HUB TECH IA

Deliverable report 48

AI and IAGEN Application Use Case

Predictive Maintenance in Vaca Muerta: Early Failure Detection in Teams with Machine Learning

Executive Summary – Application of AI and IAGEN for Predictive Maintenance in Dead Cow

This executive summary presents a strategic application of artificial intelligence (AI) and generative artificial intelligence (IAGEN) in the energy sector, specifically in the predictive maintenance of critical equipment used in oil production and Gas in Vaca Muerta. This represents a significant opportunity to optimize operations. from one of the most important unconventional deposits in the world.

Use case classification

The report classifies this application of AI and IAGEN according to the following axes:

1. By main resource: Oil and gas.
2. By activity: Optimization of production processes.
3. By technology: Machine learning, generative AI, intelligent agents and data integration platforms.
4. By strategic impact: Optimization of production and infrastructure.

1. Opportunities for using AI and IAGEN in the sector

Predictive maintenance allows early detection of equipment failures.
critical devices such as compressors, pumps and rotary units by using data from
sensors and machine learning algorithms. These opportunities include detection of
anomalies, fault diagnosis, remaining life estimation and recommendations
automated. The use of generative AI to generate alerts is also highlighted,
dashboards, and assist in operational decision-making.

2. Expected benefits

Among the highlighted benefits are the improvement in operational availability
of the equipment, extending its useful life, optimizing energy consumption and
resources, reducing unplanned downtime, preventing failures
catastrophic events and improving the safety and sustainability of operations.

3. Application of AI

The proposed approach articulates a technological ecosystem composed of IoT sensors,
Machine learning models and automated analysis workflows. The captured data
In the field they are processed and integrated into predictive systems that generate alerts and
real-time recommendations. Algorithms such as neural networks are used,
decision trees and clustering, adapted to the particular conditions of the
deposit.

4. Proposed AI Agent

The report proposes the development of a system of autonomous agents driven by
IAGEN, designed to operate in complex and highly dynamic environments such as those
from Vaca Muerta. This system includes:

- A data ingestion agent, which captures and transmits information from
  distributed sensors.
- A predictive analytics agent, which applies ML models to anticipate failures.
- An operational management agent, who communicates alerts, suggests interventions and
  coordinates maintenance plans.

These agents act collaboratively in agentic workflows, and allow automate production processes from start to finish. Its main advantage lies in the operational autonomy, scalability and ability to integrate with existing systems existing. This makes them key tools for transforming the management of industrial assets in the energy sector.

5. Conclusion

The application of AI and IAGEN in predictive maintenance represents an evolution fundamental technological innovation for the hydrocarbon industry in Vaca Muerta. Its Adoption allows replacing reactive practices with data-driven strategies, increasing efficiency, reducing costs and strengthening security. This Digital transformation also contributes to a more sustainable exploitation of resources. national energy resources.