HUB TECH IA

Deliverable report 7

AI and IAGEN Application Use Case

Optimization of Drilling Conditions in Relation to Water Activities and Oil in Vaca Muerta, Neuquén

Executive Summary: Application of Generative Artificial Intelligence in Optimization Drilling Conditions in Relation to Water and Oil Activities.

This executive summary presents an application of Generative Artificial Intelligence (IAGEN) in the oil and gas sector, with a focus on optimizing the drilling conditions in the Vaca Muerta formation, in the province of Neuquén, Argentina. This technology is emerging as a strategic opportunity to improve the efficiency, reduce risks and costs, and boost productivity in one of the the world's most important unconventional hydrocarbon deposits.

The report ranks the application according to four main criteria:

- Primary resource: Oil (water and energy as secondary resources).
- Activity: Optimization of production processes.
- Technology type: Generative AI and machine learning algorithms.
- Strategic impact: Optimization of production and infrastructure.

1. Specific opportunities for using AI and AIGEN in the sector:

Opportunities for using Generative Artificial Intelligence (GENAI) in the sector oil and gas, specifically in Vaca Muerta, are extensive and strategic. This Technology enables real-time optimization of critical parameters drilling, such as pressure, rotation speed and weight on the bit, contributing to greater operational efficiency. It also enables geosteering autonomous (geosteering), guiding the drilling path towards areas of the subsurface with increased productivity through real-time data integration. IAGEN also facilitates intelligent well planning and design completions, by leveraging predictive models built from data historical and geological.

In addition, it allows for the early detection of operational risks, such as the loss of fluids or wellbore instability, which improves incident response capacity. Finally, its application in autonomous drilling systems reduces the need for direct human intervention, promoting safer operations and efficient.

2. Expected benefits:

- Improved rate of penetration (ROP) and reduced non-productive time.
- Increased well productivity through better location and completion design.
- Reduction of equipment wear and downtime planned.
- Greater operational safety through risk anticipation and mitigation.
- Optimization of the use of resources such as water and energy.

3. Application of AI.

IAGEN is implemented through models trained with large volumes of historical and real-time data. These models allow for generating recommendations Automatic or assisted decision-making during drilling. Techniques such as deep learning, reinforcement learning, and the use of twins are used. digital to simulate scenarios and anticipate results.

4. Proposed AI agent and its function.

The report proposes a Drilling Parameter Optimization Agent in Real Time, whose main function is to dynamically adjust critical variables such as the weight on the bit, the mud pressure and the rotation speed. This agent uses Reinforcement learning algorithms and sensor data to maximize efficiency drilling and reduce operational risk. Its implementation allows for action autonomously or assisted, integrating simulations and continuous feedback.

5. Conclusion.

The adoption of IAGEN in the Vaca Muerta drilling operations represents a key innovation to address technical, economic and environmental challenges of the sector. Although there are barriers such as data integration, training of the Human talent and technological infrastructure, the transformative potential of IAGEN justifies a progressive implementation strategy. Its application can consolidate Vaca Muerta as a model of efficiency, sustainability and technological leadership in the energy industry.