

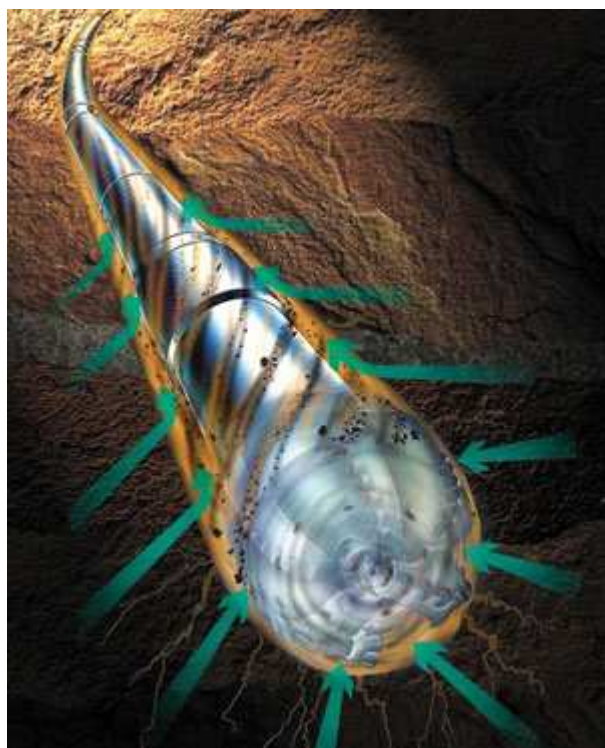
E&P**HART**

CT technology holds key to UCG

Underground coal gasification extends coal reserves.

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COLT is AnTech's bottomhole assembly for CTD.

By providing energy in the form of “clean coal,” the underground coal gasification (UCG) process extends coal reserves by exploiting reserves that were previously inaccessible or considered uneconomical. In so doing, these reserves could provide much-needed clean energy for generations.

With the success of UCG pilot programs and technological advances, commercial operations are being set in motion. A technique that plays a vital role in many pilots is coiled tubing drilling (CTD). AnTech is maximizing UCG production by using COLT, the company's bottomhole assembly (BHA) for CTD.

Coal conversion

UCG is the process of converting unworked coal into a combustible gas, which is processed to provide a source of clean energy with minimal greenhouse gas emissions. It also can be combined with “carbon capture” techniques to provide an acceptable conversion route for power.

UCG involves drilling one production well into the coal seam into which oxidants are injected. The oxidants react with the coal in the coal seam, converting it into a gas. A second well is drilled to bring the gas to surface.

Key aspects of the process include:

- Site selection. Careful consideration is required to ensure that a suitable coal formation is chosen that poses minimal risk to the environment.
- Drilling the wells. The injection well is completed with a simple slotted liner. An ignition source is run into the well on CT, similar to oil well perforation.
- Linking the wells. The preferred method is to use controlled directional drilling with CT.
- Reaction process. A mixture of O₂, N₂, and CO₂ in varying proportions is injected into the coal seam. These react with the coal through a mixture of pyrolysis, combustion, and gasification at high temperatures. The gasification process is similar to the process employed in surface gasification plants, with the gasifier replaced by the natural rock formations surrounding the coal seams.
- Production. Gases are extracted from the production well and undergo sulfur removal and additional conditioning/cleaning in a gasification reactor close to the well.

CTD: Commercially viable UCG

The preferred method of many of today’s UCG operators uses a drilling and completion system adapted from the petroleum industry to drill a series of in-seam boreholes. The drilling system features a moveable injection point called a controlled retraction injection point (CRIP) and typically uses oxygen or enriched air for gasification. This method makes it possible to construct a well at a precise horizon in the coal seam, which is then linked with additional wells to connect to the surface.

Thanks to CTD technology, this method is commercially viable. Multiple boreholes are drilled quickly and accurately, creating controlled seams in the formation for the reactions to occur. With an easy-to-control directional drilling system, it navigates complex formations, drilling quickly and accurately along the bottom of the coal seam.

The COLT’s compact size and patented orienter translate to improved performance, offering a cost-effective solution that drills straight or smooth curved sections. The remotely controlled BHA navigates the formation, drilling a borehole along the bottom of the coal seam to optimize the reaction process. To achieve this, AnTech

fitted the custom UCG COLT with an orienting tool that enables precise adjustments to direction.

Features have been included to help the tool withstand the punishing shock, vibration, and wear that are experienced down hole. This is supplemented with rigorous testing and qualification processes.

The system and CTD services have been verified in field tests carried out in shale formations in the US. Also, a Japanese company is using a custom COLT to drill boreholes subsea and has carried out more than 2,000 hours of measurement-while-drilling operations to date.

Many benefits, many uses

UCG offers a solution to help meet the world's energy needs effectively, with minimal environmental impact. Operating costs and capital required to carry out UCG are potentially much lower than traditional extraction methods. The most dramatic benefit of UCG is the minimal impact on the environment. UCG produces a fuel with a very low emissions profile and is a top candidate for carbon capture and storage. There is no need to stockpile the coal or dispose of waste produced as a byproduct. Levels of CO₂ released into the atmosphere are typically well below the strictest environmental regulations because emissions are sequestered in geologic formations underground.

With advances in UCG technology, the potential for increased access to existing reserves is impressive. According to Julio Friedmann, head of the Carbon Management Program at Lawrence Livermore National Laboratory, UCG could increase recoverable coal reserves by 300% to 400% in the US alone.

UCG products are multipurpose. They can be used to fuel power generation — for example, to fire combined cycle-gas turbines. They can be used to heat industrial facilities and to manufacture hydrogen, synthetic natural gas, and other chemicals. UCG processed gas can even be transformed into diesel.

Safety levels are high because physical interaction with the process is minimal and fewer personnel are required. The process is sealed from the surface by the geological strata at the top. If the oxygen supply is interrupted, the process stops, meaning that fire is not a threat.

Communities surrounding a UCG operation or production station will benefit by resulting improvements in infrastructure, subsidized energy, jobs, and employee spending. With industry's attraction to low-cost energy, new enterprise brings with it opportunity and prosperity. UCG is a high-tech business in its own right and requires engineering and management expertise.

A cleaner, brighter future

With companies and governments investing in its development, UCG has a bright future. The Obama Administration has declared “clean coal” a critical goal for the near term, while California and other states have mandated the reduction of CO₂ emissions. Industry growth is dependent upon further developments made by companies collaborating with partners and governments committed to enhancing the industry.
