

How Shenzhen Subway Keeps It Cool

Quickly growing subway system in southern China chose Vaisala's humidity and temperature transmitters for its air conditioning control system.

Shenzhen is a city of nearly 9 million permanent residents in southern China. Situated just north of Hong Kong, it has grown from a tiny border town of 30,000 people into a modern metropolis and one of the most developed cities in China in less than 30 years. Today, Shenzhen is southern mainland China's major financial, high-tech and manufacturing centre.

The city of Shenzhen has a quickly growing subway system, which is owned and operated by Shenzhen Metro Company, Ltd. The construction was started in 2001, and the first two lines were opened to public at the end of December 2004, making Shenzhen the fifth city in mainland China to have a subway.

The two original lines, numbers 1 and 4, had 19 stations and 21.8 kilometers of track in total. Both have been expanded since, and three new lines are under construction. The


network will reach a total length of 177 kilometers next year.

Comfortable environment and optimized energy consumption

Humidity and temperature transmitters are used in the building automation system (BAS) of the subway to monitor said conditions in the stations. The measurements help control ventilation and air conditioning to provide a comfortable environment for passengers and optimize the energy consumption for the benefit of the subway operator.

In the Shenzhen subway, each station generally has 30 wall-mounted transmitters and 15 duct-mounted transmitters. Wall-mount transmitters are used in the equipment room platform, and duct-mount





Vaisala HUMICAP Humidity and Temperature Transmitters HMD60 and HMD70 are designed for use in air conditioning applications where accurate and stable control of relative humidity and temperature are required.

transmitters in the make-up air handling unit (MAU), an air handling unit that brings in and conditions fresh outdoor air. IT also helps prevent negative pressure conditions indoors created by exhausting stale air.

Highly Humid Climate Equals Challenges for Ventilation

Shenzhen is located on about the same latitudes as the tropic of Cancer - East Longitude 113°46' - 114°37' and North Latitude 22°27' - 22°52'.

The climate is tropical maritime monsoon, with an average temperature of 24°, and humidity of 40% - 85%. At the highest, the humidity level can exceed 90 percent. High humidity levels are always uncomfortable to humans no matter the temperature. When humidity gets too high, it is also likely to form condensation on cooler surfaces and can lead to additional wear on the heating and ventilation equipment, especially during cooling. Over periods of time it can lead to corrosion or additional maintenance needs.

Condensation is a problem for the measurement devices as it affects their measurement stability. Shenzhen Metro had originally installed humidity and temperatures transmitters on its lines 1 and 4, but due to the high humidity level, most of the transmit-

ters were damaged, and the temperature measurements were recorded to drift about 2° and humidity measurements as much as 10-20 percent.

Search for Accurate and Stable Measurements

Looking for better performance, Shenzhen Metro asked Vaisala - among others - to provide samples of humidity and temperature transmitters for testing. Vaisala's offering includes a large variety of HUMICAP® relative humidity sensors that have the capability to recover from condensation without it affecting their measurement accuracy or long term stability.

All Vaisala transmitters performed well according to specification, giving accurate and stable measurements.

Also, a previous subway project in Guangzhou proved to be a very good reference to validate the testing with real world experience. As Guangzhou is located 120 kilometers from Shenzhen and has very similar weather, their positive experiences with Vaisala's transmitters in the very same application encouraged Shenzhen Metro further.

Hundreds of Transmitters in Complex System

First Vaisala transmitters were installed along Shenzhen's extended

line 1. All stations - three of which have already opened - will be equipped with Vaisala INTERCAP® Humidity and Temperature Transmitters. The rest of the stations are expected to be open for traffic next year.

Shenzhen Metro also chose Vaisala's instruments for new lines 2 and 5. All in all nearly 1,500 Vaisala HUMICAP® Humidity and Temperature Transmitters have been installed along the line 2, which was opened last year. The newest line 5 - planned to be operational in mid-2011 - will be equipped with 955 pcs of Vaisala INTERCAP® Humidity and Temperature Transmitters HMW40Y and 420 pcs of Vaisala HUMICAP® Humidity and Temperature Transmitters HMD60Y.

The number of transmitters needed illustrates the complexity of subway building automation systems. There are numerous variables in play that need to work seamlessly together. As an integral part of the whole, humidity and temperature measurements can help secure optimized conditions for passenger comfort. From a system performance point of view, accurate and stable measurements can also lower overall maintenance costs, prolong calibration cycles, reduce transmitter exchange outs, and increase efficiency through tighter operating conditions.