Fresh Air Handling Unit with Constant Speed Fans

Example Implementation with Lonix Technologies

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INDEX

1 Introduction

This document presents an implementation example for a fresh air handling unit using Lonix technologies. The controls are done using Lonix Modules, and system design and configuration utilizes the Lonix Project Creation Tool (PCT).

2 Fresh air handling unit example

This chapter introduces the control diagram and the functional description of a typical fresh air handling unit (FAHU) with both fans driven at constant speed. Please see other examples for more complex air handling units.

2.1 CONTROL DIAGRAM

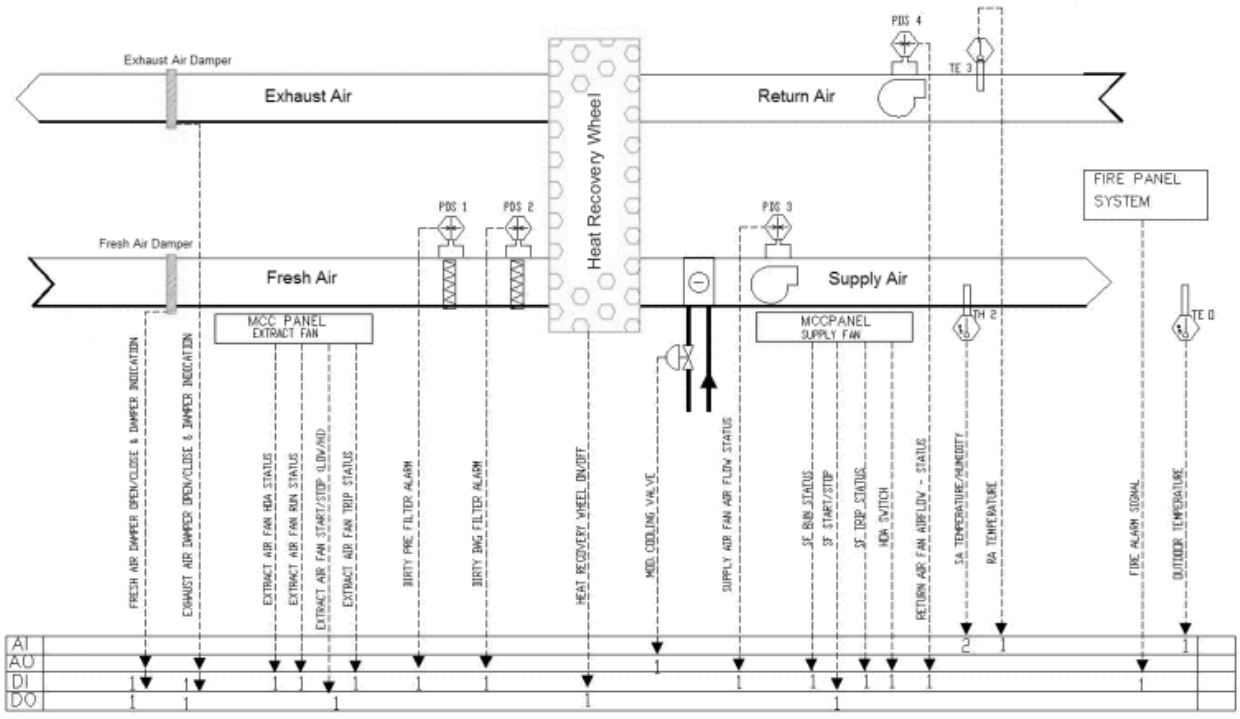

Figure 1. Control diagram of a typical fresh air handling unit, fans driven at constant speed

The air handling unit has a heat recovery unit and a cooling unit for temperature control. Supply air and exhaust air fans are driven at constant speed. Filters make sure that only clean air is supplied. Air circulation can be stopped completely with dampers.

2.2 FUNCTIONAL DESCRIPTION

Fresh air handling units are used for supplying fresh air at a desired temperature inside the building. Usually single speed fan FAHUs are used where the need for desired temperature and fresh air is confined to a specific area. FAHUs are also used for supplying air for FCUs. As this is often the case, the supply air temperature should be kept constant all the time to allow the adjustment of room temperatures with FCUs.

The target temperature of supply air is achieved by circulating district cool water through the cooling coil and by rotating the heat recovery wheel. A controller regulates the cooling valve according to the setpoint and the measured supply air temperature (TE2). In addition, if the difference between exhaust air temperature (TE3) and fresh air (outdoor) temperature (TE0) is more than, say, a few degrees then the heat recovery unit should be on for energy saving purposes.

The air circulation in the serving area will be balanced by the simultaneous functioning of the supply and exhaust fans (i.e. supply and exhaust fans will be always working together). Separate dampers for the supply and exhaust ducts make sure that there will be airflow only if the fans are running (i.e. at all other times the dampers will be closed).

Run and trip status information for both fans are received through the starter panels and in case the fans fail then an alarm is generated. Pressure difference switches (PDS3, PDS4) monitor the airflow in the ducts and generate an alarm in case there is a conflict between the fan run status and airflow status. Filter alarms (PDS1, PDS2) are generated by the pressure difference switches when the filters get too dirty.

In case of a fire alarm both fans and the heat recovery unit are turned off and both dampers are closed.

3 Solution with Lonix technologies

This chapter shows an example implementation using Lonix Modules and Lonix PCT. The following figure is a screenshot produced from Lonix PCT.

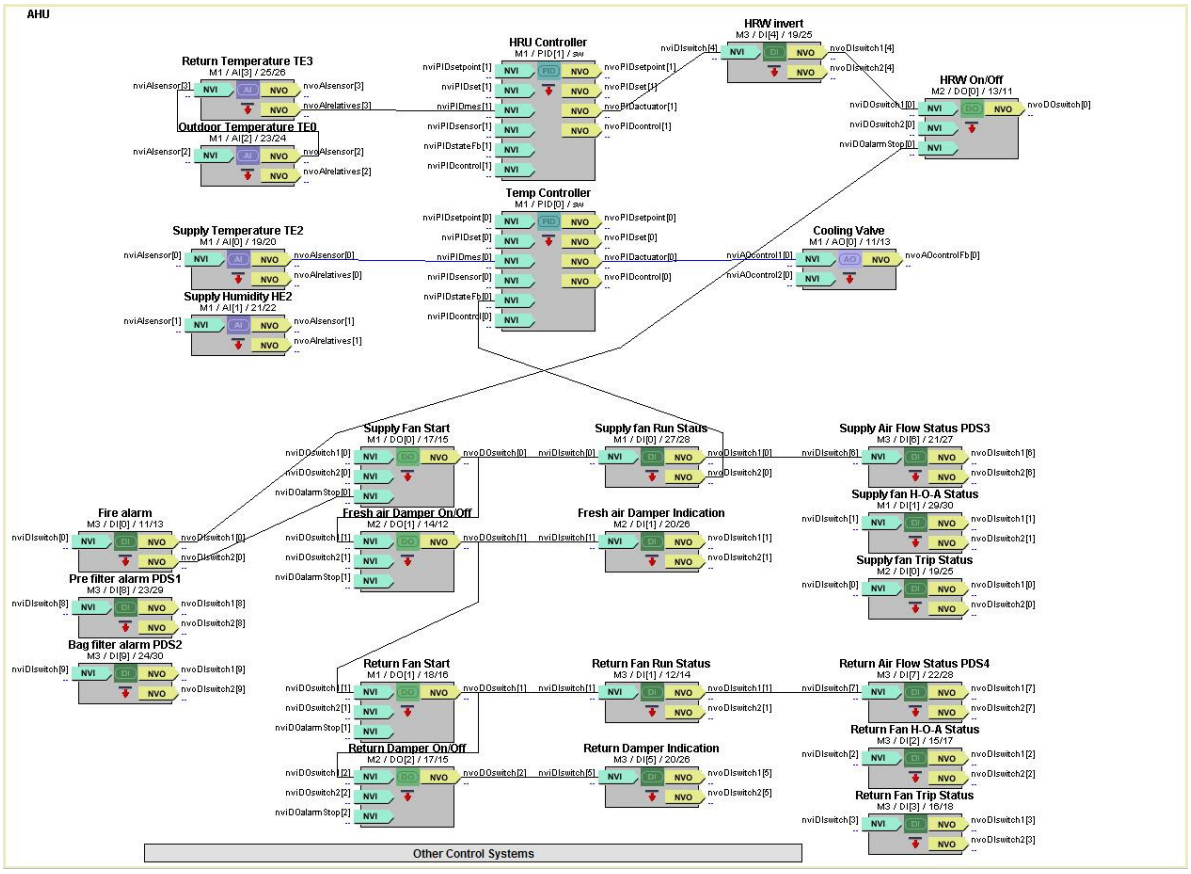

Figure 2. Control of the fresh air handling unit

The control can be roughly divided in four separate parts: heat recovery unit control, temperature control, fan & damper control and alarms. The heat recovery wheel is rotateted according to the difference between the outdoor temperature TE0 and return temperature TE3. The wheel is supposed to rotate when the temperature difference is more than 2 degrees. This is achieved by using an on/off controller (HRU Controller) which will enable the wheel run permission when the temperature difference is outside of the certain range (typically -2 to +2 degrees). Notice that the HRU controller's run permission output must be inverted. Without invert function the wheel would run only when temperature difference is within the configured range!

The cooling valve is regulated according to the measured supply air temperature TE1 and the given setpoint. A constant controller (Temp Controller) makes sure that the valve is opened when more cooling is needed. An alarm is generated when the supply air temperature deviates more than 5 degrees from the setpoint (sliding alarm feature).

All fans and dampers are controlled synchronously. When the supply air fan is started (Supply Fan Start) the fresh air damper is opened automatically and vice versa. The start command is also forwarded to the exhaust fan which works in conjunction with the exhaust air damper. So basically both fans are on and both dampers open, or both fans are off and both dampers closed.

To be sure the fresh air handling unit is working properly there are several alarming points. Run status and trip status indications for both fans are available through the starter panel. Pressure difference switches monitor the filters and airflow in the ducts. The open/close status of the dampers is also available. Run status, Airflow status and damper status indications compare the system for conflicts. In case of a fire alarm the heat recovery wheel and the fans are turned off with a binding to its nviDOalarmStop. Also the dampers are closed.

4 Required devices

This chapter lists the required devices for the example implementation.

Table 1. I/O objects

I/O type	Amount
DI	14
DO	5
AI	4
AO	1
PID	2

As you can see in the above table, you will need one (1) Lonix Multimodule 2242P, one (1) Lonix Digimodule 5400P and one (1) Lonix Indication Module 1000S.

Table 2. Lonix Modules

Module Type	Description	Units
Lonix Multimodule 2242P	2 DI, 2 DO, 4 AI, 2 AO, 2 PID	1
Lonix Digimodule 5400P	5 DI, 4 DO, 2 PID	1
Lonix Indication Module 1000S	10 DI	1

The following table lists the different sensors, transducers and actuators needed in the example implementation.

Table 3. Sensors and actuators

Device	Details	Model
PDS1, PDS2	0…500 Pa	LX-PDS-Filter
PDS3, PDS4	0…3000 Pa	LX-PDS-Fan
TE0	-40…105 ℃	LX-TE-O
TE3	-20…105 ℃	LX-TE-D200
TH2	-40…85 ℃, 0...100%	LX-RHTE-D-3
Cooling valve & actuator		e.g. VUD065F300 + AVM234S F132
Damper drive		e.g. Belimo M24

Details of the suggested products are available at www.lonix.com.