

# Driving Innovation in Antiquated NJ Wastewater SCADA Upgrades

By: Matt Ruth, President - Avanceon

Wastewater management has come a long way since the introduction of sewerage systems in Boston and Chicago in the late 1850s. And since then, managing solid and liquid waste has become a heavily regulated endeavor, both environmentally and commercially, in every state across America. The commercial bidding regulations, while encouraging fiscal responsibility, have unfortunately had an unintended consequence of making it challenging to drive innovation and provide supportability of the equipment and technology.

For the Cape May County Municipal Utilities Authority (the Authority) in Cape May County, New Jersey, the existing Supervisory Control and Data Acquisition (SCADA) system for waste management was designed in the late 1970's and early 1980's. The system utilized a 1970's vintage Square D programmable logic controller (PLC) for most of the automated control. This vintage of system made it a challenging task for Robert Winder, the Operations Coordinator with the Authority, to successfully execute a SCADA upgrade to the software and controls. Winder, a thirty-year veteran of the Authority, has both an electrical as well as an operational background, which made him the perfect fit for managing the large task at hand.

The goal of the project was to standardize the process control and data collection system across four plants and two departments, for both wastewater and solid waste. In order to effectively update the SCADA with current technology, the Authority needed a significant update and upgrade of their documentation set including piping and instrumentation diagrams (P&ID's), description of operations, functionals and a completely revised set of electrical drawings. The upgrade would allow the Authority to no longer be constrained by the limited tribal knowledge of the long-standing technology systems of the past, thus, allowing a basis to innovate in the future.

The key to having the flexibility to manage an end goal of standardization across every Authority asset was to be able to predesign and engineer the system before going to formal bid for construction. The answer to the challenge came by leveraging a unique New Jersey state contract vehicle, NJ T3121 (formerly known as Term Contract M0003). The Support and Related Services Contract (NJ T3121) has the goal of providing

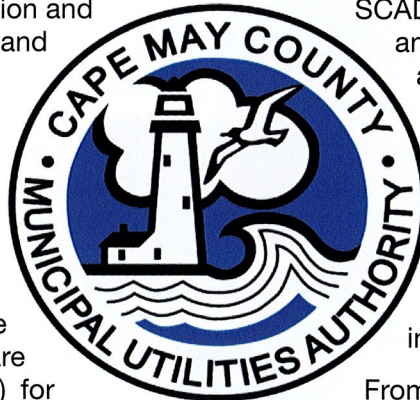
User Agencies and Cooperative Purchasing Partners with a mechanism to purchase software products and associated services through a software reseller. A key to the upgrade, the Authority knew that their SCADA system needed an improved and more fluid visualization model that also had the capability to historize their operational performance going forward as well as consider the years of data already collected. The

SCADA team determined that the best path and solution to upgrade and enhance the antiquated system would be to leverage the AVEVA Group suite of visualization and operation software with an emphasis on the core components of AVEVA System Platform, AVEVA Edge HMI software for local control and an overarching operational interface leveraging open management infrastructure (OMI) software.

From a control perspective, the authority had a long history of utilizing Schneider Electric's Modicon M340 platform of PLCs as well as wide use of Schneider / Square D variable frequency drives. The historical reliability and performance of the Schneider platform was solid motivation and justification to use that technology platform forward with the upgrade.

This project did not come to completion without its challenges, especially when trying to coordinate state contracts. According to Mr. Winder, the procurement part of this process was by far the most challenging aspect. Winder remarked that having, "a deeper knowledge of the New Jersey State Contracts would have saved years of planning and difficult decision making". Once the Authority discovered the NJ T3121 contract, they held discussions with New Jersey government officials about how to best utilize this official process in order to progress along in their project.

The NJ T3121 was not only used to procure the software, but it also provided an additional ability to engineer and configure services in a way that allowed for communication across various SCADA systems. In order to have consistency of design and planning, the Authority, through an exhaustive process, interviewed, bid and evaluated a number of SCADA system integrators and design contractors to select the right partner. At the end of the selection process, the Authority chose Avanceon ([www.avanceon.com](http://www.avanceon.com)). Avanceon is a premier system integrator with a long-standing reputation for innovation coupled with focus on customer service.

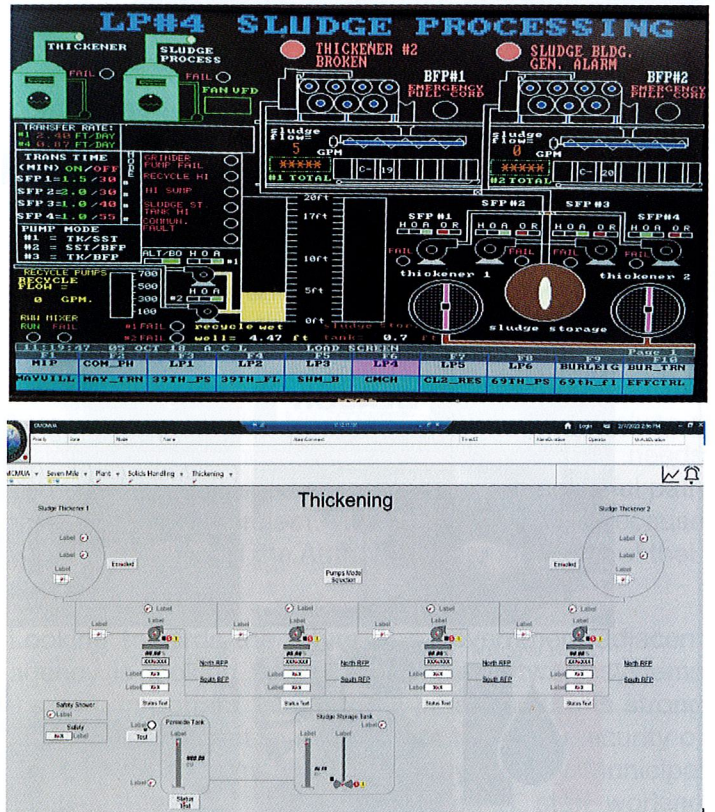


A project with fifty-six different control areas and five sites can grow quite quickly. However, Mr. Winder stressed how the project needed to stay confined and focused on the PLC layer and all of the associated instrumentation and equipment that the PLC directly controls and maintains. The SCADA visualization was tightly coupled to the PLC control upgrade to create systems needed to operate and maintain the Authority assets for the next 20 years. As per the NJ T3121 contract constraints, the entire focus of the project needed to be on the SCADA design and not address power, equipment, or installation scope. Those elements, if upgrades were deemed necessary, for the instrumentation or the equipment would be handled under traditional contractual models. Fortunately, the Authority had “good bones” in their equipment and conduit infrastructure since they had historically invested in the process layer to keep current with those components. There were few instances where conduit upgrades were deemed necessary in the field because they were corroded or damaged after many years of use. Overall, those changes were decided on a case-by-case basis and was limited in scope.

There were a number of success factors that the Authority incorporated to implement this project. First and foremost was creating a competent team to manage a project of this magnitude. The central components of the team were made up of many Authority individuals and a few key partners but, the important skills the overall team embraced were a firm understanding of wastewater control systems, knowledge of how the controls worked previously, and how the equipment needed to be working once the project concluded. A team of this caliber and experience had the potential to get lost in the project weeds and begin to develop one-off solutions to seemingly unique problems. However, Robert Winder and his team had the discipline to maintain focus on the end goal and would not lose sight of the 30,000-foot view that each of these systems needed to interact with one another fluidly and have an overall structure of standardization to ensure that the methods could be expanded and supported in the future. Also, from a compliance and alignment perspective, the importance of having a purchasing agent on the team who was well versed with state contracting and able to interact with government-adjacent agencies cannot be overstated as a project critical team component.

Another aspect that was integral to the success of this project was the partnership between the Authority and Avanceon, a trusted system integrator of the AVEVA and Schneider systems. This union allowed the Authority to navigate the various challenges of the upgrade and

Figure 1- SCADA Screens - Old (top) /New (bottom)

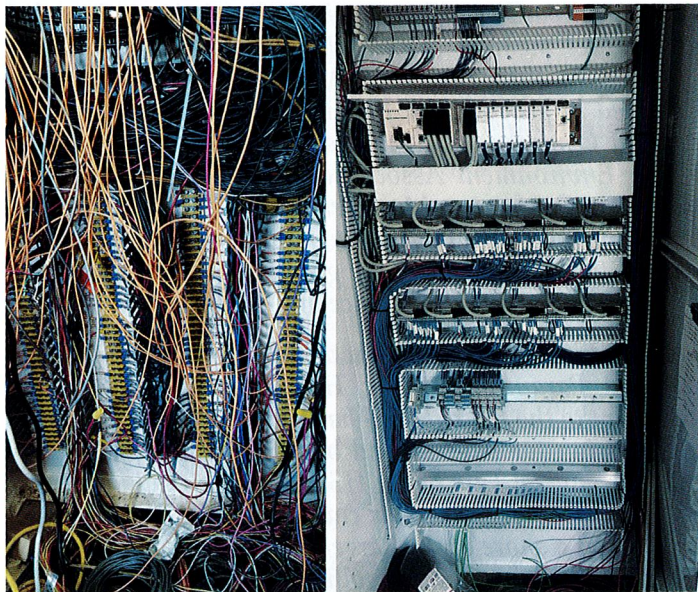


set the Authority up to implement a SCADA platform that would provide performance, insight, security, and visibility to the operations of their treatment facilities, pump stations, and landfill. Avanceon brought depth of resources, process control experience in the field of wastewater, a portfolio of prior Geo-SCADA implementations and the innovation to marry the existing process philosophies to the possibilities of Industry 4.0 technology. The Authority tapped in to Avanceon’s experience and leveraged it into a system of truth for Authority operations today and well into the future.

The end solution addressed a completely redundant, multi-level failsafe Ethernet connected architecture that ties the newly upgraded and standardized PLC control network of processors to a centralized OMI based SCADA visualization layer. The system has the ability to monitor the entire Authority as a whole, oversee a specific processing facility, control a unit of operations or diagnose a specific piece of equipment or technology. The functionality is available in a traditional control room setting, local units in each unit of operations or in a mobile tablet or laptop configuration providing complete flexibility for the Authority’s operations and maintenance personnel. By leveraging the AVEVA system platform with the history of the Authority, the end product had the ability to dig into current and past

process issues and determine causation of alarms and significant events. The system enhances the traditional Alarm Dialer function with a new technology solution that incorporates phone, short message service (SMS) and email notification and enhanced escalation options. The Alarm Dialer is reserved as a backup in case of

**Figure 2- Control Panels - Old / New**



catastrophic network failure and will call out for added insurance on only the most critical alarms. From a software and electrical drawing perspective, the project has yielded a vast library of standard documentation, control modules, drawing templates, screen objects and hundreds of examples to instantiate and rollout on future enhancements and upgrades.

The digital transformation of the Authority's system allows for a more efficient workflow in so many areas including; IT, Operations, Engineering, and Reporting. By incorporating these newer technologies, there is an increased level of reuse and familiarization that will save hundreds of hours of manpower. Taking the time upfront, via the NJ T3121 contract, to analyze a wastewater treatment process and Authority's needs and goals holistically ensured the most successful path throughout this project. This was possible because Robert Winder and the Authority never lost sight of their end goal.

Looking towards the future, if a government-adjacent agency is looking to overhaul their software systems it's very important that their IT infrastructure is strong in order to connect to and protect the cybersecurity of the SCADA system. The Cape May County Municipal Utilities Authority had a well-trained IT staff working intimately with the SCADA system upgrade. IT needed to work through a different New Jersey state contract to rebuild the network equipment that controls and monitors the business and operational tasks. All of this is to say that having open knowledge sharing of which teams need to work on which contract will save time, and ultimately, money. Based on this upgrade the possibilities for additional efficiency and functionality can continue long into the Authority's future.

*Matt Ruth is the President of Avanceon ([www.avanceon.com](http://www.avanceon.com)), an industry leading automation and information system integrator specializing in water and wastewater upgrades and digital transformation. Headquartered in Exton, PA. Avanceon helps customers with complex needs to improve operational efficiency and quality while leveraging the value from the latest Industry 4.0 technology. Avanceon and CMCMUA will be jointly presenting this case study at the 2022 NJWEA John J. Lagrosa 107th Conference on May 9th. For more information on Avanceon, please contact Matt at [mruth@avanceon.com](mailto:mruth@avanceon.com).*

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