HUB TECH IA

Deliverable report 19

AI and IAGEN Application Use Case

Design, Planning and Coordination - Maps, profiles, logistics and Communication in the Oil, Gas and Energy Industry in Vaca Muerta, Neuquén, Argentina

I. Introduction

The oil, gas and energy industry is constantly evolving, seeking new ways to optimize your operations and increase efficiency.

In this context, Generative Artificial Intelligence (AI) emerges as a tool with enormous potential to transform the industry in Vaca Muerta, Neuquén, Argentina. Through its ability to create innovative solutions and original content, Generative AI can improve efficiency, safety, and sustainability in oil and gas operations.

In this paper, we explore the use of Generative AI in design, planning and coordination in the oil, gas and energy industry in Vaca Muerta, with the objective of providing relevant information to the AI Technology Hub in the region.

II. Generative AI Use Cases in the Oil, Gas, and Energy Industry

Generative Artificial Intelligence (GENAI) is a branch of artificial intelligence that focuses on creating new content, such as models, images, code, or text, from existing data. This technology uses advanced algorithms to analyze

large amounts of information, identify patterns and generate new content and original that is often indistinguishable from that created by humans.

Generative AI is being applied in various areas of the oil, gas and energy industry, with the aim of optimizing operations, improving efficiency and security, and reduce environmental impact. Some specific use cases include:

- Drilling Operations Optimization: Generative AI can analyze data geological and operational in real time to predict potential problems and trace An optimal route for drilling management, minimizing environmental risks and improving efficiency. This technology allows for the creation of assistants intelligent conversational tools that guide managers in decision-making, driving efficiency and sustainability in the industry.
- Improved reservoir simulation: Generative AI enables the creation of reservoir models More accurate and detailed simulations, giving engineers deep insight into reservoir behavior and facilitating decision-making informed.
- Predictive equipment maintenance: Generative AI, in combination with IoT technology can analyze sensor data in real time to anticipate maintenance needs, prevent unplanned failures and reduce costs.
- Exploration of new deposits: Generative AI can analyze large amounts of data, including seismic surveys, well logs and images satellites, to identify promising areas for exploration, accelerating the decision-making and risk reduction.
- Regulatory compliance: Generative AI can help companies manage large amounts of information and stay up to date with the latest complex and evolving regulations, ensuring regulatory compliance.
- Drilling strategy design: Generative AI can simulate different drilling strategies. drilling scenarios to identify the most efficient and safe strategies, considering factors such as geology, pressure and temperature.
- Demand Prediction: Generative AI can analyze historical data,

Market trends and geopolitical events to forecast oil demand
and gas, optimizing production and resource allocation.

- Price fluctuation management: Generative AI can analyze data
historical data, market trends and geopolitical indicators to forecast
price movements, facilitating informed decision-making and strategies
flexible to changes in the market.
- Automation of administrative tasks: Generative AI can automate
repetitive administrative tasks, such as invoice processing, improving operational efficiency and
reducing errors.
- Supply chain management: Generative AI can optimize routes, evaluate
suppliers, estimate costs and improve efficiency in supply chain management
supply, facilitating informed decision-making and better planning
precise.

A key aspect that emerges from the research is that generative AI can
provide a competitive advantage in the oil and gas industry by enabling
autonomous operations.

III. Application of AI agents powered by IAGEN in the activity

1. Concept of IAGEN agents

In recent years, generative artificial intelligence (GAI) has revolutionized the way we interact with
technology, enabling the development of systems
capable of generating content, answering complex questions, and assisting with high-demand cognitive
tasks. From this capability, a new architecture emerges
Technological: IAGen-powered agents. These agents are not simple
conversational interfaces, but autonomous systems that can interpret
instructions, make decisions, execute tasks and learn from their interactions with the
around.

An IAGen agent combines large language models with components

additional features such as external tools, memory, planning and autonomous execution. This allows them to operate in complex environments, with the ability to break down objectives in steps, coordinate multiple actions, interact with digital systems (such as databases, APIs or documents) and adapt to changes in context in real time. These qualities distinguish them from traditional chatbots, and open up a spectrum of more sophisticated and customizable applications.

At the organizational level, these agents are being used to automate processes, generate data analysis, assist in decision making and improve the user experience, both internally and externally. For example, they can assume human resources, legal, financial or logistical tasks, and even those linked to the technical areas of production processes, acting as intelligent assistants that collaborate with human teams. This ability to integrate knowledge and execute tasks autonomously transforms the way organizations can scale your operations without losing quality or control.

In addition, agentic workflows—structures where multiple agents collaborate with each other to solve complex problems—allow responsibilities to be distributed between different agent profiles, each with specific functions. This generates Hybrid work environments where humans and agents coexist, optimizing times, costs, and results. The ability to connect agents with tools such as Google Drive, CRMs or document management platforms further expands its capabilities.

The development of IAGen-powered agents represents a crucial step towards a new era of intelligent automation.

Among the benefits of authentic workflows driven by business models generative artificial intelligence, the possibility of automating processes is found complete, end-to-end production systems, and even add value from the leveraging the skills of language models based on these technologies.

However, its implementation also poses technical, ethical and legal challenges,
from responsible design to human oversight. Therefore, understanding your
architecture, its operational logic and potential impacts are essential for its effective and safe adoption in diverse professional contexts.

2. Agentic Flow Design Proposal for Implementation

a. Phases of the Process

- Operational Diagnosis

Data collection on planning, logistics and risks.

Identification of critical points.

- Development of the IAGEN Model

Implementation of generative algorithms for planning.

Creating dynamic maps and diagrams.

- Integration with Existing Tools

Synchronization with GIS, ERP and monitoring systems.

Chatbot setup and automatic reporting.

- Continuous Optimization and Evaluation

Performance analysis using KPIs.

Adjustments based on real-time data.

b. IAGEN Agents Involved

Planning Agent: Creates work maps and schedules.

Logistics Agent: Optimizes distribution of resources and equipment.

Communication Agent: Facilitates real-time interaction.

c. Concrete Example

Use case: Drilling optimization

- Before: Manual planning ÿ errors in team assignment.
- With IAGEN: Automated plan, reduction of logistics costs and improvement in the security.

IV. Impact of Generative AI on the safety of the oil, gas and mining industry energy

Generative AI can have a significant impact on the safety of the industry.
Oil and gas. By optimizing processes and using energy efficiently, AI can reduce the carbon footprint of operations and contribute to a more sustainable future.
green and responsible.

AI can also improve safety by predicting equipment failures through
analysis of sensor data and historical records, allowing maintenance
proactive and avoiding costly unplanned downtime.

In addition, AI can detect oil and hydrocarbon spills by
analysis of satellite images and sensor data, facilitating rapid responses and containment measures to minimize environmental impact.

V. Challenges and Limitations of Using Generative AI

While Generative AI offers great potential for the oil, gas and mining industry, energy, there are also challenges and limitations that must be considered:

- Data availability and quality: Generative AI requires large amounts of data. of high-quality data to be trained. The lack of data or the presence of Erroneous data can affect the accuracy and reliability of models.
- Implementation complexity: The implementation of Generative AI can be complex and require advanced technological infrastructure, as well as the adaptation of processes and organizational culture.
- Short-term investment in AI agent implementation teams

Technology and training: Investment in proof of concept and testing is required pilot. The focus here has to be on training the talent to implement, since A trend towards cost reduction is observed in systems that allow “no code” and “low code” automation. For the first stage, it is also recommends using teams with experience in design and implementation AI agents. Finally, it is key to form an in-house team for the accompaniment and appropriation of an agentic culture that redefines the human-computer interaction.

- Ethical and security considerations: The use of Generative AI raises ethical issues, such as data privacy, algorithmic discrimination and the security of systems. It is crucial to ensure transparency and explainability in AI systems, so that users can understand and trusting decisions made by AI. Furthermore, data privacy protection is critical, and regulations and guidelines must be established.
  ethical measures to protect sensitive information.
- Cost of technology: Generative AI can be expensive to implement and maintain, which can be a barrier for some companies.
- Need for qualified talent: Qualified talent is required to develop, implement and maintain Generative AI solutions.
- Resistance to change: There may be resistance to change on the part of the workers who fear being replaced by AI.
- Technology Dependence: Over-reliance on Generative AI can lead to the loss of human skills and knowledge.
- Environmental impact: Training Generative AI models requires a large amount of energy, which can have a significant environmental impact.
- Regulatory framework: The European Union has published the Artificial Intelligence Act, which classifies AI applications into three risk categories and establishes specific legal requirements for high-risk applications. In addition, the ISO 42001 standard establishes the standards for Management Systems Artificial Intelligence (AIMS) within a company, ensuring the development and

responsible use of systems.

VI. Recommendations

To fully harness the potential of Generative AI in the oil industry,
gas and energy in Vaca Muerta, it is recommended to consider the following actions:

- Promote research and development: Promote research and development of Generative AI solutions specific to the oil, gas and energy industry energy in Vaca Muerta, considering the challenges and opportunities of the region.
- Facilitate technology adoption: Provide support to companies in the region for the adoption of Generative AI, offering training programs, technical advice and access to the necessary infrastructure.
- Develop qualified talent: Promote the training of AI professionals Generative, with a focus on the needs of the oil, gas, and energy industry in Vaca Muerta. Developing a skilled workforce is crucial. for the successful adoption of AI in the oil and gas industry.
- Promote collaboration: Promote collaboration between companies and universities and research institutions for the development of innovative solutions.
- Address ethical considerations: Establish an ethical framework for the use of AI Generative in the industry, considering data privacy, security and responsibility.
- Disseminate best practices: Disseminate best practices and success stories of Generative AI in the oil, gas, and energy industry nationally and internationally.
- Promote the creation of an AI ecosystem: Promote the creation of an AI ecosystem in Vaca Muerta, which includes technology companies, startups, investors and qualified talent.
- Monitor the impact of AI: Monitor the impact of Generative AI on the oil, gas and energy industry in Vaca Muerta, including its impact on the efficiency, safety, employment and the environment.
- Consider the global context: Argentina must find a balance between the

domestic and international responsibilities in the global energy context, aligning their development goals with climate goals.

VII. Conclusions

Generative AI is presented as a tool with great potential for transform the oil, gas and energy industry in Vaca Muerta. Its capacity to Optimizing operations, improving efficiency, safety and sustainability offers a unique opportunity to boost the economic and technological development of the region. The AI Technology Hub in Vaca Muerta plays a fundamental role in the promoting research, development and adoption of Generative AI, promoting innovation and the creation of a technological ecosystem that positions Neuquén as a benchmark in the energy industry at the national and international level.

VIII. Summary

Generative AI is revolutionizing the oil and gas industry in Vaca Muerta already global level. It offers solutions to optimize drilling, simulation of reservoirs, predictive maintenance, exploration of new fields and the regulatory compliance.

However, there are challenges such as data availability, complexity of the implementation, ethical considerations and the need for a regulatory framework clear.

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