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Ortenauhalle Kongress 1
Tiefe Geothermie

Thursday, 26 February 2026, 3.40 pm
Ortenauhalle Congress 1
Deep geothermal energy

AI-Driven Vibration Monitoring: Enhancing Safety and Reliability in Casing While Drilling Operations

KI-gestützte Schwingungsüberwachung: Verbesserung der Sicherheit und Zuverlässigkeit von Bohrgehäusen während Bohrarbeiten

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Casing drilling offers significant advantages in reducing non-productive time (NPT) and improving wellbore stability, especially in high-risk environments such as geothermal and unconventional fields. However, its broader deployment has been constrained by reliability concerns—primarily fatigue-related failures in casing connections caused by undetected vibrations and shock loads.

Argentina's O&G operators use massively casing drilling technology to reduce risks and improve efficiency. Up today, more than 60% of the wells (+400) use this technology in at least one of its sections. Part of the success is related to the improved reliability of the components, in particular casing connections.

This paper introduces a reliability-centric innovation: a real-time vibration monitoring system that integrates high-frequency sensors with artificial intelligence (AI) models. The system captures detailed torque and acceleration data, enabling early detection of harmful vibrational patterns that could compromise casing integrity. Unlike traditional monitoring tools, this solution empowers operators to make immediate adjustments to drilling parameters, significantly reducing the risk of connection failure.

Field implementation in Argentina demonstrated a marked improvement in operational reliability under heavy losses drilling. With more than 35 successful operations compared to 18% of failure rate at first stages. The AI model, trained on historical data, provides actionable insights on real time to prevent damage to the connections.

By proactively managing these risks, this technology enhances the safety profile of casing drilling operations, making it a viable option for geothermal drilling where circulation losses and unstable formations pose serious hazards. The system represents a step change in casing drilling safety, offering geothermal operators a proven path to safer, more efficient well construction.