

# SECONDARY ARTICLE: Drilling a Well Today

Drilling an oil or gas well involves much more than making a hole in the ground. It entails the integration of complex technologies, requiring the producer to make decisions about unexpected pressures and rock formations. The well will be the only conduit to move the oil or gas from the reservoir to the surface; it must be a conduit that will last at least 50 years and be flexible enough in design to allow for the application of future technologies.

Drilling operators must confront and solve extremely difficult technical and safety problems as they bore through layers of subsurface rock to access the strata that contain oil and gas. In addition, the drilling must be performed in a way that protects the geologic formation, the production capacity of the well, and the surface environment.



Problems that arise during drilling must be diagnosed using the data that is transmitted from the bottom of the well to the surface, where the information is collected on the rig floor. Depending on the depth of the well, valuable time can be lost before the problem is addressed, leading to the possibility that the situation worsens and drilling operations must be halted. The greatest economic risk occurs when drilling is stopped after much time and work have been invested.

Dealing with serious unforeseen problems is the greatest challenge during the drilling process and the primary reason for developing advanced drilling technologies. The U.S. Department of Energy has formed partnerships with industry, national laboratories and universities to conduct research and develop new technologies to reduce the costs and risks of drilling, reduce potential damage to geologic formations, and protect the environment. The research goals include:

**Drilling Faster...**This element addresses the need for increased efficiency during the drilling phase. Drilling rig time is the most expensive part of the operation, comprising 30-35 percent of total cost. Technologies are being developed to reduce equipment failure, extend the life of drill bits, and reach the target area with as few course corrections as possible.

**Drilling Deeper...**This aspect addresses the complex geologic environments that affect the drilling phase. Technologies and strategies are being developed that use the specific characteristics of a geologic formation itself to help drill the well. An example of this is the deeper, harder rock formations that contain natural gas. The most efficient strategy is to focus on the brittle nature of the rock itself, which breaks into large chips when hit. It is more efficient to break up the rock by hitting it than to crush and grind it into powder, as is usually done.

**Drilling Cheaper...**There is still no substitute for drilling. The goal of this aspect, then, is to develop drilling technology that is cost effective. Costs are measured in terms of impact on the environment, lifespan of the well and its machinery, and long-term productivity of the well. This requires drilling wells that will last a long time in the precise location needed to achieve maximum recovery of oil and gas, without damaging the environment.

**Drilling Cleaner...**An important objective of today's research is minimizing the environmental impact of drilling activities. This includes reducing the amount of surface disturbance and responsibly disposing of wastes generated by the drilling. The development of small bore wells has led to a 75 percent reduction in the amount of surface disturbed and waste generated. Operating costs are also reduced by 50 percent. The goal is to develop drilling technologies that are environmentally neutral, or even friendly.

**Drilling for the 21<sup>st</sup> Century...**The focus of this research is the development of 'smart well' technologies that will enable drilling without rigs—systems that will leave no footprint. There is also research into advanced drilling systems that anticipate problems and make adjustments automatically. Using lasers for drilling is another focus of the research. High-power laser technology developed by the military for national defense could possibly be adapted to drilling for oil and gas.

*For more information on new drilling technologies, go to the Fossil Energy website of DOE at [www.fe.doe.gov](http://www.fe.doe.gov).*