SCADASYSTEMS

By Titus Crabb

Plant **Programming**

A southern California water district updates an acquired reclamation plant's control system

In 2007, the Irvine Ranch Water District (IRWD) in southern California partnered with Vertech to upgrade an aging control system at the Los Alisos Water Reclamation Plant in Lake Forest, Calif. This plant became the responsibility of IRWD as a result of its 2000 acquisition of the Los Alisos Water District.

IRWD decided to implement a Wonderware System Platform SCADA system, using Modicon Quantum and M340 PLCs programmed using Schneider's Unity Pro programming software. Additional plans included a new screening facility and chlorine contact tank, two new reclaim pump stations, new chemical addition facilities and settling basin upgrades and repairs.

In addition to the plant itself, several offsite pumping stations and reservoirs were included in this project. These existing facilities are part of a reclaimed water distribution system that enables the district to reuse treated wastewater for irrigation rather than simply dumping it in the ocean.

Technical Objectives

The two primary objectives of this project were to provide a reliable, modern control system replacement for the existing plant and to provide control and data acquisition for the new processes being added as part of the plant modernization. These goals required coordination with onsite contractors and operations staff to ensure a smooth transition as construction progressed.

Secondary to the actual operation of the plant, IRWD used this project to commission a broad revision to its existing SCADA and PLC programming standards. The existing SCADA standard was largely an academic exercise at the onset of the project with no actual implementations.

Approach

The software selected lends itself highly to object-oriented programming. After reviewing existing standards and attempts by others to implement object-oriented programming philosophies, IRWD settled on the "equipment-oriented programming" philosophy presented by Vertech as a practical solution.

The equipment-oriented approach focuses on the key objective of all standards development efforts: creating reusable code for typical devices found in most systems. These pieces of reusable code then can be used as building blocks for new system-specific code development efforts and as a basis for the development of new equipment blocks as needed.

The client's measure for a successful implementation of the equipment-oriented programming methodology was ease of programming for any individual facility. For this project, the objective was to identify every possible device encountered on any of the associated P&ID documents. Once standards were put in place, a programmer could associate every piece of equipment on a P&ID with one of the devices defined in the standard.

Standard Success

For the project's standards development process, Vertech identified 55 unique device types and developed the standard PLC and SCADA level code required for each. For each of these device types, the following standard programming pieces were developed: Modicon Unity Pro PLC programming block (DFB), Wonderware System Platform Template, Wonderware InTouch Smart Symbol and Wonderware InTouch Pop-up Window Set.

The only tasks left to the programmer during implementation were to identify the devices on the P&ID, apply standards in the appropriate software development packages and write additional process or plant level control code to complete the system.

Once the standards set was created, it was used by Vertech's developers to implement the new control strategy for

the plant. During the course of implementation, refinements were made to the process, and each standard block was tested thoroughly. IRWD was left with a complete, tested set of standard code that internal staff can use to develop pump stations, wells and other stand-alone facilities without the use of expensive outside professional services.

Plant Functionality

During the course of the project, operator input was sought through multiple workshops and informal meetings. Operations staff at the plant was left with a high level of functionality as a result of this project.

One feature that has become an operations favorite is the manual override for analog instruments. Called "scan on" and "scan off," these options allow an operator to freeze the input

to the PLC while taking an instrument out of service for calibration.

In addition to small convenience features like this, powerful functionality was provided in this system. Operators have the ability to schedule time-of-use lockout for individual pumps or entire pump stations based on time of day and calendar date. A single, configurable lead-lag controller was developed that can control up to 10 pumps and provide internal pump subgrouping, prioritization and sorting based on run time, size, efficiency and pump type. A standard chemical flow-pacing object, sophisticated wet-well level controller and pump station pressure controller were developed, along with smaller devices such as the smoke detector device.

Working together, IRWD and Vertech accomplished the primary objective of this project by creating a

highly functional, feature-rich control system upgrade for an existing plant. IRWD now has a detailed set of easily implemented programming standards that are being implemented on new projects within the district. WWD
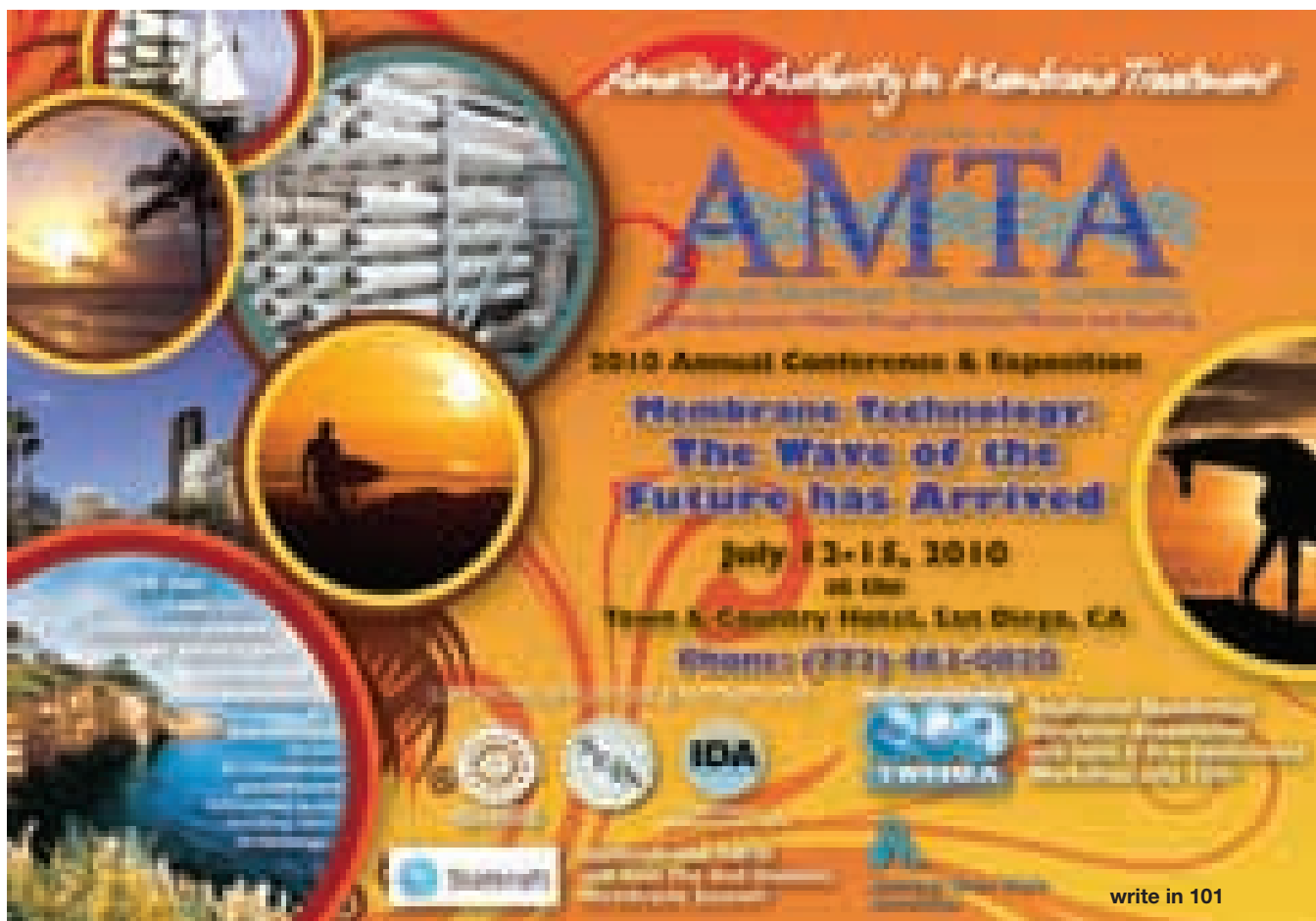
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