

S U B S U R F A C E
E N G I N E E R I N G



Untergrundspeicher-
und Geotechnologie-
Systeme GmbH

SUBSURFACE ENGINEERING

Untergrundspeicher- und Geotechnologie-Systeme GmbH (UGS) is a company specialised in underground storage, a technology aimed at the safe, cost-effective and environmentally friendly storage of energy carriers, raw materials and chemical products in deep geological formations. The specific advantage of our highly experienced engineering and service company is that we offer the full range of services, everything necessary to carry out underground storage projects from pre-investigations to the commissioning and operation of turn-key facilities. This includes all geological, engineering, drilling, workover and leaching processes.

The design, construction and operation of underground storage facilities would be unthinkable without sound engineering services in the field of

SUBSURFACE ENGINEERING

Our specialists in this field are in charge of everything that has to be constructed beneath the grassroots so that an underground storage facility can fulfil the function it is planned for. They are experts in the fields of drilling, production, geosciences and welding. They have decades of successful experience and have developed and applied many innovative processes and technologies, including softwares.

Their field of acting covers studies, programmes and expert evaluations for drilling and completing bore holes, leaching salt caverns and carrying out special measuring and inspection work. Their know-how and competence in this field is especially useful in the planning of and assistance to subsurface repair and maintenance work. The drilling and workover job undertaken by the service division are generally accompanied and supervised by experts from the Subsurface Engineering Department, often in direct co-operation with specialists in the fields of geology and reservoir engineering. This co-operation between the service division and the Subsurface Engineering Department leads to an exchange of experience unique in Germany. This results in increased competence, innovative solutions and in high quality and safety standards which are of direct benefit to our customers. The close co-operation with the purchasing department guarantees that materials and equipment are ordered and delivered according to specifications and at a good price.

The specialists of the Subsurface Engineering Department have also built up experience in the related geotechnical engineering fields of brine disposal, extraction of geothermal energy, depositing, oil and gas production.

SERVICES OFFERED BY THE SUBSURFACE ENGINEERING DEPARTMENT

- Technical studies on the subsurface part of underground storage, brine disposal, groundwater production and extraction of geothermal energy
- Expert's opinion and assessment of storage wells and storage caverns from the technical and the safety point of view. Assessment of the subsurface part of underground storage facilities
- Planning and project execution for drilling of vertical, deviated and horizontal wells
- Planning and project execution for well completion, re-completion, workover and plugging of storage wells and storage caverns
- Design of special plugging systems for replacing production strings and/or well heads while the storage cavern remains gas-filled
- Simulation and history-match of leaching processes, monitoring and evaluation of sonar measurements, parameter adaptation for the leaching process
- Technological assistance to the leaching process. This also relates to solution mining under gas (SMUG), first gas-filling of caverns, snubbing of brine withdrawal strings as well as the flooding of gas-filled caverns
- Terms of references for special bore hole logging to be performed as integrated part of casing inspection as well as interpretation and evaluation of the logging data obtained
- Research and development, engineering of specific technologies and design of special equipment, development of test procedures for underground storage
- Planning and project execution of welding, welding of casing and tubing while run-in, replacement of well heads, welding of special subsurface equipment



RANGE OF SERVICES OFFERED BY THE SUBSURFACE ENGINEERING DEPARTMENT

Expert's reports Investigations at a high competence level combined with evaluation of the subsurface part of underground storage facilities. These are frequently related to situations suspected to be critical from the safety or technical point of view.



Studies Solutions and options related to subsurface problems of an underground storage facility are offered, taking into account the geological preconditions and the technological framework. Evaluation of the chances to meet the goals of the client successfully.

Simulations Modelling of complicated scientific or technical processes by means of computer programs (e. g. for leaching)



Planning Detail planning and design of all material, equipment, measures, metering and monitoring procedures and technologies for performing subsurface work. Development of working programmes, which are the basis for purchasing material and equipment as well as for the work to be performed by the drilling, workover or leaching crews.



Supervision and Assistance Technological supervision and support of subsurface activities. This is in order to ensure that the specifications and objectives set by the working programme will be achieved safely, in time and without cost overrun while meeting the highest quality criteria.

Final reports / Documentation Presentation of the findings resulting from the subsurface work performed and their comparison to the specifications and objectives of the working programme.

SOME OF THE REFERENCES OF THE SUBSURFACE ENGINEERING DEPARTMENT

Experience, gained in a large number of projects led to the development and application of innovative technological solutions. Recent references give also evidence of the creativity and the capability of the Subsurface Engineering Department:

Technological Solutions

Welded casings and tubings in gas storage wells

Ensure long term tightness and allow favourable clearance conditions.

In-situ Frac-Test

Optimisation of the operational pressure by in-situ determination of the minimum main stress in the salt rock.

Tightness test

Extremely sensitive test routine for proving the technical tightness of the cementation of the final casings with online computation and display of results.

Solution mining under Gas (SMUG)

Before the leaching process comes to the end, the upper part of the cavern can already be used for gas storage operation.

3D-leaching simulation

Even under complicated geological conditions optimum storage volumes can be achieved

Casing-inspection

Reliable evaluation of the status of final cemented casings and forecasting of future operating life.

Repair works in non-flooded gas storage caverns

Cost efficient alternative to the flooding of gas storage caverns in order to replace the production string and/or the well head.

Resin gravel

State-of-the-art sand control

Hanger adjustable to the depth

Maximum use of the geometric volume of storage caverns by optimum brine removal during first-gas-filling.

Flooding of gas-filled caverns

Technology for cushion gas recovering with hydraulic protection against break-through of gas and gas pressure compensation.

Plugging of gas storage wells

Safe and by mining authorities certified plugging technology combined with efficient monitoring routines.

Among our References in the last 10 years

- State-of-the-art re-completion of the storage wells at the underground gas storage facilities Bernburg, Bad Lauchstädt, Kirchheilingen, Buchholz and Ketzin.
- Re-completion of storage wells at the underground gas storage facility Xanten and completion of a gas storage cavern for solution mining under gas.
- Planning and supervision of drilling work for deviated cavern wells with large diameter at the underground gas storage facilities Kraak and Rüdersdorf
- Cavern design and planning of the leaching processes at the locations Bad Lauchstädt, Angersdorf and Kraak
- Re-completion of five cavern wells at the underground gas storage facility Epe for gas storage operation
- Planning and supervision of re-completion work in gas storage wells and for drilling a shallow horizontal well at the underground gas storage facility Allmenhausen
- Replacement of the tubing string in a hazardous material salt cavern storage
- Plugging of gas storage wells at the aquifer structure Ketzin following the decision of the client to decommission the facility



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