

Operator of the Future

WHITE PAPER January 15, 2016



OPERATOR OF THE FUTURE WHITE PAPER

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Contents

Introduction	3
Purpose	5
Background	6
Approach	7
Findings, Problems and Issues	8
Discussion of Potential Solutions	10
Barriers and Challenges	12
Conclusion and Recommendations	13

Cover Photos, clockwise from top left: Joe McDonald, an Erie County WWTP operator, is using a "sludge judge" to measure the height of solids in a bioclarifier. Photo by Megan Kaszubowski (megan.kaszubowski@erie.gov)

Members of the Long Island Brown Tide operators team, this year's state winners, are seen at the Bergen Point Wastewater Treatment Plant in Suffolk County where they are in the UV disinfection building standing over one of its four channels. They are (l-r) Dale Grudier, Jake Miller, James Behr and Alec Breen. Photo by Eric Haack (spock8113)

Wastewater treatment plant licensed operators Justin Slentz and Alison Perez are seen by one of the 26 recirculation pumps in the Recirculation Pumping Station at the Frank E. VanLare WWTP in Rochester, NY. Photo by Trent Wellott, T Wellott Photography, <http://twphoto.us>

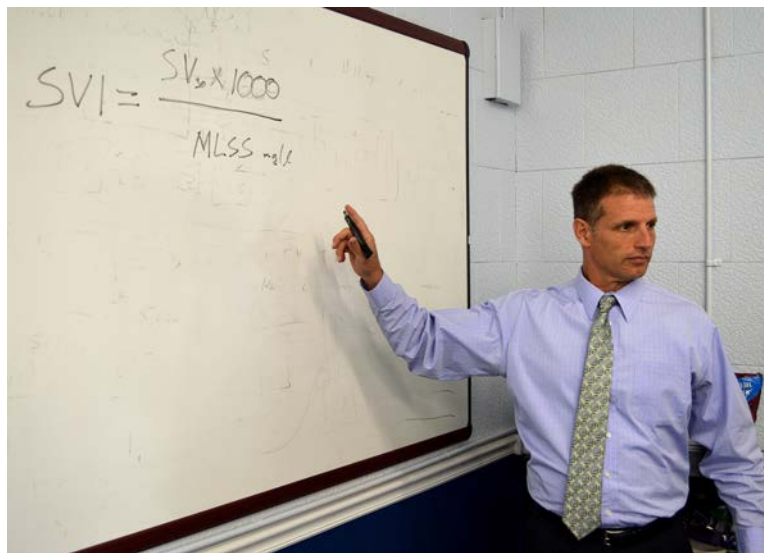
Kristofer Gushlaw, assistant chief plant operator of the Plattsburgh Wastewater Treatment Plant, with final clarifier and Lake Champlain in background. Photo by Sandra Geddes, City of Plattsburgh

Plattsburgh's Environmental Manager Jon Ruff demonstrates on the whiteboard how operators calculate different wastewater equations, such as for SVI (sludge volume index). Photo by Kristofer Gushlaw

Operators of the Future Task Force Members

- | | |
|----------------------------|--------------------|
| Jonathan Ruff, Chair | Peter Pianelli |
| William Grandner, Co-Chair | Kristofer Gushlaw |
| Patricia Cerro-Reehil | Pradeep Jangbari |
| Dick Crescenzo | Tanya May Jennings |
| William Davis | Randy Ott |
| Michael Garland | Tom Posella |
| Mike Letina | |

Many thanks to Claire and Geoff Baldwin of CDM Smith for their help in the interpretation of survey data results.



INTRODUCTION

A wide variety of Water Quality Professionals (WQPs) are needed to safely and efficiently operate and maintain water resource recovery facilities (WRRFs). WQPs include certified operators, lab technicians, maintenance specialists, mechanics, millwrights, pipe fitters, and collection system workers. All of these WQPs will eventually depart from service. Some leave for other opportunities, but the recent large exodus has been, and continues to be, due to retirements as the Baby Boomers age out. Their leadership, skills, years of experience, and vast amounts of institutional knowledge depart along with them, leaving a notable gap in many organizations. Many of these organizations have experienced difficulty finding adequately prepared WQPs to fill these vacancies. The bottom line is that there appears to be an insufficient supply of suitable replacement personnel with the knowledge, skills, and abilities (KSAs) - in particular, **certified operators**.

There are potentially significant consequences to not having capable certified operators. Those organizations that own and/or operate WRRFs should be aware of the consequences and understand why it is important to have competent certified operators. The two areas of plant operations that likely have the most significant ramifications resulting from inadequately prepared WQPs are **workplace safety** and **permit compliance**.

There are many areas at a plant that can present workplace hazards to employees. It is vital that capable operators can properly use safety equipment and can recognize dangerous conditions at a water resource recovery facility. Such failure could result in personal injury or death.

Significant consequences in permit compliance also may result from not having capable certified operators because of the stringent permit limits for most plants. Both state and federal regulations require stiff fines and penalties for water quality violations and the resulting environmental damage. Consistent failure to operate a plant properly and meet permit limits can result in consent orders that require plant upgrades at a substantial cost and hefty fines for not meeting deadlines.

Many times such regulatory action can be avoided by having a capable and certified operating staff that has the knowledge and experience to run the facility in compliance with its SPDES permit. The consequences mentioned above usually also lead to bad public relations and sometimes law suits by third party environmental organizations.

There are a number of other consequences worth mentioning. The capable operator will know how to properly operate the plant to prevent process failure and plant upsets. Experienced WQPs help to minimize equipment damage and premature equipment breakdown. Failure to properly operate and maintain a plant will result in increased costs for energy, chemicals and equipment parts, resulting in higher costs to the rate payers.



Another area that can impact cost is inadequate staff management. Factors such as lack of training, poor supervision, inadequate staffing and/or poor communications may result in higher costs than necessary to operate a facility. The trained and certified operator will have learned skills to effectively manage the staff and operate and maintain the plant in compliance with its permit.

Limited knowledge of environmental regulations can lead to improper or failed reporting to regulatory agencies. Operators who do not possess the 6NYCRR Part 650 qualifications also can limit or prohibit their organizational advancement and fail to meet New York State operator requirements.

Significant changes in wastewater treatment operations, maintenance and technologies over the last 30 years further complicate the problem of maintaining qualified operators. The KSAs needed by new workers appear to be very different, and will be especially fast changing in the future. The NYSDEC, NYWEA and all water resource recovery utilities in New York State share the common desire to find and develop suitable replacements. This goal has proven to be challenging to our industry and must be addressed.

Proactive succession plans have become standard practice in good utility operation and management. Smaller communities have more acute challenges because they usually have to wait for someone to retire before a replacement can be hired. A critical component of these plans is an understanding of the required KSAs of the “Operator of the Future” (OOTF), addressing how to find and develop such employees as we look to the next generation of workers to operate and maintain the high performance and energy efficient utilities of the future.

An OOTF Task Force was created and provided a vision with a set of goals for this, “Operator of the Future White Paper.”

Supervisory Control and Data Acquisition (SCADA) monitors water transport, distribution and treatment.
Photo source: Google



PURPOSE

The purpose of this white paper is to analyze the current dilemma WRRFs are facing and make recommendations on how to make changes that can positively affect the individuals and, ultimately, the utilities that work 24/7 to protect public health. More specifically, this paper will:

- a. Identify the knowledge, skills and abilities, or KSAs, needed by future certified operators.
- b. Identify challenges with finding, attracting, and retaining future certified operators and skilled WQPs.
- c. Recommend specific actions to overcome those challenges.
- d. Educate the NYWEA membership, the public, and all involved parties on problems, needs, challenges and recommendations.
- e. Make recommendations to the NYWEA Board of Directors and the Wastewater Operators Governance Council on decisions about strategic actions for change.

It is hoped that this paper can be used as a tool to help guide NYWEA in assisting water resource recovery utilities in finding and developing new talent to staff the treatment and collection facilities in order to continue to protect public health and the environment.

The approach and findings will be discussed, perspectives provided, challenges identified, solutions proposed, and recommendations provided for how NYWEA may assist in meeting these challenges. The NYWEA board will then need to decide which, if any, actions should be pursued.

Vash Eagelson (left) shows Eric Bertrand how to operate the PLC, aka SCADA system, to include clearing alarms and viewing incoming data.

Photo by Kristofer Gushlaw



BACKGROUND

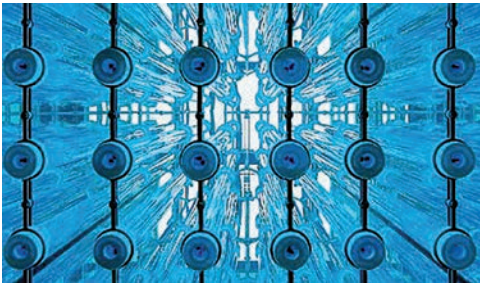
Celebration of Prior Generations of Water Quality Professionals

Prior to the Clean Water Act (CWA), rivers were on fire and waterways were polluted cesspools that were unswimmable and unfishable.

The CWA provided billions of dollars for upgrading municipal wastewater treatment plants. This resulted in a need for more WQPs. These WQPs were thrown into a raging storm and often had to figure out how to operate these new plants while they were being built. There were huge challenges, but these WQPs successfully met them head on and raised the bar of expectations. Many of these heroes have retired. Others remain to help pass the mantle of this critical vocation to the next generation of WQPs.

What Will the Future Bring?

One of the difficulties presently before us is to look into our crystals balls and try to predict what the future will require. This is easier said than done, i.e., "The only certainty is uncertainty." It is necessary to make some educated guesses and, while viewing the issue with that in mind, pursue solutions that will provide flexibility under a wide range of future conditions.



UV Filtration System:
The green glow of
ultraviolet lights illuminates
water on its way through
the sewage treatment plant.

Photo source: Google

But as we look into the next 20 years, we must also learn from the past. Previous generations have demonstrated many qualities, such as commitment, reliability, ingenuity, and persistence, which we will demand of the next generation when responding to time critical needs. It's also clear that the next generation of WQPs will need a different set of KSAs than previously required. Furthermore, their professional development must be accelerated to be prepared in time.

Change can be difficult and stressful. Every transition has its own unique sets of challenges and problems to solve. Present veteran WQPs have grown through unprecedented changes in requirements, technologies, and expectations. They have adapted admirably. They are now poised to help the industry solve one of its biggest problems, if not the biggest problem, it faces. How will suitable replacements be found and developed in time to meet the need?



APPROACH

In March 2015, a NYWEA Operator of the Future Task Force was created. The OOTF Task Force is comprised of a cross section of the water resource recovery community, including certified operators, engineers, managers, regulators, and vendors. After some initial discussion, it was decided there was not enough time to address this issue for all specialists at treatment plants but to focus solely on the need for **certified operators**. This is only one part of a larger issue which is finding and developing suitable replacements for all of the other WQPs that provide critical services.

In order to try to define the problems and develop solutions, 10 tasks were identified:

1. Identify the challenges with finding and attracting **certified operators**. Does a sufficient candidate pool exist?
 - a. Plant surveys – present and future
 - i. Survey of skill sets needed at treatment plants
 - ii. Survey of job titles at treatment plants
 - iii. Survey of organizational charts at treatment plants
 - iv. Survey of progression pathways at treatment plants
 - v. Survey of hiring practices at treatment plants
 - vi. Survey of typical candidate pools for different plant titles and skill sets
 - b. Historically, from where have certified operators come?
 - c. What is the present candidate pool?
 - d. Is the present candidate pool for OOTF adequate? If not, why?
2. Identify the problem and the consequences of not having well trained and qualified OOTFs.
3. Define the **present** roles and KSAs of certified operators.
4. Define the **future** roles and KSAs of certified operators.
 - a. Identify OOTF education requirements
 - b. Identify OOTF technical skill requirements
5. Conduct a statewide operator survey to understand firsthand their motivations, needs, and the challenges they face.
6. Are organizations having difficulty **retaining** good operators?
 - a. If so, where are they going?
 - b. Why are they leaving?
7. Recommend specific training, education, certification and scholarship opportunities.
8. Civil service
 - a. What are the civil service challenges?
 - b. Review and recommend any revisions to the civil service requirements.
 - c. Recommend changes to civil service and license titles to elevate the image of the water resource recovery and collections system operators.
9. Review and recommend any revisions to state regulatory licensing requirements.
10. What are collective bargaining challenges or other union concerns?



Two separate electronic surveys were created to try to obtain this information. One survey was geared toward operators and the other toward managers. The operator survey was emailed to all of the operators in the NYWEA database. Due to time constraints, the manager surveys were only emailed to a select cross section of the wastewater treatment plant community. There were also a number of individual discussions with skilled staff, operators, and utility managers.

FINDINGS, PROBLEMS AND ISSUES

There were over 300 responses to the operator survey and 13 to the manager survey. Not all of the responses are presented here nor are the answers to all of the questions.

The traditional “entry level and work your way up” hiring and development method is not meeting the demand for certified operators in time.

- There are not enough certified operators in the pipeline or seeking employment.
- Most entry-level employees have only a high school diploma, so the time needed for them to become certified makes efficient succession planning very difficult.
- Many candidates are struggling to pass the higher level exams.
- Many candidates don’t have the KSAs that the higher level certifications demand.
- Many candidates don’t have the desire/interest for additional responsibility.
- For a variety of reasons, it is difficult to attract candidates with the desired KSAs. Some common reasons are because of the perception of the work, the work schedules, and the amount of time it takes to get certified.

The overriding findings in the surveys and discussions are outlined below.

Operators Survey and Discussions

The main observations from the operators were:

- Replacement certified operators are not sufficiently available.
- Contributing to the important mission of protecting public health and the environment was the most satisfying aspect of their work.
- Insufficient communication and lack of management support are the biggest challenges for operators. Other challenges include perception of the work, time needed to become certified, and compensation.
- Finding candidates with the needed knowledge, skills, and abilities is the main challenge to hiring and developing new operators. Other operator concerns included employee attitudes, tight budgets, loss of staff, lack of public appreciation, and few opportunities for advancement.
- Stronger math and science backgrounds will be needed by future operators.



Managers Survey and Discussions

The main observations from the managers were:

- Replacement certified operators are not sufficiently available internally or externally.
- Candidates with the needed KSAs are not available in existing candidate pools.
- Candidates holding high school diplomas or GEDs often struggle to pass the Grades 3 and 4 certification exams.
- Many current employees are not interested in obtaining higher levels of certifications, assuming more responsibility and working different schedules.
- Future operators will need stronger math and science backgrounds, plus desirable management capabilities, personal characteristics and other soft skills.

Common Operator/Manager Themes

The common themes apparent throughout the surveys and discussions were:

- **There is an inadequate pool of replacement certified operators to meet present needs.**
- **Existing candidate pools do not contain the needed KSAs for future demands.**
- **Stronger math and science backgrounds plus a number of desirable personal characteristics and soft skills are needed for future candidate pools.**

Other Findings and Observations

- The KSAs needed for certified chief/assistant operators (“operators in responsible charge”) are much different than the KSAs needed for the various other skilled water quality specialists needed.
- Candidates who have the desired KSAs for chief/assistant operators can be difficult to attract for a number of reasons, including:
 - Generally, they must start and remain in a labor intensive entry-level position for a number of years.
 - The perception of the work
 - The amount of time required working nights, holidays and weekends to obtain the required experience for certification
 - The amount of time it takes to work their way up through the ranks into duties meaningful to them



Knowledge, Skills and Abilities Needed by the Operator of the Future

The predominant KSAs needed for the future include:

- Technical background
 - Science, engineering, technology, and math (STEM)
 - Ability to use computers and software programs as a tool
- Personal Characteristics
 - Drive, ambition and initiative
 - Dedication and reliability
- Soft Skills
 - Critical thinking, problem solving and decision making
 - Collecting and interpreting information
 - Determining and implementing appropriate actions based on the information
 - Planning, organizing, directing and controlling (from NYSDEC guidance)
- See Employability Skills Profile for more detail

DISCUSSION OF POTENTIAL SOLUTIONS

In addition to the traditional method of “entry level and work your way up” to chief/assistant/shift operators, additional pathways are needed to accelerate the certification and development (capability and competence) of candidates with the needed KSAs in a shorter amount of time.

Some potential additional pathways include:

Develop Accelerated “Operator in Responsible Charge” Training Programs

Create programs that are designed to recruit candidates with the desired KSAs and develop their proficiency, getting them certified on an accelerated track. Such a program would provide intense, comprehensive “laser-like focus” on developing the capabilities needed to become a Chief Operator and Assistant/Shift Operator. This could be similar to private management training programs that provide rotational assignments throughout the organization to develop the base for higher level work. Military organizations also use similar training and development programs.

The KSAs required would include:

- Drive, ambition and initiative
- Dedication
- STEM
- Analytical abilities, problem solving, decision making and management skills
- Computer experience
- Soft skills, personal characteristics, and employability criteria



Time factor requirements for internal and external candidates would ensure that certification could be obtained in *the fastest possible time* by requiring a sufficient combination of education and operating experience to be eligible to apply for Grade 3 NYSDEC/ABC certification within 18 months of starting work.

A program like this could be attractive to non-traditional candidates, such as working parents who, upon completing the program and becoming certified, could work some nights or holidays, similar to some nurses who have young families and want to be home during the day.

Develop Certification Partnerships Between Publicly Owned Treatment Works (POTWs) and Educational Institutions

Work with colleges or other educational institutions to provide NYSDEC certification coursework within their curriculums concurrent with operating experience at POTWs during summers and the school year, to result in certification along with the degree. This would provide a steady pool of certified operators for direct hiring.

Develop Recruitment/Development Plans for Skilled WQPs

The KSAs for skilled positions such as maintenance mechanics, electricians, pipe fitters/plumbers, millwrights, I&C specialists, and unit process technicians are much different than for certified “operators in responsible charge.” The hiring and development practice for these positions needs to be tailored accordingly.

Craig Cummings (left), chief operator of the Albany County Sewer District North Plant with Vince Cordi, chief operator of the ACSD South Plant.
Photo by Tim Murphy-ACSD



BARRIERS AND CHALLENGES

Barriers and challenges to overcome, along with some possible success strategies are:

- Civil service requirements
 - Improve recruitment of candidates with the desired KSAs for exams, along with resulting candidate lists, to be more likely to have qualified KSA candidates.
- Identify specific candidates or types of candidates and recruit them for exams.
 - Engage civil service as a partner in helping to solve these problems.
- Educate the civil service on our needs and concerns to develop a better understanding of the industry.
- Hold routine strategy sessions.
- Arrange tours of the facilities and meet different types of employees.
 - Change the certified “operators in responsible charge” (OIRC) title to non-competitive or exempt so an exam and hiring from a list is not required.
- Collective bargaining agreements
 - Each one is different and their concerns will need to be addressed.
 - Use a “What’s In It for Them?” approach to develop a win-win solution. Figure out how to make an accelerated operator development program attractive to the unions.
 - Or, make the OIRC positions management or not in the union.
- Local politics
 - Use a “What’s in it for Them?” approach to develop a win-win solution.
 - Develop a working relationship with elected officials and educate them on the importance and complexity of the work and what KSAs are needed.
- This is life safety work. Bring me someone in whose hands you would be comfortable placing your kids’ lives.
- Is the person worth \$2,000,000 in lifetime salary and benefits?
- The work environment for getting necessary experience for certification can be a stumbling block – nights, weekends, and holidays for many years as one works his/her way up through the ranks.
- Certification guidance that needs to be updated
- Change is frequently difficult and stressful
 - Implement deliberate, effective change management strategies
- Tours
- KSA sheet for each type of position



CONCLUSION AND RECOMMENDATIONS

The Operator of the Future is going to need the best knowledge, skills and abilities possessed by previous generations of operators plus different KSAs to handle the additional demands of the future. Certified operators are the ultimate responsible party for the safe and efficient operation of today's water resource recovery utilities. Due to the mass exodus of veteran WQPs because of Baby Boomer generation retirements, there is a significant shortage of willing and capable certified operators prepared to fill the ranks. The time constraints for certification combined with the more demanding KSAs have created a difficult situation that can't be remedied solely by the traditional development practice of hiring entry-level employees that work their way up over a number of years. Fast-track pathways are needed. Two possibilities identified are (1) creating accelerated operator development programs and (2) creating certification partnerships with educational institutions.

The Operator of the Future Task Force makes the following recommendations to help facilitate implementation of the solutions:

1. Review the consistency and applicability of the regulatory education and experience requirements.
2. Continue developing the advanced responsible operator training program NYWEA currently has underway.
3. Help develop partnerships with educational institutions by facilitating a demonstration project that can be used as a model.
4. Support an initiative that changes the civil service operator title from competitive to non-competitive and makes the NYSDEC certification the minimum requirement instead of the civil service exam.
5. Work with NYSDEC to update, clarify and/or expand certification requirements and technical and operational guidance documents (TOGS) to address present and future conditions, including the types of experience that should count toward certification.
6. Work to improve the perception and appreciation of all water quality specialists and the wastewater industry in general.
7. Assist municipalities in becoming "Employers of Choice" and promote the positive aspects of a water career to attract the best future candidates.

