HITA NV Uses Subsurface Modeling Capability to Create Accurate, State-of-the-Art Depth Models

HITA

Seismic Models Reduce Project Risk and Cost Uncertainty

"We are convinced of the added value of the SKUA-GOCAD software in reducing overall project risks by generating state-of-the-art subsurface models based on the integration of all available data sets."

-Stijn Bos, COO, HITA NV

CHALLENGE

Perform risk reduction for deep geothermal projects, ensuring that plants, once constructed, are safe for staff and the surrounding communities.

SOLUTION

Aspen SKUA-GOCAD™ was deployed to visualize well and seismic data, interpret vintage 2D and new 3D seismic data, report on geothermal reservoirs and create structural models.

VALUE CREATED

- Using SKUA-GOCAD, HITA was able to integrate all data sets, convert the data from time to depth domain and generate accurate depth structural models.

- These models enabled the creation of depth maps of the target reservoir, providing valuable input for well trajectory calculations.

- The models provided the base for a thorough understanding of the reservoir's subsurface, which is an essential component in the safe and economical construction of geothermal plants.

Overview

HITA NV is a young and ambitious Belgian company focused on the development of deep geothermal energy. Its goal is to contribute to energy transition by heating local homes and businesses using sustainable methods. Among the company's most important tasks is performing risk reduction for deep geothermal projects, ensuring that once constructed, the plants will be safe for both those working in them and the surrounding communities.

In this case, there was a very deep geothermal project that needed to be de-risked in Northern Belgium. In projects such as these, geothermal heat is brought to the surface from a depth of 2-4 kilometers and distributed via a local network. In the early stages of the project, the company was looking for a suitable location for the production of geothermal heat (not electricity) for heating buildings. The reservoir lies in fractured carbonate limestones.

HITA geologists used all available data, including old well and seismic data, and recently acquired 3D seismic data. Given the depth of the reservoir and its proximity to cities, it was critical to gain a thorough understanding of the subsurface in order to design a development plan for the safe and economic production of heat. Building a depth structural model was an essential step in this process.
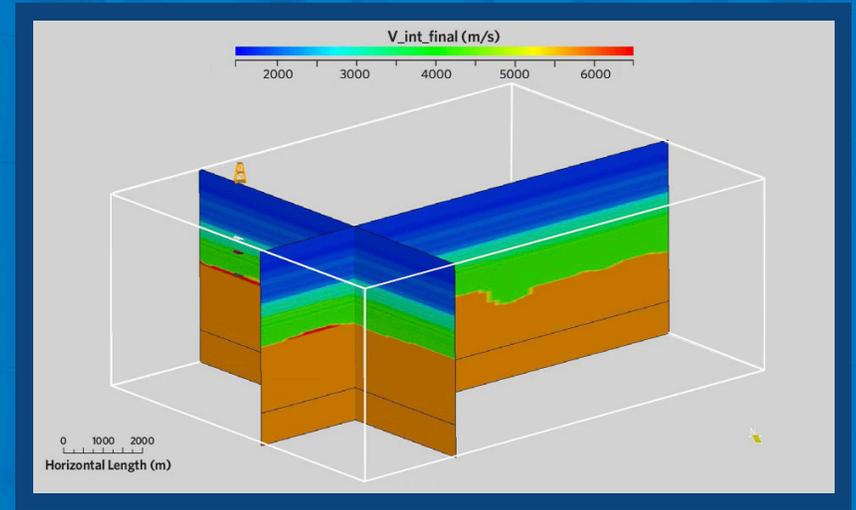
Velocity modeling and time-depth conversion performed in Aspen SKUA-GOCAD. Well velocities are the only available input.
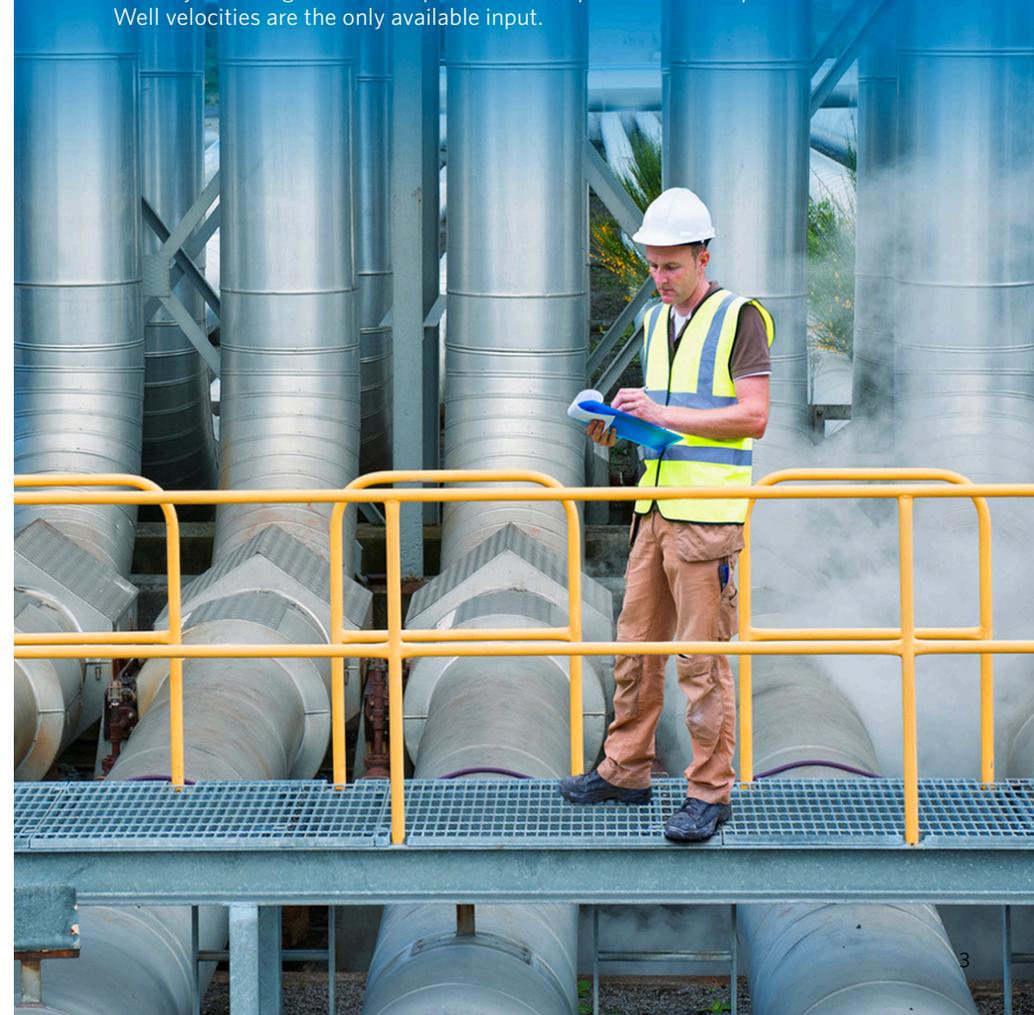
Choosing the Right Visualization Solution

The GOCAD Foundation Modeling and Structural Modeling modules in AspenTech's Subsurface Science and Engineering suite, Aspen SKUA-GOCAD, were selected as the most optimal data integrators, due to their ability to visualize both well and seismic data. The next major step was to perform seismic interpretations on vintage 2D seismic data sets and newly acquired 3D seismic data. Lastly, it was necessary to provide geological reports on the geothermal reservoirs, and create structural models. These structural models would be used to enable creation of depth maps of the target reservoir that would act as input for well trajectory calculations.

The SKUA-GOCAD workflow included:

- Import of all available data: 2D and 3D seismic (various vintages) and well data (old data from coal mining industry)

- Velocity modeling, leveraging the advanced scripting capabilities in SKUA-GOCAD

- Seismic interpretation, horizon mapping, seismic attribute extraction along surfaces and structural modeling

- Identification of faulted structures to target, and design of conceptual well trajectories (doublet)

- Export to third-party application for dynamic modeling

- Maps and views used in the report submitted to regulatory authorities

A seismic amplitude extraction along a mapped top reservoir surface indicating zones with (possibly) higher permeability.
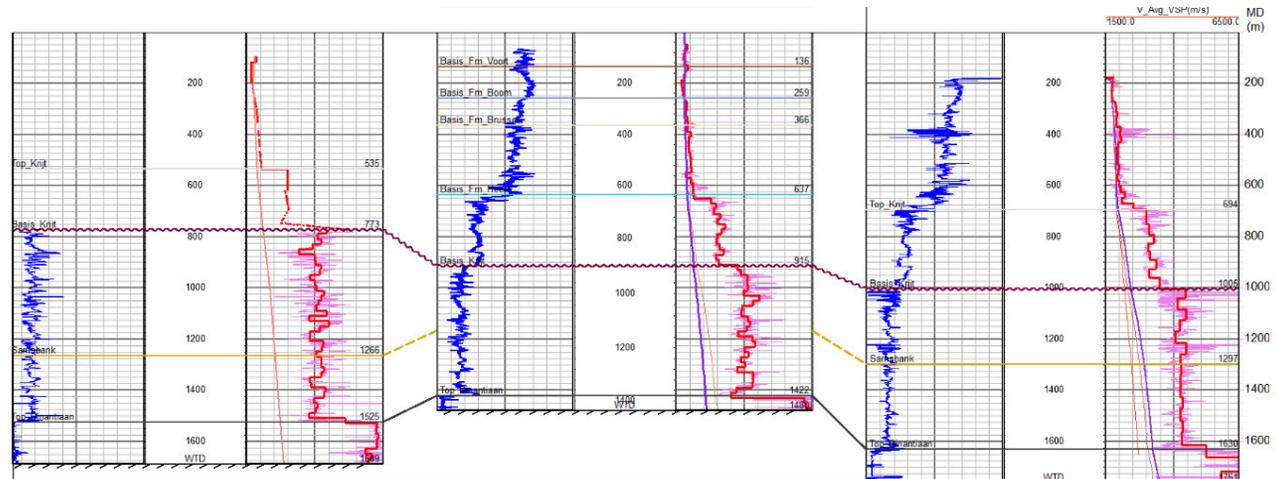
Well velocity logs and marker correlation used as input for velocity modeling in Aspen GOCAD.

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Subsurface Modeling Provided Better Insights

Using the SKUA-GOCAD software, HITA was able to integrate all existing data sets, use velocity data to convert data sets from time to depth domain and generate structural models. The models provided the base for a thorough understanding of the reservoir's subsurface, which is an essential component in the safe and economical construction of geothermal plants.

For a project in the city of Turnhout, a detailed 3D structural model was created of the target reservoir in the Lower Carboniferous Limestones. HITA is currently working on three locations for which 3D seismic acquisition was performed.

Once the 3D reservoir structural model is ready, it is used to support the design of conceptual well trajectories (doublet). It is also exported and used as input for dynamic geothermal simulation.

Conclusion

Geothermal development companies often operate under budgetary restraints; however, HITA is convinced of the added value of the technology in reducing overall project risks by generating state-of-the-art subsurface models based on all available data sets.

Due to a combination of the user-friendliness of the solution and the increasing number of projects for which HITA has been contracted, the company recently extended its contract for the SKUA-GOCAD suite.
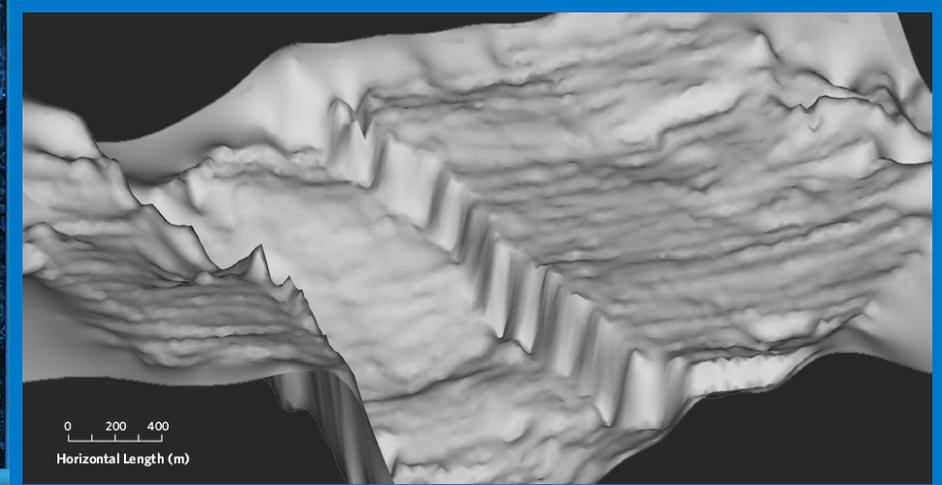
2D and 3D seismic data interpreted in Aspen SKUA-GOCAD and used as input to create horizon depth maps and fault surfaces. In this picture: top of the reservoir, which is normally faulted, and highlighting a graben structure.

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