HUB TECH IA

Deliverable report 16

AI and IAGEN Application Use Case

Construction and installation - Safety - Development of protocols and work guides

I. Introduction

The oil industry in the Neuquén region, specifically in Vaca Muerta, faces fundamental challenges related to security in the activities of construction and installation of critical infrastructure. These challenges involve Maintain high standards in accident prevention and rigorous risk control and continuous optimization of operating protocols. Opportunities arise when implement advanced technologies to substantially improve prevention and incident response, thus increasing operational efficiency.

In recent years, there has been an increase in oil activity, which has brought with it an increase in accidents and incidents. According to records, in the In the last two years, several deaths of oil workers have been reported in the area. The causes of these incidents are diverse, including accidents in locations, road accidents on poorly maintained roads, impacts between vehicles transporting personnel and materials, falls of large objects, and explosions in wells.

II. Specific Application of IAGEN

Generative Artificial Intelligence (GENI) is a branch of artificial intelligence that focuses on the creation of 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 and original that is often indistinguishable from that created by humans.

Generative Artificial Intelligence (GENI), particularly through platforms such as GPT-4 Turbo, Claude 3 and Gemini, can revolutionize the creation and updating of guides, protocols and specific training programs for critical activities in oil construction and installation. These models are capable of generating Content adapted to legal regulations, internal protocols and operational situations specific, also allowing the creation of virtual simulation scenarios through visual tools such as Stable Diffusion or Midjourney.

a. Creating Guides:

IAGENs can be used to generate customized safety guides for each specific task in oil construction and installation.

For example, GPT-4 Turbo can generate detailed guidance for working at height, including safety procedures, personal protective equipment necessary and the measures to be taken in case of emergency. This guide could include Step-by-step instructions for the use of harnesses, lifelines and fall arrest systems, as well as communication and rescue protocols in case of emergency.

Claude 3 can generate guides for handling chemicals, including information on storage, transportation, and safe handling. These guides could include information on the classification of chemicals, risks associated with its handling, the necessary personal protection measures and emergency procedures in case of spills or leaks.

b. Preparation of Protocols:

IAGENs can automate the creation of security protocols, adapting them to the specific needs of each operation. Claude 3 can generate protocols for safety protocols for handling hazardous liquids, including steps to isolate the area, notify supervisors, and perform cleanup safely. These protocols could include information on the use of personal protective equipment, containment of the spill, neutralization of the substance and waste management.

c. Design of Training Programs:

IAGENs can create interactive and personalized training programs for the workers.

Gemini can generate questions and answers to assess the knowledge of the students. workers on safety procedures. For example, training could be created Interactive learning modules that include questions on the correct use of personal protective equipment, fire evacuation procedures, or the handling of specific tools.

You can also create simulations of risk situations for workers to practice decision-making in a safe environment. These simulations could recreate situations such as gas leaks, fires or accidents with heavy machinery, allowing workers to experience the consequences of their decisions and learn from their mistakes without putting their safety at risk.

d. Generation of Simulation Scenarios:

IAGEN, in conjunction with imaging tools such as DALL-E and Midjourney, can create virtual accident simulation scenarios.

Midjourney can generate images of oil well accident scenes, including fires, gas leaks and oil spills.

DALL-E can create images of risk scenarios for training personnel, such as a worker exposed to a fall from a height.

These images can be used to create virtual reality simulations that allow workers to experience emergency situations safely and controlled. For example, an evacuation drill could be created in case of fire on an oil platform, using images generated by DALL-E and Midjourney to recreate the virtual environment.

III. Specific Technologies Implemented

Technology	Description	Example of use in Cow Dead
GPT-4 Turbo	Language model advanced for the text generation.	Generate procedures security for work at height, including step-by-step instructions step for the use of harnesses, lifelines and fall protection systems.
Claude 3	Language model specialized in the generation of protocols and	Generate protocols of security for he substance handling chemical, including

	technical documents.	information about your storage, transport and safe handling.
DALL-E	Tool of image generation from descriptions textual.	Create images of risk scenarios for the training of the personal, such as representation of a oil spill in a Vaca location Dead.
Midjourney	Tool of image generation with a focus on the industrial design.	Generate images of scenarios of well accidents oil tankers, including fires, gas leaks and oil spills, to be used in simulations of reality virtual.
Stable Diffusion	Tool of image generation and videos with high degree of realism.	Develop simulations hyperrealists for training

		immersive virtual, as the recreation of a fire in a plant of gas processing.
Inspections with Drones	Drones equipped with cameras and sensors for inspection infrastructures.	Conduct inspections security in areas difficult to access or dangerous, like towers drilling, pipelines and tanks of storage.

IV. Application of artificial intelligence agents powered by IAGEN

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 tasks high-demand cognitive skills. From this capacity, 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 additional components such as external tools, memory, scheduling, 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 take on human resources, legal, financial, or logistics tasks, and even those related 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. Detailed Agentic Flow Proposal for Implementation

- Initial Identification: The specific needs of the client are clearly defined. security and critical scenarios in the operational area. At this stage, interviews would be conducted with operational personnel to identify critical scenarios and specific security needs in each work area. It also would analyze historical accident and incident data to identify patterns and areas for improvement.
- IAGEN Model Selection: Choosing the most appropriate model based on performance and required specialization. The capabilities of different IAGEN models, such as GPT-4 Turbo, Claude 3 and Gemini, to determine which one best suits the specific needs of the company. will consider factors such as natural language processing capacity, text generation, image analysis capabilities and creation of simulations.
- Specialized Training: Models trained with historical documents, specific regulations, and human feedback for precise customization. IAGEN models would be trained with industry-specific data oil company, including historical safety documents, regulations, internal procedures and best practices. It would also incorporate the feedback from security experts to ensure accuracy and relevance of the generated content.
- Automatic Generation: Instant creation of specific guides for each operational activity. Once trained, IAGEN models could generate

automatically guides, protocols and training programs for different operational activities, such as working at height, handling chemicals, heavy machinery operation and emergency response.

- Automated Validation: Use of validation agents that ensure accuracy regulations. Supervised AI systems would be implemented to validate automatically the documents generated by the IAGEN, comparing them with the current regulations and industry best practices.
- Training and Simulation: Execution of customized virtual simulations through automatically generated scenarios. Tools would be used Image generation such as DALL-E and Midjourney to create virtual scenarios of accident simulations, which would be integrated into virtual reality platforms for staff training.
- Monitoring and Feedback: Real-time monitoring of practical use, with continuous feedback to improve the AI system. The use of the guides, protocols and training programs generated by IAGEN, and would collect feedback from workers to identify areas for improvement and adjust the AI system.

3. IAGEN Intelligent Agent for Operational Safety in Industry

Oil company

a. Initial Identification

- **Objective:** To deeply understand the security needs in areas critical operations.
- **Key actions:**
  - Structured interviews with operational staff.
  - Mapping of dangerous tasks and risk environments.
  - Analysis of historical accident and incident data to identify repetitive patterns.
  - Classification of critical scenarios (work at height, spaces confined, high pressure, hazardous materials).

b. Selecting the IAGEN Model

- **Objective:** Select the most appropriate generative AI model according to the complexity of tasks and requirements.
- **Selection criteria:**
  - Natural language processing capabilities (technical instructions) clear).
  - Coherent generation of protocols and technical documents.
  - Image analysis for scene evaluation.
  - Scenario simulation capabilities.

c. **Candidate models:**

  - GPT-4 Turbo (OpenAI): High competence in text generation, complex contexts.
  - Claude 3 (Anthropic): Focused on alignment with security principles and robustness.
  - Gemini (Google): Advanced multimodal capability and extended context.

d. Specialized Training

- **Objective:** Adapt the chosen model to the specific domain of operational security oil company.
- **Dataset:**
  - National and international regulations (OSHA, ISO 45001). • Internal safety procedures.
  - Historical accident cases.
  - Feedback from experts and supervisors.
- **Methodology:**
  - Fine-tuning of the base model.
  - Incorporation of local technical language and petroleum glossary.

e. Automatic Generation

- **Objective:** Create protocols, guides, and training programs in seconds adapted to each operation.
- **Types of generated content:**
  - Safe work protocols at height, confined spaces, energies

dangerous.

- Emergency response and evacuation guides.
- Chemical handling manuals.
- Training programs by role and task.

f. Automated Validation

- **Objective:** Ensure that each document generated complies with regulations current.
- **Features:**
  - AI validation agents that check regulatory consistency.
  - Comparison with national and international regulatory frameworks.
  - Automatic alerts in case of deviations.

g. Training and Simulation

- **Objective:** To train staff in simulated risk-based scenarios real.
- **Tools:**
  - Visual scenario generation with DALL-E or Midjourney. • Integration with virtual reality (VR) environments. • Virtual simulations guided by the IAGEN model.

h. Monitoring and Feedback

- **Objective:** Keep the system updated and continuously improved. •

Metrics and action:

- Record of use of guides and protocols.
- Surveys and direct feedback from staff.
- Analysis of effectiveness in the face of post-implementation incidents.
- Periodic retraining of the model with new information and improvements practices.

4. Hypothetical Concrete Example Case

Simulated Scenario: A methane gas leak is simulated in a high-pressure valve. Located on the main gas gathering line at a location in Vaca Muerta.

Leak occurs during the afternoon, while maintenance work is being carried out Preventive. The location staff detects the leak by the characteristic sound and the smell of gas. Immediately, the emergency protocol generated by the IAGEN, which includes the following steps:

- Evacuation: The evacuation of the location's personnel to a designated evacuation point is ordered. safe meeting, following the evacuation routes indicated on the map generated by DALL-E.
- Alert: Emergency response teams and supervisors are notified, using a communication system integrated with AI.
- Leak Control: The instructions generated by GPT-4 Turbo for the leak are followed. Leak control, including closing valves, activating safety systems ventilation and the application of containment techniques.
- Monitoring: Smart sensors are used to monitor the concentration of gas in the area and ensure that they remain within safe limits.
- Investigation: Once the leak is controlled, an investigation is initiated using the AI to analyze data collected by sensors and security cameras, with the aim of determining the causes of the leak and preventing future incidents.

This simulation, created with Stable Diffusion, allows workers to experience the emergency situation in an immersive way and practice safety measures in a secure virtual environment.

V. Direct Operational and Strategic Benefits

- Safety Optimization: Significant reduction in incidents and accidents labor market thanks to clear and updated protocols in real time. For example, the early risk detection using camera image analysis AI security would allow to identify unsafe behaviors or conditions dangerous in the work environment, such as the lack of use of personal protective equipment or the presence of obstacles in high traffic areas, which in turn would facilitate timely intervention to prevent accidents. The combination of

IAGEN with real-time data from sensors can create a system proactive safety that anticipates and prevents accidents.

- Productivity Improvement: Saving 40% of the time usually spent on manual documentation and review. Automation of the generation of documents and security protocols with IAGEN would free up valuable time for security professionals to focus on more strategic tasks, such as safety planning, monitoring compliance with regulations and risk management.
- Workload Optimization: IAGEN would be used to optimize the workload work and prevent physical stress in workers. By analyzing data such as individual performance, hours worked and tasks performed, AI could recommend breaks at key times or redistribute tasks to avoid fatigue and fatigue-related injuries.
- Economic Savings: Reduction of operating expenses related to traditional in-person training by 30%. The implementation of drills Virtual training with IAGEN would reduce the need for expensive training in person, reducing expenses in logistics, materials and time of worker inactivity.

VI. Expected Tangible Results

- Expected reduction in the rate of workplace accidents. This reduction would be achieved By combining proactive accident prevention with AI, the improvement in staff training and optimization of protocols security.
- Measurable increase in accuracy in the implementation of procedures in field. Accuracy in the implementation of procedures would be measured by the analysis of real-time sensor data, which would record the actions of the workers and compare them with established protocols. For example, they They could use sensors in personal protective equipment to verify their correct use and in the tools to monitor their proper handling.

- Improved staff preparedness for emergencies through drills
  More effective and personalized virtual drills. The effectiveness of virtual drills
  It would be measured through the evaluation of the performance of the workers in the
  simulation, including their ability to make correct decisions, follow the
  emergency protocols and working as a team.

VIII. Key Challenges and Implementation Strategies

- Technical challenges: Requires integration of advanced technologies with systems
  existing ones. For example, integration with legacy systems would be achieved by
  developing specific adapters that allow communication between the
  new AI technologies and legacy systems. It would also require the
  implementation of a robust technological infrastructure that supports the
  processing large volumes of data and running simulations
  complex. In addition, the need for staffing must be considered.
  trained in the use of these technologies and in the interpretation of data
  generated by AI.
- Cultural resistance to change: Staff accustomed to traditional methods
  can resist technological change. To overcome this resistance,
  would implement pilot programs with select groups to quickly demonstrate
  tangible benefits. Communication campaigns would also be carried out to
  Inform workers about the advantages of IAGEN and how this technology
  can improve your safety and efficiency at work. It is essential to involve workers in
  the implementation process and provide them with information.
  clear about the benefits of IAGEN to encourage its acceptance.
- Short-term investment in AI agent implementation teams
  Technology and training: Investment in proof of concept and testing is required
  The focus here must be on developing the talent to implement it, as there is a trend
  toward cost reduction in systems that allow
  “no code” and “low code” automation. For the first stage, we 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.

IX. Metrics and Impact Assessment

- Documented reduction in operational incidents. Dashboards will be used in real-time to monitor incident reduction, comparing data before and after the implementation of IAGEN. Incident reports generated by AI will also be analyzed to identify trends and areas of improvement.
- Significant reduction in unproductive times resulting from incidents. will measure worker downtime and production losses caused by incidents, comparing data before and after the implementation of IAGEN.
- Improved regulatory compliance through automatic updates and timely. Periodic audits will be carried out to assess compliance with the security regulations, using AI to analyze documents and generated protocols.

X. Conclusions

The implementation of IAGEN in the Vaca Muerta oil industry has the potential to revolutionize safety in construction and installation activities. Through the generation of guides, protocols and training programs personalized, IAGEN can improve accident prevention, response to emergencies and regulatory compliance. Despite the technical and cultural, IAGEN offers significant benefits in terms of security, productivity and economic savings. The adoption of this technology is crucial for ensuring a safer and more efficient future for the oil industry in Vaca Muerta.

Beyond the immediate benefits, IAGEN can contribute to a cultural shift in long-term in the industry, promoting greater awareness of safety and risk prevention. AI's ability to analyze data, identify patterns and Predicting potential incidents can lead to the creation of a safety culture proactive, where prevention becomes a priority. To maximize these benefits, it is essential that the implementation of IAGEN be accompanied by a continuous improvement process, adapting technology to the changing needs of the industry and the new regulations.

Recommendations

- Implement an IAGEN pilot program in a specific area of Vaca Muerta.
  This will allow the effectiveness of the technology to be evaluated in a real environment and to carry out the necessary adjustments before large-scale implementation.
- Create a multidisciplinary team that includes security, technology, and IAGEN experts.
  This team will be responsible for the planning, implementation, and monitoring of the IAGEN program.
- Train staff in the use of IAGEN tools and new
  safety protocols. It is essential that workers understand the advantages of IAGEN and how this technology can improve your safety and work efficiency.
- Establish a monitoring and evaluation system for the impact of IAGEN on the
  security. This will allow measuring the effectiveness of the technology and making improvements continuous.
- Promote collaboration between oil companies, energy suppliers, technology and government institutions. Collaboration is crucial to ensure successful implementation of IAGEN in Vaca Muerta.

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To overcome this challenge, you can be effective
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