kW meters)
- ▶ Control of pump stations for parallel or duty/standby operation
- ▶ Provide instruction to the isolation valves and modulate the bypass valve
- ▶ Provide system alarms and warnings
- ▶ Communication of plant room operation and alarm data to the building automation system, and optional control through IP

The proposal of the control system shall be capable of operating the chilled water plant for this comfort cooling application at less than or equal to 0.5 kW/ton on an average annual basis, and the submittal package shall indicate calculations to confirm this based on the selected chiller, cooling tower and pumping system.

The chilled water plant control system shall utilize demand based control for the tower fan and pump speed, and shall provide the chiller with a chilled water supply temperature set-point for the chiller to govern its operation to. The chillers shall be sequenced/staged, both on and off in a manner to maintain their operation as close as possible to the Natural Curve. The cooling tower fan speed and pump speed settings shall vary in accordance with the Equal Marginal Performance principle. The "natural curve", "demand based control", and "equal marginal performance principle" methodologies described above are to be in accordance with the Hartman LOOP™ operating principles of an all variable speed chiller plant. Alternate plant control sequences that can be proven to provide a net plant efficiency level of 0.5 kW/ton or better will be considered with a written proposal submitted at the time of quotation. Net plant efficiency level is calculated as the average annual kW/ton for the annual energy input to the chiller, cooling tower, condenser pumps and distribution pumps, divided by the annual tons delivered to the system.

The chiller plant control system (IPC 11550) shall be specifically designed for the control of a chiller plant that involves up to three chillers, up to three cooling towers, up to six constant and/or variable chilled water primary pumps, [up to six constant and/or variable chilled water secondary pumps] and up to six constant and/or variable condenser pumps. Chilled water primary pumps, [secondary pumps] and condenser pumps could be in parallel or duty/standby operation.

The IPC 11550 system shall allow field adjustments of control parameters as described below. The IPC 11550 system shall be capable of accepting and processing appropriate signals for the following serial data points from associated panels:

- ▶ Analog inputs for zone differential pressure (DP) transmitter signals 4-20 mA
- ▶ Digital inputs for pump DP switches for primary [and secondary] pump fault signals
- ▶ Digital inputs for remote connection for pump start/stop
- ▶ Digital inputs for primary [and secondary] pump remote start/stop signals from up to 5 chillers
- ▶ Digital inputs for alarm horn (buzzer)
- ▶ Digital inputs for alarm silencer
- ▶ Digital outputs for primary [and secondary] pumps run signals
- ▶ Digital outputs for alarms of pump/motor/VFD alarm, DP transmitter alarm, primary [and secondary] pump fatal alarm and general system alarm
- ▶ Analogue inputs for primary [and secondary] pump motor temperatures selectable between NTC or PT1000
- ▶ Digital inputs for primary [and secondary] pump motor run feedback signals
- ▶ Analogue outputs for primary flow, kW, supply and return temperature sensors
- ▶ Serial port for communication with the BAS
- ▶ Serial port for communication with the VFD's

Trending and Reporting Capabilities

The chilled water plant control system shall have alarm and event logging capability and shall store logged data, in the memory, and the data must be easily retrievable. The chilled water plant control system shall display live and trend data on demand. The controller shall allow the operator to select points, group of points and mechanical systems through a menu. The controller shall provide graphic screens of system schematics.

Communication Protocol

The chilled water plant control system shall communicate with one or more of the following protocols: Lonworks, Modbus or BACnet.

BAS/BMS Access and Internet

The chilled water plant control system shall provide BAS/BMS access and internet access through either or both the BMS/BAS serial network, and an internet TCP/IP internet address with read/write functionality. This access shall allow the relevant staff to:

- ▶ Program remote controllers from the BAS/BMS room
- ▶ Receive alarm messages, automatically process and convey them to the maintenance personnel via the network
- ▶ View live and trend data from the remote stations

Alarms

Whenever abnormal conditions arise, alarms shall be generated and the alarm messages shall be displayed in clear textual form on the screen, until it is acknowledged.

Graphics

Graphics shall be included for ease of system operation. Graphic screens shall include, but will not be limited to, the following:

- ▶ System schematic
- ▶ Chiller system schematic
- ▶ Cooling tower loop schematic
- ▶ Building loop schematic

Access Security

The IPC 11550 system shall have three levels of password security.

For a full specification contact your local Armstrong Sales Office.

EXPERIENCE BUILDING...

S. A. Armstrong Limited
23 Bertrand Avenue
Toronto, Ontario
Canada, M1L 2P3
T: (416) 755-2291
F (Main): (416) 759-9101

Armstrong Pumps Inc.
93 East Avenue
North Tonawanda, New York
U.S.A., 14120-6594
T: (716) 693-8813
F: (716) 693-8970

Armstrong Holden Brooke Pullen
Wenlock Way
Manchester
United Kingdom, M12 5JL
T: +44 (0) 1612 232223
F: +44 (0) 1612 209660