Water and Liquid Waste Treatment Plant and System Operators

(O*NET 51-8031.00)

Significant Points

- Employment is concentrated in local government and private water, sewage, and other systems utilities.
- Because of a large number of upcoming retirements and the difficulty of filling these positions, job opportunities will be excellent.
- Completion of an associate degree or a 1-year certificate program increases an applicant's chances for employment and promotion.

Nature of the Work

Clean water is essential for everyday life. *Water treatment plant and system operators* treat water so that it is safe to drink. *Liquid waste treatment plant and system operators*, also known as wastewater treatment plant and system operators, remove harmful pollutants from domestic and industrial liquid waste so that it is safe to return to the environment.

Water is pumped from wells, rivers, streams, and reservoirs to water treatment plants, where it is treated and distributed to customers. Wastewater travels through customers' sewer pipes to wastewater treatment plants, where it is treated and either returned to streams, rivers, and oceans or reused for irrigation and landscaping. Operators in both types of plants control equipment and processes that remove or destroy harmful materials, chemicals, and microorganisms from the water. Operators also control pumps, valves, and other equipment that moves the water or wastewater through the various treatment processes, after which they dispose of the removed waste materials.

Operators read, interpret, and adjust meters and gauges to make sure that plant equipment and processes are working properly. Operators control chemical-feeding devices, take samples of the water or wastewater, perform chemical and biological laboratory analyses, and adjust the amounts of chemicals, such as chlorine, in the water. They employ a variety of instruments to sample and measure water quality, and they use common hand and power tools to make repairs to valves, pumps, and other equipment.

Water and wastewater treatment plant and system operators increasingly rely on computers to help monitor equipment, store the results of sampling, make process-control decisions, schedule and record maintenance activities, and produce reports. In some modern plants, operators also use computers to monitor automated systems and determine how to address problems.

Occasionally, operators must work during emergencies. A heavy rainstorm, for example, may cause large amounts of wastewater to flow into sewers, exceeding a plant's treatment capacity. Emergencies also can be caused by conditions inside a plant, such as chlorine gas leaks or oxygen deficiencies. To handle these conditions, operators are trained to make an emergency management response and use special safety equipment and procedures to protect public health and the facility. During these periods, operators may work under extreme pressure to correct problems as quickly as possible. Because working conditions may be dangerous, operators must be extremely cautious.

The specific duties of plant operators depend on the type and size of the plant. In smaller plants, one operator may control all of the machinery, perform tests, keep records, handle complaints, and perform repairs and maintenance. Operators in this type of plant may have to be on-call 24 hours a day in case of an emergency. In medium-sized plants, operators monitor the plant throughout the night by working in shifts. In large plants, operators may be more specialized and monitor only one process. They might work with chemists, engineers, laboratory technicians, mechanics, helpers, supervisors, and a superintendent.

Water quality standards are largely set by two major Federal environmental statutes: the Safe Drinking Water Act, which specifies standards for drinking water, and the Clean Water Act, which regulates the discharge of pollutants. Industrial facilities that send their wastes to municipal treatment plants must meet certain minimum standards to ensure that the wastes have been adequately pretreated and will not damage municipal treatment facilities. Municipal water treatment plants also must meet stringent standards for drinking water. The list of contaminants regulated by these statutes has grown over time. As a result, plant operators must be familiar with the guidelines established by Federal regulations and how they affect their plant. In addition, operators must be aware of any guidelines imposed by the State or locality in which the plant operates.

Work environment. Water and wastewater treatment plant and system operators work both indoors and outdoors and may be exposed to noise from machinery and to unpleasant odors. Operators' work is physically demanding and often is performed in unclean locations; they must pay close attention to safety procedures because of the presence of hazardous conditions, such as slippery walkways, dangerous gases, and malfunctioning equipment.

Plants operate 24 hours a day, 7 days a week. In small plants, operators may work during the day and be on-call in the evening, nights and weekends. Medium and large plants that require constant monitoring may employ workers in three 8-hour shifts. Because larger plants require constant monitoring, weekend and holiday work is generally required. Operators may be required to work overtime.

Many water and liquid waste treatment plant and system operators work alone, managing small plants.

Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2006	Projected employment, 2016	Change, 2006-16	
				Number	Percent
Water and liquid waste treatment plant and system operators	51-8031	111,000	126,000	15,000	14

NOTE: Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook*.

Training, Other Qualifications, and Advancement

Employers usually hire high school graduates who are trained on-the-job, and later become licensed. Education after high school improves job prospects.

Education and training. A high school diploma usually is required for an individual to become a water or wastewater treatment plant operator. The completion of an associate degree or a 1-year certificate program in water quality and wastewater treatment technology increases an applicant's chances for employment and promotion because plants are becoming more complex. The majority of such programs are offered by trade associations, and can be found throughout the country. These programs provide a good general knowledge of water and wastewater treatment processes, as well as basic preparation for becoming an operator. In some cases, a degree or certificate program can be substituted for experience, allowing a worker to become licensed at a higher level more quickly.

Trainees usually start as attendants or operators-in-training and learn their skills on the job under the direction of an experienced operator. They learn by observing and doing routine tasks such as recording meter readings, taking samples of wastewater and sludge, and performing simple maintenance and repair work on pumps, electric motors, valves, and other plant equipment. Larger treatment plants generally combine this on-the-job training with formal classroom or self-paced study programs.

Most State drinking water and water pollution control agencies offer courses to improve operators' skills and knowledge. The courses cover principles of treatment processes and process control, laboratory procedures, maintenance, management skills, collection systems, safety, chlorination, sedimentation, biological treatment, sludge treatment and disposal, and flow measurements. Some operators take correspondence courses on subjects related to water and wastewater treatment, and some employers pay part of the tuition for related college courses in science or engineering.

Licensure. The Safe Drinking Water Act Amendments of 1996, enforced by the U.S. Environmental Protection Agency, specify national minimum standards for certification of public water system operators. Operators must pass an examination certifying that they are capable of overseeing water treatment operations. Mandatory certification is implemented at the State level, and licensing requirements and standards vary widely depending on the State. There are generally three to four different levels of certification, depending on the operator's experience and training. Higher levels qualify the operator to oversee a wider variety of treatment processes. Although relocation may mean having to become certified in a new jurisdiction, many States accept other States' certifications.

Other qualifications. Water and wastewater treatment plant operators need mechanical aptitude and the ability to solve problems intuitively. They should also be competent in basic mathematics, chemistry, and biology. They must have the ability to apply data to formulas that determine treatment requirements, flow levels, and concentration levels. Some basic familiarity with computers also is necessary, as operators generally use them to record data. Some plants also use computer-controlled equipment and instrumentation.

Certification and advancement. In addition to mandatory certifications required by law, operators can earn voluntary certifications that demonstrate their skills and knowledge. The Association of Boards of Certification offers several levels and types of certification to people who pass exams and have sufficient education and experience.

As operators are promoted, they become responsible for more complex treatment processes. Some operators are promoted to plant supervisor or superintendent; others advance by transferring to a larger facility. Postsecondary training in water and wastewater treatment, coupled with increasingly responsible experience as an operator, may be sufficient to qualify a worker to become superintendent of a small plant, where a superintendent also serves as an operator. However, educational requirements are rising as larger, more complex treatment plants are built to meet new drinking water and water pollution control standards. With each promotion, the operator must have greater knowledge of Federal, State, and local regulations. Superintendents of large plants generally need an engineering or science degree.

A few operators get jobs as technicians with State drinking water or water pollution control agencies. In that capacity, they monitor and provide technical assistance to plants throughout the State. Vocational-technical school or community college training generally is preferred for technician jobs. Experienced operators may transfer to related jobs with industrial liquid waste treatment plants, water or liquid waste treatment equipment and chemical companies, engineering consulting firms, or vocational-technical schools.

Employment

Water and wastewater treatment plant and system operators held about 111,000 jobs in 2006. Almost 4 in 5 operators worked for local governments. Others worked primarily for private water, sewage, and other systems utilities and for private waste treatment and disposal and waste management services companies. Private firms are increasingly providing operation and management services to local governments on a contract basis.

Water and wastewater treatment plant and system operators were employed throughout the country, but most jobs were in larger towns and cities. Although nearly all operators worked full time, those in small towns may work only part time at the treatment plant, with the remainder of their time spent handling other municipal duties.

Job Outlook

Water and wastewater treatment plant and system operators jobs are expected to grow faster than the average for all occupations. Job opportunities should be excellent for qualified workers.

Employment change. Employment of water and wastewater treatment plant and system operators is expected to grow by 14 percent between 2006 and 2016, which is faster than the average for all occupations. An increasing population and the growth of the economy are expected to boost demand for water and wastewater treatment services. As new plants are constructed to meet this demand, new water and wastewater treatment plant and system operator new jobs will arise.

Local governments are the largest employers of water and wastewater treatment plant and system operators. Employment in privately owned facilities will grow faster, as Federal certification requirements have increased utilities' reliance on private firms specializing in the operation and management of water and wastewater treatment facilities.

Job prospects. Job opportunities should be excellent because the retirement of the baby boomer generation will require that many operators with years of experience be replaced. Further, the number of applicants for these jobs is normally low, due primarily to the physically demanding and unappealing nature of some of the work. Opportunities should be best for persons with mechanical aptitude and problem solving skills.

Earnings

Median annual earnings of water and wastewater treatment plant and system operators were $36,070 in May 2006. The middle 50 percent earned between $28,120 and $45,190. The lowest 10 percent earned less than $21,860, and the highest 10 percent earned more than $55,120. Median annual earnings of water and liquid waste treatment plant and systems operators in May 2006 were $36,200 in local government and $34,180 in water, sewage, and other systems.

In addition to their annual salaries, water and wastewater treatment plant and system operators usually receive benefits that may include health and life insurance, a retirement plan, and educational reimbursement for job-related courses.

Related Occupations

Other workers whose main activity consists of operating a system of machinery to process or produce materials include chemical plant and system operators; gas plant operators; petroleum pump system operators, refinery operators, and gaugers; power plant operators, distributors, and dispatchers; and stationary engineers and boiler operators.

Sources of Additional Information

For information on employment opportunities, contact State or local water pollution control agencies, State water and liquid waste operator associations, State environmental training centers, or local offices of the State employment service.

For information on certification, contact:

➤ Association of Boards of Certification, 208 Fifth St., Ames, IA 50010-6259. Internet: **http://www.abccert.org**

For educational information related to a career as a water or liquid waste treatment plant and system operator, contact:

➤ American Water Works Association, 6666 West Quincy Ave., Denver, CO 80235. Internet: **http://www.awwa.org**

➤ National Rural Water Association, 2915 S. 13th St., Duncan, OK 73533. Internet: **http://www.nrwa.org**

➤ Water Environment Federation, 601 Wythe St., Alexandria, VA 22314-1994. Internet: **http://www.wef.org**