

KEEPING THE WATER ON

HOW ENGINEERS CAN HELP THE MUNICIPAL WATER SECTOR

By Graham Nasby

EACH YEAR the American Water Works Association (AWWA) publishes a report card on the current state of water utilities and the challenges facing them. Similar reports are available from the Water Environment Federation (WEF) and the American Society of Civil Engineers (ASCE). The theme is consistent: The current challenges to our municipal water infrastructure are many, and there is no magical way to fix everything.

One of the major challenges, particularly in North America, is that water infrastructure assets are typically out of sight and very long-lived. The postwar period—the 1950s to the 1970s—was a period of rapid economic growth, and this growth funded the creation much of the municipal water infrastructure that we use today. The catalog of our collective water assets is a long one, including purification plants, pumping stations, reservoirs, towers, distribution systems, sewers and wastewater treatment facilities – just to name a few, and it was not built overnight. In fact, I remember my dad telling me that it wasn't until the late 1950s that city sewers made it into his neighborhood in Hamilton, Ontario, Canada. Can you imagine a modern family of five in a major city still using an outhouse or latrine? In the 1950s and 1960s, this was a common story for many communities in North America.

The investments in water infrastructure made by our grandparents' generation have served us well. The difficulty is that many of those investments, after a very long and productive service life, are now becoming due for replacement. We also now have much higher expectations for water purification and wastewater treatment. This time around, however, we do not have a postwar economic boom to fund the work.

The theme of infrastructure renewal is not a new one. Much has been written on this topic in the past 20 years. Many professional associations, concerned utilities and engineering firms have published a wide range of opinion pieces about the issue. Regulators have also chimed in with new regulations, requiring utilities to look at the entire asset/operations life cycle and move away from the shortsighted year-to-year budgeting that has often plagued the water sector. A central tenet is that we need to be using better and more sustainable funding models to drive more effective water operations, maintenance and asset renewal. We cannot rely on large capital investments to miraculously appear when our current infrastructure is on its last legs. Sustainable funding models and continual improvement are responsible efforts that we all need to support.

Aging infrastructure and the development of responsible funding models are not the only issues facing the municipal water sector. We as engineers play an important role, and we can and should be doing more. In this article I will outline what we engineers could be doing to better support this critical part of our collective municipal infrastructure.



Yes, Funding Is Important

From the standpoint of economics, the municipal water sector is challenging. Providing water and sewage service is typically built around a cost-recovery model. Water rates are often set to cover the cost of delivery, but not all utilities are collecting enough money to also cover preventive maintenance and asset renewal. Compared with other high-value industries such as oil, gas, chemicals and mining, the amount of potential profit in water and sewage is low, and the regulatory burden is high. Assets are expensive and usually hidden, and most of the customers are municipal ratepayers. Also, there is little to no tolerance for service outages. This is a challenging mix of conditions.

As engineers, we need to be aware of these challenges and incorporate them into our thinking when it comes to working in the water sector. When we work with clients on water projects, we should be asking them how the assignments they give us fit into their long-term funding models and asset plans. Maybe we can design or sequence a project better to help it fit with available long-term funding. Perhaps we can provide engineering expertise to help utilities tailor their funding models to align with their operational and long-term asset needs.

Understanding What Engineering Is and Isn't

We live in a capitalist society, and at the end of the day everyone needs to get paid. To put it bluntly, engineering is a business, and anyone who tells you otherwise is either unobservant or not telling the truth. In our engineering schools, and when we are working with junior engineers, we need to take the time to talk about how the business of engineering works. Understanding the business model is central to being able to deliver good projects and services.

No one tries to deliver a bad project, but sometimes we as engineers set ourselves up for failure. If a client does not have enough funding to execute a project properly, we should have the strength to say no, and then take the time to educate our client about why the request isn't feasible. When a client's funding is tight, we need to work with the client to help them make informed decisions on what aspects of a project can be cut, and which cannot. Many a project has gotten in trouble when QA/QC oversight has been reduced, or when junior staff have been used without adequate supervision, in order to meet a budget target. We have a duty to avoid these situations and to educate our clients about what is needed for successful project completion.



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Keeping Long-Term Client Interests in Mind

When we undertake water projects, we as engineers should start by asking our clients how the project fits into their long-term plans for their utility. By getting answers to these questions, it enables us as engineers to properly service the needs of our clients. If we find that client has not thought about the long-term implications of a project, this could be opportunity for us to help them identify potential lifecycle cost-savings/opportunities by using a longer term approach.

Promoting Best Practices

The municipal water sector is unique in that water utilities are rarely, if ever, in competition with one another. Providing water and wastewater service is also unique in that it is pretty much a natural monopoly, centered on a common public good. The resulting business environment makes it much easier for best-in-class designs and construction practices to be shared among utilities and engineers. Engineers should take advantage of this! The use of best practices and lessons-learned

results in savings for everyone involved. The easiest way to do this is to keep abreast of industry developments, maintain regular communications with colleagues and share project experiences through articles and presentations.

Documentation Matters

We as engineers need to do a better job of documenting our projects. From a utility perspective, as-built drawings and documentation are one of the most important deliverables of a project. Knowing what has been installed, where it is and how it works is critical to being able to operate and maintain an asset during its entire service life. Government regulators and inspectors are also taking an increasing special interest in as-built documentation, such as P&ID (piping & instrumentation diagram), electrical and structural drawings. Furthermore, when repair, upgrade or replacement work is to be carried out, having drawings that correctly reflect what is on site makes future engineering work so much easier. As part of the project planning and execution process, we need to make sure that enough budget is held in reserve to guarantee that, at project end, accurate, site-verified as-built drawings are created.

Developing Our Workforce

We currently have a shortage of experienced senior engineers, and this shortage is hurting the ability of engineering organizations to service clients. Read any article about workforce development; it will talk about the impending challenges of retirements, skills shortages and lack of training. This is not someone else's problem. We as engineers need to take a more active role in developing the future workforce. What this means is taking the time to make sure that our junior staff get the right experiences, right project exposures and proper mentoring. As junior engineers develop in their careers, they will be able to complete projects more quickly, be more efficient in their work, and require less oversight – resulting in cost savings (and higher profits) for everyone involved.

Like the water utilities, we as engineers need to adopt a longer-term outlook when it comes to managing staff. Yes, we still need to focus on getting projects out the door, but we also need to take a more active role in developing our own employees in the process.

On the Shoulders of Giants

The current water infrastructure that we enjoy today was not built overnight. It was the result of many, many years of hard work by generations of engineers, contractors and other specialists. As we embark on the asset-renewal, growth and operations challenges of the 21st century, we as engineers have an important role to play in the municipal water sector. We've come a long way from the water truck and outhouse of my father's childhood. Let's keep it that way.

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