

Mining and construction industry

Caverns and securing of shafts

Apart from exploring and establishing new cavern storage facilities, it often becomes necessary to locate older, already existing caverns and pits in order to make them safe and secure. This process, that is, a long-term sealing of the caverns by applying the advanced environmental protection and security technology, serves to protect the population and the environment.

It is of great importance to eliminate any subsidence or uplifting which may result from former mining. It is for this purpose that drilling becomes necessary, to plug the well or to retain the water there permanently. This serves to maintain the security of the respective area.



Drilling rig 400 kN

Use of methane

Another area of responsibility that has been growing in the last years is drilling for methane.

By drawing off or accessing methane in populated regions, the amount of gas that diffuses uncontrollably into the atmosphere can be reduced.

In this way, aspects of security and environmental protection can be met. On the other hand methane can be used as an energy source for decentralized energy supply.

The generation of energy from methane, with the remnant carbon dioxide, lessens environmental damages while at the same time substituting a fossil energy source.



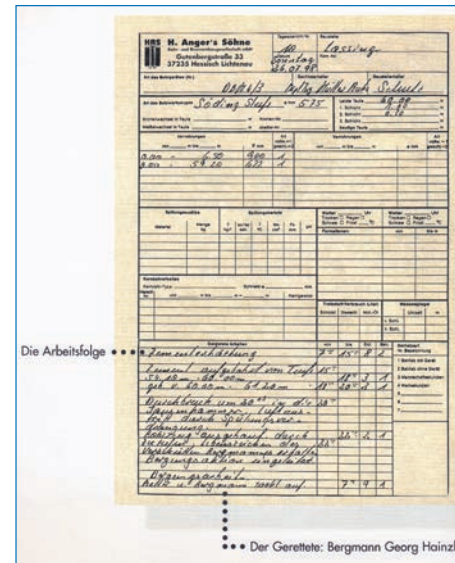
Core 85 mm

Rescue drilling

In case accidents happen in which humans come to harm, due to human error or forces of nature it is necessary to help with special care and know-how.

Remarkably enough, H. Anger's Söhne has been able to prove its competence in the field of drilling for the supply and rescue of miners after a mining disaster.

For instance a miner could be rescued by our company after the partial collapse of a pit in the municipality Lassing/Austria. He was rescued on the tenth day following the catastrophe via a well produced by Anger.



A rescue's report, Lassing



This success strengthens our company's intention to continuously support and advance the development of our staff and to ensure that our facility is always up-to-date.

The high availability of our drilling rigs is guaranteed by our workshops and public utilities in virtually every place at any time.



ANGER
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Deposits
and Mining Works

Outlook

The mechanized world we live in is almost entirely dependant on the availability of mineral resources (coal, ores, salts, rare earths...) and fluid energy resources (oil and gas). The consumption of these reserves of non-renewable substances have led to a significant increase in demand in recent years.

A large number of wells are needed both for the exploitation and later use (production) of (fluid or gaseous) resources, as well as for their storage. Drilling is also required for site investigation for what is called CCS (Carbon Capture Storage). This idea of storing CO₂ underground is part of the present day intense debate about how to proceed with the industrial waste produced

by our power generation. The same applies to the exploration for sites of the ultimate disposal of radioactive waste.

Underground gas storage

Consequently, as there is little demand at that time of the year, an interim storage is necessary because of commonly used Take-or-Pay-contracts, which stipulate that gas has to be bought in summer, too.

(Exploration-) Drilling

for gas-bearing structures (e.g. tight gas or shale gas)

Access to resources

Copper, rare earths, salts, carbon

Accurate freeze holes

Abandoned mine management

Work on safeguarding of shafts

Stabilization of the subsoil

Investigation for suitable locations for the ultimate storage of CO₂

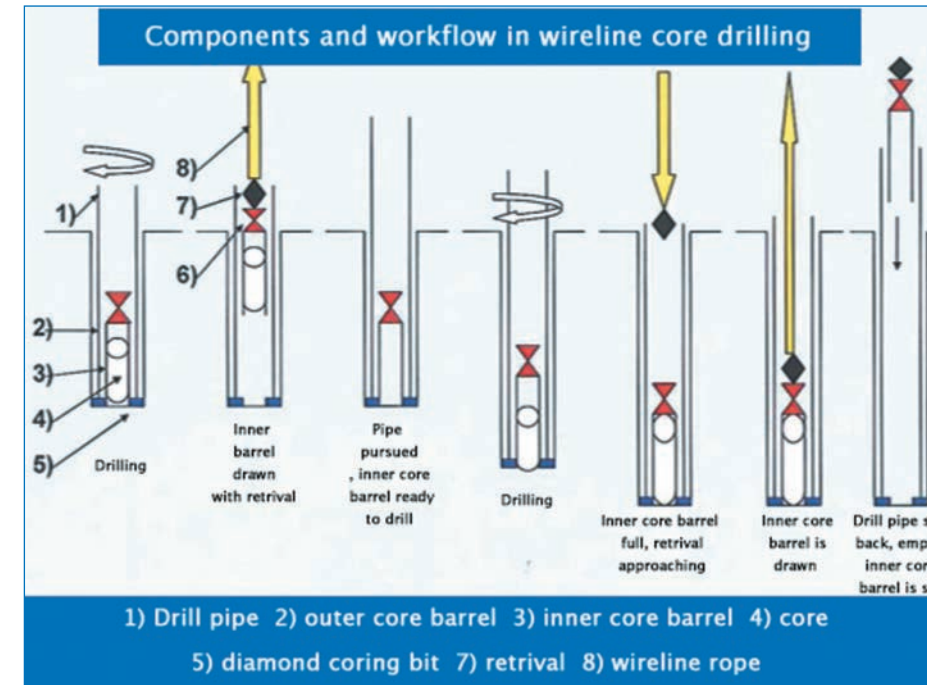
The current debate about the correct way of supplying energy and about the best energy mix, including renewable energies, leads to a large amount of tasks in the field of drilling engineering for our company.

Reservoirs and abandoned mine management

H. Anger's Söhne explores locations of cavern- or pore storage facilities for the later storage of different materials. By making use of different drilling techniques – such as directional-, casing- or underbalanced drilling – a specific drilling program can be planned and carried out for any storage.

The continuously rising demand for storage is due to the increase in gas sales and the necessity of storing carbon dioxide (CO₂) as well as the need for locations suitable for the ultimate disposal of radioactive residual material.

For an accurate reservoir engineering and for the determination of the conditions of the over- and underlying geological layers, Anger makes use of the wireline core drilling procedure. In doing so, high quality requirements must be met. The international standard is a core diameter of 100 mm. Our company, however, is capable of



performing drilling of different measurements as well. This also applies in cases in which preventer and overpressure technologies are employed in addition to the wireline core drilling procedure.

The latter is done to bring volatile material and material that is under

pressure to the surface as part of the core. The range of services is enhanced by exploration- and production wells in the field of oil and gas. In order to further use and exploit oil deposits, injection wells become necessary to inject fluids or superheated steam into the formations. Thus, the diminished natural storage pressure can be increased again, which leads to an optimization of the exploitation of the fields.

Abandoned mine management is gaining more and more importance for Anger. Former mining regions require complex solutions and innovative work plans, so as to keep in check long-term consequences that result from decades of mining. To achieve this goal the company co-operates with external specialists and qualified employees in every single project.



Core holes up to 1500 meters

Scouting for reservoirs

H. Anger's Söhne has completed several projects in the past years for the scouting of mineral resources, especially of coal, halite, copper and rare earths.

In this field, wireline core drilling is often used for an exact determination of the content of ore and minerals, as well as for a specification of other geotechnical parameters.



Employee at working platform

After the recovered cores have been brought to the surface they are examined to determine their mineralogical components.

The results of this examination enable the company to draw conclusions as to availability and yield of the given reservoir.

Subsequently, in case the tapping of the reservoir is considered economically appropriate and technically feasible, the next step is to determine the concept of a mine for the exploitation of resources.

In the beginning, in order to make the right choice with regard to how to proceed with the drilling, it is essential to examine the stability of the formation, especially regarding any possible water inflows.

In case water-bearing, loose formation layers do exist, the most secure way of drilling is to perform a freeze hole. This technique makes use of artificial icing to support the reservoir or, rather, the shaft. More precisely this means that several freezing holes are drilled in a circle around the planned shaft, frequently by making use of the directional well technique.

It is often the case that these wells are spaced only 1 - 1.50 meters apart. Our company sinks wells like these up to a depth of 600 meters. Subsequently a cryogenic fluid circulates inside the well so that warmth can be extracted from the surrounding formation, icing develops and, under its protection, the drilling can proceed safely.

Drilling and freezing have been an inseparable pair since 1883, when artificial cold was used for securing a shaft in Britain for the first time.

This drilling technique has been continuously developed ever since and has made it possible to sink freezing wells deeper and deeper in Europe.

Up to this day H. Anger's Söhne, too, has applied the freezing hole technique successfully.



44 wells at 550 m for freeze shaft

Search for reservoirs