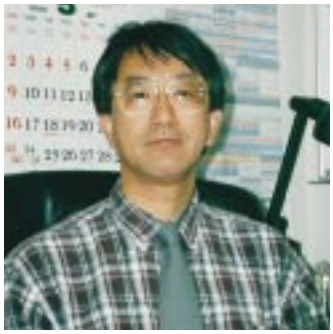
Advanced studies on construction materials and air conditioning impact in Japan

Searching For New Solutions

More attention is nowadays being paid to the quality of the air we breathe, resulting in an increasing need for humidity measurements in the home and office environments. Maintaining the proper level of relative humidity is also necessary to avoid conditions of extreme humidity condensation in buildings.



Dr. Kakitsuba uses Vaisala's sensor to measure indoor humidity condensation.

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The summer in Japan is very hot and humid and the winter is very dry. The average temperature in summer is about 30 degrees Celsius, with humidity at about 80 per cent. In winter the temperature is below 10 degrees Celsius and humidity is about 20 per cent. In Japan, a lot of research has been dedicated to building houses and developing building materials that best suit the changing weather conditions.

Humidity monitoring in man-made environments

Dr. Naoshi Kakitsuba at Ashikaga Institute of Technology, Gunma, Japan, is one of the leading experts in the construction research field in Japan. He monitors and studies indoor environments to analyze humidity and temperature conditions inside buildings and in construction materials. Such man-made environments include all the places where people spend their time, from living rooms to offices.

"In Japan, people are especially interested in solving the humidity condensation problems that cause a lot of harm inside buildings in the winter. Japanese houses are typically made of wood and reinforced concrete, each with different construction methods and characteristics. The indoor environment changes, for example, if air conditioning or floor carpets are used. If we don't know the house and its materials well, we can't protect it from humidity condensation. And even if we make a strong wall against condensation, it will not always prevent it. I have tested many kinds of houses and collected data for ten years. After my analyses, I have tried to solve the condensation problem by choosing the correct ventilation system, for example," explains Dr. Kakitsuba.

People are part of the environment

Dr. Kakitsuba studies not only the buildings but also the people occupying them. "Our measuring object is not just the house, but also the people that are affected by the indoor environment. We monitor and examine changes in the human body – breathing and sweating, etc. It's clear that human comfort is much improved when humidity levels remain within the desired range in the building. This means that my study is a kind of ecological study," he says.

The factors measured in this kind of research include the humidity and temperature in rooms, ceilings and walls. They even include items such as the moisture permeation through textiles, and the humidity and temperature inside bed clothes.

Vaisala's sensor measures humidity condensation

Dr. Kakitsuba examines the correlation between condensation and ventilation in houses, and the problems caused by condensation. Key measurements include:

1. Relative humidity and temperature in the room
2. Humidity condensation on windows or walls
3. Relative humidity and temperature outside the building
4. Perspiration of people, and moisture permeation.

The data is collected for two hours, twice a day, during one week or ten days, and the test is repeated four times a year. Dr. Kakitsuba uses Vaisala's sensor to measure indoor humidity condensation, and the human perspiration affected by ventilation and changing humidity and temperature conditions.

He has modified Vaisala's humidity sensor and transmitter to allow it to be put on window surfaces. He places the humidity and temperature sensors at a distance of 0.5 cm from each other. Based on the measured results, he draws curves showing the window condensation and the correlation between condensation and ventilation. Humidity condensation can be prevented by using suitable ventilation. Furthermore, he analyzes data on the moisture permeation through textiles.

"When I choose new instruments, it is important that I can carry out the tests I want, and that the manufacturer can help with professional and good advice about measuring," Dr. Kakitsuba points out. In particular, he requires accuracy, fast response times, repeatability and small size. Vaisala meets these requirements. "Vaisala's suggestions on how to use the sensor and how to calibrate it were one reason for choosing it," Dr. Kakitsuba concludes. ■