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

Classification of deliverable report 48: "Predictive Maintenance in Vaca Muerta: Early Detection of Equipment Failures with Machine Learning":

Classification 1: By Main Resource

- Selected option: Oil and Gas (main), Water + energy (secondary).
- Justification:

The report focuses on early detection of faults in equipment used in the production and processing of oil and gas in Vaca Muerta. Although it is They mention collateral benefits in energy consumption and sustainability, the The focus is on hydrocarbon infrastructure, so corresponds to a main classification in oil and gas.

Classification 2: By Activity within Vaca Muerta

- Selected option: Optimization of Production Processes
- Justification:

AI-based predictive maintenance improves availability

equipment, reduce operating costs, avoid unscheduled downtime and increase the overall efficiency of operations. These goals correspond directly to the optimization of production processes in the energy sector.

Classification 3: Type of AI Technology Used

- Main selected option:
  2ÿÿMachine Learning Algorithms,
  1ÿÿGenerative AI Models,
  5ÿÿAgent-Based AI Systems, 6ÿÿAI Platforms for
  Data Integration and Big Data, 3ÿÿNatural Language
  Processing (NLP) (secondary).
- Justification:
  Multiple machine learning algorithms are detailed (regression, clustering, decision trees, neural networks), including agentic flows for ingestion, Predictive analytics and decision-making. The use of AI is also mentioned. generative for visualization, dashboards, alert generation and recommendations. All of this forms a hybrid architecture of AI applied to maintenance in an energy context.

Classification 4: By Strategic Impact on the Industry

- Selected option: AI for Production and Quality Optimization
  Infrastructure
- Justification:
  The report shows that applying AI to predictive maintenance reduces costs, extends asset life, improves operational safety, and Reduces critical failures. This has a direct impact on the infrastructure productive and is key to operational continuity and industrial sustainability in Vaca Muerta.

The oil and gas industry is characterized by operating in complex and challenging environments where safety, efficiency and reliability are crucial. In this context, predictive maintenance emerges as an indispensable tool to optimize operations and maximize return on asset investment, especially in unconventional deposits such as Vaca Muerta. This report analyzes in detail the application of predictive maintenance in Vaca Muerta, with a particular focus on early detection of equipment failures through Machine Learning.