Get a TrueSense of Water During Manned Spaceflight

The Water and Food Analytical Laboratory (WAFAL) of the Environmental Factors Branch at NASA's Johnson Space Center, in collaboration with GE Water and Process Technologies and the GE Global Research Center in Nishkayuna, NY, recently completed a preliminary evaluation of the GE TrueSense Personal Water Analytics (PWA). This evaluation is part of an effort by WAFAL to expand water-analysis capabilities for manned spaceflight in a cost-effective manner by investigating various options offered by industry, academia, and other government agencies. The GE TrueSense PWA is a simple platform specifically designed for offline, routine testing of water in industrial settings. Although not designed for spaceflight applications, several of the analytes measured with the PWA cooling water analysis cards are also parameters of interest for water and wastewater monitoring on the International Space Station (ISS). As such, evaluation of the TrueSense PWA was an attractive route to potentially advance water-analysis capabilities for spaceflight.

The TrueSense PWA is a battery-operated, hand-held unit about the size of a portable DVD player that performs colorimetric analyses on water samples using application specific analysis cards (such as the cooling water cards tested). The parameters measured with the cooling water analysis card that overlap NASA's interests include pH, total alkalinity, calcium, and magnesium. The analysis cards are pre-loaded with reporter molecules designed to react with target analytes in water samples. As the water sample is introduced to the analysis card, capillary forces draw the sample to individual reaction chambers where the reaction between the target analyte and the reporter molecules occurs, resulting in a color change. This color change is measured by the TrueSense PWA and used to calculate analyte concentrations that are displayed on the LCD screen on the unit. The TrueSense unit and the analysis cards were provided by GE and used "as-is", with no modifications. The evaluation was performed with the understanding that monitoring water in manned spacecraft was not the intended application and, as a result, negative results were not interpreted as a limitation of the technology. WAFAL scientists challenged the TrueSense with commercial standards used in the water lab for quality control, ITCS (internal thermal control system) coolant standards, biocide standards, and urine standards. The test results demonstrate the potential for the GE-developed technology to be used for water quality monitoring in manned spacecraft. The preliminary results also suggest that this technology may have applications in space medicine, monitoring fluids such as urine and blood, and in the maintenance of the thermal control system, monitoring the aqueous working fluid of the internal thermal control system. Future testing is under discussion with appropriate groups at JSC and with GE.