GEOLOG

Surface Logging Services
Drilling Solutions
Lab Studies
Innovation Hub

New Technologies for Geothermal Exploration & Development

Franco Caselli

28th June 2022

IWelS
Innovative Welding Solutions

40th ANNIVERSARY 1982 - 2022

www.geolog.com

ADRILLTECH
ADVANCED DRILLING TECHNOLOGIES

GEOTech
RESEARCH & LABORATORY

Confidentiality Disclaimer

All information, materials and data whether in a tangible or intangible form, relating to Geolog (the "Disclosing Party"), its affiliates, branches and/or subsidiaries, its business activities and/or assets and/or properties, its technologies, R&D activities and intellectual property which are exchanged with or made available to and/or disclosed by the Disclosing party to the Reader (the “Receiving Party") within the context of this presentation and related attachments are of a highly confidential nature ("Confidential Information").

The Receiving Party hereby agrees and undertakes (a) to keep strictly confidential any and all Confidential Information by using at least the same degree of care as it uses to safeguard its own information of a highly confidential nature (b) to use all Confidential Information for no purpose other than internal distribution (c) not to communicate or disclose to any third parties any Confidential Information.

The Receiving Party expressly agrees that (i) the Confidential information obtained under this presentation is and shall remain the exclusive property of the Disclosing Party, and (ii) nothing contained in this presentation shall give, or be construed as giving, to the Receiving Party any right, title, ownership, interest, license or any other right in or to the Confidential Information.

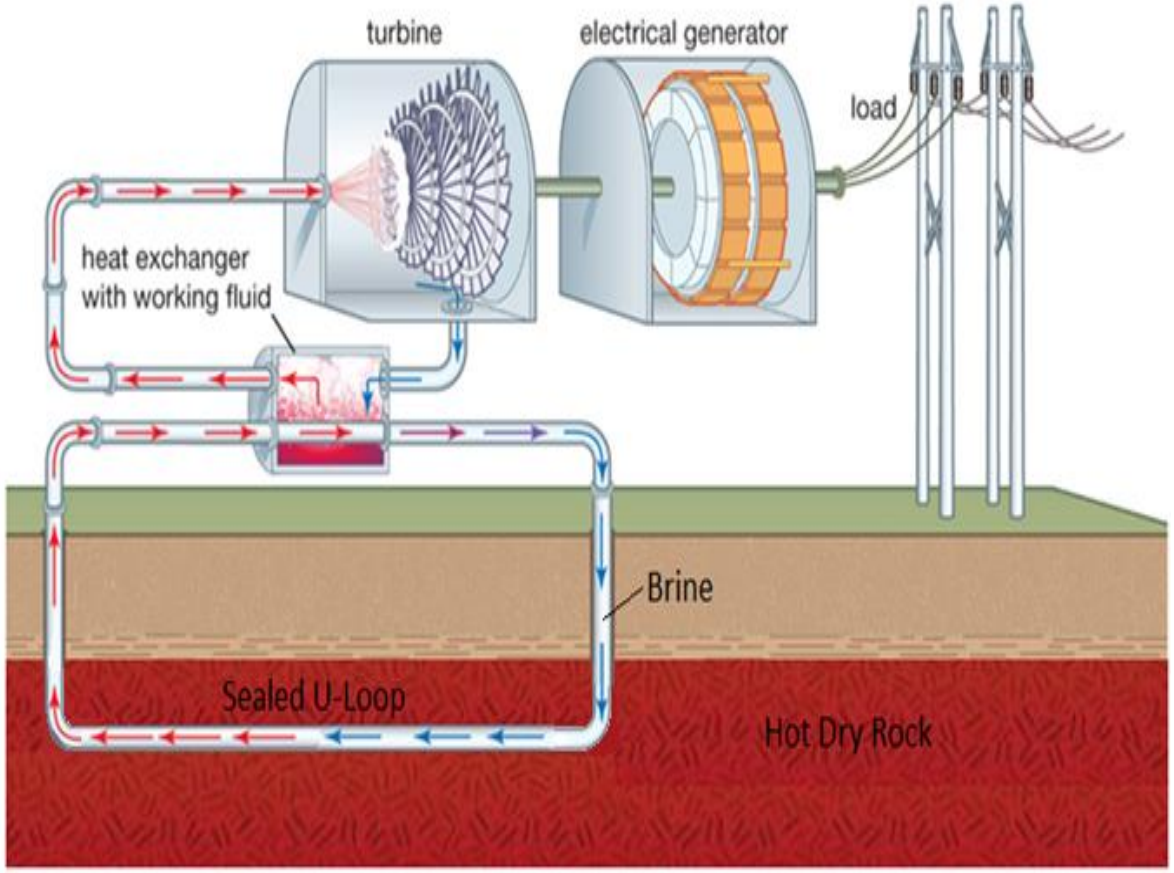
Sealed U - Loop Well Technology

A Successful Geothermal Project requires Temperature and Water Resources

Geothermal Production with Sealed U - Loop Well

- No groundwater is required
- No environmental impact
- No scaling in the casing
- Relevant cost reduction
- Easier permitting and EIA for wells

Geolog Technologies can reduce costs, avoid CO2e emissions and enhance the project feasibility= scalability



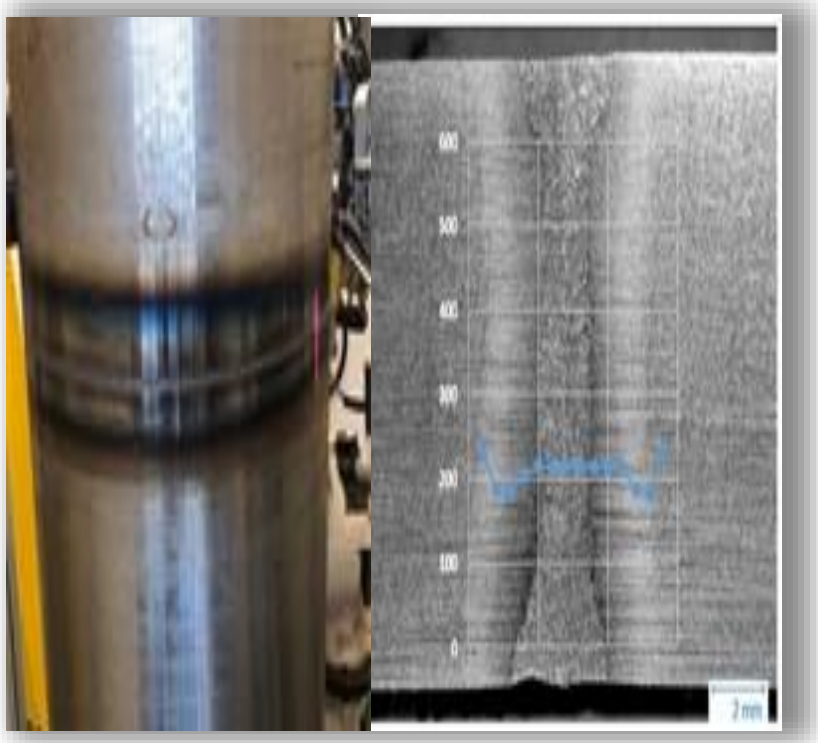
Welded Casing for Sealed U - Loop Wells

40th ANNIVERSARY 1982 - 2022 GEOLOG

IWels Technology advantages:

IWelS
Innovative Welding Solutions

- 100% fluid tight – Saves costs of leaking casing
- Laser Welding time comparable to current casing joint
- No mechanical manufacturing tolerances – low cost
- Chemically joined – No added material
- Strong as the joint tubular – Less failures
- Tolerant of high doglegs –
- Same diameter as the casing – Good Cementation -
- Welded Casing Joints with no weak points at the joints
- Casing cost reduction up to 40%
- Well cost strongly reduced
- Proper slim hole can be executed

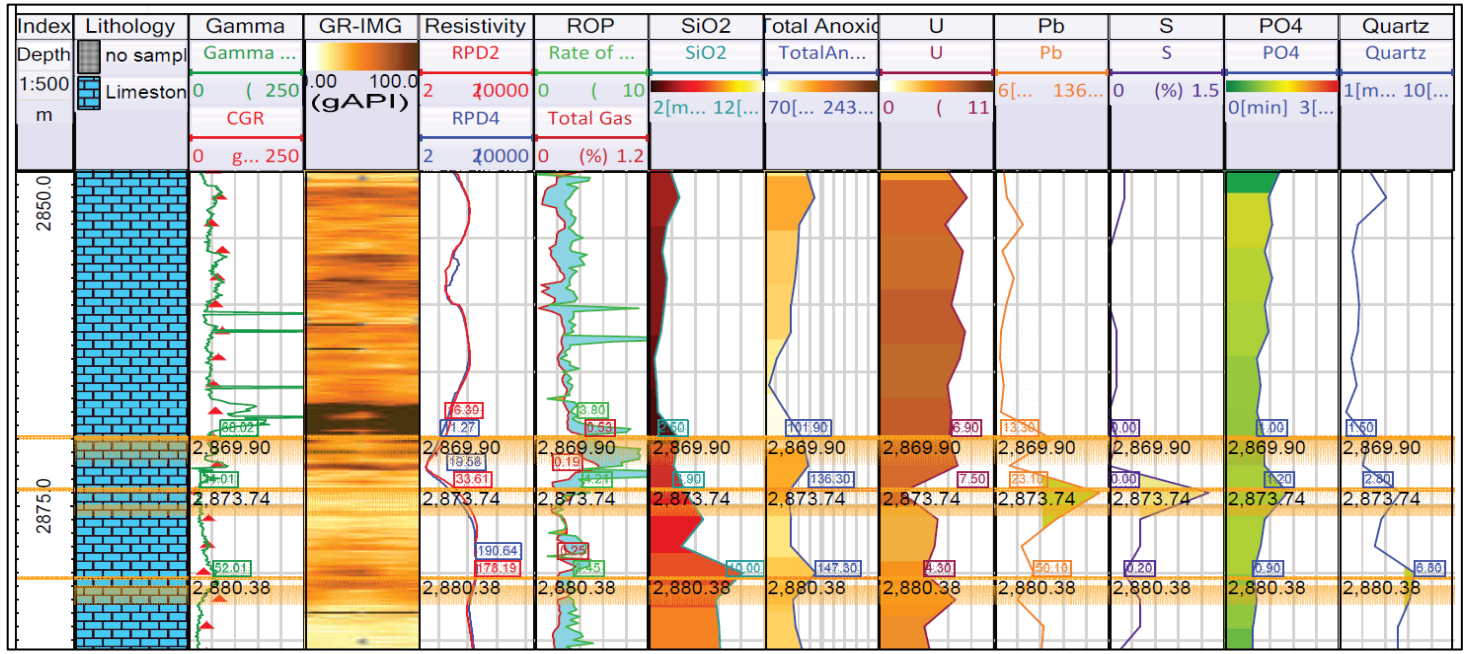


Laser Welded Casing can reduce well construction by 40%

Geothermometers

GEOROX

The elevated temperatures encountered in the geothermal environment limited the utilization of most downhole tools, which face harsh condition that lead to critical failure.



XRF-XRD technologies, coupled with exclusive and proprietary GEOLOG software, identify the specific mineral groups related to temperature ranges within different lithology from the rock cuttings in near-real-time, directly on site for critical drilling decisions

- ❑ Lithological Assessment
- ❑ Geothermal Reservoir Zonation
- ❑ Well placement Assistance (Chemosteering)
- ❑ Correlation with WL/LWD interpretation models
- ❑ Shale stratigraphy
- ❑ cross-well correlation
- ❑ Scaling prevention
- ❑ **Geothermometers study** → **CRITICAL IN HIGH ENTALPHY**

Water and Gas Characterisation

40th ANNIVERSARY 1982 - 2022 GEOLOG

Benefits

Lab Technology focused on specific applications. It is a proven cost savings where expensive multi-phase flowmeters are installed having an alert for fracture closing and water breakthrough, setting the correct reaction plan, and also in geothermal wells, where production from shallow aquifers could be critical for subsidence and interference

Applications

Conventional O&G fields

- ***Injection monitoring - EOR***: injection water is different from formation water and the presence of injected water in time can be monitored to indicate the water breakthrough (*End User: Production Dept. Reservoir Engineer, Reservoir Geologist*)
- ***Fluid allocation***: when more than one well is producing, the contribution of each well can be allocated through oil, but produced water can complete the allocation (*End User: Production Dept., Reservoir Production Engineer*)

Unconventional O&G fields (*Well phase: during production*)

- ***DRV – drained rock volume***: with the same approach of oil DRV, different layers might have different kinds of water and the monitoring will indicate which reservoir zone is producing and how much this is changing over time
- ***Fracking monitoring***: fracking water is different from formation water, fracture opening and closing can be monitored by tracing some proxies

Geothermal wells

- ***Aquifer monitoring***: from which aquifer is the produced water coming from? Is it changing over time?
- ***Injection monitoring***

also E*nvironmental application*, monitoring of water quality before disposal; **scaling potential** from the producing fluids

GEOLOG

Surface Logging Services
Drilling Solutions
Lab Studies
Innovation Hub

40th ANNIVERSARY 1982 - 2022

www.geolog.com