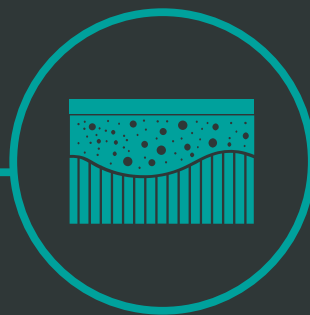# AVENTUS Ai
## total asset control
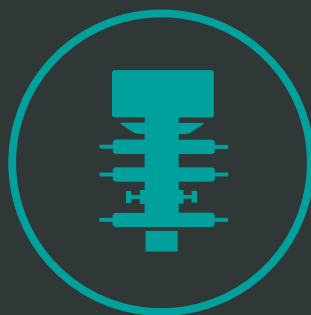
# ASSET **4.0™**
# PRODUCTS & SERVICES

DOING MORE WITH WHAT YOU HAVE
GETTING GREENFIELD RIGHT FROM THE START

**MINERAL
MINING**

**HYDROCARBON
RESERVOIR**

**WELL
INTEGRITY**

**PLANT**

**EXPORT &
DISTRIBUTION**

**RENEWABLE
INDUSTRIES**

# WHO WE ARE, WHAT WE DO & HOW WE DO IT

**AVENTUS Ai**
total asset control

## WE ARE A GEOSCIENCE, MULTI-DISCIPLINED ENGINEERING ANALYTICS AND PREDICTIVE MAINTENANCE MODELLING SOLUTIONS SERVICE PROVIDER.

## AI AND MACHINE LEARNINIG ARE THE BACKBONE TO OUR PRODUCTS AND SERVICES PORTFOLIO

We understand that the reservoir and production assets are inter-dependent, and as such the outputs in one can affect the health condition of those further down the line. Ai and machine learning driven platforms and processes allow us to unlock the value from your asset data. We strive to be disruptive and highly competitive, yielding a richer customer experience.

## INDUSTRY CHALLENGES

Well Integrity, gas leakage detection and prevention, and ageing installations are still subjects requiring special attention by all operators, regardless of tier level. Cutting costs where there seems to be least tangible day-to-day effect is obviously tempting for operators, but Aventus Ai can help leaders and senior managers fully understand where health and safety, and particularly process safety, reliability centred asset integrity, IIoT 4.0, APM 4.0, artificial intelligence and machine learning sits in this mix.

## OPPORTUNITIES

As clean tech industries are maturing, Aventus Ai are seeing distinct comparisons with oil and gas, where our specialist transferable skills have clear applications.

## HOLISTIC ASSET MODEL

Aventus Ai's holistic physics-based approach to bring Ai precision engineering and break down silo's through joined up thinking.

We combine geoscience, risk-based engineering, reliability-based engineering, Technical Safety methodologies, and FEA structural engineering to see the bigger picture, deeply understand trends and put robust implementations in place.

Aventus Ai harness the power of machine learning, artificial intelligence, and IIoT 4.0, which feed high precision data into traditional methodologies and Physics based analytical models, enabling our scientists and engineers to deliver high precision solutions, empowering the client to make the right decisions for the short, mid and long terms.

Our professional competence is divided into the following disciplines:
o Drilling and well technology
o Reliability Centered Multi-Discipline Engineering & RCA
o Technical safety, QRA, Process integrity and barrier implementation and management
o FEA & RBI driven Structural integrity

Our holistic asset modelling looks at the reservoir through to tank farm distribution, and is a transferable skill and knowledge base, that extends to power generation, mining and renewable Energy industries.

This is a huge undertaking, and cannot, should not be done by one company. Aventus Ai is aiming for breakthrough performance no individual company can achieve, while making our cross-functional teams accountable for reaching it. Again, working from the principals of breaking down silos and employing joined up thinking, Aventus Ai have brought together an ecosystem of innovative specialists in each field, providing tools and complimentary expertise that support our science and engineering project teams, enabling us to seamlessly deliver our holistic services. Through collaboration we bring you innovation by the barrel.

Our lean business model and ecosystem of partnerships enable Aventus Ai to enter a whole new era of business efficiency, where we can provide cutting edge service offerings, at highly competitive rates.

We have remade an end-to-end process with changes that promote speed, agility, and efficiency.

This service offering, we are calling ASSET 4.0™

# ASSET 4.0™

## GEOLOGICAL HYDROCARBON AND MINERAL CHARACTERISATION & PRODUCTION OPTIMISATION

### PARADISE™ MACHINE LEARNING SOFTWARE

- Identify thin beds
- See detailed stratigraphy
- Reveal Direct Hydrocarbon Indicators (DHIs)
- Analyze reservoir properties
- Expose faults and fracture trends
- Isolate pressure-related facies
- Geobody Analysis
- Enhanced Data Management
- High Performance Computing
- Petrel Connector

### ATOMIC DIELECTRIC RESONANCE SCANNING

- Scanning for oil and gas
- Scanning for minerals
- Subsea Scanning – Shallow Pool

### 4D SEISMIC DIGITAL OILFIELD SOLUTIONS USING MACHINE LEARNING

- 4D Geomechanics
- BCC 4D Inversion
- well2seis data analytics
- pressure & saturation estimation
- Single pass data casting
  - Geomechanical modelling to locate the remaining oil
  - Integrated reservoir modelling
  - Dynamic reservoir simulation
  - Direct Petrophysical Estimation (Powered by Big Data analytics)
  - Digital 4D: Pressure & Saturation

### RESERVOIR MODELLING

- Flash Geomodelling
- Geomodelling

### RESERVOIR MODEL AUDIT

- Petrophysical Interpretation Review
- Seismic Interpretation Review
- Geomechanical Model audit
- Dynamic model audit

## INTEGRATED WELL DELIVERY

- o Drilling Engineering
- o Integrated Well Delivery

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## GEOSCIENCE

- o Geophysics
- o Seismic acquisition management
- o Seismic processing and inversion
- o Seismic interpretation
- o Structural geology
- o Petrophysics
- o Integrated petrophysical evaluations
- o Facies and permeability prediction
- o Saturation-height modelling
- o Special core analysis
- o Operational support
- o Geology
- o Sedimentology
- o Data analysis & geostatistics
- o Geological modelling

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## RESERVOIR ENGINEERING

- o PVT and rock physics review/analysis
- o Decline curve analysis
- o Communication analysis
- o Material balance modelling
- o Well testing
- o Dynamic simulation – HM and Predictions
- o Production optimisation
- o Inflow control device modelling
- o Economic analysis
- o Single well or field level analysis

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## DRILLING & COMPLETION ENGINEERING

- o Mechanical well & completion design
- o Well Surveillance
- o Intervention planning
- o Well testing and stimulation planning
- o Drilling Engineering studies
- o Drilling Optimisation

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## PRODUCTION TECHNOLOGY

- o Integrated Asset Modelling
- o Production Operations
- o Production Optimisation
- o Artificial Lift
- o Water Management
- o Well integrity

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## DNODES ™

*dNodes*[TM] aids operators and governments authorities to visualise and provide insight into problem situations that are too complex to model using traditional tools. Typically, forward looking strategies where decisions for development options are interlinked over time or where predictions about the future are highly uncertain. *dNodes*[TM] allows the combination of decisions tress with stochastic cash flow models for petroleum projects.

## INSIGHTR ™

Monitoring Resources and reserves, providing realistic forecast on the development of petroleum resources and enabling governments and operators to optimally manage their resources

## PRODUCTION ENHANCEMENT CANDIDATE WELL SELECTION

Identify candidate well, IPR and VFP improvement measures

## MATURE FIELDS – RESERVOIR LIFE EXTENSION

Looking at nodal analysis, well integrity, bypassed hydrocarbons, production management and improved oil recovery

## PRODUCTION WELL LIFE EXTENSION

Downhole integrity analytics, supporting corrosion management, hydraulic isolation, pinhole location, casing deformation, etc. and new technology adoption to remediate classic cased well issues and look at new PHM monitoring sensor design and placement.

## RESERVOIR MODEL AND WELLBORE POSITIONING

Using Ai driven modeling techniques to assess the mature assets and provide opportunity identification. (4D Seismic, 3D Geomechanocal modelling and gaining geophysical insights for history matching.

## PRODUCTION MANAGEMENT

Downhole fluid flow and well conditions monitored to evaluate production and injection performance

## ENHANCED–IMPROVED OIL RECOVERY

Aventus Ai's 5 Stage consisting of candidate well Identification, assessment, project design process, implementation of EOR techniques and control services.

## WELL PLUG & ABANDONMENT

Full subject matter expertise to enable the application of technical, operational & organisational solutions to reduce risk of uncontrolled release of formation fluids during and post well abandonment

- o Well data assessment
  - Well data reviews
  - Cement bond evaluation
  - Well status verification
- o Well abandonment requirements evaluation
- o Well abandonment optimisation planning
  - Evaluate non-standard methodologies to save time/money
- o Equipment evaluation
  - 3rd party service providers
  - Abandonment rig requirements evaluation
  - Rigless abandonment opportunities

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**AVENTUS Ai**
total asset control

# ASSET 4.0™

**RISK & RELIABILITY BASED PHYSICAL ASSET MANAGEMENT ENGINEERING**

## BROWNFIELD HYDROCARBON PROCESS CONTAINMENT ASSURANCE

- o *Intelligent Asset Valve Management™* – using gas leakage detection and reliability analysis, Maintenance Strategy Analysis, maintenance optimisation through systemic FMEA maintenance strategy modifications and rapid CMMS master data builder
- o *Intelligent Asset Turbine Management™* – FEA driven turbine twin analysis, Maintenance Strategy Analysis, maintenance optimisation through systemic FMEA, maintenance strategy modifications and rapid CMMS master data builder.
- o *Intelligent Pump Management™* – FEA driven pump twin analysis, Maintenance Strategy Analysis, maintenance optimisation through systemic FMEA, maintenance strategy modifications and rapid CMMS master data builder.

## BROWNFIELD DEEP DIVE MASTER DATA BENCHMARKING

Where you are now and what clear-cut direction for needs to be done
- o *Realizer™* – Whole asset reliability bad actor KPI analysis tool.
- o *OPEXellence™* – Asset register OPEX Analyser
- o *Startegyzer™* – Maintenance distribution analysis

## BROWNFIELD ASSET MASTER DATA BUILD FOR RISK & RELIABILITY ENGINEERING SOLUTIONS ASSURANCE

- o *iAsset™* – High Precision Rapid Master Data rebuild process, combing Aventus Ai's Digital-PAV™ and Asset 4.0-DAV™ and SPYRSYS™ Total Spares Data Management for master data equipment enrichment

## GREENFIELD MASTER DATA BUILD, OPTIMISED FOR RISK, RELIABILITY AND PREDICTION MODELLING

- o Digital asset capture using multiple payloads to generate critical engineering data
- o Asset Register ISO14224 Build and enrichment
- o Process and technical Safety application
  - – SECE equipment status allocation
  - – Performance standard allocation
  - – Equipment priority level setting
- o RBI, PMO, IPF (Sil) equipment PM task assessment
- o FMEA Based Maintenance Strategy Build
- o Probability of failure risk matrix analysis
- o Consequence of failure analysis
- o Spares Modelling and strategy development
- o RCM CMMS Master data build enrichment
- o Master Data equipment information enrichment down to the LMU
- o CMMS Implementation build for task list generation under work groups.
- o Development of CMMS master data upload file
- o Development of the asset digital twin (optional)

## ASSET INTEGRITY MANAGEMENT

(ISO55000, ISO 55001, ISO 55002, ISO 14224, NORSOK Z-008, ISO 15663, ISO 19008)

- ISO 55000 Asset management framework implementation
- Review of safety case and verification scheme, performance standards and integration into maintenance strategy build
- Master Data build including technical hierarchy assembly, safety critical equipment identification, full data enrichment with attributes included assuring full reliability modelling capabilities.
- Engineering reference documentation, by equipment type, will be mapped to each functional location, down to the lowest maintainable unit (LMU)
- Integration of reliability, availability and maintainability (RCM2)
- Asset spares management data design and build, with *SPYRSYS™* spares modeling
- Continuous improvement facilitation, covering: key performance indicator design, Life extension assurance (HSE KP4), RCA back-fit RCM, Brownfield audit health check & regulatory compliance and plant maintenance optimization.
- Asset economics and application of whole lifecycle costing principals
- Management of Change assurance through post project delivery hand over facilitation
- Equipment Geotagging

## RISK-BASED & RELIABILITY-BASED ENGINEERING

(ISO 31000, ISO 31010, IEC 60300-3-9, IEC 61882, ISO 14224, NORSOK Z-008, ISO 20815, ISO 12489)

- FMEA – System Based Failure modes and effects analysis
- HAZID - Hazard Identification
- HAZOP - Hazzard on operability analysis
- PRA – Probabilistic risk assessment
- QRA - Quantitative risk assessment
- RBD - Risk based design
- RBI – Risk Based Inspection
- Probabilistic fatigue and fracture risk assessment
- Uncertainty modelling
- System reliability modelling using FMMEA
- Equipment life prediction
- Risk characterization
- Probabilistic approach to reliability engineering
- Probabilistic risk assessment
- Human reliability analysis
- Digital system reliability
- Functional safety analysis for safety integrated level (SIL) rated IPF systems
- Safety case reviews
- Performance standard & assurance task review optimisation and authority
- SECE rule set for determining safety and environmental critical equipment
- RAM modelling– Analysis of reliability, Availability and Maintainability, using DNV Maros
- FEA Prediction –Electrical Systems Modelling

## STRUCTURAL INTEGRITY

(API-579, DCR. SI 1996/913, DNVGL-SI-0167, SCR.SI 2005/3117, PD 8010, DNV-OS-F101, DNV-RP-C205, DNV-RP-C203, DNV RP-F107, ASME VIII)

- API-579 Fitness for Service Evaluation
- RBI – Risk Based Inspection
- Equipment life prediction
- FEA Prediction –Structural Integrity Modelling
- Vibration analysis
- Thermal Surveillance
- Gas Leakage detection
- Surface Corrosion Detection
- Hydrates analysis
- Corrosion Mapping

## SPARES MANAGEMENT

Spares Master Data build and Prediction Modelling Analytics using *SPYRSYS™* Covering:

- Operations & Commissioning Spares Build, Modelling and Asset Life Cycle Management
- Offshore Materials Control Management
- Spares Surplus Management

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## MASTER DATA REBUILD AND DIGITAL ASSET MANAGEMENT

(ISO 14224, NORSOK Z-008, ISO/PAS 17506:2012, ISO 17359:2018)

- Using Ai and machine learning to rapidly strip data from drawings and documentation, removing human error that normally causes 40% errors that need to be corrected during post extraction QA.
- Utilizing an Ai driven, deep search engine for individual equipment tag enrichment
- CMMS Master Data Attributes Design for Reliability
- Multi-Inspection & 3D Digital Asset Capture – Aventus Ai's *Digital PAV™*
- System Based Failure mode mechanism and effects analysis (FMMEA)
- Physics or failure approach for electronics and structural sensor design
- Prognostics and health management – *Condition Monitoring 4.0™*
- Risk informed decision-making
- Risk-based and risk informed applications
- Building a functional 4D digital twin today

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## WELL INTEGRITY CONTROL

(NORSOK D-010, ISO 16530-1, ISO 16530-2, API-RP90, NOPSEMA-GL0936, API-579, NOG 117, ISO 13533)

Prevention of uncontrolled release of process fluid/gases through our well-engineered solutions relating to prevention and mitigation of uncontrolled flow to the environment. Key focal areas:

- Wells Integrity Management Systems (WIMS)
- Strategies & Procedures
- Barrier Assessment
- Corrosion & Chemical Management
- Life Extension Surveys using FEA
- Compliance Audit & Reviews
- Data Collection, Analysis & Integrity Reporting
- Integrity Failure Assessment
- Engineering & Troubleshooting
- Safety Critical Assessments & Performance Standards
- API-579 Fitness for Service Evaluation
- Safety Analysis & Risk Assessment

Aventus Ai's Reservoir Characterisation & Well Integrity Management group have partnered with multiple strategic partnerships to deliver a superlative Well Fitness Program

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## ASSET DIVESTITURE

Vulnerability and Exposure Prediction Modelling

- Current operating status (Equipment, Systems & structures)
- Detailed report on remnant life (Equipment, System & Asset Value)

Divestment: Whole Asset Transfer to New Operator, or In Parts: Decommissioning

- Legacy Asset integrity management system review
- End of life prediction (Equipment & Systems)
- Maintenance strategies review and optimisation
- Spares Modeling and usage identification, Post maintenance optimisation

# FRACAS RCA – INCIDENT INVESTIGATION

(IEC 62740:2015)

Common reasons why corrective failures persist, and root cause analyses fail if they are performed at all are:

o Poor Corporate Reliability Guidelines & Policies

o No RCA process in place

o No Problem Management

o High Frequency of Incidents

o Limited Time to Conduct RCA

o RCAs Produce Ineffective Solutions

o Preventions of Re-Occurrence Don't Get Implemented

o Ineffective Solution Tracking

o Cultural Resistance to Change

o No Qualified Reliability Engineers

o No Problem-Solving Process in Place

Aventus Ai's Reliability Engineers have extensive incident investigation experience, where we use the Failure Reporting Analysis and Corrective Action Systems, (FRACAS), methodology for root cause analysis. Integrated into this process is Six Sigma's Define, Measure, Analyse, Implement and Control (DMAIC), philosophy and Aventus Ai use this method in achieving true root cause, and so defining the finite preventions of reoccurrence that need to be implemented, and controlled for an RCA to be truly effective.

Aventus Ai Incident Investigation services:

o *Root Cause Analysis (RCA) Incident Investigation using FRACAS* – but also harnessing traditional condition monitoring, using Ai and machine learning to extract data, and using modern telemetry logged machine sensor data and video-based condition monitoring to feed into the RCA, and reach that finite solution, implementing remediations that work.

o *Backfit RCM* – FMEA and root cause analysis alignment

# AVENTUS AI'S COMPLETE REGULATORY COMPLIANCE

Aventus Ai Limited, as a minimum standard, work in strict regulatory compliance with global and client local standards. In addition to ISO's: 55000, 55001 and 55002 (Standards for Asset Management), Aventus Ai operate to all major standards and guideline policies, both globally and the organisations that regulate the local geo-market.

These include fixed platforms, FPSO's, drill-ships, semi-submersibles, subsea, well Integrity, export pipelines, refineries, distribution tank farms, which are principally governed by API, ISO, NORSOK and OGP as well as localised standards e.g. ROK in Kazakhstan, NOPSEMA in Australia, etc.

Further examples of Aventus Ai's compliance conformance are listed below for specific processes:

o *FMEA:* AIAG, SAE J1739, IEC 60812, ISO 14971, VDA-4 and MIL-STD-1629A

o *RCM+:* SAE JA1011, SAE JA 1012, MSG-3 and NAVAIR 00-45-403

o *RBI:* API RP 580, RP 581 and ASME PCC-3-2007

# DIGITAL PAV™

(ISO/IEC 19770-1:201, ISO/IEC 27001, ISO15926, ISO/IEC 20546:2019)

## Digital Asset Capture

- o LiDAR Survey
- o Topographical Survey
- o Point Cloud 3D Modelling
- o Digital Elevation Model
- o As Built Surveys
- o Geospacial Survey
- o Orthophoto
- o Ground Penetrating Radar
- o UAS Survey
- o Volumetric Calculation
- o Hydrographic Survey
- o Acoustic Time of Flight Deflection & Non-Intrusive Inspection 3D corrosion maps

## Physical Asset Health Status

- o UAV Inspection
- o Structural Inspection
- o Solar PV Survey
- o Bridge Inspection
- o Confined Space Survey
- o Visual Asset Management
- o Corona UV Imaging
- o FLIR Thermal Imaging
- o Optical Gas Imaging
- o Building Condition Survey
- o Remote Visual Inspection
- o Motion Amplification
- o Prognostics & Health Management Sensor Design and Implementation

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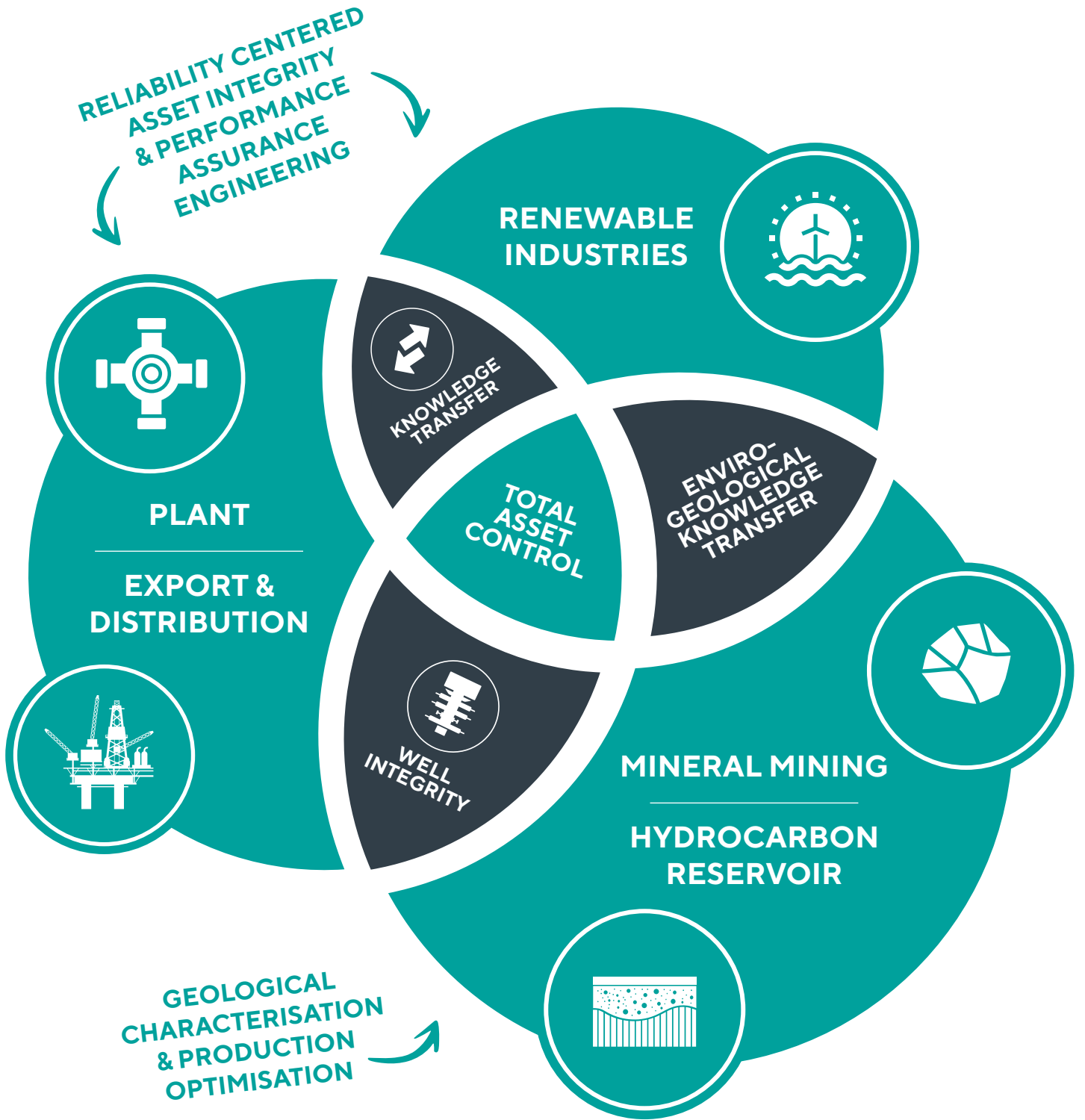
# COMPLETE SOLUTION

Full Utilisation of Oil & Gas Authority (OGA) Data Centre
Analyse > Cost > Access Point

**ANALYSE**

**REPORT**

**CHANGE MANAGEMENT**

**TECHNOLOGY**

**PEOPLE**

**IMPROVEMENT**

SUCCESSFUL PROJECT EXECUTION, DELIVERY AND MOC FASCILITATION

↑ 100%

**CHANGE MANAGEMENT**

**PROJECT MANAGEMENT**

**ANALYTICS & SOLUTIONS (TECHNOLOGY ADVANCEMENT)**

**AI + MACHINE LEARNING DATA MINING & AI ANALYTICAL PROCESSES FOR PREDICTION** + **KEY SME ASSET KNOWLEDGE**

0

→ TIME

**PEOPLE / CULTURE CHANGE**