

Taking irrigation monitoring from disaster to success



**Pairing MicroLogix PLCs and
SRM6000 serial modems
makes the difference**

By

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Abstract— Cherry Lake Tree Farm occupies 1200 acre near Orlando, Florida, where water regulation is strictly enforced with significant fines for water overflow and usage outside their allotment. Cherry Lake’s legacy system was not reliable which increased operating costs due to manual data collection and “misuse” fines. Installing Data-Linc modems to interface with Rockwell equipment produced a trouble-free, reliable and cost-effective system for monitoring and control of water usage and overflow, benefiting both the environment and the bottom line.

CHALLENGES

The Cherry Lake Tree Farm, a supplier of standard and ornamental trees to landscape design firms for use on commercial real estate, occupies a 1200 acre site in Groveland, Florida near Orlando. According to Steve Young, Cherry Lake’s Irrigation Systems Manager, the farm requires a significant amount of irrigation water which Florida strictly regulates, assessing significant fines for any water used in excess of the allotment or for any water released into lakes on the property. Careful water management, therefore, is crucial for both environmental and financial concerns.

Several years ago, Cherry Lake attempted to deploy an irrigation monitoring and control system using commercial grade 2.4GHz Ethernet radios with Ethernet to serial converters at each programmable logic controller (PLC) location. The project required data to be reliably transmitted among the Allen-Bradley MicroLogix controller locations and an RSView32 workstation at the office. The original consultant added thousands of dollars worth of serial-to-Ethernet converters to the MicroLogix controllers, reaching for near real-time performance using commercial wireless Ethernet modems—but that system NEVER worked, despite huge consulting fees and extensive antenna work. The modems overheated and growing trees obstructed line-of-site data transmission. It was so disastrous that they went an entirely different direction



For over six years, workers drove to each remote site to monitor and adjust the irrigation system.

exploring wire and fiber optic options. Both proved to have prohibitively expensive installation costs. The “successful” work-around during the six years of total failure of the commercial wireless Ethernet system involved workers in pickup trucks driving to the remote sites to observe, record, and modify.

THE PLAN

Steve needed a cost-effective, reliable automated monitoring and control system. Enter Larry Lawver, a PLC-EOI System Consultant from Rexel Orlando, who proposed a better solution.

900MHz serial modems simply worked as soon as they were installed,” said Larry.

Carefully examining the customer needs and system-performance requirements before selecting a data transfer option was critically important to this success story. The problematic, commercial Ethernet 2.4 GHz modems in the first system were not only data rate overkill, but also inherently unreliable since they weren’t designed for the specific challenges of the operating environment. The Data-Linc SRM6000 modems afforded long

range, full industrial temperature span radios with 10 years of field proven operation. And knowing Data-Linc’s reputation for quoting conservative specifications to ensure trouble-free operation, Lawver knew their use would eliminate the costs involved in having to re-do a system installation because the modems couldn’t perform. Lawver, Young and the others at Cherry Lake have been pleased with the trouble-free Rockwell/Data-Linc solution. They can be added to the long list of customers who state: “Why Data-Linc modems? Because they simply work!”

About Data-Linc Group

Since 1988, Data-Linc Group has provided robust communication solutions for industrial automation and instrumentation systems and manufactures the world’s broadest line of industrial wireless and wire modems. Data-Linc Group, an alliance partner with most major PLC manufacturers, provides expert technical support and communications consultation. Data-Linc’s industry proven RF technology has been successfully implemented globally in all major industries including oil and gas, water/wastewater, metals and mining, automotive, manufacturing/ packaging, materials handling, pulp and paper, utilities, transportation and security. With its line of wireless modems for the European Union, Data-Linc’s products and support are available worldwide. Data-Linc provides field proven product performance and industrial grade support. For assistance regarding your project or for details about the capabilities of the powerful LincView OPC diagnostic RF network management software and its appropriateness for your specific application, please contact Data-Linc using phone or fax information below or email modems@data-linc.com.

About Rexel

Rexel is the leading distributor worldwide of electrical supplies. With over 1000 branches in 29 countries, most of the Group’s 25,400 employees are in daily contact with clients—contractors, technicians and industrial customers—and process over 10 million orders per year. Rexel’s ability to offer its customers innovative services ensures that it remains one step ahead as the uncontested leader in its markets.

About Rockwell Automation

Rockwell Automation is a leading global provider of automation, power, control, and information systems and services that help manufacturers achieve a competitive advantage in their businesses. Headquartered in Milwaukee, Wisconsin, the company employs about 21,000 people serving customers in more than 80 countries.

Cherry Lake Tree Farm Pump Station Map

Pump Station elevation and distances from the Production Building Master radio

MicroLogix 1200 Key Features and Benefits

- 24 pt. and 40 pt. DC powered controllers
- High speed I/O: 20 kHz HSC, 20 kHz PTO/ PWM output
- Expansion to 136 I/O for greater application flexibility
- Six new discrete and analog expansion I/O modules to solve even more applications
- Full ASCII (read/write) capability
- Large non-volatile 6K memory
- Several communication options to solve applications from peer-to-peer to Device level to SCADA/RTU
- Real time clock and memory modules
- Compatibility with MicroLogix and SLC 500 instruction set and RSLogix 500 software

LincView™ OPC RF Network

Enhanced Diagnostics Utility

- Simplifies monitoring and control of large, complex networks
- Offers OPC server capability
- Graphically displays view of entire wireless network
- Provides programmable warning/ alarms with logging
- Displays both ends of all RF links
- Supports multiple radio networks
- Timestamps last communication
- Delivers historical graphing of key statistics and values
- Allows re-configuration of each network modem (RF link must first be present)



Pump 3
Elevation 94 ft.
Distance from
Production: 1.01 mi

Pump 6
Elevation 148 ft.
Distance from
Production: 1.35 mi

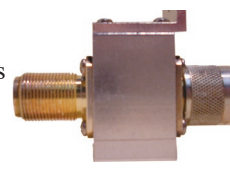
Pump 5
Elevation 157 ft.
Distance from
Production: 1.70 mi

Pump 4
Elevation 154 ft.
Distance from
Production: 1.56 mi

Pump 2000
Elevation 102 ft.
Distance from
Production: 0.67 mi

Lightning Arrestor

For outdoor antenna installation, to protect the equipment from electrical storm strikes, the network design specified the installation of lightning rods and lightning arrestors, that should always be installed between the antennas and the modems at the modem end.



Pump ABC
Elevation 174 ft.
Distance from
Production: 0.49 mi

Pump 200
Elevation 130 ft.
Distance from
Production: 0.14 mi

Production Bldg
Elevation 114 ft.

Pump 2
Elevation 108 ft.
Distance from
Production: 0.65 mi

Pump 1
Elevation 96 ft.
Distance from
Production: 0.39 mi

Pump 7
Elevation 96 ft.
Distance from
Production: 0.30 mi

SRM6000 wireless serial 900MHz modem

Data-Linc's frequency hopping spread spectrum, industrial grade radio modem. Modems and cables factory configured for easy installation.

Range: Up to 35 miles with line-of-site, farther with Repeaters

RF Data rate: 144 Kbps

Operating temperature:

- 40 to +167° Fahrenheit

- 40 to + 75° Celsius

Configuration: Quick and easy with complementary *ConfigLinc-S* Software, included



The maximum range between irrigation stations and central control was only two miles with a change in elevation about 200 feet, but they needed to consider the impact of foliage on wireless transmission as the trees grew.

Cherry Lake's project required only small amounts of data to be reliably transmitted among the Allen-Bradley MicroLogix controller locations and an RSView32 workstation at the office. Since the A-B MicroLogix controllers were all DF1 communicators, Larry strongly recommended eliminating the Ethernet feature and using wireless serial modems. He knew the MicroLogix were reliable and was convinced that Ethernet (and 2.4GHz) commercial grade modems were a significant part of the problem. Because of his experiences with Data-Linc modems, Lawver was confident that Data-Linc's 900 MHz SRM serial radio modems would be able to handle data transfer without errors or performance degradation. And because he also knew that Data-Linc custom configures its modems and cables, he trusted that the installation would be straightforward.

In spite of the prior disappointing experience with wireless communications, Cherry Lake agreed to try Data-Linc's robust SRM6000 serial radio modems capable of supporting a range of 35 miles, with an RF data rate of 144 Kbps and an operating temperature of -40 to +167 degrees Fahrenheit (-40 to + 75 degrees Celsius)— performance specifications, even with a very generous operating margin, well beyond those required. Plus, these industrial grade modems came with 10 years of demonstrated, field-proven reliability ensuring that year-round, weather conditions would not impede operation.

THE DESIGN

The system controls irrigation valves and monitors a number of parameters, one of the most important of which is irrigation pipe pressure to insure that there is no water leakage. The “only” change to the legacy system was abandoning the entire field Ethernet structure and connecting everything by serial DF1.

The new system design involved 10 remote stations with Allen-Bradley MicroLogix controllers, (primarily ML1200s) and a total of 11 SRM 900 MHz serial radio modems, one Master and 10 Remotes. The control station in the main office included the SRM modem configured as a Master with a PC server running Rockwell's RSLinx software and RSView32. This station communicated via the Remote modems, configured to transfer data using DF1 half duplex, with the MicroLogix PLCs located throughout the tree



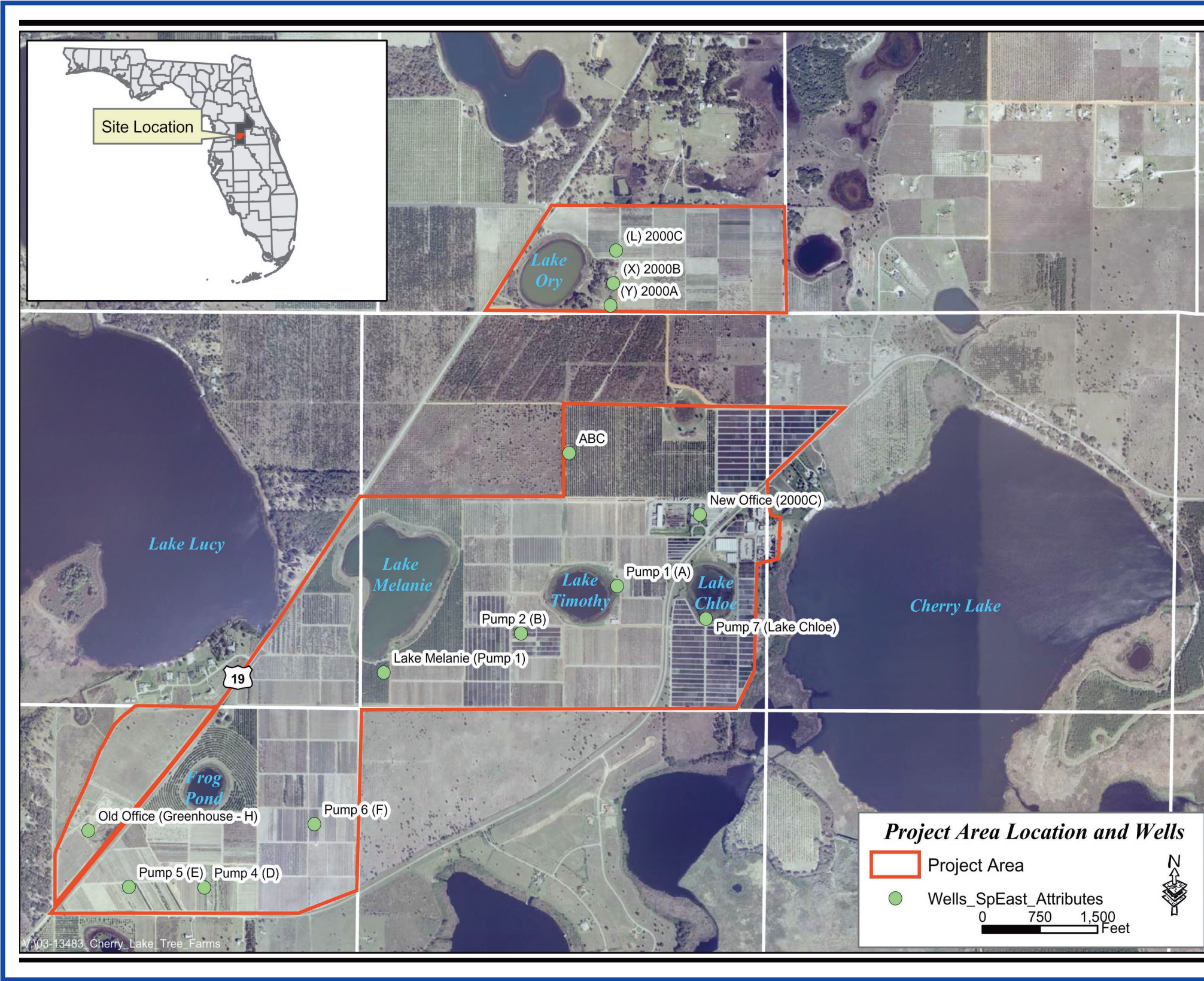
Installing a tall antenna at the Production Building where the Master station resides provided clear lines-of-sight with all ten Remotes, assuring reliable communication.

farm property. Both the modems and the PLCs are encased in weatherproof enclosures with the antennas mounted on poles to achieve line-of-sight.

Because of central Florida’s severe and frequent electrical storms, the design specified the installation of lightning arrestors between the antennas, topped by lightning rods, and the SRMs at the modem end.

INSTALLATION

Because of their former experience with the commercial grade modems, Cherry Lake asked for help with the initial deployment. Lawver had recently attended Data-Linc distributor training. He installed the Master per Data-Linc User Manual instructions, then, went methodically through the Remotes. He reconfigured the RSVIEW32 Nodes to DF1 Half-Duplex. As he worked, he trained the folks at Cherry Lake on reconfiguration and modem setup. Using an earlier site survey, they planned for clear lines of sight using the tall antenna at the Master to communicate with all ten Remotes. “We quit adjusting when we (quickly!) got to zero comm errors in RSLinx at each node,” said Larry. And after two days of field support, Cherry Lake found the installation process so uncomplicated that they proceeded with the project without further outside assistance



Layout of the Cherry Lake Tree Farm which occupies a 1200 acre site in Groveland, Florida near Orlando, and grows standard and ornamental trees requiring critical reporting, monitoring and control of runoff and irrigation water.

SUCCESS

According to Lawver, as soon as the system was installed it worked. “After dealing with the legacy commercial grade 2.4GHz modems that had been problematic for six years, the Data-Linc modems worked without errors and system time-outs immediately.” Young stated that the SRM6000 radios have functioned flawlessly since they were installed over a year ago. As a result, Cherry Lake’s water management is much more efficient and the potential for costly fines has been virtually eliminated. The data update every few seconds from all remote locations is a vast difference from data collected via workers traveling by truck to each station.

LESSONS LEARNED

“The real lesson learned,” stated Larry, “is ‘Don’t over specify!’” Ethernet was not needed for this installation, as the operation required the transfer of small amounts of data. Serial was the answer and the industrial grade SRMs could get the data through without overheating like the legacy commercial grade modems. Specifying serial rather than Ethernet saved money, and the robustness of the network saved personnel troubleshooting time and ensured rapid response to leaks and other conditions that could otherwise result in damage to the trees or significant state water usage fines. Using SRM serial modems made the project very cost effective. “After the 2.4GHz Ethernet modems had failed to perform for six years, the Data-Linc