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News

Innovation and Industry

Renewable energies | Geothermal energy

Geosciences | Geology - Sedimentology | Geomechanics | Petrophysics and transfers in porous media | Physical Sciences | Thermodynamics/Molecular modeling | Physical chemistry | Electrochemistry and corrosion

The WGC 2020+1 World Geothermal Congress, held last October, brought together more than 3,000 experts from around the globe. Objective: to discuss the latest technologies in this sector. The event was an opportunity to highlight recent advances developed at IFPEN aimed at addressing the principal difficulties encountered by geothermal energy operators.

In 2018, IFPEN began developing expertise and technologies to overcome the challenges associated with geothermal energy, most of the potential of which remains unexploited for various technical or economic reasons.

The available resources are, in part, poorly understood and investment costs are significant. In addition, geothermal waters, which contain dissolved gases and minerals, can **corrode installations** and **form deposits in wells**. Moreover, some of these gases may contribute to the greenhouse effect if they are emitted into the atmosphere so they preferably have to be reinjected into the underground environment. Some **complex zones** such as **fractured media** are the focus of **stimulation techniques** (Enhanced Geothermal System or EGS) that present risks and need to be better controlled. The geochemistry and thermodynamics of **fluid circulation in rocks and on the surface**

also have to be better understood in order to address these challenges.

Thanks to its multidisciplinary teams, IFPEN is able to propose solutions adapted to operational problems, drawing on a global understanding of the geothermal loop, from reservoir and wells through to surface installations.

A bubbling research activity

At the WGC 2020+1 World Geothermal Congress, IFPEN's teams presented innovative research in a variety of disciplines, including mechanics (fluid, rock), thermodynamics, geology, petrophysics, geochemistry, physical chemistry, microbiology and process engineering. A significant proportion of this research was conducted within the framework of collaborative research projects.

GECO, a multifaceted collaborative project

IFPEN is participating in the European GECO (Geothermal Gas Emission Control) project focusing on **the reinjection of non-condensable gases (NCG)**. The objective is to prevent greenhouse gases such as CO_2 and H_2S - the latter is toxic - being released into the atmosphere.

Three aspects of IFPEN's research were presented at WGC 2020+1:

- A feasibility study for a new geothermal site in Italy, with two production wells and one injection well (7)
- An original solution (2) for **the reinjection of gases (CO_2 and H_2S) into the same well** with water that has been condensed on the surface after producing electricity. The solution is based on a well model developed by IFPEN, GWellFM, which makes it possible to simulate the monophase or two-phase flow of a multi-component mixture.
- A comparative study (1) of several tools making it possible to describe the thermodynamic behavior or fluids made up of water, salt (NaCl), CO_2 and other impurities such as H_2S and methane.

A broad range of complementary expertise

WGC 2020+1 was also an opportunity for IFPEN's teams to present their know-how in other fields:
- The problem of corrosion was addressed, focusing on two aspects: **steel corrosion under the action of supercritical CO_2** (4) and **steel corrosion under the action of H_2 and H_2S** (5).
- Geothermal potential in **a magma environment** was the focus of a study (6) based on basin modeling.
- A new approach(3) for simulating the behavior of **geothermal reservoirs in a fractured zone** was also presented.

All of these presentations demonstrate the multidisciplinary nature of the research conducted at IFPEN and its teams' capacity to tackle complex and varied problems.

To find out more

Discover the solutions proposed by IFPEN in the field of geothermal energy.

Bibliography

1. Di Lella, A. & Mougin, P. Thermodynamics of Geothermal fluids : a benchmark between thermodynamic models, from Henry's approach to advanced EoS (GECO Project)
2. Leontidis, V., Gainville, M., Jeannin, L., Perreaux, M. and Souque C. Modelling of the non-condensable gases re-injection for geothermal emission control (GECO project)
3. Ricois, O. & Gratien, J.-M. A New Parallel Reservoir Simulation Tool for the Production of Fractured Geothermal Reservoirs.
4. Ropital, F. & Kittel, J. Corrosion evaluation of steels under geothermal CO2 supercritical conditions.
5. Kittel, J., Ropital, F. and Grosjean, F. Evaluation of the interactions between hydrogen and steel in geothermal conditions with H2S.
6. Traby, A., Bonte, D. and Souque, C. Thermal assessment of Los Humeros geothermal system through basin modeling.
7. Trumpy, E., Baneschi, I., Batini, F., Bonini, M., Brogi, A., Dini, A., Gola, G., Jeannin, L., Lelli, M., Liotta, D., Norelli, F., Manzella, A., Montanari, D., Montegrossi, G., Orlando, A., Raco, B., Ronconi, A., Ruggieri, G., Santilano, A., Souque, C. and Boschi, C. Geological Assessment of Castelnuovo (Italy) Demonstration Site for CO2 Reinjection in Deep Geothermal Reservoir. H2020 GECO Project

IFPEN and geothermal energy: multidisciplinary research for complex technical challenges
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