ACE3600

Motorola Solutions for Water and Wastewater Systems

Water utilities worldwide operating try to reduce and maintenance costs and defer unnecessary investments. Grade of service and water quality are the primary concerns of the water Companies.

Use of Supervisory Control And Data Acquisition (SCADA) systems for control of fresh water and waste water systems help meet these objectives and help reduce major investments in infrastructure.

The Motorola ACE3600 SCADA Remote Terminal Unit (RTU) provides ultimate flexibility in terms of communications between RTUs and Regional and Master Control Centers. Any wireless or wireline based communications media can be used, enabling the user and the system designer to implement the most cost effective solution for his water control system.

Water Control Applications Overview

MOSCAD, MOSCAD-L and ACE3600 RTUs and systems are widely used by many water and wastewater utilities worldwide. The primary goal of water distribution management is to balance water demand and supply in the most cost effective way.

The following are the most common water distribution and wastewater applications:

Water Reservoirs

This application primarily entails monitoring of water level, water flow rate to the reservoir/water tower and the flow and pressure to the main pipe. In this application the ACE3600 RTU can also control pressure regulated valves to ensure maximum effectiveness of the water system. Monitoring of water quality and related chemical parameters can be done by utilizing the ACE3600 RTU data transfer capabilities.

Water Wells & Booster Pumps

Excessive pumping from water wells is of primary concern since it affects the water quality and availability.

Electric energy used for pumping is another major concern.

The ACE3600 RTU can monitor well parameters such as: water flow rate, pressure and electric pumping costs. A comparison of the energy used to pump the water, provides information on pump efficiency and alerts on possible malfunctions. In a multiple booster site, the ACE3600 RTU can perform sophisticated pump sequencing. This means that the appropriate, most cost effective pump or number of pumps can be operated depending on the required water flow and pressure.

"Unaccounted For" Water

The ACE3600 RTUs can monitor selected water meters along the major pipes in order to detect pipe bursts or unauthorized water use. Main water valves can be shut off in order to isolate a faulty pipe section from the system. This will conserve water, reduce use of electric energy, prevent property damages and increase public satisfaction with the utility.

ACE3600 Advantages for Water Control System

Wide Range of Communications Media

The ACE3600 system architecture is designed with wide area SCADA communications in mind.

RTUs can be configured to operate over a range of wireless and physical communications media including: Digital and Analog Conventional or Trunking Radio, TETRA, Cellular (GSM/GPRS), Microwave, Satellite, dial-up, multidrop leased/private lines, fiber optics, or any combination of these media, linked to the same network.

Data Reliability

Water utilities need to be absolutely sure that SCADA commands received and executed at the remote site can be trusted as being genuine. The ACE3600 provides full message integrity with high reliability of the reported indications and parameters. This can be ensured by using the highly reliable MDLC protocol. The MDLC protocol utilizes efficient error handling mechanism that minimizes erroneous transmissions without overloading the data communication.

Data Security

The entire SCADA industry and especially utilities such as water, electricity and gas all have applications that require secure data communications. These systems must be protected from eavesdropping, illegal intrusion attempts such as recording and re-transmitting commands, modification of monitored data and commands. These challenges are met through the use of encryption.

Radio Network Coverage

It is common industry knowledge that, in most cases, wireless communications is the most reliable and cost effective solution for communications between the Control Center and RTUs. The main issue in a radio network is the coverage. In some water control systems the topographical conditions and the long distances require the establishment of radio repeater sites and use of multiple radio frequencies. The Motorola ACE3600 solution overcomes these limitations due to a unique communications networking solution based on the "Store & Forward" principle.

Each ACE3600 RTU in the network can act as a radio S&F Data Repeater, serving other RTUs. There is no need for costly radio repeater sites and the entire SCADA system can be based on a single radio channel.

SUMMARY OF BENEFITS

The unique capabilities of ACE3600 based SCADA systems allow implementation of advanced water and waste water system solutions in which each and every RTU can fulfill four important tasks:

1. **LOCAL MONITORING & CONTROL**
   ACE3600 RTUs execute local monitoring and control functions via Input/Output (I/O) ports. These I/Os can be connected via serial ports, dry and wet contact inputs, FET and relay outputs, analog inputs and/or analog outputs. ACE3600 I/O modules offer mixed I/O connections providing maximum compactness.

2. **COVERAGE**
   ACE3600 allow seamless wireless networking between RTUs, either directly or via RTUs, which act as Store & Forward repeaters on a single radio frequency. This capability allows significant cost saving, eliminating the need for additional channels and use of costly master repeater stations.

3. **VERSITILE NETWORKING**
   ACE3600 provide reliable data networking function, allowing an RTU to communicate with other RTUs over a variety of communications media. Each RTU may also serve as a communication node linking two or more communication media to the network.

4. **PROTOCOL CONVERSION**
   ACE3600 RTUs are able to act as protocol converters for disparate SCADA protocols. This can be implemented using either protocol encapsulation or protocol emulation methods.

THE ACE3600 RTU has the Most Advanced Architecture

Application Programming

Development of the application program for ACE3600 RTUs is simplified by the use of the STS programming software running on standard Windows® based Operating System. This is the only tool required for all programming, configuration and all maintenance functions including testing and commissioning of ACE3600 RTUs. STS programming tool connects to the network of ACE3600 RTUs via any available RS-232 or LAN port. From that node, the PC with the STS software can link to any RTU over the network.

Versatile Data Transaction Methods

RTUs can be polled by the water SCADA control center, but can also initiate unsolicited messages to the host computer. The link establishment process is very fast since radio is an inherently a multi-drop medium and the only delay is the channel access time (typically 5-200 ms, depending on radio type). This action is commonly referred to as "Event Driven Reporting" and takes place when unusual conditions are detected by an RTU.

Power Supply Solutions

ACE3600 RTUs include an uninterruptible AC or DC power supply include a back-up battery. The ACE3600 power supply is capable of supplying the peak current to the radio and the other control devices without having to rely on the back-up battery. This ensures a reliable RTU operation regardless of battery condition. The back-up battery provides full operation of the RTU and the field instrumentation for several hours/days depending on battery size. The MOSCAD-M RTU models feature very low power consumption electronics with built-in power management capabilities. The unique advantage of the power management function is that it allows using smaller size solar panels, lower capacity battery while providing extended RTU operation during a power outage.

Maximum Flexibility With Operating Redundancy

ACE3600 RTUs support redundant communication links to the control center(s) or other RTUs. It can also support a redundant/secondary CPU within the RTU enclosure. This configuration is needed in some critical applications to guarantee fail-safe seamless transfer of the control function and the data base, from a primary CPU to a secondary CPU.

HIGH OPERATING RELIABILITY ENSURES EXTENDED LIFE CYCLE

Experience has shown that typical life-cycle cost of SCADA hardware (RTUs, radio modems, etc.) is more than double the initial purchase cost. One must also take into consideration that a significant share of the system cost lays in system implementation, programming, commissioning, post-installation modifications, expansions and occasional repairs.

Use of ACE3600 and associated communication solutions assist in coping with these challenges and reduce the acquisition and bottom line operating costs figures.

TYPICAL WATER SYSTEM

A typical water and wastewater SCADA system using ACE3600 RTUs performs remote monitoring and controls of wells, pumps, water reservoirs, valves, flow meters and other waterpipe instrumentation reading.

Using sophisticated, effective wireless communications links between the RTUs and the SCADA control center provides a optimal cost effective solution for water utilities.

Reduced RTU Maintenance

Efficient, convenient and remotely performed maintenance is highly important in water and waste water systems. This function includes remote upload or download of parameters and the entire application program. This function is possible to execute from any RTU connected to the SCADA communications network. This function can even be performed "over-the-air" or from a distant location via a phone line modem or any RTU or to the control center connection.

Advanced Remote Diagnostics

ACE3600 RTUs supply extensive hardware and software diagnostics, both locally and remotely, without interrupting the application and the communications with the control center. Upon detection of a problem, a technical support person can upload the log file from all ACE3600 RTUs for post-event analysis.