Innovarpel 2025

TECHNICAL DAYS

DIGITAL TRANSFORMATION
& INDUSTRIAL CYBERSECURITY
IN THE OIL&GAS INDUSTRY

arpel 60 YEARS

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Remote Operation and Supervision of Oilfield Assets

A Strategic Shift in Managing Complex Energy Infrastructures

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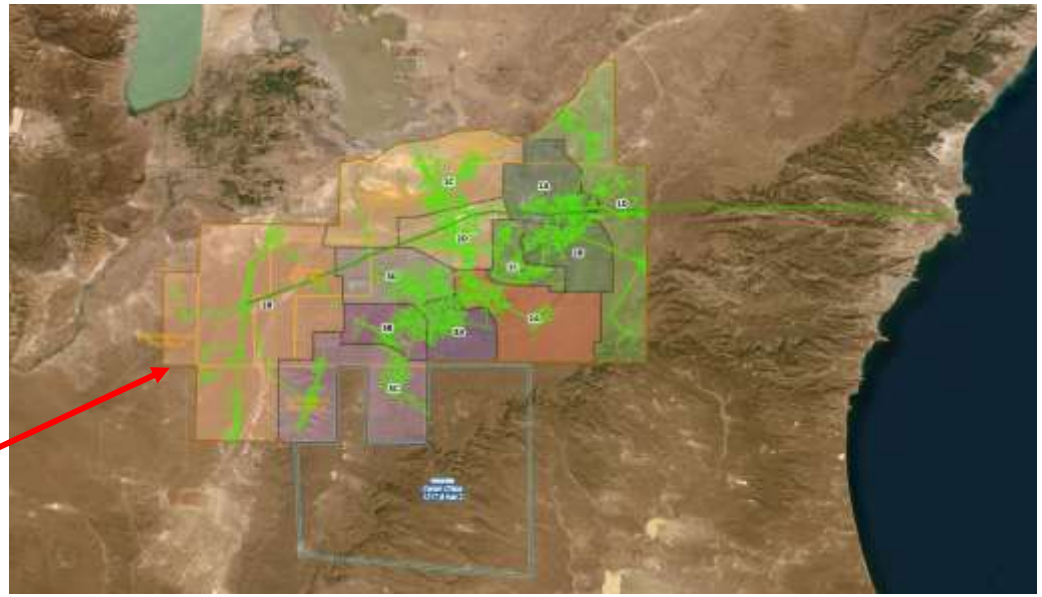
Strategic Context

Why Traditional Models Are No Longer Enough

With a consolidate surface area of +3,480 km², located 70 km from the nearest urban center, this asset provided the ideal environment to implement and test a new operational model.



- Vast mature fields with dispersed infrastructure
- High-risk environments and elevated supervision costs
- Siloed operations leading to reactive decision-making
- Rising complexity

REQUIRES

- ✓ Integrated systemic focus
- ✓ Need for real-time visibility
- ✓ Proactive intervention

Cerro Dragón: A Real-World Testbed

A Complex Asset Driving Operational Transformation

Wells

+1120
Inyection wells

+4270
Production wells

SRP: +2400

ESP: +1500

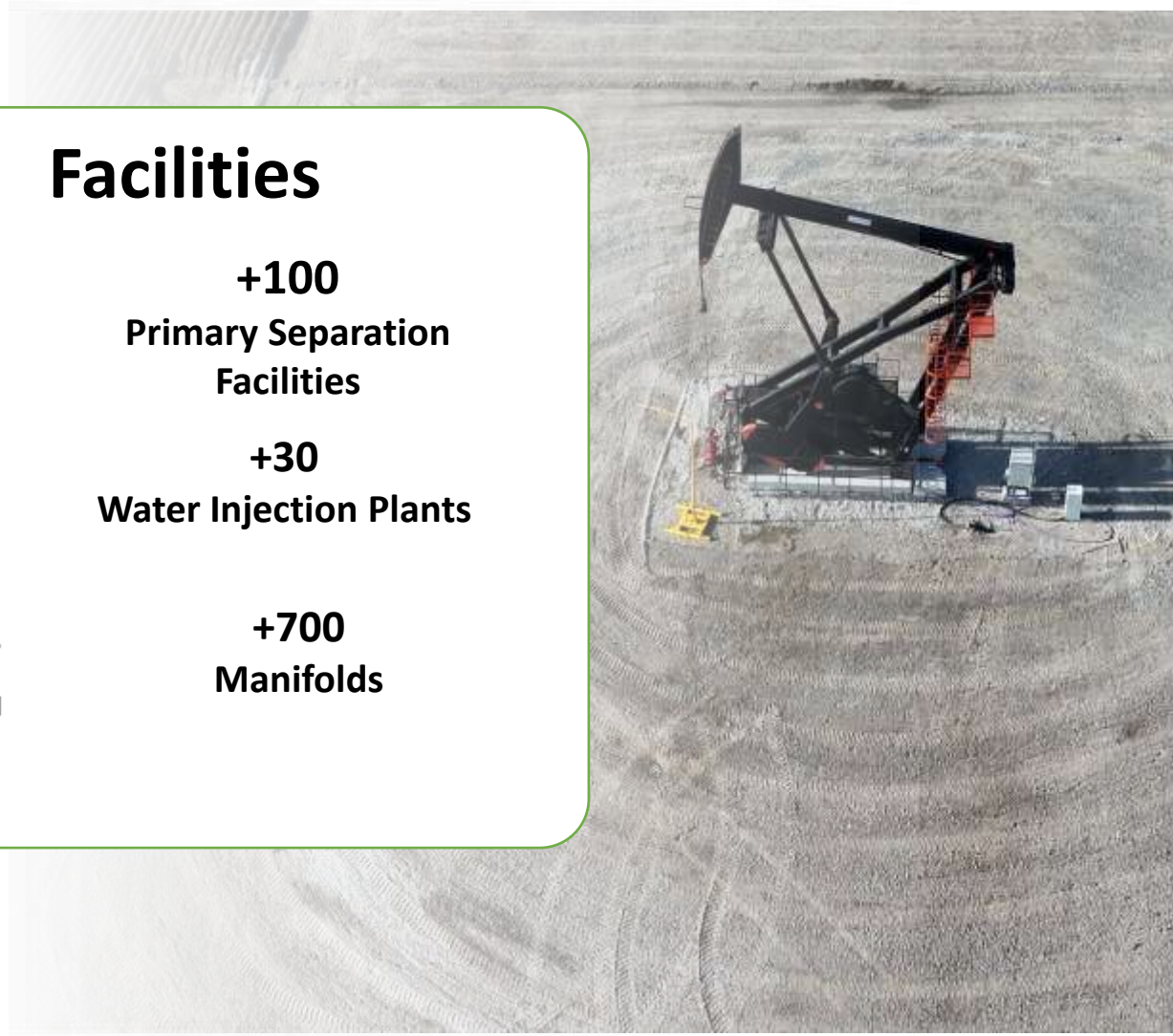
PCP: +180

Facilities

+100
Primary Separation Facilities

+30
Water Injection Plants

+700
Manifolds



- ***HARSH WEATHER***
- ***DIFFICULT TERRAIN***
- ***AGING INFRASTRUCTURE***

Ideal scenario to explore remote-centric models

From Silos to Synergy

The Shift from Decentralized to Integrated Management

TRADITIONAL MODEL

- Siloed teams
- Local Operation/Local Supervision.
- Descentralized decisions based on limited data and subjective urgency assessments
- Push-based model driven by routine and fixed schedules

NEW PARADIGM

- Centralized control
- Remote Operation/Intelligent Remote Supervision
- Empowering decision-making through unified platforms
- Pull-based model triggered by real-time deviations

A Dual Strategy for Remote Management

Operating and Supervising from a Distance

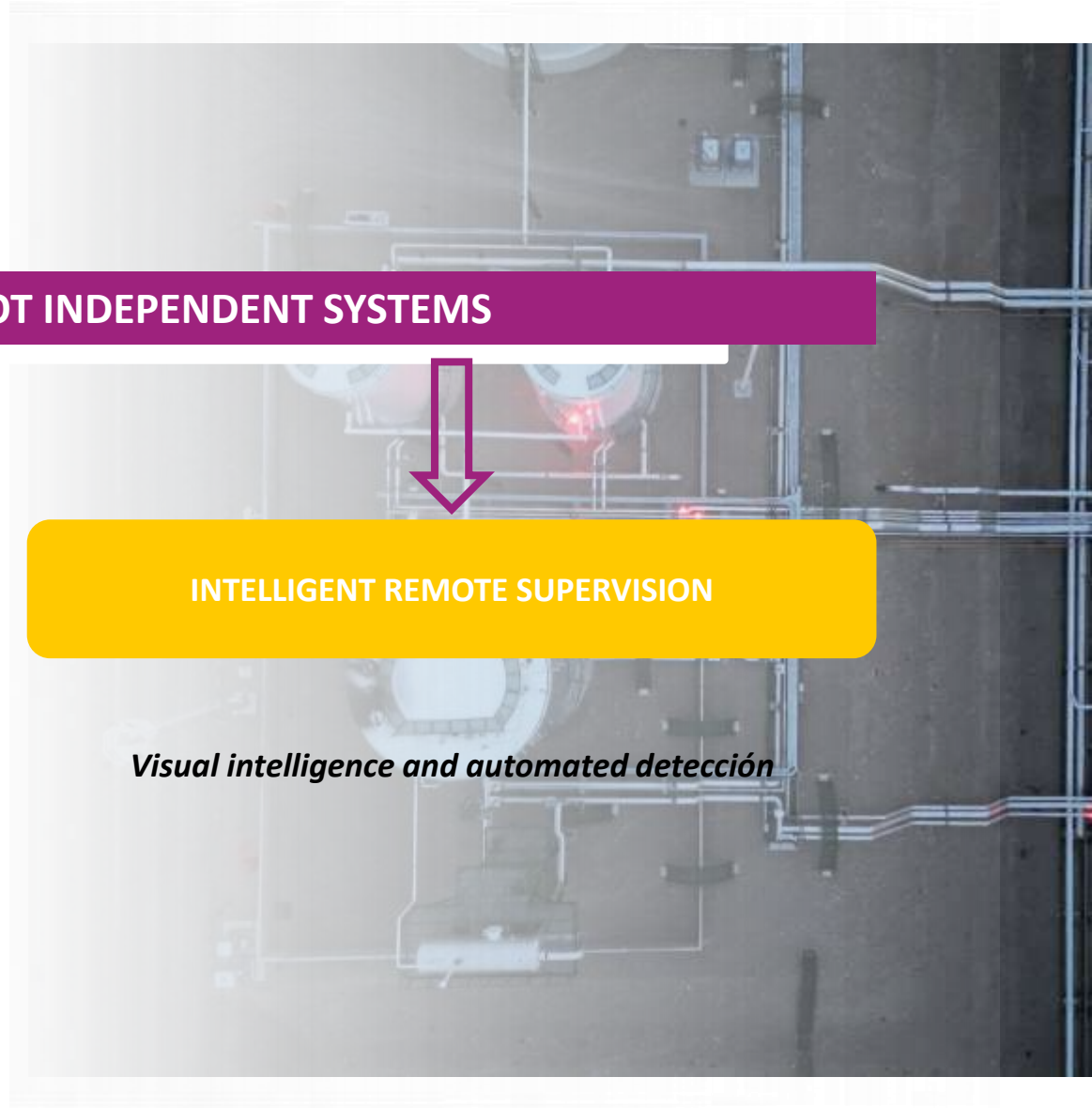
DESIGNED AS COMPLEMENTARY, NOT INDEPENDENT SYSTEMS

REMOTE OPERATION

Centralized Control and remote Operation

INTELLIGENT REMOTE SUPERVISION

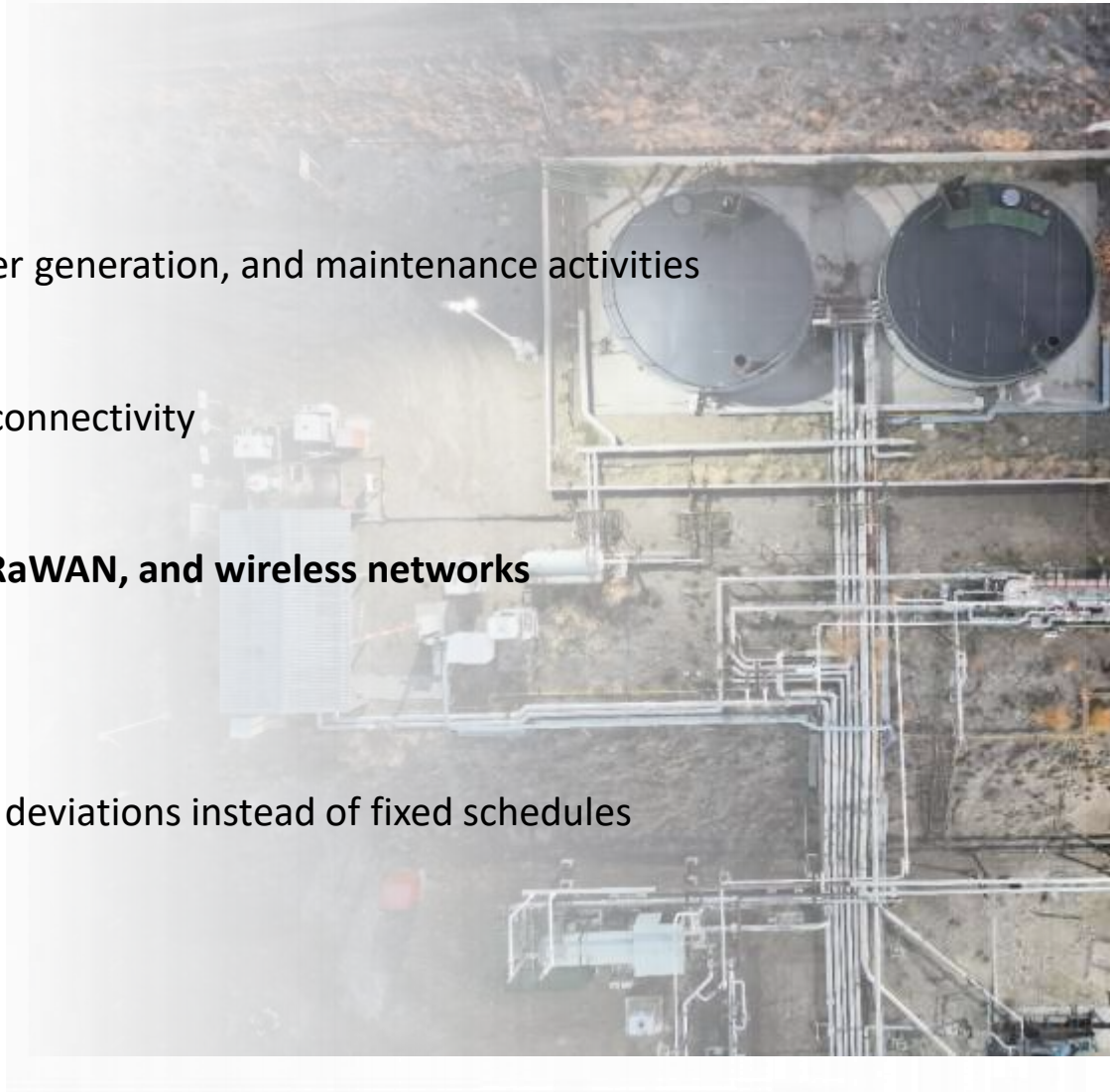
Visual intelligence and automated detección



Centralized Operations: The ROC Model

Enabling Real-Time, Cross-Functional Decision Making

REMOTE OPERATION



- **Unified monitoring** of oil & gas production, water injection, power generation, and maintenance activities
- **Real-time, continuous remote operations** enabled by advanced connectivity
- Use of **SCADA systems combined with Cloud data platforms, LoRaWAN, and wireless networks**
- Transition from **“push routines” to “pull signals”**

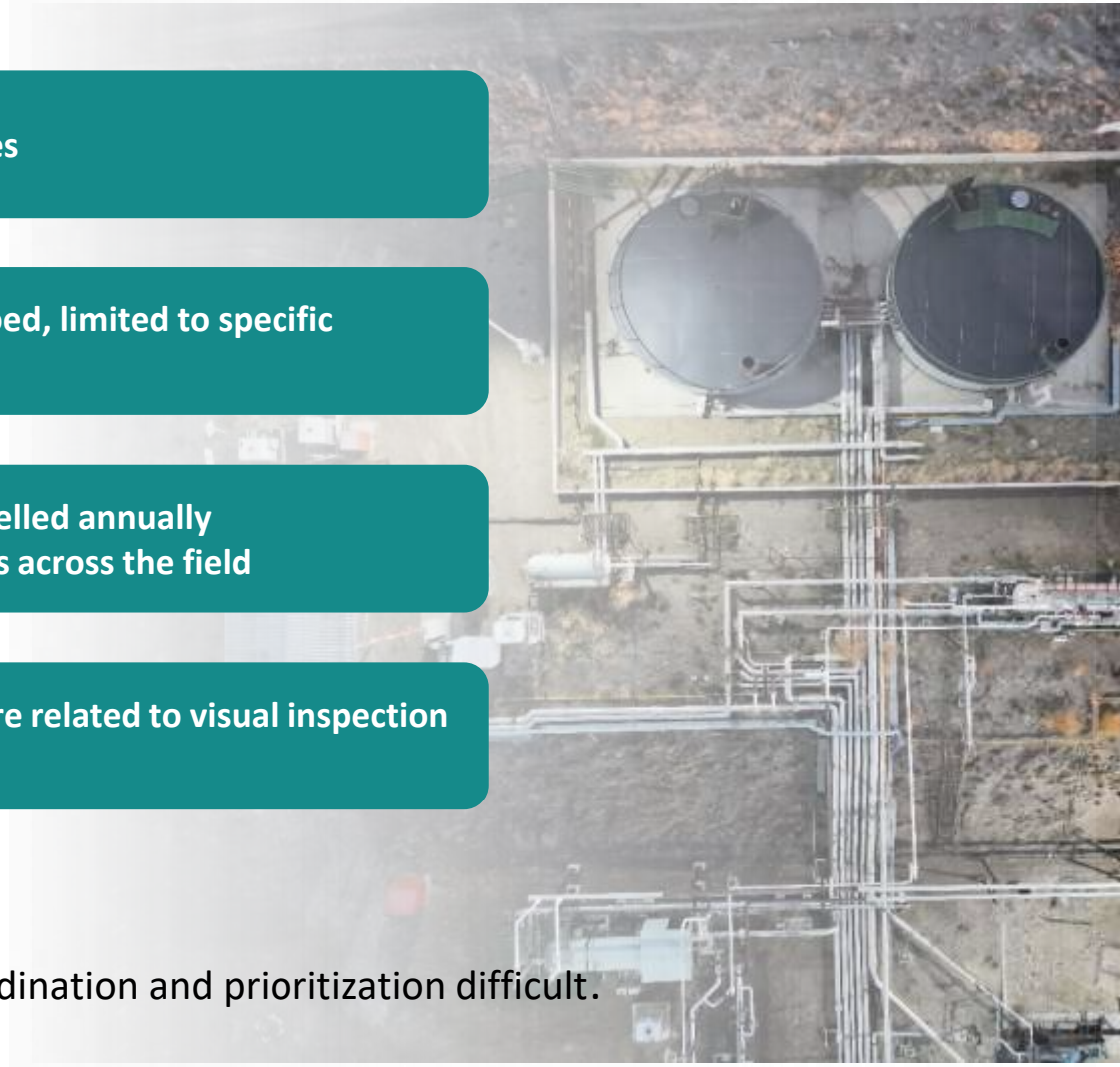
→ operations triggered proactively by deviations instead of fixed schedules

Intelligent Remote Supervision: The Challenge

INTELLIGENT REMOTE SUPERVISION

TRADITIONAL MODEL

- Frequency Based Routines
- Teams geographically siloed, limited to specific coverage zones
- More than 2 MMkm travelled annually by operations supervisors across the field
- Over 85% of field tasks are related to visual inspection activities.



Our field was not just large it was also fragmented.
Supervisors were in charge of defined territories making global coordination and prioritization difficult.

Intelligent Remote Supervision: AI and Autonomous Drones

Expanding Human Reach with Collaborative Intelligence

INTELLIGENT REMOTE SUPERVISION

NEW PARADIGM

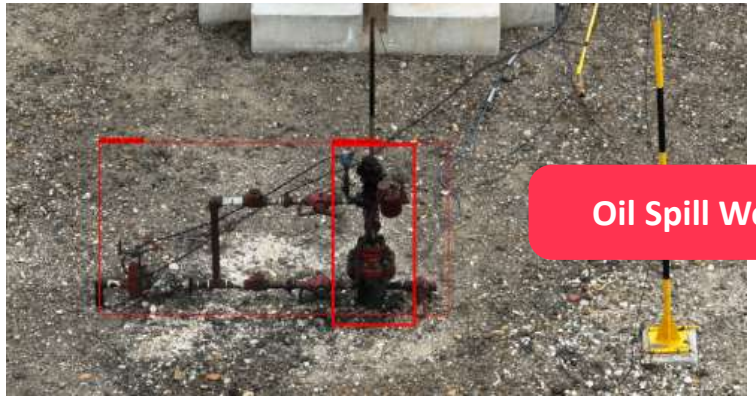
- Condition Based Supervision
- Pre-programmed UAV missions with RGB and thermal imaging
- AI models detect leaks, anomalies, and malfunctions (>90% accuracy)
- Cloud-based analytics trigger automated work order generation
- Cloud-based analytics trigger automated work order generation

DRONES + **AI**

Supervisors no longer manage fixed territories — they respond dynamically to real-time priorities across the entire asset according to what is detected by the drone

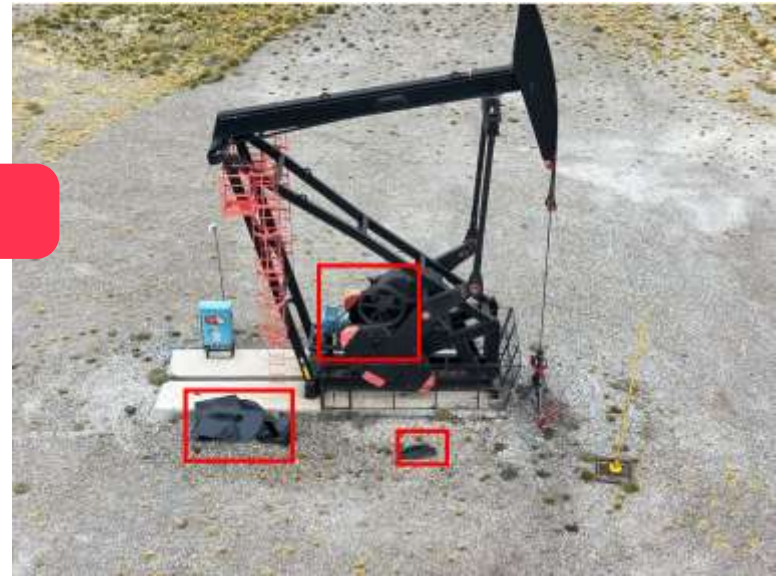
Examples of IA Models on autonomus Drones.

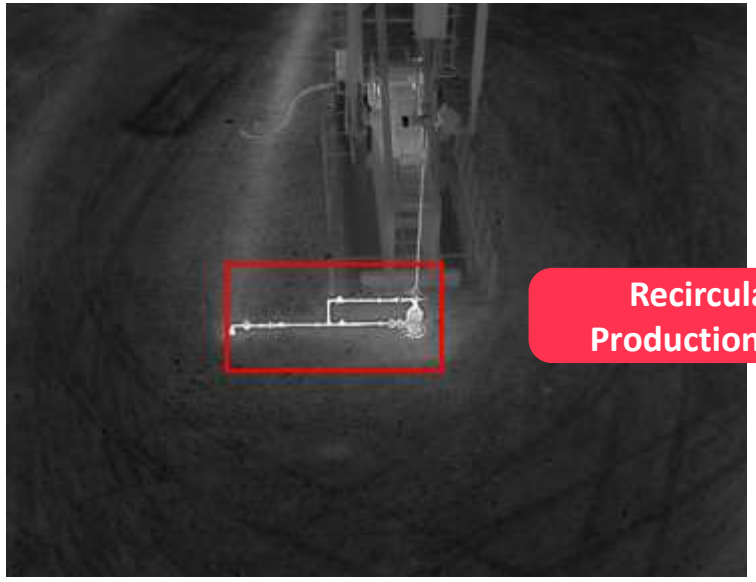
Expanding Human Reach with Collaborative Intelligence



Oil Spill Wellhead

CounterWeight & Objects





Recirculating Production Bridge

Level Chemical Kit

How Intelligent Supervision Transforms Operations

A New Model of Field Intelligence

- Up to 94% AI detection accuracy for critical failures with IA
- Faster anomaly detection, less reactive work → less downtime
- Data becomes a trigger, not just a report
- Continuous optimization loop with COR + Drones + AI

- Engineers, pilots, planners now work through **shared platforms and workflows**
- From **isolated action** to **collaborative intelligence**
- Seamless coordination across **subsurface, surface, energy, production and maintenance**
- **Improved resource allocation**
- **Fewer chemical overdoses** due to better operational insight
- Asset coverage improved: **from 45 assets/week to 90/day**

- **Faster and proactive issue resolution, fewer production losses**
- **60% reduction in kilometers driven by supervisors**
- **Less supervisor travel → Less risk, less emissions**
- **Reduced exposure to hazardous zones**
- **Reduction in blackout recovery time**
- **Fewer failed interventions**
- **Increase in decision quality → Proactive maintenance**

Lessons Learned & Scalability

From Field Trial to Operational Model

Real Time Data → Faster Field Response → Smarter decisions

CULTURAL + TECHNOLOGICAL

- People: cross-functional alignment is key
- Culture: from routine execution to demand based operations
- Technology: infrastructure + cloud + analytics

→ Integration must be cultural as much as technological

STANDARIZED + SCALABLE

- Standardization enables scale to other fields
- Scalable Model adaptable to other field and operational contexts

Closing

Collaborative Intelligence at the Core of Managing Complex Energy Infrastructures

- Efficiency. Safety. Sustainability.
- Field-proven, human-enhanced digital transformation
- Not just monitoring from afar, but operating with intent

REMOTE ≠ PASSIVE –> IT'S ACTIVE, INFORMED, AND PREDICTIVE

- People + AI + autonomy → smarter decisions
- Data becomes a *trigger*, not just a report

KPIs available, but transformation lies in the method

MUCHAS GRACIAS
THANK YOU SO MUCH

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