AI and IAGEN Application Use Case

Machinery fault detection - Diagnostics in Vaca Muerta

Executive Summary – IAGEN Application for Fault Diagnosis in Machinery in Vaca Muerta

This executive summary presents a strategic application of artificial intelligence generative (IAGEN) in the energy sector, focused on fault diagnosis in critical machinery within the Vaca Muerta operation. This represents a concrete opportunity to improve operational efficiency, reduce risks and strengthen the sustainability of one of the main production areas of unconventional hydrocarbons in the world.

Use case classification

The report classifies this IAGEN application based on four axes:

1. By main resource: oil and gas.
2. By activity: optimization of production processes.
3. By technology: generative AI models, machine learning algorithms, data integration and big data, and language processing natural.
4. By strategic impact: optimization of production and infrastructure.

1. Opportunities for using AI and IAGEN in the sector

Specific opportunities include automatic fault detection mechanics, generation of real-time diagnostics, prediction of future failures

through machine learning, technical solution suggestion and risk analysis environmental. In addition, the automation of maintenance tasks and the integration with systems such as SCADA, ERPs and IoT sensors.

2. Expected benefits

The implementation of IAGEN in the diagnosis of faults in Vaca Muerta generates the following: following concrete benefits:

- Reduction in diagnostic time: allows you to move from diagnoses that Previously, they took days to get real-time results, accelerating the response to faults.
- Reduction of operating costs: by anticipating failures, the emergency repairs and optimizes the use of resources in maintenance.
- Improved operational safety: Early detection of anomalies helps prevent incidents that could affect personnel or the environment.
- Facilitation of strategic decisions: provides reliable and timely for maintenance planning and asset management.
- Transition to predictive maintenance: drives a change from a reactive approach to a proactive one, increasing availability and equipment efficiency.
- Contribution to sustainability: by improving energy efficiency and reducing emissions, favors a more environmentally friendly operation.

3. Application of AI

The application integrates multiple technologies: models such as GPT-4 for analysis technical, machine learning algorithms for learning historical patterns, RPA for data collection automation, APIs for connecting to systems industrial, and specialized tools for corrosion analysis. All of this is articulated in an agile workflow that includes extraction, processing, diagnosis, notification and continuous feedback.

4. Proposed AI Agent

The report proposes the implementation of an agentic flow composed of four specialized agents who operate in a coordinated manner. The Extraction Agent collects real-time data from sensors installed on equipment such as pumps, pipelines and drills, as well as historical records of maintenance and SCADA systems. The Analytical Agent then processes this information using IAGEN models to identify anomalous patterns, such as unusual variations in pressure or temperature, and predicts incipient faults, for example, blockages in valves or progressive corrosion in pipelines.

Based on this analysis, the Reporting Agent prepares technical diagnoses. detailed with specific maintenance recommendations, while the Integration Agent automatically sends alerts and instructions to teams technicians through existing industrial systems. This architecture allows for rapid and precise response to potential failures, reducing unplanned downtime and maximizing operational availability of assets critics.

5. Conclusion

The implementation of IAGEN for fault diagnosis represents a strategic transformation for Vaca Muerte. This progress allows us to overcome the limitations of traditional methods, facilitating a leap towards models Safer, more efficient, and more sustainable predictive maintenance. Its adoption drives a new era in industrial maintenance management, strengthening competitiveness. country's energy sector in the face of global challenges.