

SWAGELOK® FLUID SYSTEM COMPONENTS

Part of Urban Heat Island Relief

Temperatures in cities across the globe have been rising year after year due, in part, to the urban heat island phenomenon. Essentially a bubble of hot air that can engulf a city, urban heat island phenomenon is caused by increasing exhaust heat generated by soaring energy use, radiant heat from paved streets and high-rise buildings, and reduction in evaporated water due to fewer trees. In Tokyo, Japan, the minimum temperature has increased by 4° or more over the past hundred years due, in part, to this phenomenon. Some scholars predict that it will not be uncommon to see days with temperatures of 40°C (104°F) or more in Tokyo thirty years from now if this situation continues.

Dry Mist has been drawing some attention as a measure to combat the heat island phenomena. A system to reduce the ambient air temperature by 2 to 3° at maximum, the Dry Mist system generates a fine fog, absorbing the heat of vaporization as water changes from liquid to vapor and depriving the surrounding areas of heat. Because the water droplets consist of extremely fine particles that evaporate right away, people barely notice they are getting wet even if they touch the water droplets. In addition, air is cooled directly through the evaporation of mist and requires less power consumption than other cooling methods.

Professor Makoto Tsujimoto, Department of Architecture, Faculty of Engineering Division, Tokyo University of Science, who researched and developed Dry Mist, said, “An extremely small water droplet of sixteen one-thousandths of a millimeter comes out of a nozzle of one centimeter in diameter and two centimeters in length when water is sent to the nozzle under high pressure. In the summer, the water droplets will evaporate instantaneously, deprive surrounding areas of heat, and cool the areas. Dry Mist can reduce the temperature by two to three degrees with energy consumption one twentieth of that needed for air conditioners.”

Professor Tsujimoto’s Dry Mist system was installed along the Global Loop as part of countermeasures against heat in “Expo 2005 Aichi, Japan” held in Aichi Prefecture, Japan in 2005, and cooled visitors. At the Expo, “ambient temperature reduction with the use of Dry Mist” took third place according to questionnaires circulated among visitors with regard to environment-friendly activities, and drew great attention.

To establish the Dry Mist system, it was essential to create a piping system which could endure high pressures. To generate the fine fog, a compact piping system was needed to withstand a system pressure of 60 atm. Such piping systems are readily available in the manufacturing industry; however, in the architectural industry, it was not generally easy to establish a piping system that could withstand 60 atm. So, Swagelok® tubing and fittings were used to construct the Dry Mist system. The result: a flexible, leak-tight system that was easy to install.

As his reason for selecting Swagelok products, Professor Tsujimoto said, “Dry Mist needed fluid system components that withstood high pressure, and allowed safe and flexible piping design. Based on these criteria, Swagelok tubing and fittings were selected. After actually using them, I was impressed by their ease of use.”

Dry Mist has continued to draw attention after the Expo, and the Tokyo Metropolitan Government provided subsidies (up to 10 million yen in two cases) for the provision of Dry Mist under the “Prioritized Project 18 in 2006, ‘Global Warming Countermeasures.’” Dry Mist was actually installed in Akihabara Cross Field, and Roppongi Hills 66 Plaza. In addition, at the end of July 2007, a Dry Mist system using Swagelok components was installed at Futamatagawa Station of the Sagami Railway for one week. The installation of Dry Mist at the station was aired on TV programs across the country and attracted more public attention as a countermeasure to the urban heat island phenomenon. Professor Tsujimoto is also considering using Dry Mist as an alternative for household air conditioning and has been actively engaged in research and development of a household Dry Mist system fitted with Swagelok components.