ADNOC Accelerator Programme

Artificial Intelligence

COHORT 2

Top 10 Use Cases: An Overview

ENERGYai: Pioneering AI in the Energy Sector

ENERGYai is ADNOC's enterprise-wide AI strategy aimed at enhancing efficiency, sustainability, and growth across its operations. Developed in collaboration with AIQ, Microsoft, and G42, ENERGYai integrates advanced AI technologies to transform energy production and management.

Strategic goals

- **Operational excellence:** Leverage AI to streamline processes, reduce emissions, and enhance decision-making capabilities
- **Sustainability commitment:** Utilise AI to support ADNOC's goal of reducing greenhouse gas emissions and achieving net-zero targets
- **Workforce empowerment:** Equip employees with AI tools and training to foster a digitally proficient workforce

AI-enabled solutions to date

- **RockInsight:** Visualises subsurface rock formations for efficient resource analysis
- **AR360**: Consolidates real-time reservoir data to optimise field development planning
- **Remal:** Forecasts sand accumulation patterns to enhance safety and productivity
- **Integrated Logistics Management System (ILMS):** Supports vessel planners with optimal routing options
- **Centralised Predictive Analytics and Diagnostics (CPAD):** Tracks and diagnoses operational anomalies for proactive maintenance

Future outlook

- **Continued expansion of AI applications** across ADNOC's value chain
- **Ongoing collaboration with leading technology partners** to drive innovation in the energy sector

Priority use cases

- **Operational**
  - **Production optimisation** (ROBOWELL, AR360, DRILLTECT)
  - **Operational efficiency** (ILMS, Extruder Analytics)
  - **HSE and asset integrity** (SMARTi, CORROVISION)
- **Sustainability** (EmissionX)
- **Workforce development** (Skill Sphere)

ADNOC’s top 10 AI use cases

Upstream Downstream Support Sustainability

Value chain	AI use case	Description	Technology type
	1. **ROBOWELL**	Autonomously operates wells	Optimisation models
	2. **AR360**	Boosts new well production & extends existing well lifespan	Predictive analytics
	3. **SMARTi**	Improves vessel safety and security	Image and video analysis
	4. **DRILLTECT**	Detects anomalies in real-time from surface drilling data	Predictive analytics
	5. **CORROVISION**	Automates corrosion detection and classification	Image and video analysis
	6. **Extruder predictive analysis**	Enhances production as less extruder equipment shutdowns	Predictive analytics
	7. **AI polymer optimisation**	Cuts transition time and speeds new grade development	Predictive analytics
	8. **ILMS**	AI Logistics Management System	Optimisation models
	9. **Skill Sphere**	Advises and coaches on career paths	Conversational AI
	10. **EmissionX**	Monitors, reports & forecasts emissions data across facility	Predictive analytics

ROBOWELL enables stable, efficient, and profitable oil production, driven by automation and intelligence

Upstream

Challenge

- Oil & Gas operations face instability, manual supervision, and lack of automation due to diverse well conditions
- Current methods require constant human input, increasing downtime and operational costs

Solution

ROBOWELL uses real-time data and advanced models to automate well monitoring and control

- Executes operations and tracks performance in real time
- Combines ML, physics, and expert systems to simulate and optimise well conditions every few minutes
- Maintains safety within constraints like MAASP and flowline pressure

Value

- +5% production gains from existing wells
- Up to 30% gas lift optimisation
- Reduces operator load and non-value tasks
- Fosters digital collaboration across teams
- Global first: APC + AI for gas-lift wells

Source: ADNOC; AIQ

Advanced Reservoir 360 (AR360) transforms reservoir management and production optimisation

Challenge

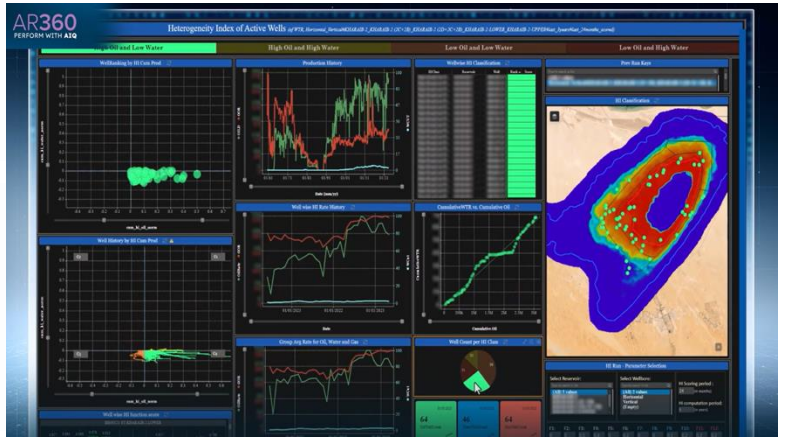
Field Development Plans are essential for maximising economic returns from oil and gas fields, but face key challenges:

- Inaccurate recovery estimates due to poor reservoir characterisation and fragmented workflows
- Complex reservoir fluids, inactive strings, difficult recovery conditions
- Siloed systems and outdated planning tools that can't keep pace with evolving field data

Solution

AR360 provides a 360° view of the reservoir through 3 core modules:

- Digital Model Reviewer: Assesses model quality, predictability, and suggests improvements
- Performance Advisor: Uses AI to analyse reservoir performance and recommend candidates
- AI-Assisted Forecasting: Combines ML and physics for multi-scenario planning and optimal infill well placement



Value

- Enhanced water flooding performance (up to A1 level)
- 75% improvement in reservoir model reviews
- Up to 20% longer life for active wells
- Up to 10% reduction in new infill drilling costs over 5 years

Source: ADNOC; AIQ

SMARTi elevates maritime safety by enabling proactive prevention and real-time detection

Challenge

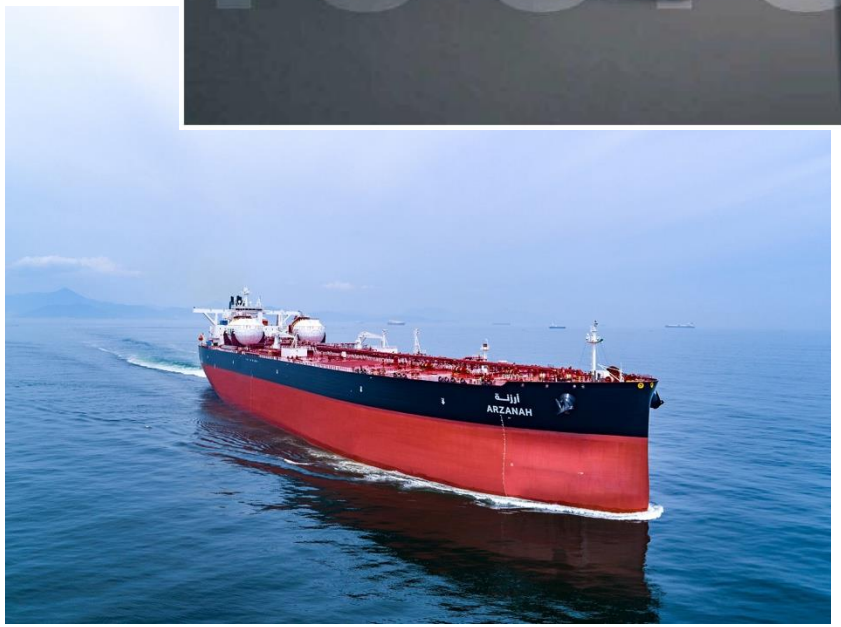
CCTV in industrial sites often provides passive, post-event review. Lack of real-time monitoring leads to higher injury rates, equipment damage, and OPEX increases due to preventable incidents.

Solution

SMARTi connects to existing CCTV to enable real-time, AI-powered hazard detection, alerting, and monitoring. The system identifies risks like PPE non-compliance or slips / falls, and routes alerts to a central command.

Value

- 24/7 continuous HSE monitoring
- 90%+ accuracy in detecting violations
- <2 second reaction time to alerts
- 1B+ predictions per day for proactive safety



Source: ADNOC; AIQ

DRILLTECT helps operators proactively manage drilling efficiency

Challenge

Non-Productive Time (NPT) drives up OPEX and stalls drilling progress, making early detection and mitigation essential to improving efficiency and reducing costs. Common causes include:

- Equipment failure (surface / subsea)
- Stuck pipes or major repairs
- Environmental hole issues
- Human error or accidents
- Unplanned delays

Solution

DRILLTECT uses data from 100+ wells to boost drilling efficiency by:

- Analysing real-time surface sensor data
- Detecting anomalies to predict failures and inefficiencies
- Sending automated alerts to minimise human intervention
- Enabling plug-and-play integration across rigs
- Delivering dashboards with performance trends and insights

Value

- Sends alerts to operators automatically and autonomously
- Predicts borehole issues early, reducing risk of escalation
- Minimises costs by reducing NPT
- Improves operational safety and overall efficiency

Source: ADNOC; AIQ

CORROVISION automates corrosion detection and classification across industrial assets

Upstream Downstream

Challenge

Corrosion remains a major challenge in oil and gas, requiring SMEs to manually review thousands of images, often resulting in inconsistent assessments due to varied expertise. Consequences include:

- Safety hazards and environmental risks
- High costs from equipment failure and downtime
- Labor-intensive, subjective visual inspections

Solution

- Detects corrosion presence, type, and severity
- Analyses large volumes of inspection images
- Provides real-time, cloud-based results via web and mobile
- Spots early signs of wear to enable preventive action

Value

CORROVISION's pipeline combines expert-labelled data with advanced analytics

- Data Collection: Images annotated by SMEs for corrosion type and severity
- Pre-Processing: Enhances image quality and model performance
- Modelling: 3-phase AI detects corrosion, assesses severity, and identifies pitting
- Evaluation: Accuracy benchmarked through rigorous training and testing

Actionable dashboards

- Main dashboard: Centralised access to labelled image data
- Severity dashboard: Visualises corrosion types, severity levels, and trends
- Predictive alerts: AI-driven notifications for proactive maintenance

Source: ADNOC; AIQ

Downstream

Extruder predictive analytics: Real-time failure forecasting with anomaly detection

Challenge

Borouge extruders face recurring inefficiencies and unplanned downtime due to:

- Unalarmed shutdowns with no early warnings
- Complex root causes that are infrequent and hard to diagnose
- Production delays from unexpected maintenance
- Loss in value through reduced productivity and higher costs
- Ineffective monitoring that misses slow-building faults

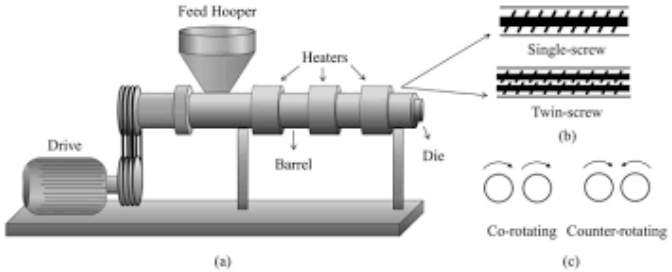
Solution

Predictive AI Maintenance prevents extruder failures before they happen

- Current focus: Pre-event detection through a data-driven model that identifies early warning signs
- During events, anomaly detection and root cause tools help reduce repair time

Core components

- Real-time sensors tracking equipment performance
- AI model predicting time-to-failure with confidence levels
- Interactive dashboard displaying system health and risk indicators



Value

- Avoidable production loss: 110-130 kT/year
- Sales margin: $700-800 per kT
- Potential value: $80-90M/year in savings by eliminating downtime-related losses

Source: ADNOC; AIQ; Borouge; ScienceDirect

AI polymer optimisation accelerates innovation and improves production

Downstream

Polymer production and grade innovation are slowed by reliance on time-consuming lab tests

- Prime production: Grade transitions are delayed while waiting for lab results to adjust process parameters
- New grade development: Iterative testing to validate polymer properties extends time-to-market

A machine learning model predicts polymer quality in real time using 100+ process and quality parameters from PP3 and PE5 plants, replacing slow lab-only testing for key qualities (e.g., melt flow rate, density, impact strength) and enabling:

- Prime production: Real-time quality control and faster, data-driven process adjustments
- New grade development: Faster innovation through scenario-based testing and AI-driven “grade recipe” creation

The solution significantly reduces lab testing delays, accelerating both prime production and new grade innovation

- Prime production
  - Before: Transition between grades (e.g., Grade A → B) delayed by lab result wait times
  - After: Real-time quality predictions allow immediate parameter adjustments, maximising prime output
- New grade development
  - Before: Multiple lab tests required to validate polymer properties
  - After: AI cuts testing iterations, speeding up time-to-market

Source: ADNOC; AIQ

Integrated Logistics Management System (ILMS) optimises vessel scheduling for reliable, on-time delivery

Challenge

- Limited visibility: Planners face tight timelines and low situational awareness
- High impact: Suboptimal decisions drive multi-day delays and increased costs
- Optimisation potential: Smarter routing and scheduling can boost efficiency, accuracy, and service levels

Solution

Improve how vessels are scheduled by using smart data and advanced modelling

Input data →
- Port info
- Vessel details
- Site info
- Demand needs
- Travel distances

Data processing →
- Pick important data
- Clean and filter it
- Combine all data sources
- Fill in missing pieces

Optimisation model →
- Optimises routes
- Reduces cost/time
- Ensures timely delivery
- Matches vessel capacity to route

Results
- Multiple planning options with simulations
- Manual scheduling also available

Value

PoC indicates potential to unlock $30-40M annually

PoC achievements
- Data: Analysed, validated, and pre-processed
- Model: Optimisation model implemented
- UI: Dashboard developed for visualisation
- KPIs: Defined and value confirmed
- Collaboration: Strong cross-functional teamwork

Value potential
- Fleet size reduction (3-7%, $8-12M in savings
- Utilisation increase (7-12%, $20-25M in revenue)
- Reduced delays/NPTs (55-65%, $0.5-1.5M) in savings

Total potential annual value: ~$33.5M

Source: ADNOC; AIQ

Skill Sphere serves as an AI-powered coach, tutor, and career advisor

Support

Challenge

Fragmented onboarding experience

- Training relies on scattered tools (PDFs, Excel, coaching) with no unified platform
- Learning is inconsistent – dependent on role, coach availability, and individual initiative
- Progress tracking and personalised support are limited or absent

Solution

AI-powered onboarding assistant

- Virtual Expert: Answers technical and role-specific questions in real-time
- AI Coach: Delivers interactive, personalised learning and assessments
- AI Career Counsellor: Guides students and graduates on study / career paths using aptitude tests and interviews

Key features

- Personalised interaction from day one
- Integration with ADNOC systems
- Progress dashboards and learning analytics
- Mental wellbeing check and referral if needed

Value

For ADNOC

- Faster, smarter onboarding and training
- Higher ROI through targeted development
- Strengthened employer brand and CSR impact

For stakeholders

- Better alignment of graduates with market needs
- Improved job satisfaction and career fulfilment
- Clearer career paths, higher success rates, and personal growth

Source: ADNOC; AIQ

Sustainability

EmissionX: Machine learning platform for real-time GHG forecasting and reporting across all facility levels

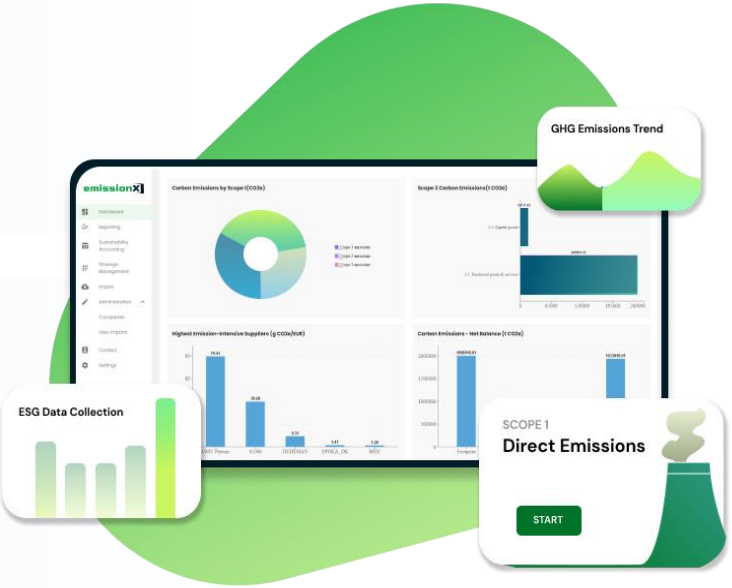
Challenge

Oil and gas accounts for 42% of global emissions. Key barriers include:

- High capital expenditure requirements for decarbonisation solutions
- Long deployment timelines needing in-depth planning and analysis
- Fragmentation due to geographic, asset-type, and regulatory diversity, complicating emissions reduction strategies

Solution

- Uses real-time, source-level data
- No additional infrastructure needed for monitoring and forecasting
- Can forecast emissions up to 5 years ahead using AI/ML models
- Dashboards show emissions trends, anomalies, and target tracking
- Allows for detailed carbon mitigation analysis



Value

- Assesses impact of carbon abatement initiatives
- Makes carbon reduction more cost-effective and impactful
- Provides actionable emissions data at granular levels
- Enables comparisons across sites and equipment
- Supports long-term forecasting, empowering adaptive strategies

Source: ADNOC; AIQ