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EMA SEES A BIG FUTURE IN BIG DATA, BETTER SENSORS, MOBILE SOLUTIONS, ANALYTICS AND IOT ALL ADDING UP TO SMART WATER

*Founded in 1975, **EMA** has helped over 500 of the largest water/wastewater utility clients across North America successfully implement systems to enable process changes and leading practices for utility efficiency and effectiveness. EMA addresses utility needs and drivers through strategic plans and technology plans to cover all aspects of utility management, operations and maintenance. They help their clients redesign the way they do business by applying appropriate technology based on leading research and utility proven results. Bob Daly, Principal Consultant with EMA, provided the responses.*

EBJ: What impact are smart water solutions having in the water/wastewater segments of the environmental industry?

Bob Daly: "Smart Water" is today's buzzword for water utility technology. The differences from previous utility implementations are based on the emergence of consumer-level technologies and other low-cost solutions that leverage:

- Mobile solutions using hand-held devices.
- Widespread sensors from watersheds to consumers using many wireless communication options.
- Access to data sets, i.e. "big data", both within the utility [Supervisory Control and Data Acquisition (SCADA), Advanced Metering Infrastructure (AMI), GIS, Customer Information Systems (CIS), etc.) and beyond including publicly available data for customers, property records, weather, water resources, etc.
- Advanced data analytics borrowing from other sectors such as business intelligence tools and genetic algorithm optimization solutions.
- Other emerging technologies that are being widely applied - e.g. Internet of Things (IOT), AMI, embedded smart assets, etc.

EBJ: What are the main drivers impacting smart water/wastewater technology?

Daly: Utilities have an ongoing need to "do more with less". Leveraging technology is one of the few ways utilities can improve processes and gain efficiencies. The typical utility obstacles to new technology adoption are risk aversion, due to the high consequences for public health and the environment in the event of failures, or unintended consequences. Cyber security is also a big threat and must be addressed in any technology application to minimize risks and provide mitigation strategies.

EBJ: How are utilities responding to the challenge of disruptive changes? What is the importance of change management?

Daly: Successful adoption of new technology always requires change management. Our approach to projects begins with the inclusion and commitment of people involved with the changes. Change management is part of the change process for utilities to be successful. Retirements coupled with a more technology savvy workforce provide utilities with the opportunity to move farther and faster.

EBJ: Could you provide an overview of EMA's O-P-T methodology? What does it consist of and how has it helped your clients achieved their goals? Can you provide some examples?

Daly: EMA's approach to utility improvement projects is holistic, encompassing utility organization, practices and technology aspects (O-P-T). We adopted this methodology in the early 1990's based on experiences that the most successful technology projects also included along with changes in practices and organization (structure, roles, responsibilities). We adopted the system champion concept with executive sponsors to improve project success by clarifying roles and responsibilities. We redesigned business processes using new leading practices before technology solutions were applied. We continue this methodology today for our client's projects to be most successful.

EBJ: Please provide some background regarding trends, challenges and opportunities of what is happening regarding the major technologies that are being used to transform our water systems into smarter ones?

REMOTE SENSING

We are living in an exciting time of change. As powerful trends towards miniaturization, lower power requirements, improvements in battery technologies, increased communication options, and cloud-based services continue, costs for remote sensing products and services continue to drop while more products and services are made available. These changes open new possibilities for both, smart cities and utilities, to implement cost effective solutions that improve customer service and operational efficiency. As a result, the pace of implementation of AMI systems has increased. Leak detection, additional pressure and water quality monitoring systems are being implemented, which enhance traditional monitoring through SCADA. The challenge utilities face is to make sure that implementation of the technology is accompanied with the required organizational resources and practices. For example, resources and practices to perform required periodic sensor checks and

calibrations must be part of the solution or the organization risks becoming reliant on remote sensing that is not accurate or reliable.

REAL TIME CONTROL AND BIG DATA SYSTEM ANALYTICS

EMA has implemented real time control systems in water/wastewater utilities since the mid 1970's. Collection of additional sensor data such as AMI-based water consumption and pressure measurements, sewer levels and flows, and watershed monitoring via USGS or utility implemented remote monitoring enhances traditional monitoring and control strategies. Publicly available data sets for weather data, property records, and utility customer information systems add to the possibilities of data analysis. Analytical tools help convert the additional data to insight, which inform operators and managers about emerging situations. The additional sensing data helps calibrating operational models that are used to predict future conditions to optimize current operations and maintain excellent service, while reducing costs.

ADVANCED METERING INFRASTRUCTURE (AMI)

We are seeing an increasing trend towards adoption of AMI. Emerging low power and long-range communication options will add to the mix as technology becomes more affordable and provides more data than just meter readings. Remote shut-off/on and pressure, temperature and water quality indicators are being added. Hourly or more frequent meter readings can be used to alert customers of potential leaks and incent water conservation practices. Analytics on meter data over months/years can be used to identify meter performance issues for improved maintenance, calibration or replacement cycles. As the trends previously discussed continue, AMI itself will evolve to bringing back more data to inform intelligent customer service and operational efficiencies.

EBJ: How much of investment in "smart water" or "smart sewer" projects over the next decade in the United States do you think will be done by public agencies and publicly funded infrastructure projects? Or do you think the private sector will provide a substantial portion of investments, and will these be merchant power or utility entities or large scale private users?

Daly: We anticipate significant investment by both public agencies as well as private utilities in smart water and smart sewer projects because utilities use this technology to directly address core mission-related goals including improved customer service, stewardship of resources, and responsible operation and maintenance of assets. Public agencies will continue to invest in public infrastructure including "smart" projects through municipal bond funding, state revolving funds and the federal Water Infrastructure Finance and Innovation Act (WIFIA) program.

EBJ: How is the water-food-energy nexus shaping smart water solutions available?

Daly: For the development of sustainable policies, especially around food and water security, the three axes of this nexus are inextricably linked. However, in the case of the industry we serve and our clients, it takes a different slant - our clients are focused at maintaining the levels of service in water quality and quantity as mandated by their Boards, customers, and regulators. As a result, they're not really concerned with food security in as much as they are concerned at maintaining adequate service levels for food growers and processors who are customers of their water and sewer services – as they do for all of their customers.

Therefore, the axes that our industry are concerned with are water, as a long axis, and energy, as a short axis. Food is treated as a water customer and drives, to some extent, the velocity of the other two axes. Even having said this, in parts of the U.S. where energy is cheap, energy is often not as important as water sources/supplies.

In those areas with expensive energy, like California and Hawaii, technologies serve a crucial part in the smart water strategy. These include advanced metering technologies, IoT, and data analytics, such as: the ability to assess irrigation needs based on weather prediction or in-situ soil moisture (water-food); the ability to pump (irrigate) water at time of less electric demand (food-energy); and the ability to utilize renewal energy (e.g. wind, solar) for agricultural water pumping (energy-food-water).

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The idea is to create balanced operational scorecards, determine the appropriate metrics, and create decision-support dashboards for operational baselines and continuous performance improvements.

EBJ: How are smart technologies being used in stormwater planning programs? How is stormwater runoff being used now as an alternative water supply source? Do you believe we will see more of this in the future?

Daly: Intelligent stormwater management is a growing need. New stormwater utilities are being formed to address regulations focused on improving the quality of priceless water resources such as the Chesapeake Bay. Some utilities provide incentives or mandates to customers of the utility to actively manage and intelligently control or contain runoff. Green infrastructure is augmenting grey infrastructure to control runoff directly to water bodies and stormwater or combined sewer systems. Stormwater management includes all of the elements of natural and constructed infrastructure that must be actively managed or passively monitored.

The "one water" concept is closing the loop including direct and indirect potable reuse, such as groundwater recharge and aquifer storage. Holistic water management includes all of the surface water and groundwater resources. The same smart technologies apply across all dimension of the "one water" waterscape.

EBJ: How are smart water solutions being used to deal with problems generated by climate change?

Daly: Smart water solutions will help cities and utilities adapt more quickly to changes in climate. For example, smart water networks can be used to monitor localized road flooding conditions in coastal areas to allow more rapid response and public warning. Smart applications have been developed to use precision rainfall measurement and forecasts to more intelligently control the release of water from stormwater detention basins, which can both improve the quality of water resources, as well as help reduce peak flooding. Smart sewer network sensors are helping to drive intelligent use of storage in existing collection systems to minimize occurrence of combined sewer overflows and to reduce the need for more expensive capital improvements.

EBJ: Could you provide an overview of EMA's services and how is it beneficial for the water and wastewater segments of the environmental industry? How do you contribute by providing "smart water" solutions?

Daly: For over 40 years, EMA has focused on providing specialized utility management, engineering and consulting services to the water/wastewater/stormwater industry. Our focus has been improving customer service and operational efficiency through the implementation of organization, practices, and technology (OPT) that achieve improved business results. EMA has helped clients implement the systems that operationalize "smart water". These systems include SCADA, process control, AMI, CIS, work and asset management, GIS, ERP/FIS, LIMS and operational data management.

EBJ: How do you integrate water supply and management assessments into your services?

Daly: EMA helps utilities optimize operations. One key aspect of operations for many utilities is water supply management. Services in this area range from design and implementation of water supply monitoring to implementation of decision support systems to optimize use of water supplies. EMA has long provided management consulting services that include organizational consulting, strategic planning and master planning. These services are increasingly more important to utilities given the rapid advance in technology and the increased convergence of the worlds of traditional operational technology (OT) and traditional information technology (IT).

EBJ: Who are your main clients? Where do you see opportunities for growth? Which type of clients are the ones who could benefit the most from your products?

Daly: For over 40 years, EMA has focused on providing management, engineering and consulting services to the water/wastewater/stormwater industry. We have assisted over 500 of the largest water utility organizations in North America improve their management of utility resources and customer service through successful application of technology. Areas for growth continue to be those areas associated with the core mission of the utilities; customer service, operational efficiency, and resource stewardship. We have found great success partnering with progressive cities and utilities who value an approach to improvements that considers Organization, Practices, and Technology (OPT). □