Living Infrastructure

By John Seldon

Wastewater equipment operators provide essential support to water facilities

Wastewater operators are an equipment manufacturer's onsite proxy for ensuring their equipment functions properly, optimizing the quality of final effluent discharging to a receiving stream.

Wastewater equipment manufacturers are early participants, bidding on supplying equipment when a water resource recovery facility (WRRF) is being newly designed or upgraded. Manufacturers provide instructions for equipment operation with equipment delivery. A WRRF operating manual often is generated by the consulting firm responsible for the overall project. Consequently, equipment suppliers and WRRF operators are unlikely to communicate on equipment operation.

Operators may not know the cost of individual treatment equipment, such as a primary clarifier. This lack of cost insight is compounded by operators often not knowing the equipment's basis of design parameters (such as the surface over flow rate for a clarifier). This unfortunate separation of equipment manufacturers from the operators responsible for the daily operation of a plant matters a great deal for two overarching reasons:

1. Operators are key to the optimal performance of this essential infrastructure.
2. WRRFs protect the public's health by serving as a crucial barrier between source water and contaminants.

WRRFs warrant respect for:

- Their protection of watershed receiving streams and the public health;
- The sophisticated engineered equipment integrated into a complex treatment process, which functions 24 hours a day, seven days a week; and
- The operators that dedicate their working careers to protecting receiving stream integrity as source water for downstream municipalities.

Municipal WRRFs typically operate with a microbiologically based activated sludge system for raw waste influent, while primary sludge is stabilized by either aerobic or anaerobic biological treatment, with a primary clarifier serving as a food delivery system to both systems. It is the well-being of microorganisms on an industrial scale that operators must facilitate, effectively turning these plants into living infrastructure, distinct from roads, bridges, electrical grids and railways.

Operator Training

Operators need to be appropriately educated and formally accredited by an independent licensing authority prior to being hired as operators, although this may be a hard sell.

In Ontario, Canada, the minimum academic qualification for an operator is a high school education, regardless of which academic courses were taken. Further, there is no regulatory requirement for an operator to hold technologist's certification. Municipalities may seek operators with qualifications exceeding the provincial minimum, but will accept and hire applicants without Certified Engineering Technologist certification or specialized microbiological expertise.

Operators who are not well versed in microbiology, chemistry, mathematics and hydrology are poorly equipped to operate, troubleshoot and report on the treatment process or the performance of in-place equipment. By hiring operators with the requisite qualifications, municipalities will establish their own in-house expertise.

The need for optimally trained operators is becoming more acute as the exotic wastes, sometimes called microconstituents, entering these plants are not being properly captured and removed mechanically—such as plastic microbeads found in some cosmetics and cleaners—or processed by the activated sludge bacteria—such as pharmaceuticals, their metabolic byproducts and possible endocrine disrupters.

Sophisticated computer-based monitoring and process control programs may exacerbate this situation even further. Unless operators can independently calculate process parameters, the fundamental meaning of computer-generated process values will become simply numbers judged by their position within a predetermined range. Nicholas Carr, in his 2013 article in The Atlantic, "The Great Forgetting" (online version titled, "All Can Be Lost: The Risk of Putting Our Knowledge in the Hands of Machines"), wrote: "Psychologists have found that when we work with computers, we often fall victim to two cognitive ailments—complacency and bias—that can undercut our performance and lead to mistakes ... Our trust in the software becomes so strong that we ignore or discount other information sources, including our own eyes and ears ..."

Compound this with a lack of academic knowledge of process fundamentals, and there is a perfect storm forming over receiving streams and the watershed ecosystems they define.

Equipment Manufacturers & Operators

The daily practical insights into equipment operation by an appropriately trained, responsible operator are an invaluable resource for an equipment supplier looking to better appreciate equipment performance under continuous, real-world operating conditions.

Equipment manufacturers need to become major visible supporters of operators and their essential work. There are a number of productive actions equipment manufacturers—working independently or as an association—can take to provide this support while improving and benefitting from closer ties to wastewater operators:

- **Education.** Advocate with regulatory agencies responsible for operator certification to establish minimal educational requirements of community college completion in an environmental course of study that includes microbiology, mathematics, chemistry and hydraulics pertaining to wastewater treatment. Manufacturers can offer academic scholarships to students committed to an operations career in wastewater treatment to reflect their commitment to increased academic study.
- **Hands-on training.** Manufacturers can support educational institutions that provide hands-on

operator training like that found in the program offered by Southern Illinois University Edwardsville's Environmental Resources Training Center. There, students are trained on operating process equipment long before finding positions as operators, including completing an internship at a municipal wastewater treatment plant before graduation.

- **Annual operator and receiving stream celebration.** WRRFs are a hidden municipal infrastructure, both figuratively and technically, and their product is lost to sight when discharged into their associated receiving streams. In order to provide a stage for highlighting this most environmental of all occupations, wastewater equipment manufacturers should promote an annual national celebration for operators. This could be held at a different location each year, with operators receiving the recognition they deserve while the local receiving stream is used as a focus for the celebrations with water-based events. It is time operators were acknowledged nationally for their work protecting watersheds and the public's health.

Wastewater equipment suppliers are critical for providing the sophisticated, engineered equipment required for operating microbiologically based WRRFs—living infrastructure. Operators of these facilities are key to producing effluent of the highest quality for discharge to a plant's receiving stream. For these reasons alone, bringing equipment suppliers into closer cooperation with operators makes sense. It also makes for better treatment.

Wastewater operations is an honorable, demanding career that warrants greater involvement between manufacturers of wastewater equipment and the operators responsible for its performance. w&wd

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