DESTRESS
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DESTRESS is progressing – more highlights to be expected

The successful soft stimulation in Pohang, a joint effort of eight institutions engaged in work package 5, is definitely a DESTRESS highlight in 2017. So are the first best practice reports, which make DESTRESS results available to an interested public and accomplish one of the main objectives in our project.

As DESTRESS will reach half-time next April, more success stories have to be expected. While you read this newsletter, the operator, Trias Westland, is drilling a well into a 4'000 meters deep reservoir. The aim is to explore whether the reservoir is suited for geothermal heat extraction. Further achievements in terms of an increase in energy output are expected in Soultz-sous-Forêts after conducting a chemical treatment at one well planned for 2018.

First results and more DESTRESS insights will be presented at our midterm

conference in Glasgow from 3 to 6 April 2018. Therefore, save the date and join us in Scotland!

News and Progress

Pohang: first successful soft stimulation

The first hydraulic soft stimulation treatment within DESTRESS took place this August in Pohang (South Korea). There, an "enhanced geothermal system" (EGS) project has started in 2010 with the aim to produce 1 MW of electricity.

The soft stimulation succeeded thanks to a combination of a cyclic injection scheme, an advanced traffic light system, and the knowledge gained during previous stimulations. The aspired threshold of a magnitude 2 was, in contrast to previous treatments at the site, not exceeded.

Currently, several DESTRESS members analyse the hydraulic data to gain a profound knowledge of the effects the treatment had in terms of hydraulic performance. First results are planned to be presented at the 12th Euro conference on Rock Physics and Geo-Mechanics, "Bridging between Rock Physics and Structural Geology", which will be held in Ma'ale HaHamisha (Israel) from 5 to 10 November 2017.

In parallel, seismologists are locating the seismic events recorded in the course of the soft stimulation treatment to map the reservoir geometry. In combination with relocated events from previous stimulations, an activated zone can be defined, which might be drilled in next.

The soft stimulation treatment experiment was a joint effort of experts from GFZ, GES, KICT, KIGAM, NexGEO, SNU, TNO, and UoG, who are involved in work package 5 "Demonstration of cyclic hydraulic and multi-stage treatments in granites and tight sandstones".

Soultz-sous-Forêts: feasibility study for chemical stimulation

For 2018, a chemical stimulation treatment is foreseen to be executed in Soultz-sous-Forêts (France). In preparation for it, the working group Hydrogéochimie of the Laboratory of Excellence G-EAU-THERMIE-Profonde (University of Strasbourg UoS/ESG) conducted a feasibility analysis. The subcontractor of this task was the GEIE Heat mining of Soultz-sous-Forêts.

The study focused on the choice of chemicals (between acids, chelating agents and mixtures), the operation design (wellhead or downhole injection), as well as on picking the most suitable well (between the different geothermal wells of Soultz-sous-Forêts: GPK2, GPK3 and GPK4).

Given that GPK2 is not accessible for chemical stimulation due to a casing restriction, and given that GPK3 is already a relatively productive injection well, a chemical stimulation would have the highest economic value in well GPK4. Therefore, a call for tender was launched in July 2017 for a preliminary logging phase of GPK4. The objectives of these logs are:

- quantify the casing condition of well GPK4 in order to decide if it is possible to inject acids in the well without risking to damage the casing, and if it would be possible to set downhole packers in the well.

- identify flow zones and damaged zones in the open-hole section of GPK4 before stimulation, in order to be able to quantify the effect of a potential chemical stimulation in GPK4.

Trias Westland: drilling into 200-million-year-old rocks

Drilling 4’000 meters into the earth, encountering water at temperatures of 130 degrees, and exploiting the feasibility of the reservoir for geothermal heat extraction. This briefly describes the plan of actions of Trias Westland for its geothermal power plant located in the south-western part of the Netherlands.

Only a few weeks ago, the rig arrived after its journey from Turkey. These days, the drilling, the deepest ever performed in the Netherlands, is being geared up. Based on a daily drilling advance of 50 meters per day, the Buntsandstein reservoir should be reached around Christmas. In the following, the well has to be tested, proofing to meet the requirements regarding flow rate (~ >150m3/h) and temperature (~120°C), enabling an efficient and sustainable exploitation of the geothermal energy. In case of success, the Trias Westland geothermal doublet will be completed with a second well, which will make heat extraction possible.

Identifying the risks of soft stimulation

Often, soft stimulation treatments are the only means to meet economical and sustainability requirements for a geothermal plant. Nevertheless, their application is expensive and due to varying natural conditions not always successful. “Therefore, an operator developing a geothermal field using soft stimulation must evaluate the pros and cons of this technology”, says Sören Reith, the first author of a recently published study elaborating techno-economic evaluations in geothermal energy.

The authors present an approach to assess the key factors for a techno-economic evaluation of soft stimulation. As a first step of the risk assessment, methodologies from strategic corporate planning are used to identify risk factors. Based on the so-called dependency-structure-analysis, the authors conclude that pumps, water volume or well design have minor effects on the techno-economic evaluation. However, geological and physical parameters, chemical or biological effects are very influential. As the only parameter out of the public affairs, public acceptance may significantly shape the evaluation.

To prioritize the risk factors, the authors interviewed both industrial and scientific experts. They identified the following risk factors of most relevance: public acceptance, lack of information and induced seismicity. "Yet, the experts concluded that soft stimulation is already today a controllable measure for enhancing geothermal energy provision", says Reith.

Original report: Sören Reith (EnBW), Régis Hehn (ésg), Hanna Mergner (EnBW), Dr. Thomas Kölbel (EnBW). "Systematic preparation of the techno-economic evaluation of soft stimulation", 2017.

Risk assessment process within DESTRESS (Reith et al. 2017)

What, why, how? – Four best practice reports online

An important achievement of DESTRESS is the compilation of best

practice reports. New techniques, innovations or crucial experiences are made available to an interested audience. Until today, there are four reports online, which are shortly introduced below.

Decision analysis
Decision making in fields where experience is rare and technologies are new is challenging - as it is for geothermal energy production. In the investment world, decision analysts compare systematically various alternatives, and recommend whether to invest or not invest. Advances in research can support specific alternatives, such as a certain stimulation technique, by improving its expected utility and by reducing the possible range of bad outcomes. Linking DESTRESS research results to investment decision-analysis is the topic of this report, which was written by Christian Bos from TNO.

Geochemistry and hydrochemistry
To successfully run a geothermal plant, it is crucial to know how fluids, rock minerals and gases interact in the underground. A poor understanding of those processes can result in corrosion of plant, clogging of wells and reservoirs and may even cause environmental problems. This best practice report, written by David Banks from the University of Glasgow, deals with the question how to design a geo- and hydrochemical sampling campaign for a geothermal programme.

Risk assessment
The long timeline of a geothermal project with the drilling, construction and operation phase poses numerous risks such as legislation, accidents and public acceptance. Therefore, risks should already be assessed in the beginning of a project. Key to a reliable risk assessment are expert interviews or, wherever available, historical data. This best practice report, written by Sören Reith from EnBW, addresses in more detail the topic of risk assessment.

Well construction
Drilling a well is more than just digging a hole into the ground. A well designer must know before drilling what is expected from the wellbore in order to determine for example its hole size diameter or possible stabilization measures. Therefore, this best practice report, written by Frédéric Guinot from Geo-Energie Suisse AG, presents a guideline to successfully drilling and operating wells.

Did You Know...

...that the world's most productive geothermal installation provides enough energy for a city as large as San Francisco?

This geothermal field called "The Geysers" lies in California (USA) and produces currently 900 MW of energy. Heat for the steam reservoir comes

from a large molten rock chamber, spanning over seven kilometres beneath the ground.

However, this is only a small beer compared to the largest power plant in the world: the "Three Gorges Dam", a barrage in the south-eastern part of China, produces around 22'5000 MW of energy – or as much as 15 modern nuclear power plants together.

The Sonoma Calpine 3 geothermal power plant at The Geysers field in the Mayacamas Mountains of Somona County, Northern California. (Licence: CC0 1.0)

Save the date

Midterm Conference in Glasgow

The midterm conference will take place between 3 and 6 April 2018 in Scotland. It will be hosted by our partner, the University of Glasgow. The main objectives of the conference are to present important project results of the first two DESTRESS years and enable public discussion. The conference will consist of various workshops open to internal and external public. The participation at the conference will be free of fees. The external conference attendees will need to register online in advance and cover their travelling expenses. Programme details will be published in the next newsletter and on our website.

Services

Talking about DESTRESS

Conferences

3 . - 6.4.2018 in Glasgow, Midterm Conference
Details will follow.

29.11. - 30.11.2017 in Amsterdam, Netherlands
Global Geothermal Energy Summit

10.1. - 11.1. 2018 Dallas, USA
Power Plays: Drilling into Geothermal Energy Applications

1.3. - 2.3.2018 Offenburg, Germany
GeoTHERM - expo & congress

Education

10.09.2018 - 15.03. 2019 Neuchâtel, Switzerland
CAS Deep Geothermal Systems
Deadline applications: 15 June 2018

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Demonstration of soft stimulation treatments of geothermal reservoirs

DESTRESS demonstrates methods of enhanced geothermal systems (EGS). The aim is to expand knowledge and to provide solutions for a more economical, sustainable and environmentally responsible exploitation of underground heat.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 691728