

Petroleum Drilling Production Workers



Occupational Brief Title Codes:

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- G.O.E.: 05
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- H.O.C.: No Code

Occupational Subtitles:

- Derrick Operators
- Drilling Engineers
- Mud Loggers
- Production Engineers
- Production Supervisors
- Pumpers
- Rotary Drillers
- Rotary Helpers
- Rotary Rig Engine Operators
- Roustabouts
- Tool Pushers
- Treaters

Work Classification Based Related

D.O.T. Occupations:

- Blasters
- Barge Workers
- Jackhammer Operators
- Miners
- Quarry Supervisors

Interests Based Related

G.O.E. Occupations:

- Bulldozer Operators
- Crane Operators
- Foundation Drill Operators
- Pile Driver Operators
- Riggers

Skills Based Related

O*NET Occupations:

- Aerospace Engineers
- Brazers
- Continuous Mining Machine Operators
- Gas Compressor Operators
- Geological Sample Test Technicians
- Mechanical Engineering Technicians
- Optical Instrument Assemblers
- Power Distributors and Dispatchers

Petroleum drilling and production workers (pe'tro-leum 'dril-ling and pro'duc-tion 'work-ers) set up a rig and drill to extract oil or gas contained in rock layers deep in the earth or below the ocean floor.

Oil and gas are used to fuel vehicles, heat homes, and run machines. They provide the nation with about three-fifths of its energy needs. Oil and gas are the raw materials for plastics, chemicals, medicines, fertilizers, and synthetic fibers. They allow Americans to travel a total of more than 2.6 trillion miles a year to work, to school, to the store, and on vacation.

When it comes out of the ground petroleum is crude oil. It is a combination of oil, natural gas, natural gas liquids, and other related products. It is composed of several chemical compounds, primarily hydrogen and carbon. What is recovered today was formed millions of years ago when plant and animal matter settled at the bottom of oceans and was compressed by the weight of many layers of sediment.

Petroleum drilling production workers set up rigs for drilling wells to bring petroleum and natural gas reserves up from the layers of rock where they exist. It has been estimated that 48,000 wells will need to be drilled annually to meet the nation's oil and gas needs.

Work Performed

Although a prospecting team may find sites that have evidence of petroleum deposits, the only way to be sure is to drill a well. Drilling operations do not always result in a producing well. If oil or gas deposits are present, it may be necessary to drill from 1,000 to 25,000 feet to reach them.

Drilling engineers are usually responsible for several rigs. They work in a regional office and keep in touch with the teams by telephone or radio. These workers direct drilling and production operations. They prepare cost figures, plan schedules, choose the equipment, and plan the drilling methods and recovery methods. They determine the most desirable rate of oil flow from the well. They usually deal with tool pushers.

Tool pushers are on-site supervisors in charge of one or more drilling rigs and the drilling operations in the field. They oversee preparation of the site, the erection of the rig, the construction of roads, and the installation of water and electrical connections. Tool pushers oversee the selection of drill bits, the operation of the drilling machinery, and the mixing of mud. If the team strikes oil or gas, they direct the workers who put a control head on the well to regulate the flow.

To begin drilling at a site, the drilling crew fits and bolts together the steel members of the rig that holds the hoisting equipment, pipes, casing, and engines. A drilling crew consists of four or five workers: rotary driller, derrick operator, engine operator, and one or more rotary helpers, also called roughnecks. Since drilling goes on twenty-four hours a day, seven days a week, several crews work on each rig in rotating shifts.

Rotary drilling is the most common method of drilling. A drill bit attached to rotating lengths of pipe (called the drill string) grinds and penetrates rock layers. As the bit bores deeper and deeper the crew adds lengths of drill pipe. Each pipe is thirty feet long; three pipes joined together form a stand ninety feet long. A pump forces fluid called drilling mud down the drill pipe to cool the bit and to exert pressure that holds back any oil and gas it encounters. This mud goes out through holes in the bit, plasters

the walls of the drilled hole, and returns to the surface carrying samples of rock the bit has drilled through. As the bits wear out, the crew replaces them. They pull all the pipe from the well, rack it at one side of the derrick, replace the drill bit, and run the pipe back down the well. A crew may pull out and run back miles of pipe each time a bit needs changing.

The **rotary driller** directs the crew for one shift and is responsible for the operation of machinery that raises, lowers, and rotates the drilling pipe and bit. The driller watches gauges, works throttles and levers to control the hoisting and rotation speed of the drill pipe, the pump pressure, and the amount of weight on the bit. Driller and crew select the drill bits for the kind of strata or rock layers being drilled. They take samples from the drill hole and watch the advancement of the bit so as to be ready to replace the bits with other suitable drill bits.

Drilling crews keep records of costs; footage drilled; kinds, depths, and thickness of strata penetrated; and materials used. If oil or gas begins to flow, drillers immediately control the flow of fluid by chokes (devices that constrict the pipe opening). To keep the oil or gas from escaping while they install these devices, workers may add heavy particles to the circulating mud. This makes the fluid column heavy enough to prevent the oil or gas from rising to the surface.

Derrick operators are second in charge on the drill crew. They work on a small platform high (about ninety feet) on the rig. When the crew removes or attaches sections, these operators handle the upper end of the pipe. These workers are also in charge of the mud circulation system. They mix clay with water to make the drilling mud and control the pumps that circulate it through the pipe.

Rotary rig engine operators run diesel or natural gas engines to supply power for rotary drilling machinery. These operators oversee, service, and maintain the plant that delivers power to the rig. When a crew pulls or adds sections of pipe to the pipe in the well, engine operators may help.

Rotary helpers, or **roughnecks**, are laborers who help the drillers. To make up and break out pipe sections, they use hand and power wrenches and tongs. Roughnecks guide the pipe sections to or from the well opening. They tend the agitators that mix the drilling mud. These laborers also dig drainage ditches, rack tools, and perform rig housekeeping. They help set up, maintain, and take down rigs.

Mud loggers analyze mud and drill cuttings circulated in drilling operations. From these samples they can tell whether oil is present. They may use other equipment such as well-logging tools. These devices, lowered into the well and reeled back, measure electric, physical, sonic, and other properties of the rock formations as they travel up or down the hole. If enough oil or natural gas is present to make production profitable, a production group takes over.

Preparation for production is known as completing a well. Pipe, called production casing, is set and cemented into the drill hole. Through this pipe the oil can come to the surface without leaking into the upper layers of rock. Perforations in the casing next to the oil-bearing or gas-bearing layers let the fluid into the well bore. A piece of equipment (called a Christmas tree) with arms and valves (set at the wellhead)

controls the flow of oil or gas from the wellhead into the pipelines. As a rule, production crews direct operations for several wells on one or more leases.

It is the job of **production engineers** to get the best possible yield from the well or wells. Sometimes subsurface pressure forces the oil out of the well. Ordinarily, however, production engineers decide on the method used to get the oil or gas out of the ground. They may inject water, chemicals, or steam into the reservoir to force more of the oil out. They may use a nitroglycerine explosive charge to open cracks in the oil-bearing sandstone. In fracturing, they force a slurry containing special white sand into cracks to make space and hold it open for the fluid to flow from the rock layers to the well. In acidizing, hydrochloric acid and water pumped under pressure into limestone widens fractures by dissolving some of the rock thus speeding up the movement of oil. Production engineers may also choose the equipment that separates, handles, and meters surface production equipment.

Production supervisors or **lease supervisors** direct workers who pump, gauge, and treat oil from wells. They direct the operation and adjustment of pump engines, gauges, oil treating units, and control heads. They keep records on production rates, well servicing operations, equipment maintenance, and other operations.

Pumpers, sometimes called **gaugers**, operate the equipment that brings oil and gas to the surface. It is their job to get the petroleum from the well to the distribution system or the purchasers. Pumpers measure specified amounts of gas and oil from the well and make sure the owner gets credit for the amount delivered.

Pumpers also control the production from each well. In each twenty-four-hour period, pumpers or gaugers must measure the volume of gas, oil, and saltwater produced by the well. They record the temperature of the oil and measure the tank before and after delivery.

Treaters add chemicals to remove impurities from oil pumped from the well. They also regulate the flow of the well when the natural pressure is great enough to force oil from the well without pumping.

Roustabouts do routine maintenance work in petroleum production. They dig trenches for foundations or for drainage around wells, storage tanks, and other installations. They load and unload trucks, mix concrete, and tamp it into building forms. They clean and adjust machinery. Roustabouts roll, sort, and load pipe sections onto racks. They connect pipe ends and hydraulic hoses, paint oil storage tanks and equipment, and clean and maintain trucks and related gear.

Although offshore drilling work is similar to onshore drilling, the workers operate from seagoing vessels or from fixed platforms. Offshore rigs require, along with drilling and production workers, radio operators, cooks, ship officers, and sailors. Aircraft or boats transport workers to the ship or platform.

Working Conditions

Workers in drilling and production do almost all their work outdoors, day and night, in all kinds of climates and weather.

Crews may work in the Far North in Alaska or in the tropics. The work is rugged and more dangerous than many other kinds of work. Crew members lift heavy objects and climb rigs. They get dirty from handling greasy tools and equipment.

Safety is a major concern. Blowouts can injure or kill workers if well pressure is not controlled. Most offshore rigs have survival capsules. Employees get instructions in safety, first aid, escape, and survival techniques.

Drilling crews may be away from home for weeks or months at a time. They may commute long distances or move from place to place. Living quarters may be rough and uncomfortable.

Workers in offshore drilling and production live on the vessel or platform for days at a time and then get several days of leave away from the rig. Other workers fly back and forth daily in helicopters.

Hours and Earnings

Drilling workers often work eight-hour or twelve-hour days seven days a week and then get several days off. Offshore rig workers usually work seven straight days and then have seven days off. Other workers such as oil production and well maintenance employees work five days a week. Drilling engineers and other professionals in the field may have long and irregular hours. They may be on call for occasional night or weekend work or in the event of an equipment breakdown.

Petroleum engineers are among the highest paid engineers. According to the Bureau of Labor Statistics, petroleum engineers earned an average of \$78,910 in 2000. A 2001 salary survey completed by the National Association of Colleges and Employers reported that bachelor's degree candidates in petroleum engineering received offers averaging \$54,878 a year. Master's degree candidates were offered, on average, \$58,500.

Average earnings in the oil and gas extraction industry were much higher than the average for all industries in 2000. The Bureau of Labor Statistics reported in October 2002 the average hourly earnings of production workers in the crude petroleum and natural gas industry were \$24.49, or \$937.97 a week.

According to the Bureau of Labor Statistics, first-line supervisors/managers of extraction workers earned an average of \$22.44 an hour in 2000. Petroleum pump system operators, refiner operators, and gaugers earned an average of \$20.51, while geological and petroleum technicians earned an average of \$19.64. Wellhead pumpers earned an average of \$16.05 an hour; rotary drill operators earned an average of \$14.67. Derrick operators earned an average of \$12.04 an hour. Roustabouts earned an average of \$9.79.

Fringe benefits are generous. Most employers offer health and accident insurance, sick pay, retirement plans, profit-sharing plans, and paid vacations.

Education and Training

High school studies are the base for petroleum drilling workers. Algebra and geometry are important in this work.

Other useful courses are chemistry, physics, and earth science. Shop courses are helpful.

Many technical schools and two-year colleges offer programs of study in engineering technologies. Some employers encourage workers to take college courses by paying the tuition and fees.

Special skills or knowledge may help people get jobs on drilling crews. Some background in construction work or heavy equipment operation is valuable.

Persons who plan to enter petroleum engineering work should earn a degree in petroleum engineering or in civil, mechanical, chemical, or mining engineering. Those with a degree in geology or geophysics will also be well-prepared for this work. High school students should take the courses required for admission to an engineering school or college.

Organizations and Unions

Some companies have a contract with a labor union whereby job seekers must join a union in order to be hired. Other companies have an open shop. Workers may also be required to join a union after they are hired.

Which union workers join depends on the kind of work they do. Some workers are members of the Oil, Chemical, and Atomic Workers International Union. Others are members of the International Union of Operating Engineers.

Some workers may belong to professional societies or associations such as the Society of Petroleum Engineers. Other professionals may belong to the American Association of Petroleum Geologists or the Society of Professional Well Log Analysts.

Personal Qualifications

Workers in petroleum drilling and production should be able to work out of doors. Physical strength and stamina are essential. Drilling and production workers should be alert, willing to follow orders, and able to communicate well with others. The ability to work well as a team, sometimes in trying circumstances for days at a time, is also important. Those in charge of drilling crews or production crews should have leadership qualities and should be able to take responsibility.

Occupations can be adapted for workers with disabilities. Persons should contact their school or employment counselors, their state office of vocational rehabilitation, or their state department of labor to explore fully their individual needs and requirements as well as the requirements of the occupation.

Where Employed

Petroleum drilling and production goes on in thirty-three states. The top five oil producing states are Texas, Louisiana, Alaska, Oklahoma, and California. Approximately 25 percent of oil and gas in the United States is produced offshore in the Gulf of Mexico and off the coast of Southern California.

Most people involved in petroleum exploration and production are employed by independent companies. These companies, many with ten or fewer workers, drill 85 percent of the wells in the United States. Many Americans work for oil companies located in the Middle East, Africa, the former Soviet Union, South America, Indonesia, and the Far East.

Employment Outlook

In 2000 there were approximately 311,000 wage and salary jobs in the oil and gas extraction industry. The Bureau of Labor Statistics projects that the overall employment in the oil and gas extraction industry will decline approximately 7 percent through 2010. It is projected that employment in the crude petroleum, natural gas, and natural gas liquids segment of the industry will decline about 23 percent. Employment in oil- and gasfield services is expected to increase by approximately 4 percent.

Employment in the oil and gas extraction industry is largely dependent upon the future price of oil and gas. High prices for oil and gas create an increase in employment, while lower prices cause a decrease in employment. Stable prices for oil and gas are necessary for stable rates of employment in the industry. Stable prices, however, are difficult to maintain.

Other factors that effect the oil and gas extraction industry are environmental concerns and the discovery of oil and gas deposits in other countries.

While an overall decline is expected through 2010, job opportunities in the oil and gas extraction industry should be good. Openings will occur as workers transfer to other industries, retire, or leave the workforce. Employment opportunities will be best for workers with substantial technical skills and with previous experience. New exploration methods, drilling techniques, and deepwater and subsea technologies will create a demand for workers who are capable of using advanced equipment.

Entry Methods

Students planning to enter this work should check with high school or college counselors for facts on careers in the field. High school graduates should register with state employment agencies, local job service centers, or private agencies. College graduates can get help from their school placement service. They can send letters and resumes to oil companies or contractors. Persons who live in or near petroleum producing regions may apply in person to oil drilling firms. The Internet is a good source of employment information.

New workers with only a high school background may learn skills on the job. Most start as roughnecks in drilling or as roustabouts in production. After a year or two they may have enough skills to assume more responsible work.

Advancement

Promotion methods vary. Experienced roughnecks and other field workers may become rig operators and tool pushers. Seasoned roustabouts may become lease operators, mechanics, or technicians. Some, along with graduates of two-year technical schools, may become aides who help petroleum or production engineers.

College graduates with a degree in chemical, mining, civil, geological, or mechanical engineering start as trainees helping petroleum engineers, drilling engineers, or other professionals. After several years they may advance to management work.

For Further Research

PennWell, 1421 South Sheridan Road, Tulsa, OK 74112.
The Petroleum Industry: A Nontechnical Guide.
Charles F. Conway. \$64.95.

Petroleum Extension Service (PETEX), The University of Texas at Austin, 1 University Station, R 8100, Austin, TX 78712-1100.

A Primer of Oilwell Drilling, 6th Ed. \$35.00.

The Rosen Publishing Group, 29 East 21st Street, New York, NY 10010.

Oil Rig Workers: Life Drilling for Oil (Extreme Careers). Katherine White and Linda Bickerstaff. \$19.95.

WetFeet, Inc., 609 Mission Street, Suite 400, San Francisco, CA 94105.

Careers in Oil and Gas. E-book. \$27.95.

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