Operators take samples of water or liquid waste, perform laboratory analyses, and adjust the amounts of chemicals in the water.
manding and often is performed in unclean locations. Operators must pay close attention to safety procedures, due to the presence of hazardous conditions, such as slippery walkways, dangerous gases, and malfunctioning equipment. Plants operate 24 hours a day, 7 days a week; therefore, operators work one of three 8-hour shifts, including weekends and holidays, on a rotational basis. Operators may be required to work overtime.

**Employment**

Water and liquid waste treatment plant and system operators held about 99,000 jobs in 2002. About 3 in 4 operators worked for local governments. Others worked primarily for private water, sewage, and other systems utilities, and for private waste treatment and disposal companies. Private firms are increasingly providing operation and management services to local governments on a contract basis.

Water and liquid waste 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.

**Training, Other Qualifications, and Advancement**

A high school diploma usually is required for an individual to become a water or liquid waste treatment plant operator. Operators need mechanical aptitude and should be competent in basic mathematics, chemistry, and biology. They must have the ability to apply data to formulas prescribing treatment requirements, flow levels, and concentration levels. Some basic familiarity with computers also is necessary because of the trend toward computer-controlled equipment and more sophisticated instrumentation. Certain positions—particularly in larger cities and towns—are covered by civil service regulations. Applicants for these positions may be required to pass a written examination testing their mathematics skills, mechanical aptitude, and general intelligence.

The completion of an associate degree or a 1-year certificate program in water quality and liquid waste treatment technology increases an applicant's chances for employment and promotion because plants are becoming more complex. Offered throughout the country, these programs provide a good general knowledge of water and liquid waste treatment processes, as well as basic preparation for becoming an operator.

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 liquid waste 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.

The Safe Drinking Water Act Amendments of 1996, enforced by the U.S. Environmental Protection Agency, specify national minimum standards for certification and recertification of operators of community and nontransient, noncommunity water systems. As a result, operators must pass an examination to certify that they are capable of overseeing liquid waste treatment plant operations. There are different levels of certification, depending on the operator's experience and training. Higher certification levels qualify the operator for a wider variety of treatment processes. Certification requirements vary by State and by size of treatment plants. Although relocation may mean having to become certified in a new jurisdiction, many States accept other States' certifications.

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 liquid waste treatment, and some employers pay part of the tuition for related college courses in science or engineering.

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 liquid waste treatment, coupled with increasingly responsible experience as an operator, may be sufficient to qualify a worker for becoming 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 a 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.

**Job Outlook**

Employment of water and liquid waste treatment plant and system operators is expected to grow about as fast as the average for all occupations through the year 2012. Job prospects will be good for qualified individuals because the number of applicants in this field is normally low, due primarily to the unclean and physically demanding nature of the work.

The increasing population and growth of the economy are expected to boost demand for essential water and liquid waste treatment services. As new plants are constructed to meet this demand, employment of water and liquid waste treatment plant and system operators will increase. In addition, many job openings will occur as experienced operators leave the labor force or transfer to other occupations.

Local governments are the largest employers of water and liquid waste treatment plant and system operators. However, Federal certification requirements have increased utilities' reliance on private firms specializing in the operation and management of water and liquid waste treatment facilities. As a result, employment in privately owned facilities will grow faster than the average.

**Earnings**

Median annual earnings of water and liquid waste treatment plant and system operators were $33,390 in 2002. The middle 50 percent earned between $25,790 and $42,490. The lowest 10 percent earned less than $20,220, and the highest 10 percent earned more than $52,110. Median annual earnings of water and liquid waste treatment plant and systems operators in 2002 were $33,210 in local government and $32,190 in water, sewage, and other systems.

In addition to their annual salaries, water and liquid waste 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