



Deliverable report 42

AI and IAGEN Application Use Case

Rig Automation: Adjust Drilling Conditions

Executive Summary – IAGEN Application for Condition Adjustment

Drilling in Vaca Muerta

This executive summary presents a strategic application of generative artificial intelligence (GENI) in the energy sector, specifically in rig automation to fine-tune drilling conditions in the Vaca Muerta formation.

This is a key opportunity to optimize critical processes and improve efficiency operational and reduce risks in one of the main unconventional reserves of oil and gas in the world.

Use case classification

The report classifies this IAGEN application according to four dimensions:

1. By main resource: oil and gas (main), water and energy (secondary).
2. By activity: optimization of production processes.
3. By technology: generative AI models (LLMs, GANs, Transformers, models diffusion), machine learning, computer vision systems, agents smart and data integration platforms.
4. By strategic impact: optimization of production and infrastructure.

1. Opportunities for using AI and IAGEN in the sector

The applications cover all phases of the production cycle: generation of production plans optimal drilling, geohazard prediction, reservoir simulation, predictive equipment maintenance, logistics and energy network optimization.

IAGEN allows you to interpret seismic, historical and real-time data to make informed decisions. more accurate decisions, identify anomalies, anticipate failures and maximize the performance of each well.

2. Expected benefits

The use of these technologies allows:

- Reduce operating costs in drilling, logistics and maintenance.
- Increase hydrocarbon efficiency and recovery.
- Minimize downtime due to operational failures.
- Improve safety and reduce polluting emissions.
- Streamline strategic decision-making with greater data support.

3. Application of AI

AI is implemented in workflows that integrate sensors, predictive models and generative algorithms to automatically adjust critical drilling variables such as weight on the drill bit, rotation speed and tilt angle. Also generates production simulations and intervention recommendations, based on the continuous learning from operational data.

4. Proposed AI Agent

The report proposes the development of an intelligent agent powered by IAGEN that It operates as an autonomous system for drilling optimization in Vaca Muerta. This agent collects and preprocesses historical well data (pressure, temperature, production rate, and geological characteristics), trains predictive models such as GANs and machine learning algorithms, and generates simulations for

anticipate the future behavior of each well under different operating conditions.

Its main function is to assist in technical decision making, recommending optimal drilling parameters (such as weight on bit or tilt angle) and anticipating production drops based on real-time analysis. It integrates with existing monitoring platforms and allows operational strategies to be adjusted accordingly dynamic, reducing risks, improving efficiency and extending the useful life of the assets.

5. Conclusion

The incorporation of generative artificial intelligence in Vaca Muerta represents a leap forward qualitative towards a more precise, proactive and sustainable energy operation. This Digital transformation not only improves Argentina's competitiveness in the market global energy sector, but also positions the country as a benchmark in the adoption AI strategy for the efficient exploitation of unconventional resources.