

Cristo'Control

An air conditioning of refrigeration plant with thermal energy storage is a unique concept consisting of a complete system of high energy performances. Operational costs' savings are achieved with the system.

In order to reach optimum performances and to maintain them for a long time it is necessary to associate it with an intelligent control system which will provide a measurement of performances, monitoring support as well as help with the preventive maintenance, both locally and remote.

This is the subject of the control system named "Cristo'Control" developed by our company which profits of more than 20 years of experience in the field of thermal energy systems.

Cristo' Control allows to secure :

1) Automatic management of authorized variable operating modes

According to the predefined parameters (time, tariff sections, actual cooling demand, energy available, etc...) Cristo'Control authorises the adequate operating mode,

2) Control of the cooling production network

Cristo'Control controls all the circulating units of primary cooling production including plate heat exchanger and the chiller (on/off , chiller set points of the V3V, openings/closings of valves, etc...),

3) Alarms and defaults report

Messages about alarms and defaults are sent to an entity being in charge of the installation maintenance (telephone, fax, email, etc...),

4) Remote follow-up in real time

Visualization of the installation, position of valves, chiller and pump operation and other operating parameters - all being calculated in real time in relation to BMS information report (via RS 485). It is also possible to obtain an access by a Web navigator through the Cristo'Control Web site that additionally allows data refreshment,

5) Storage of operating parameters and measured values

The access to the values and information storage enclosed in a historical database allows to:

- establish balances of the periodical energy installation,
- analyse and optimise the operation of the cooling production according to the evolution of demand,
- analyse the reasons of parameter drifts and to start a maintenance activity in order to fix it (preventive maintenance).

Presentation

Cristo'Control is presented in the form of a small electrical box supplied by the 24. This box has to be connected to the principal electric box with an adequate equipment protection.

This electrical box is composed of:

- 24V DC power supply,
- the automation which controls the equipment of the transfer group (pumps, chiller, valves...) ,
- logic and analogic in and out,
- internal wiring,
- determined connections of the connector blocks,
- display panel for manual operations.

Cristo'Control Web site

Cristopia Energy Systems has created an Internet server which is fully dedicated to the Cristo'Control applications as well as to the long-term operating parameters' safeguard of each connected site.

It offers an access to the historical database (through Internet, with help of the Internet Explorer's Web navigator) which is free during the first year of using following the start-up.

It provides information (direct access – by a name of user with the specified password) of all operating parameters as well as of measured values stored in a long run.

At the same time it helps to define specific processing data tables which are in relation with the installation equipment (energy balances, capacity, various statistics, etc...)

The address of Cristo'Control's Web site is: www.cristocontrol.com

Cristo'Control functions

Cristo'Control is especially designed to help with piloting and regulation processes of the installed components. It carries out all necessary calculations of the various operating modes and allows:

- to control the equipment being in accordance with the operating modes authorized by the software,
- to obtain the statement of all measured points and signals entering in logics of control,
- to get continuous calculations of variable reference values,
- to have an access to the parameters, conditions and measurements being in relation with the operation of the installation,
- to store events of the operating parameters as well as of the measured values (locally - per week, in a long – term - through the server on the Cristo'Control Web site),
- to modify parameters of the regulation as well as to order and monitor all the units,
- to help with the process of maintenance,
- to communicate externally by connection series RS232, RS485 and STN (telephone network).

Monitoring the installation process

Monitoring the installation process is both locally (display panel of the Cristo'Control box' front door) and remotely (information sending with one /or several off-set stations) accessed through the connection series and/or a telephone line (by the company in charge of the maintenance or any other entity indicated by the owner of the installation).

This information is:

- alarms or defaults which are announced directly to the entity being in charge of the installation maintenance (through the report which is accessible on the Web site or in a form of a message being sent with the use of a telephone line, fax or email),
- operating parameters (in real time) through the visualisation of the operating parameters, locally and through the off-set on the BMS,
- parameters, conditions and operating relative measures of the installation which are temporarily stored in the Cristo'Control local memory and which are regularly downloaded (by the telephone line) on the long-term safeguard server (alarms, defaults and drifts are also being stored).

Installation's follow-up

Ensuring optimal performances and maintaining them in a long term requires that the owner (and/or any other person chosen) should be informed (in a real time) of the installation parameters evolution. On the other hand (taking into account defaults and alarms) drift of values being defined by the optimal operation of the installation allows to anticipate the system or the component failure and to start a preventive maintenance procedure.

At our disposal there is a dashboard having all necessary indicators to run the observation of permanent drifts and the global control which are accessible both locally (by the owner) as well as through the off-set station within the framework of the performances' guarantee.

Information list available locally and remote (not exhaustive):

- STL inlet temperature
- STL outlet temperature
- course ending of motorised valves openings/closings
- % of openings of the valve 3 ways
- chiller pump feedback
- distribution pump feedback
- stored energy being available
- limitation of the discharge capacity
- limitation of the capacity available during nights
- stored energy reserves
- operating mode information
- plate heat exchanger instantaneous capacity
- plate heat exchanger instantaneous flow rate
- plate heat exchanger inlet temperature
- plate heat exchanger outlet temperature
- chiller inlet temperature
- chiller outlet temperature
- chiller operation feedback
- temperature set points of the chiller in direct production
- temperature set points of the chiller in a charge mode
- set points' state of the chiller positive/negative temperature
- thermal energy provided by the package
- thermal energy provided by the chiller
- thermal energy provided by the storage
- information on peak and off-peak hours
- information on the cooling plant operation period

List of alarms, defaults and drifts (not exhaustive):

- general chiller alarm
- general alarm
- default/alarm of the chiller pump
- default/alarm of the distribution pump
- default/alarm of pressure (HP or LP) primary network
- default/alarm of the expansion
- default/alarm of the motorized 2V valves' openings/closings
- mode outlet fault on not reached conditions
- default/alarm flow rate of the chiller activity
- default/alarm flow rate of the plate heat exchanger primary action
- V3V opening default
- communication default
- drift of charge temperature
- drift of discharge temperature
- drift of the set points' temperature
- drift of the 3 ways valves positioning
- drift of the temperature probe
- drift of the primary pressure network
- drift of the exceed of the supplied energy
- drift of a primary plate heat exchanger flow rate



Connections to be previewed on the Cristo'Control located connector blocks:

Logical ins

- feedback of the distribution pump's operation from the pump
- feedback of the chiller pump's operation from the pump
- feedback of the opening position of each 2V motorised valve from the valve
- feedback of each 2V motorised valve closing position from the valve
- flow meter impulses on the primary plate heat exchanger from the flow meter (except supply)
- expansion system default
- chiller's operation feedback (if no numerical protocol)
- feedback of the general chiller alarm (if no numerical protocol)

Logical outs (towards general electrical box, outside on scope of supply)

- order 24V, control of the distribution pump towards relay of the pump power
- order 24V, control of the chiller pump towards relay of the pump power
- order 24V, motorized 2V valves' openings/closings towards relay of the valve power
- report 24V, information on general defaults towards main electrical box indicators
- order on/of of the chiller (if no numerical protocol) towards the chiller
- order of the chiller's changing set points (if non-numerical protocol) towards the chiller

Analogical outs

- order 0/10 V of the positioning of the valve 3 ways towards V3V

Analogical ins

- Feedback of the valve 3 ways 0/10 V position from V3V
- STL top temperature from the STL high probe PT1000 or PT100
- STL bottom temperature from the STL low probe PT1000 or PT100
- Chiller inlet temperature from the chiller inlet probe PT1000 or PT100
- Chiller outlet temperature from the chiller outlet probe PT1000 or PT100
- Plate heat exchanger inlet temperature from the exchanger inlet probe PT1000 or PT100
- Plate heat exchanger outlet temperature from the exchanger outlet probe PT1000 or PT100
- Primary network pressure from the pressure sensor 0-10V or 4-20 mA

Other connections

- 220 V power supply
- phone line dedicated to Cristo'Control
- serial link with the chiller (according to the protocol), in this case all planned communications dedicated above are not useful and Cristo'Control is able to transfer other not listed above functions from the chiller
- serial link of BMS connections on port series RS 485