Source:JASE-W Japanese Smart Energy Products & Technologies
https://www.jase-w.eccj.or.jp/technologies/index.html

Azbil Corporation

Activ™ motorized two-way valve with flow meter control function

Features

◆ **Realization of energy conservation**
A continuously optimized flow rate is achieved by switching from a conventional valve opening control to the flow rate control. An excessive flow rate is restrained to reduce the number of heat sources and pumps in operation, contributing to energy conservation. A circulating temperature compensation control, which maintains the circulation temperature of the air conditioner coil at a constant temperature and an application for reducing the transfer power of the pump, may be added for further energy conservation.

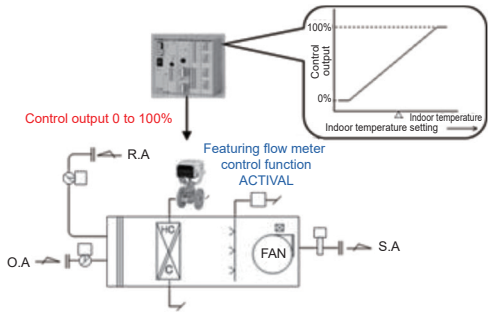
◆ **Energy management**
No additional equipment is required for energy management, since the valve is integrated with temperature, pressure, flow rate and heat quantity instrumentation functions. Energy management can be performed for each individual air conditioning unit, with space and cost savings.

◆ **Improvement of comfort**
The flow rate inside the air conditioning coil varies, as the pipe internal pressure fluctuates, however, with conventional valve opening controls, in some cases, the indoor temperature could not follow the set temperature. Controlling the flow rate, however, improves indoor comfort, as an optimum flow rate is sustained the whole time, even when the pipe internal pressure fluctuates.

Overview or Principles

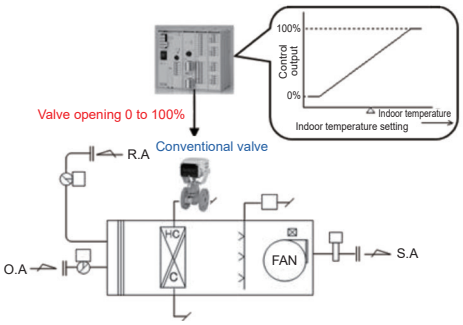
◆ **Differences between controls**

● **Valve opening control (conventional control system)**



The output for the control valve opening is determined by the valve opening control, based on the difference between the measured indoor temperature (supplied air) and the set temperature. Since the deviation of the measured indoor temperature (supplied air), for the set temperature, is great when the air conditioning is turned on, or when the temperature setting is excessively low, the control valve opening becomes fully opened (100%) and, in some cases, the flow rate exceeds the design flow rate for the air conditioner coil (excessive flow).

● **Flow rate control (system adopted by ACTIVAL with flow meter control function)**

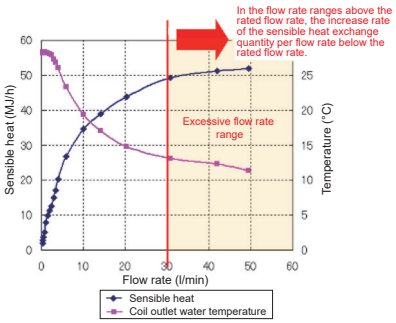


The flow control computes the flow rate setting by referring to the deviation of the measured indoor temperature (supplied air), for the set temperature and controls the actuator to set the actual flow rate, according to the flow rate setting. An excessive flow rate is suppressed and the circulation temperature difference of the secondary side cold-hot water can be secured, since the flow rate setting will not exceed the preset coil design flow rate (maximum flow rate) even if the difference between the measured indoor temperature (supplied air) and the set temperature becomes significant.

Effects or Remarks

◆ **What is excessive flow rate?**
An excessive flow rate refers to the phenomenon of a flow that exceeds the design flow rate. This can occur depending on the pipe pressure conditions, when the control valve opening is fully opened (100%), at the time the air conditioning is turned on in the morning, or if the air conditioning operation is set to an excessively low temperature. The transfer power of the heat source pump is determined to ensure that the rated flow for all air conditioning units, inside a building, is maintained. Air conditioning units located on the highest floor of an office building, which is the furthest from the heat source unit, requires the most amount of transfer power. This can lead to an excessive flow rate at the air conditioning units installed on other floors and also, depending on the number of air conditioning units in operation, due to pressure variations in the pipe system. Once an excessive flow rate occurs, the transfer power of the heat source pump increases by that amount and deteriorates from the heat source unit operating efficiency, which ultimately leads to an increase in energy consumption.

Reference: Coil characteristic data



Inlet air temperature 26°C
Inlet air humidity 50%RH
Supply water temperature 7°C
Return water temperature 12°C
Design flow rate 30l/min
Rated sensible heat quantity 50MJ/h

Effects or Remarks

◆ **The Control State of the Air Conditioner and the Effect of Reducing the Pump's Transportation Motive Power**

A comparison study is made on the behaviour of the air conditioner during flow rate control and opening control during the set up in the morning. From the comparison results, it shows a large deviation between the actual air supply temperature and the air supply temperature set value. Fig. 1 shows that when the opening control is conducted, the control valve's opening is fully open and flows more than the designed flow rate, in another words, excessive flow rate, whereas the flow rate control is restricted to prevent exceeding the designed flow rate as seen from Fig. 2.

A further comparison between opening control, and flow rate control which is restricted to not exceed the designed flow rate is also done during summertime and wintertime. The visual shows that it contributes to a reduction in the pump's transportation motive power as referred to Fig. 3.

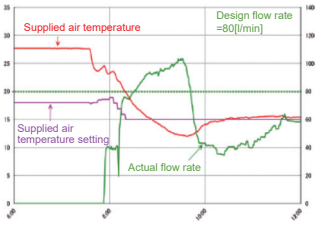


Figure 1: Air conditioning unit with valve opening control (cooling)

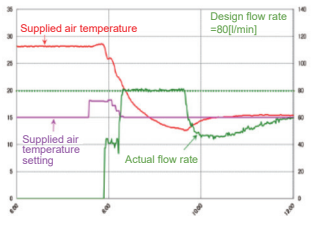


Figure 2: Air conditioning unit with flow rate control (cooling)

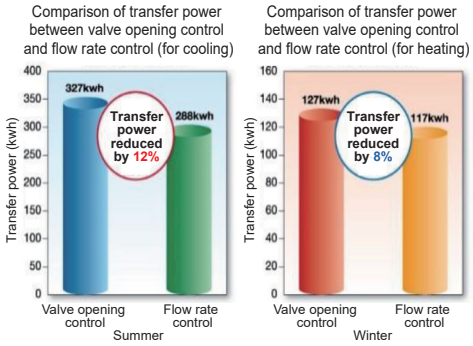


Figure 3: Comparison of transfer power between valve opening and flow rate controls
<Actual data taken at our Fujisawa Technology Center>

Note) A day's worth of pump transportation motive power during both summertime and wintertime. Comparison is conducted on days with almost equal treated calorific value.

◆ **Securing Supply and Return Temperature Difference**

A different comparison is made on the supply and return temperature difference on the instantaneous flow rate when using the existing valve and ACTIVAL™. When using the existing valve, as compared to the 10ºC designed temperature difference, it cannot secure a temperature difference of 10ºC as graphed in Fig. 5. On the other hand, when ACTIVAL™ is used, it secures a temperature difference of 10ºC and above as displayed in Fig. 6.

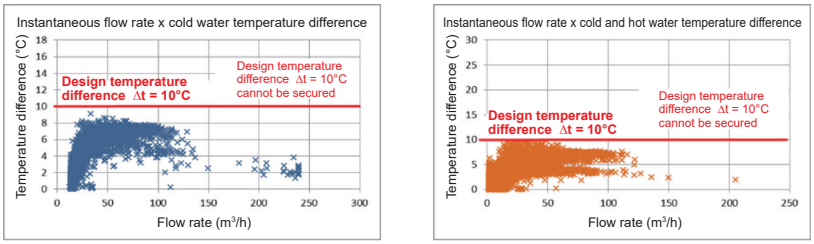


Figure 5: Circulation temperature difference with conventional valve
(Left figure: Cold water; Right figure: Hot water)

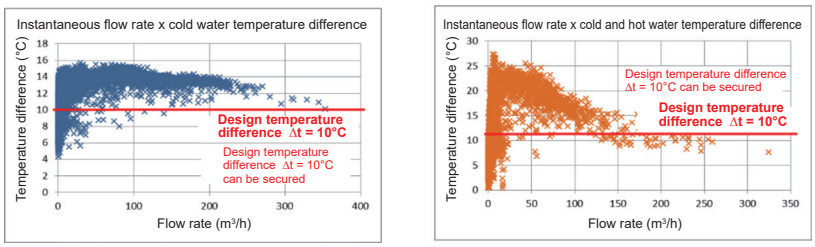


Figure 6: Circulation temperature difference with
Actival™ motorized two-way valve with flow meter control

Installation in Practice or Schedule

Domestic Cumulative total of approximately 80,000 units sold

Overseas Cumulative total of approximately 4,000 units sold

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