## Case Study – Watts Water Technologies Rainwater Harvesting

Sustainability is not just a platitude that Watts Water Technologies bandies about. It's the main driver behind its future growth. Rainwater harvesting systems are one of Watts' fastest growing divisions and they are poised to become ubiquitous in water stressed areas such as California and the Southwest. Diverting rainwater from storm drains and funneling it into a building's non-potable plumbing—the purple pipes that are becoming more commonplace. The water is used for toilet flushing, cooling towers and irrigation.

Watts installed its first rainwater harvesting system in several government buildings in San Francisco. San Francisco has very stringent regulations for the use of recycled water in buildings. Even though it is non-potable it still must have a minimum chlorine level. Since pH affects the readings of a free chlorine (the sum of HOCl and $OCl^-$ concentrations) probe a chlorine analyzer must correct the free chlorine level and must, therefore, include pH measurements. Buildings that are large enough to use cooling towers as part of their HVAC system fill the towers with harvested water. The conductivity of water must be below a certain level (approximately 1500 µS/cm) to avoid scaling. Therefore, conductivity measurements are also necessary. The systems add city water, as needed, to its collected rainwater to meet all non-potable needs. City water has a consistent pH of 9 and needed no further adjustment. Flow and level sensors complete the instrumentation needed to monitor the system.

The Watts systems transports rain captured from the roof into large containers in the basement, where it is monitored for pH, free chlorine, conductivity and level. Rainwater has a pH that can be as low as 4 and is passed through calcite filters. Chlorine is the only other chemical added.

The first generation of instrumentation did not hold up well and resulted in frequent overdosing of chlorine. Not being able to monitor water quality remotely resulted in more manpower hours. In 2017 Watts switched to the AquaMetrix AM-2300 web-enabled controller and AquaMetrix pH, conductivity and chlorine sensors. The differential pH probes initially installed are still in service. The probe's reference solution and salt bridge can be replaced to restore the probe to factory condition. Like most chlorine analyzers, the AM-2300 controller calculates the free chlorine concentration from the pH and chlorine probes' output. However, it also takes inputs from as many as eight sensors and is 100% web enabled to allow remote monitoring and control.

Watts Engineering Manager, Tracy Santoro, credits the AquaMetrix instrumentation as being "more robust." She also found customer support to be extremely supportive: "The difference in customer service [between the previous manufacturer] is night and day." Following the successful pilot study Watts has standardized on the AquaMetrix instrumentation package.

*For the Watts rainwater harvesting system, pH, chlorine and conductivity sensors are connected to one AM-2300 web-enabled controller and ensure that water purity and chorine residual are within tight tolerances.*