Kaus, Andreas (Baker Hughes)

NEUE ENTWICKLUNGEN FÜR DIE (TIEFEN-)GEOTHERMIE IM SEDIMENT UND IM KRISTALLIN

The future of deep geothermal projects presents unique challenges for service companies such as Baker Hughes and others. Central to these challenges are the Great Shift Change, characterized by a significant demographic shift in the workforce, and the increasing pressure to reduce costs amidst the energy transition. As experienced professionals retire, there is a critical need for transferring knowledge to a younger, less experienced workforce, which can impede operational efficiency and innovation. Concurrently, the imperative to minimize expenses necessitates the adoption of advanced technologies and streamlined processes. To address these issues, improving the efficiency of drilling operations is paramount. Enhanced drilling technologies, such as advanced drill bits and high-temperature tools, are essential for navigating the demanding conditions of deep geothermal wells.

Additionally, the integration of artificial intelligence (AI) and machine learning offers substantial benefits. AI can optimize drilling parameters in real-time, predict equipment failures, and facilitate remote monitoring, thereby reducing down-time and operational costs. Furthermore, digital twin technology, which creates a virtual model of the drilling process, enables precise simulation and planning, leading to more efficient and safer operations. Automation and robotics also play a crucial role in enhancing productivity and mitigating human error, especially in hazardous environments. The implementation of these innovative solutions not only addresses the operational challenges posed by the workforce shift and cost reduction pressures but also contributes to the broader objective of the energy transition. As the world increasingly relies on renewable energy sources, geothermal energy stands out as a vital component of the sustainable energy mix. Without the successful exploitation of geothermal resources, achieving global energy transition goals would be unattainable. In conclusion, service companies must leverage technological advancements and foster a new generation of skilled professionals to overcome the challenges in deep geothermal projects. Through such strategic approaches, they can ensure their pivotal role in the global shift towards a sustainable energy future.

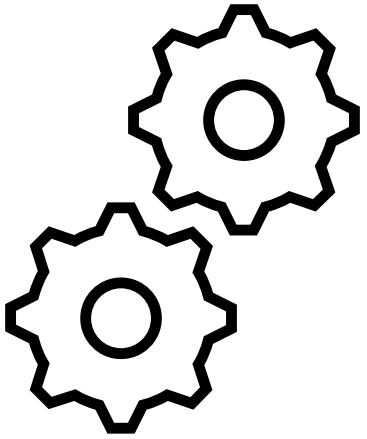
Tiefe Geothermiebohrungen
Herausforderungen und Neuentwicklungen

Dr. Andreas Kaus

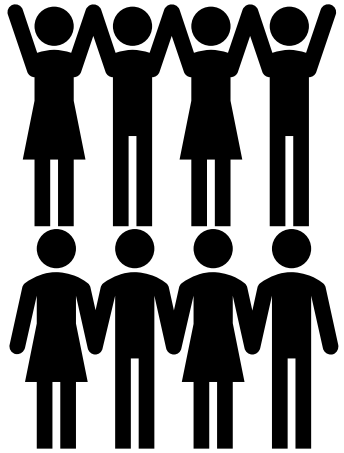
07. Juni 2024

Zwei Herausforderungen

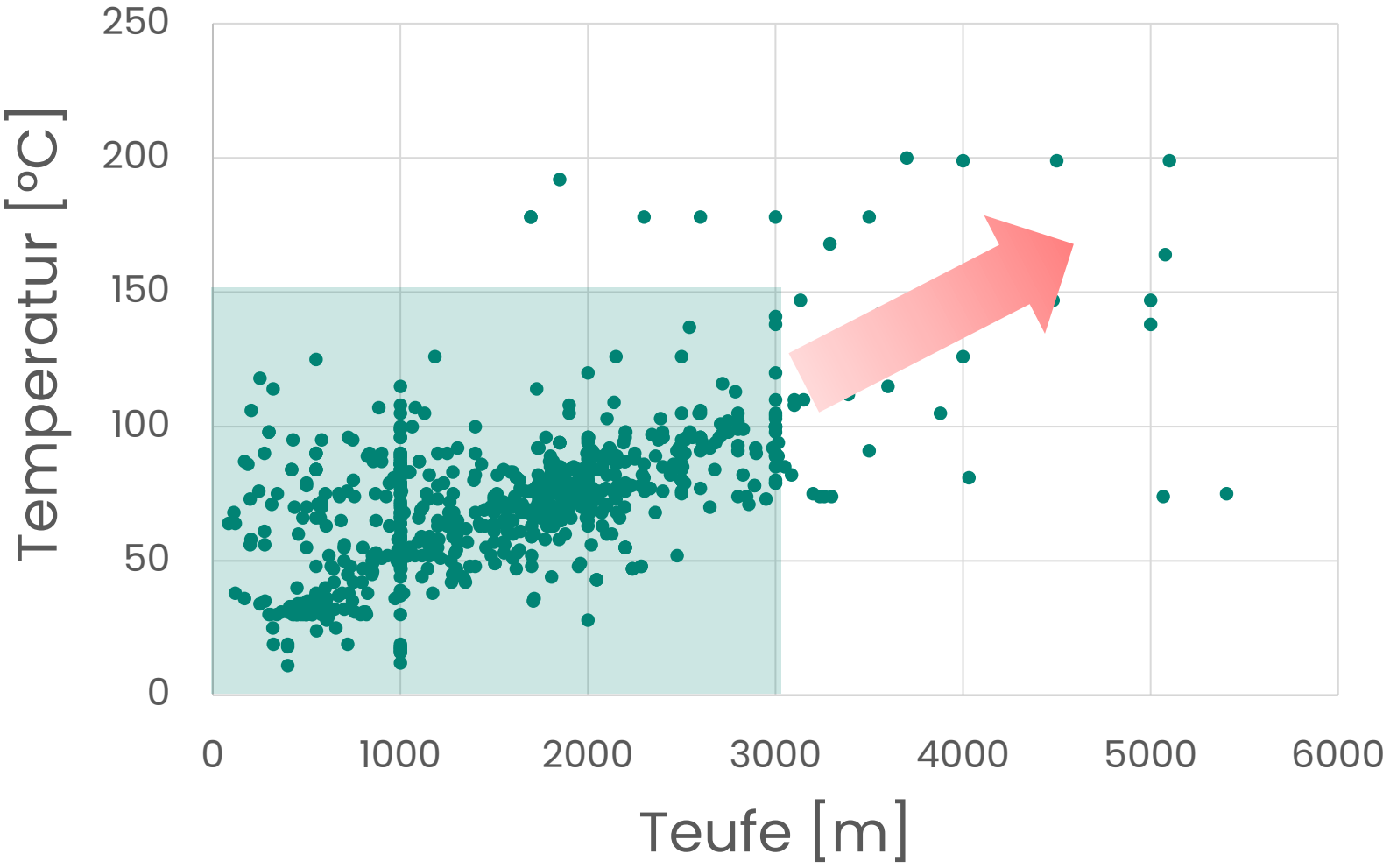
Technisch



Demografisch



Geothermie in Europa



Beispiel 1: Die Elektronik

Benötigt für:

- Orientierung
- Steuerung
- Messung

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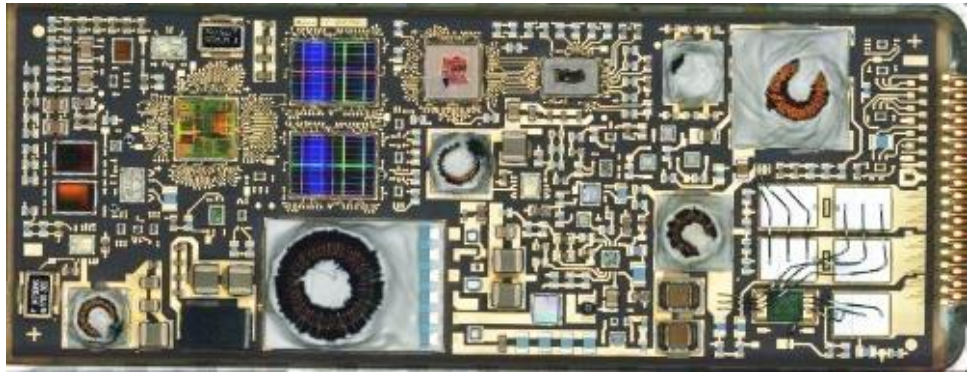
Hochtemperatur Elektronik

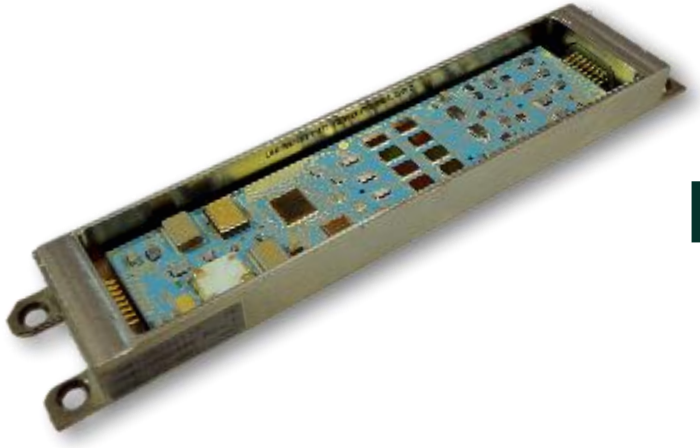
Alt PCBM



Schwächen
- Kunstoff
- Größe
- 150 °C Max

Neu

MCM

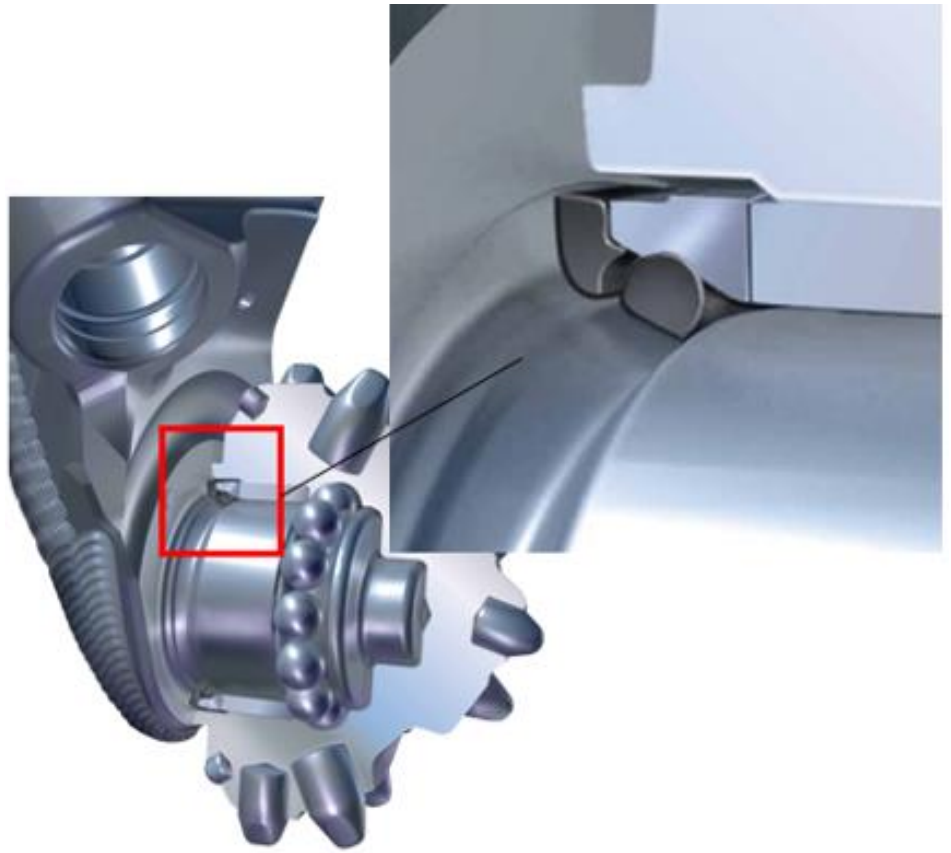


Stärken
- Sehr Robust
- Größe
- 200 °C
- 250 °C (ASICs)

Beispiel 2: Meisel

Stärken:

- Robuster
- Bis 290 °C



Extended life drill bit

Stable drilling in harsh environments

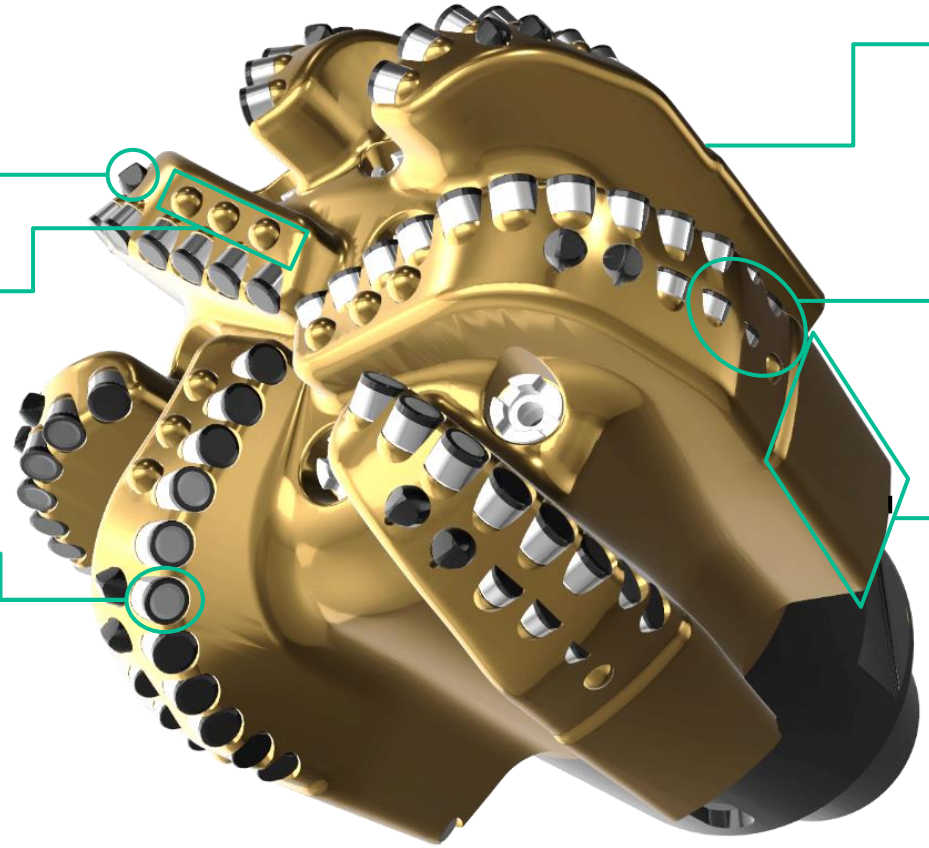
StayTrue diamond elements

Extreme overload protection

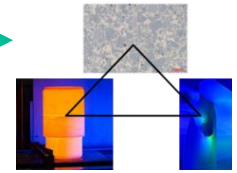
Tough cutters that keep going

Dynamus cutters

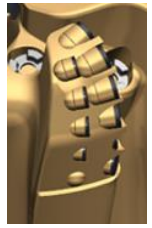
StayCool 2.0



Durable frame reduces risk



Tough matrix body



Shoulder/gauge protection

Gauge pad protection

Kein Aspekt der nicht angepasst werden muss

Downhole motors

Drilling Fluids

High Temperature Packers and Seals

Well Testing

Wireline Services

Cement

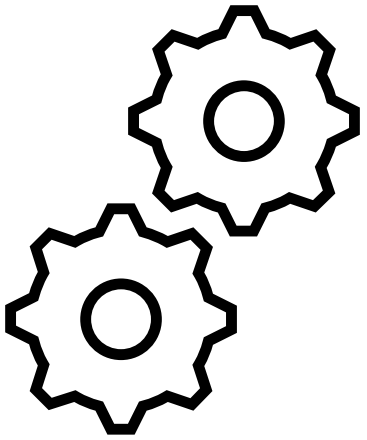
Casing and tubing

Thermally insulated drillpipes

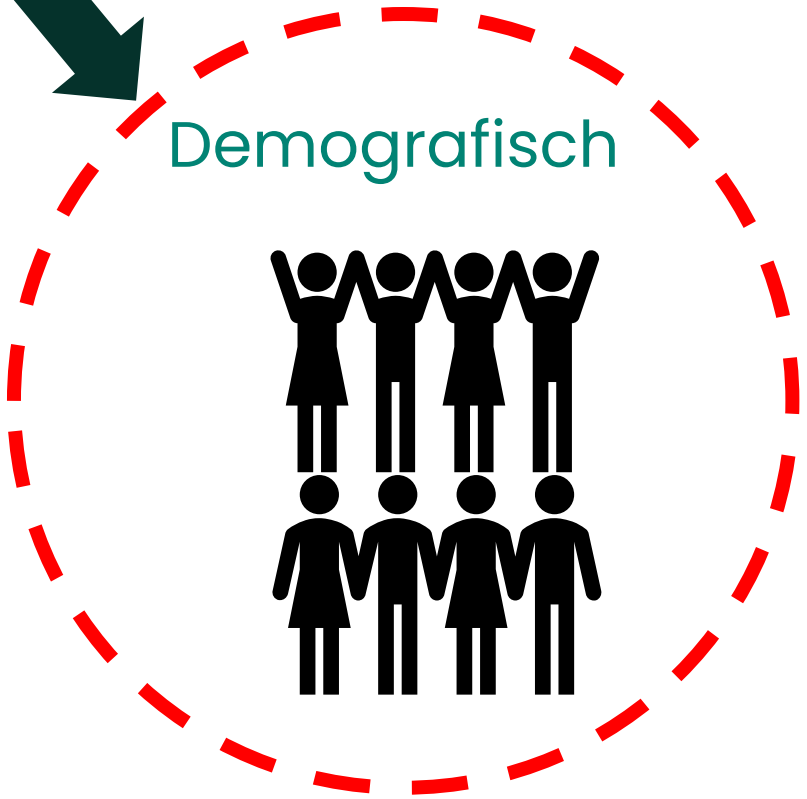
Corrosion and Scaling Management

Zwei Herausforderungen

Technisch

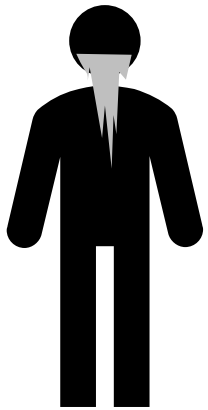


Demografisch



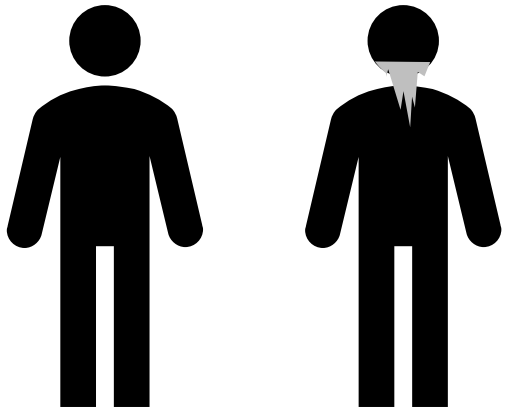
The Great Crew Change

50%



Ca. 50% der O&G Arbeitskräfte gehen in den nächsten Jahren in Rente

<35 ⟷ 55+



Großer Altersunterschied

2:1

Für jeden neuen Mitarbeiter gehen zwei in Rente

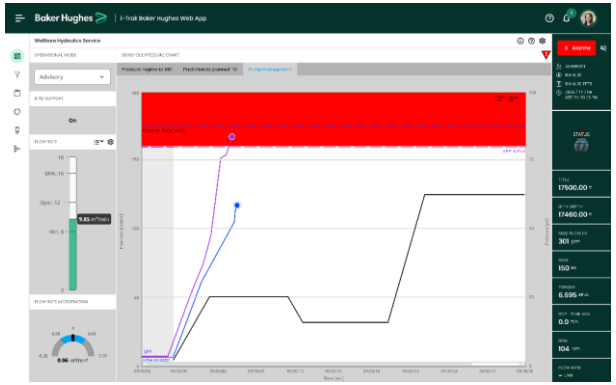
The Great Crew Change

Kostendruck

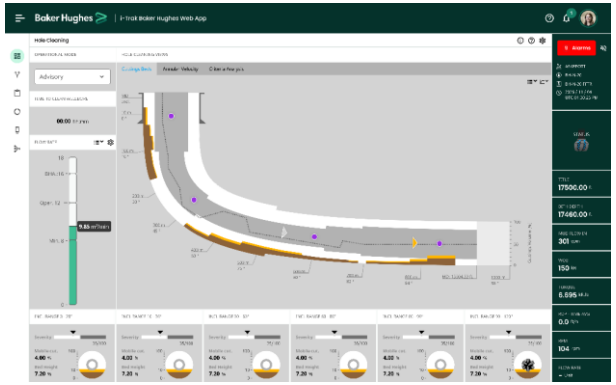
Dekarbonisierung

Ist Digitalisierung die Lösung?

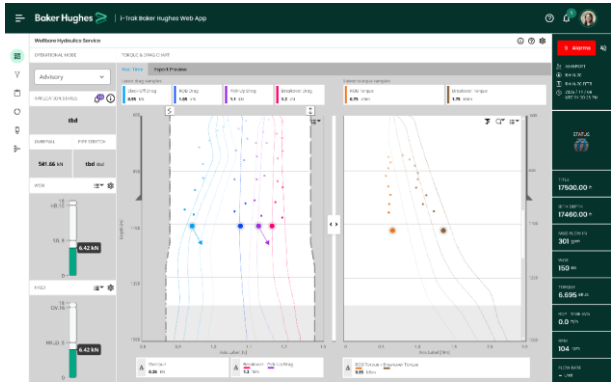
Borehole Pressure – pump-ramp up control including gel breaking and fill pipe



Hole Cleaning – transient cuttings modelling, predicted time-to-clean wellbore, ASM visualization

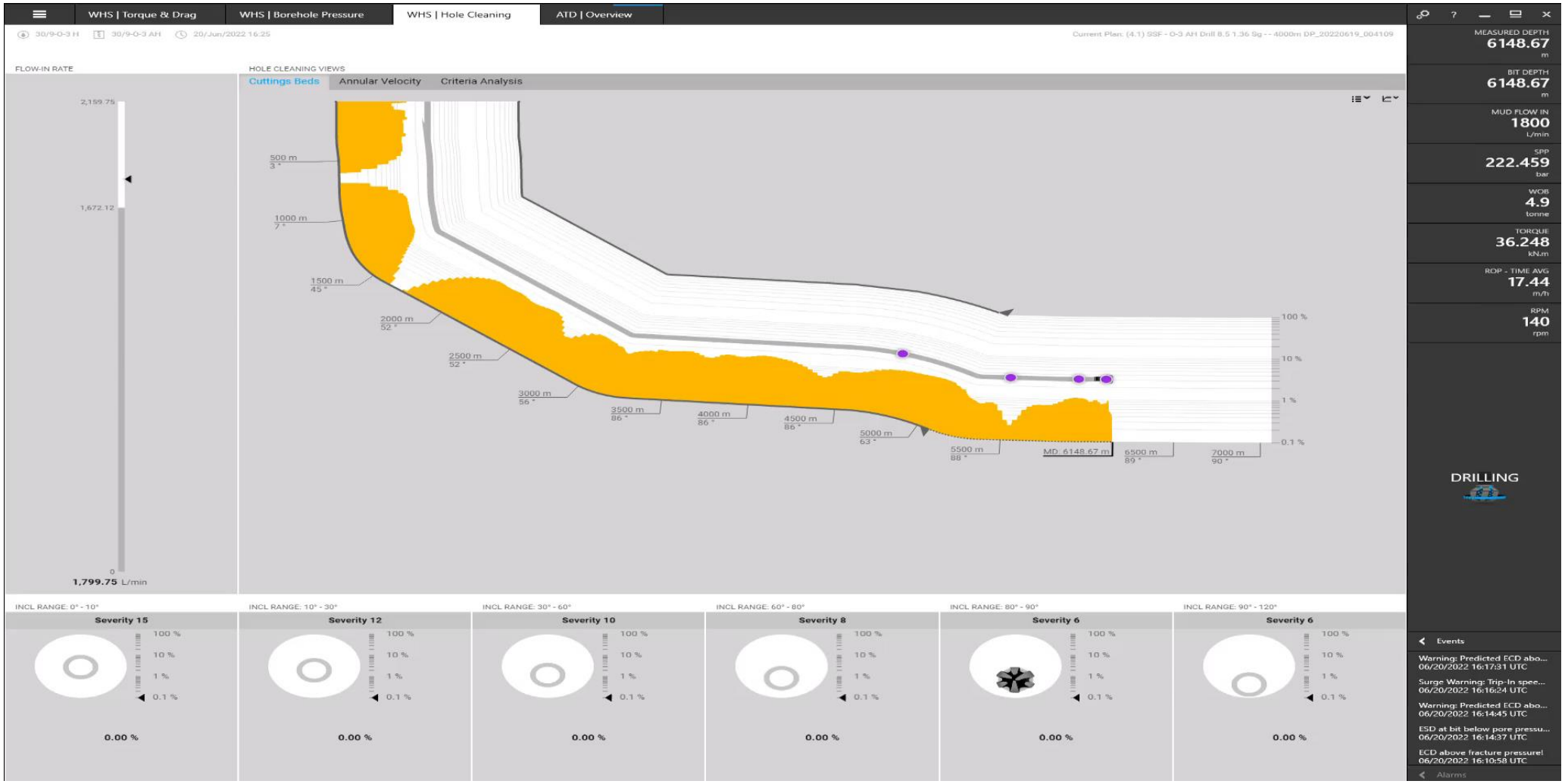


Torque & Drag – Overpull and over-torque protection, pipe stretch supplied for NOVOS

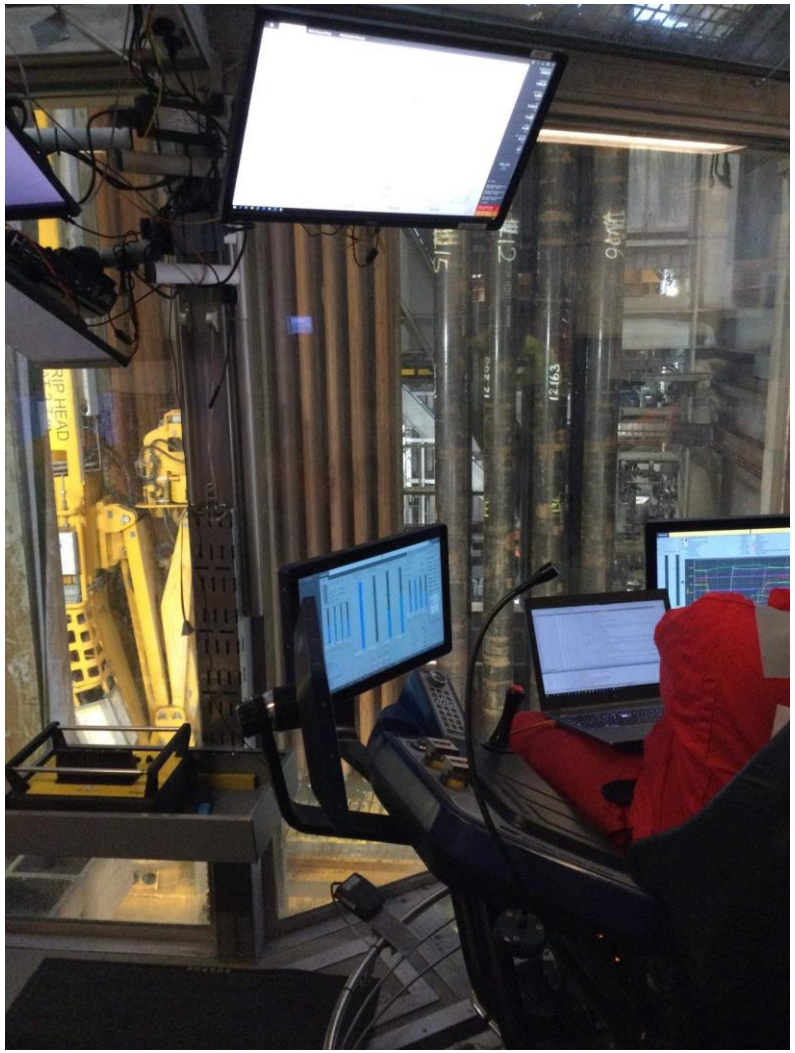


ROP Optimization – WOB & RPM control for VSS mitigation and ROP optimization

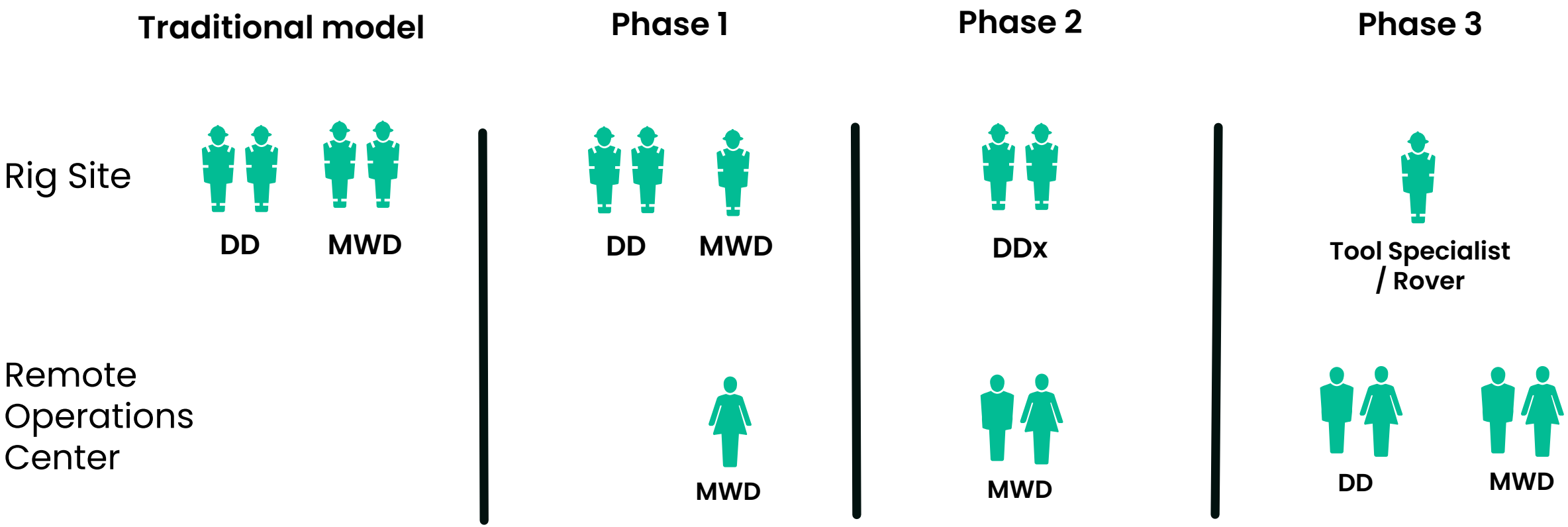
Beispiel: Hole Cleaning



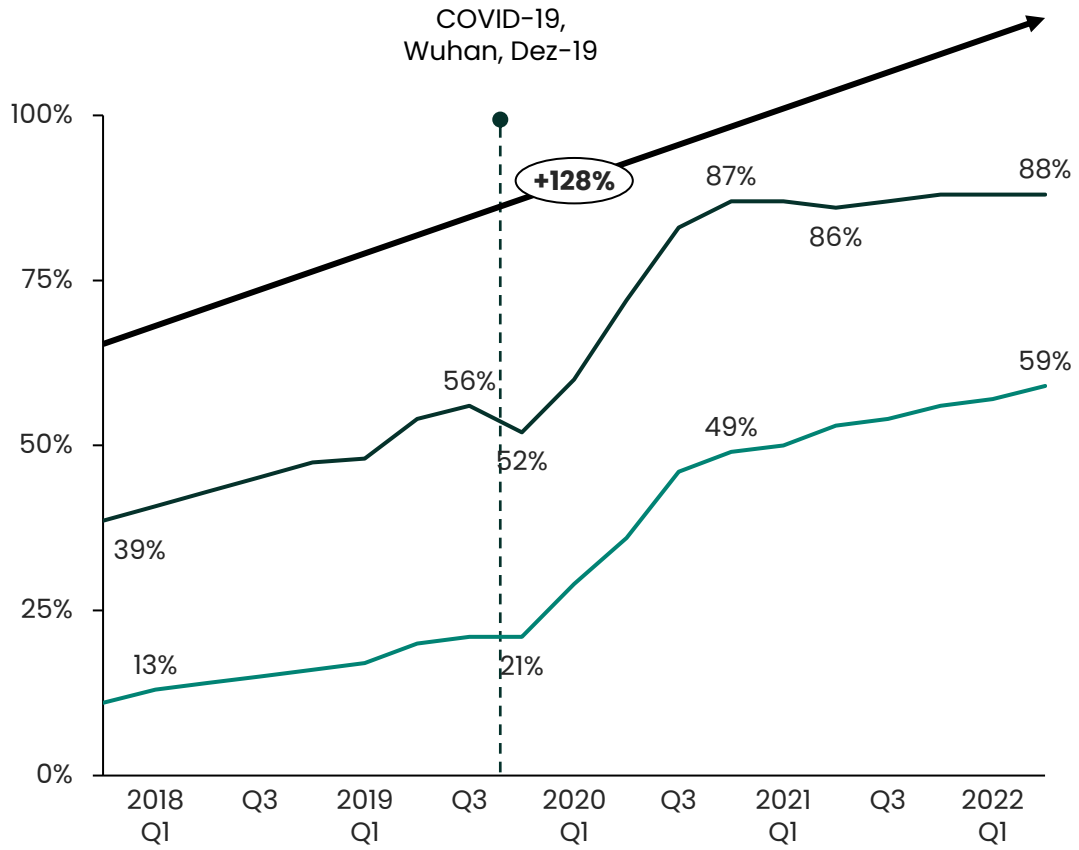

SWL GRIP HEAD
12163


GRIP HEAD
12163

Remote Operations – Beispiel Richtbohrservice



Remote-Operations sind kein Hindernis



Penetration
Einsätze in % mit mindestens einer Schicht in Remote OPS

Intensität
Prozent der Schichten pro Einsatz in Remote Centre

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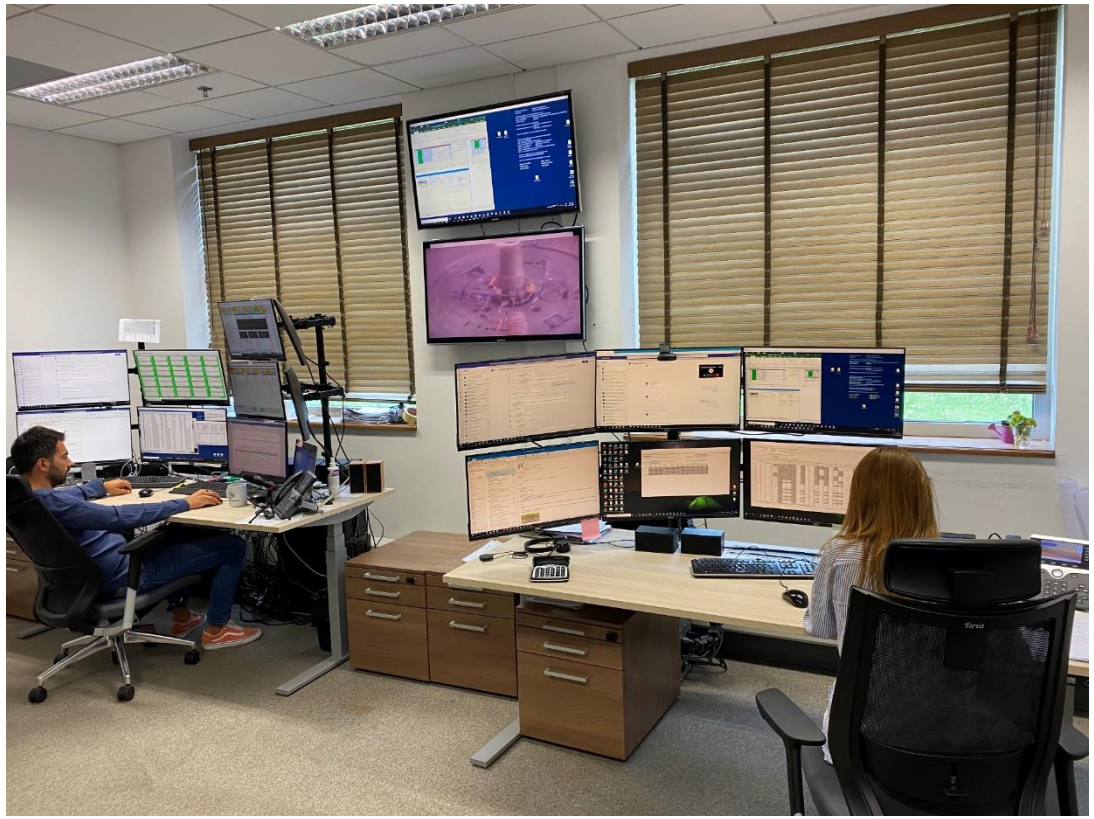
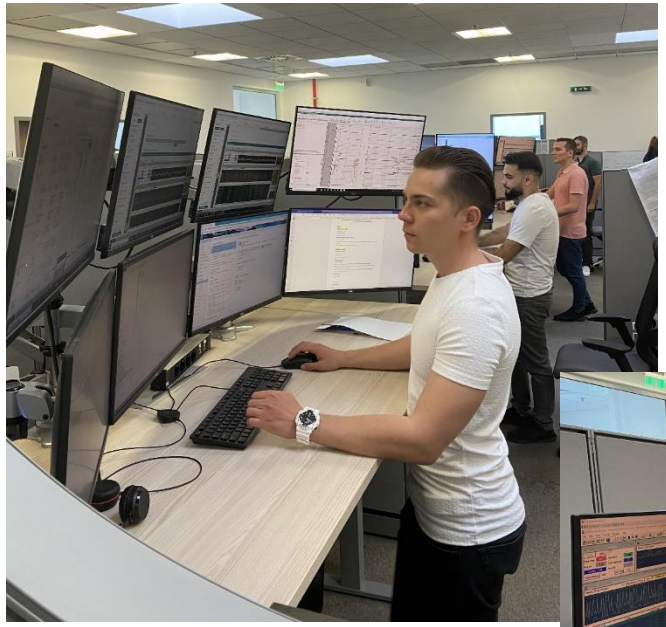
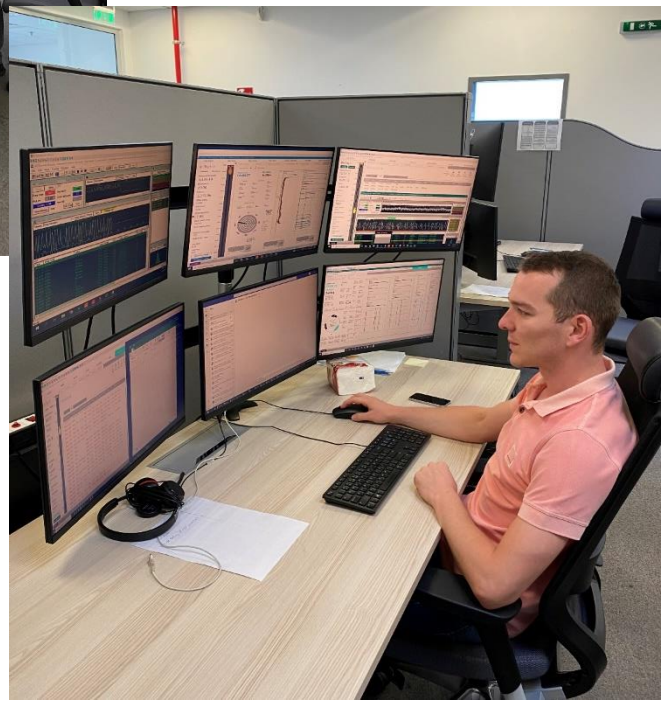
Remote Operations Centre

- Backup Generatoren
- High Speed Internet
- Mehrere Glasfaserkabel

Remote Operations Centre







Tiefe Geothermiebohrungen Herausforderungen und Neuentwicklungen - Fazit

- Anforderungen aus Erdöl/Erdgas und Geothermie überlappen sich.
- Kontinuierliche Verbesserung der Zuverlässigkeit bei höheren Temperaturen findet statt.
- Digitalisierung als wichtiger Baustein, um Auswirkungen des Great Crew Change entgegenzuwirken.
- Traditionelle Betriebsmodelle werden durch Remote-Operations ergänzt

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