MANAGEMENT AND OPERATIONS ASSISTANCE IN OPTIMIZING OPERATIONS AND MAINTENANCE

PROJECT HIGHLIGHTS AND SUCCESSES

Six years ago, the Erie County Water Authority (ECWA) Board of Commissioners and ECWA management recognized that the Authority was operating with outdated technology and unsupported business practices and set the goal to leverage newer technology and align their operations with industry best practices.

With help from EMA, a strong ECWA leadership team, and a committed Board of Commissioners, ECWA has implemented new technologies and business practices that have surpassed many of their peers. This includes the use of Supervisory Control and Data Acquisition (SCADA) for their transmission system, Enterprise Asset Management (EAM), and Geographic Information System (GIS).

The following memorandum summarizes the efforts and results over the past six years in this effort and discusses how ECWA can continue to improve by building on the work completed.

PROJECTS

Information Technology Master Plan (ITMP)

One of the first steps was to complete an ITMP that identified a vision for the future and a roadmap to get there. The plan has been completed and has been the guide for technology related projects over the last six years.

The plan has helped ECWA follow industry standards and governing IT resources. The ITMP has assisted in ensuring that the Board's vision being implemented. The ITMP has also helped ensure that all the technology projects are being integrated, systems of limited functionality are being avoided, and risks are being identified and dramatically reduced or eliminated.

Based on direction from the Board, ECWA has successfully met all of the NY State requirements on cybersecurity and is well positioned to meet the cyber requirements in the recently passed federal legislation S.3021 - "America's Water Infrastructure Act of 2018".

To date, the plan has been approximately 50% implemented.

SCADA

ECWA's previous water distribution SCADA system had limited ability to operate automatically and required constant operator attention. Alarms generated by the system were not prioritized and did not draw an operator's attention to critical alarms. This could cause important

information to be missed during high alarm periods. The displays and alarm descriptions were not consistent, which required additional operator attention to determine how the distribution system was performing. This contributed to inconsistent operations between various operators causing additional risk in the system. The system was also becoming obsolete and required specialized skills to maintain it.

The new SCADA system is a modern state-of-the-art system with significantly increased automation. This has reduced operator manual interaction with the system and normalized operations. Alarms are now prioritized to help ensure that critical alarms and events are not missed. The displays have been updated to increase the operator's situational awareness and thereby help operators to react quickly to abnormal situations. The concept of a mass balance has also been introduced. The mass balance allows operations to quickly determine if the various service areas have enough stored water to meet current and future needs throughout the day. By being able to see a comprehensive view of the system, control operators can better plan and limit the need to "push" water through the system and thereby reduce the stress on the system. This, along with automation, has contributed to a significant decrease in line breaks.

The SCADA communications network has been upgraded and now provides redundancy to prevent a single point of failure causing loss of communications to critical sites.

In addition to the technology changes, ECWA was able to move control operations from the Service Center to the Van de Water plant. Control operators are now co-located with plant operators so that they can collaborate on overall system operations. This has helped management reduce dramatic swings in plant water production and has improved plant operations.

Enterprise Wide Area Network (WAN)

ECWA did not have a reliable and robust high-speed communications network between the plants and the service center. This presented a constraint on the deployment of technologies and applications to the plants. It also prevented ECWA from co-locating distribution operators with plant operators. The new Wide Area Network now provides a high-speed, high reliability communications for business applications and for the SCADA control system. In the future this will allow ECWA to integrate the SCADA control systems between the plants and the transmission system. It will also allow ECWA to set up a disaster recovery operations center at any one of their plants or the service center.

Cityworks Enterprise Asset Management (EAM)

While ECWA had invested in developing a robust and comprehensive GIS, it was providing limited value beyond accurate maps. There was also a custom-built application running on the IBM servers that was designed to capture the work being performed on both Distribution and Water Treatment Plant assets. This system provided value to the finance group. However, due to a number of factors, including the difficulty of the user interface, extremely slow response,

limited functionality compared to modern systems, no mobile interface, limited integration with inventory, and no integration with GIS, the system was not being fully utilized by staff.

At the time the project was being executed, ECWA leadership wanted to capture the work associated with leak repairs. ECWA staff quickly rallied to get the project started and were able to come online in 12 weeks for the leak repair work flows. The effort to do this was quite high, and ECWA staff should be commended on their work. This was the fastest implementation ever completed by EMA. Subsequently, additional functionality and other asset classes were added. This project also provided a complete integration with the GIS and was implemented on the Azure Cloud.

Leadership has successfully implemented many of the industry best practices. The following is a partial list of both the work completed to date and the work slated for the next phase.

1. ECWA was able to identify and quantify the workload associated with maintenance allowing leadership to develop a staffing strategy tailored directly to the needs of ECWA.
2. The asset hierarchy was re-designed to meet industry standards.
3. A backlog of missing assets was added to the system.
4. Staff were trained to both use and maintain the system.
5. Industry standard business practices were implemented including:
   - Work Initiation
   - Work Order Screening Process
   - *Planning Process – next phase*
   - *Materials Management Process – next phase*
   - Scheduling Process
   - Assignment Process
   - Performance Process
   - *QA Review and Completion Process – next phase*
   - *PM (Preventive Maintenance) or PdM (Predictive Maintenance) Maintenance Process – next phase*
   - *First Responders Process – next phase*
   - Asset Creation & Modification Process
6. Operations tasks were added in Cityworks which will allow for:
   - Eliminating or reducing unnecessary tasks
   - Justifying technology investments by showing drop in labor hours

- Establishing tasks for unplanned events like storms or equipment failures

- Dynamic prioritization of operations task

- Use of mobile technology to track work and the associated costs

- Ability to redirect staff and adjust workload based on staff availability - reducing the use of overtime for low priority work

7. Develop and train staff on using data to execute management practices

  - Focus should be on planning and evaluation of executed work

8. *Reliability centered maintenance and Capital Planning – next phase*

9. *Integration with the finance and billing system – next phase*

10. *Electronic documents need to be assigned to assets – next phase*

POISED FOR THE FUTURE

The work completed on the SCADA, EAM system, and the WAN projects has already provided significant value to ECWA. It has also created the foundation for ECWA to take the next steps towards being a "world class" water utility. The next logical step is to continue with work in the plants and use the new systems to optimize operations.

As we move into the next phase ECWA will be able to:

1. Add smart instruments and other devices to create an intelligent water infrastructure system (IWS). This will position ECWA to work along with other leading utilities as they develop their IWS. IWS is a leading strategy being developed by AWWA at the national level, and ECWA should follow their lead.
2. Use tools like demand forecasting to optimize operations in the watershed and reduce energy while improving cost and reducing risk.
3. Increase level of automation in the water treatment plants. This will provide flexibility in system operations, allow for operations from any locations, optimize use of staff, optimize water sourcing and transmission, and provide redundant operating strategies.
4. Deploy resources to continue optimizing the system once plant operations are further automated.
5. Share data in real-time from other enterprise systems over the WAN.
6. Update systems over the WAN including card access, system patches and upgrades, etc.