HUB TECH IA

Deliverable report 47

AI and IAGEN Application Use Case

Hydraulic Fracturing Design and Propagation Modeling Fractures to Optimize Inputs

Executive Summary – Application of IAGEN in Hydraulic Fracturing Design in Dead Cow

This executive summary presents a strategic application of generative artificial intelligence (IAGEN) in the energy sector, specifically in the design of Hydraulic fracturing and fracture propagation modeling to optimize inputs. This application represents a key opportunity for Vaca Muerta, by offering advanced solutions to improve efficiency, reduce risks and promote a more sustainable exploitation of its unconventional resources.

Use case classification

The report classifies this IAGEN application based on the following axes:

1. By main resource: oil, gas, water and energy (comprehensive approach).
2. By activity: optimization of production processes.
3. By technology: generative AI models, machine learning, platforms data integration, intelligent agent systems and artificial vision.
4. By strategic impact: optimization of production and infrastructure.

1. Opportunities for using AI and IAGEN in the sector

Key opportunities include fracture propagation prediction,
optimization of water and additive use, real-time monitoring, risk analysis and
scenario simulation. IAGEN allows for the generation of predictive models based on
geological and operational data, improving decision making in high-pressure environments
complexity and uncertainty.

2. Expected benefits

The implementation of these technologies allows:

- Increase hydrocarbon production through more efficient design of fracturing.
- Optimize the use of resources, minimizing water consumption and the amount of chemical additives.
- Improve operational safety through real-time monitoring and prediction of critical events.
- Reduce the environmental impact and emissions associated with operations.

3. Application of AI

AI is applied through neural networks, genetic algorithms and learning
automatic, which allows you to analyze sensor data, simulate scenarios and adjust
parameters in real time. This technological integration allows for more precise design
of the fracturing stages and greater operational efficiency.

4. Proposed AI Agent

The report proposes the development of an intelligent agent based on IAGEN with
advanced agentic architecture, designed to operate autonomously within the
hydraulic fracturing operational ecosystem. This agent is not limited to executing
predefined tasks, but also has planning and continuous learning capabilities
and real-time decision-making, interacting with multiple data sources
—such as downhole sensors, analytics platforms, and operational management systems—

to adapt its actions to the changing context of the site. Its design includes
Integration with existing workflows, enabling task orchestration
between humans and digital systems, and facilitating fluid collaboration in environments
of high technical complexity.

Its main function is to assist in the design, execution and continuous monitoring of the
fracturing operations, dynamically adjusting key parameters such as flow rate
injection, type and quantity of additives, or stage configuration according to the
geological and operational conditions in real time. Thanks to its capabilities
predictive, this agent can anticipate risks, propose more efficient alternatives, and
trigger alerts in case of critical deviations, all with supervised autonomy.
The core benefit lies in its potential to transform the operating model,
providing traceability, efficiency and resilience to Vaca Muerta's operations,
while reducing dependence on human intervention in routine or high-volume tasks.
cognitive load.

5. Conclusion

The adoption of IAGEN in Vaca Muerta allows an evolution towards an exploitation
more efficient, safer and sustainable. Faced with geological, environmental and
operational, artificial intelligence offers a decisive advantage by facilitating decisions
data-driven, optimize resource use, and reduce risks. Its implementation
consolidates a digital transformation that enhances energy productivity and
environmental sustainability of one of the country's most strategic deposits.