The SURE Project

Novel Productivity Enhancement Concept
for a Sustainable Utilization of a Geothermal Resource

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German Research Centre for Geosciences GFZ

Workshop on the geochemistry of geothermal fluids
Miskolc, 26th October 2017

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Project Consortium

GFZ Helmholtz-Zentrum Potsdam (Coordinator)

TU Delft

GZB

TNO innovation for life

SURE

ÍSOR Iceland GeoSurvey

Imperial College London

WSG Well Services Group

Gamtos tyrimų centras

DTU

GEOTERMA

Project Details

- Call: H2020-LCE2-2015-1-two-stage
- Funding Scheme: Research and Innovation Action - RIA
- Total Cost / EC contribution: 6.1M€ / 5.9M€
- Project Duration: start in March 2016, 42 months
- Technology Readiness Level: 3-4

Objectives – Main Idea

- Investigate and test the Radial Water Jet Drilling (RJD) technology for increasing the performance of geothermal wells with low productivity/injectivity across different spatial and temporal scales.

- Aim: connect high-permeable structures (faults/fractures, karst systems, high-permeable sedimentary structures) to main wellbore.

Objectives – RJD Technology

(GFZ, 2016)

(GZB, 2016)

Objectives – Three main questions addressed

- What is the maximum productivity/injectivity increase in strongly heterogeneous geothermal reservoirs?
  - Parameters controlling the jet-ability of rocks
  - Expected benefit
  - Optimized design
- How sustainable is the productivity increase (compared to conventional hydraulic stimulation)?
  - Stability of laterals and fractures in stress field
- What is the environmental impact?
  - Induced seismicity
  - Environmental impact of fluids
  - Environmental footprint

Approach

State-of-the-Art

- Conventional stimulation technologies
- Radial water jetting technology

Micro-Scale Investigation (Sample-Scale)

- Mechanical and hydraulic sample characterization
- Fracture permeability characterization
- Stability of laterals

Meso-Scale Investigation (Rock Block-Scale)

- Jetting in lab with full scale equipment
- Jetting experiment in quarry
- Jetting at reservoir conditions

Macro-Scale Investigation (Field-Scale)

- Pre-operational survey
- Field tests
- Long term evaluation

Integration

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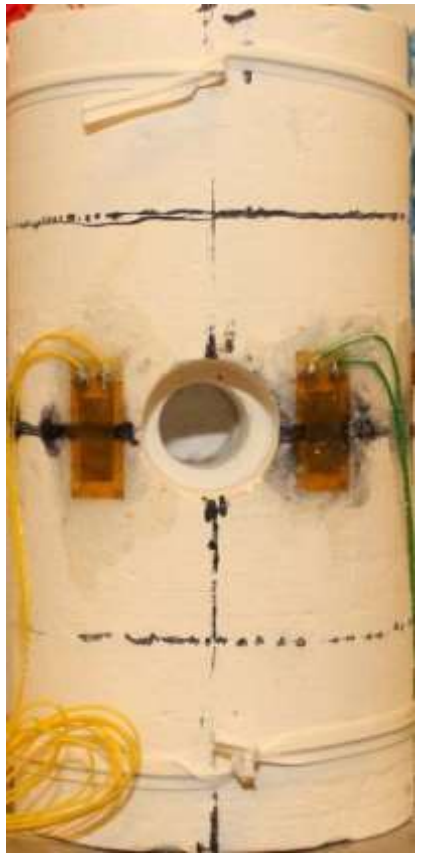
Approach – Micro-Scale

- Rock property determination
- Fracture permeability measurements
- Stability of laterals in stress field
- Formation damage due to jetting operation

(WSG, 2016)

(GFZ & TUD, 2016)



(DTU, 2016)

Approach – Meso-Scale

- Jetting experiments on rock blocks
- Jetting experiments under simulated reservoir conditions
- Jetting experiments in quarry (Gildehaus, Germany)
- Nozzle optimization

(GZB, 2017)

Approach – Macro-Scale

- Site characterization
  - Well candidate in the South of the Netherlands (**sedimentary rock**) has been proposed as a candidate well RJD
  - Well candidate located in Northern-Iceland (**basaltic rock**) has been selected for RJD
- RJD operation
  - Apply radial jet drilling in field
  - Production log prior and after operation (injectivity/productivity)

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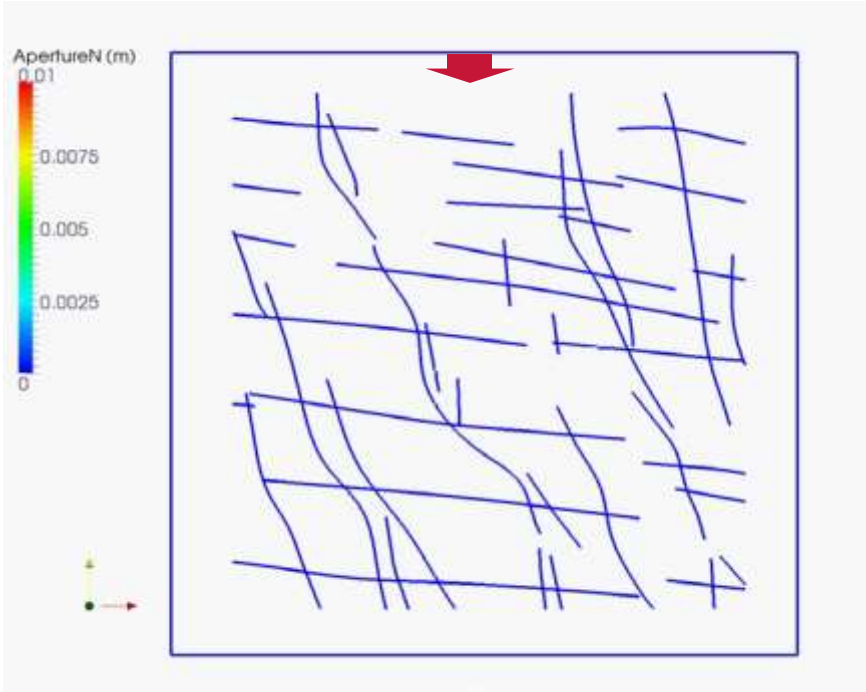
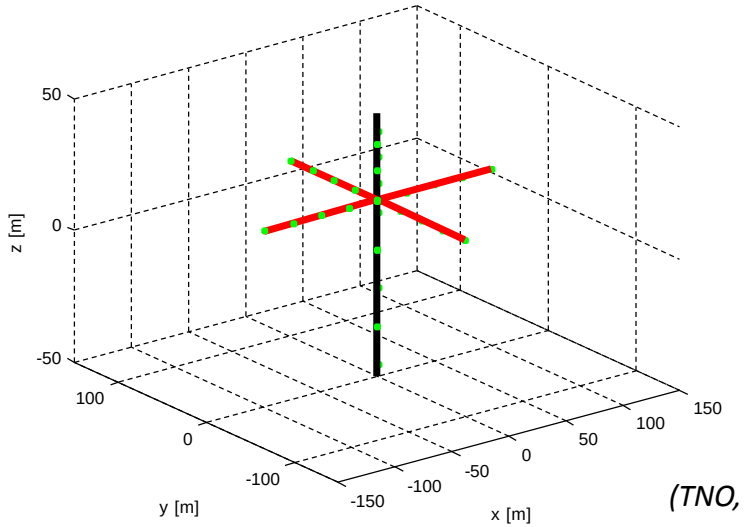
Approach – Integration

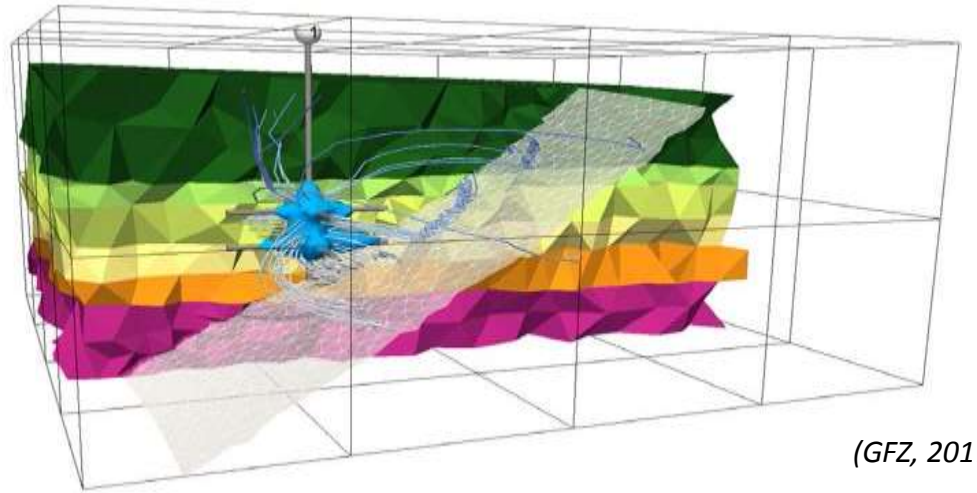
- Micro-scale analysis of jet drilling process
- Analysis of stability of laterals in stress field



(ICL, 2012)



(TNO, 2016)



(GFZ, 2017)

Acknowledgement

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www.sure-h2020.eu