Unlocking the Promise of AI-Optimized O&G Assets

PI Enabled Data Pipelines for Analytics and ML

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Who is EOT?
Modernizing OT/IT Infrastructure to Utilize Modern AI/ML around the Globe

EOT is a global industrial software company offering a platform designed to enable AI-optimized digital assets using enterprise-wide insights to optimize each individual asset.

www.eot.ai
Best Practices Compass
How to Unlock the Promise of AI Optimized O&G Assets

1. **Why and why now?** 1) Unpacking the Promise and Dilemma of AI Optimized O&G Assets, 2) Making a business case.

2. **Pick one! Use Case Discovery and Identification:** Identify 1-3 business challenges and size the financial and productivity impact and ROI when solved.

3. **8-Week Implementation Roadmap:** Design and deliver the Minimal Viable Product (MVP) within a short period of time.

4. **Roll MVP out into Production:** Plan and deliver an app or system to business and/or operational users.
Step 1: Why and why now?
Unpacking the Promise and Dilemma of AI Optimized O&G Assets

1. The Promise of a Golden Future (revenues, profits)
2. Challenge 1: The Gen AI/LLM Hype and Reality Gap
3. Challenge 2: OT/IT Data Chasm

The Implication: Innovator’s Dilemma
The Hype and Reality Gap

If you want unlock the business value of Operational IoT Data

Forget LLMs

Don’t fall for the hype.

Let’s talk about the (one) reason why these models can't be directly applied to operational data
Step 1: Why and why now? AI/ML Potential

**ESP & ALS Top 10 Failure Reason/Operational Inefficiencies**

*that can be predicted or mitigated using AI/ML*

<table>
<thead>
<tr>
<th>ESP &amp; ALS: Top 10 failure reasons</th>
<th>ESP &amp; ALS: Top 10 operational inefficiencies</th>
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<tbody>
<tr>
<td><strong>Challenge</strong></td>
<td><strong>Benefits</strong></td>
</tr>
<tr>
<td>Sand and Solids</td>
<td>Predictive Analysis: ML can forecast the probability of excessive sand production based on real time downhole measurements.</td>
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<tr>
<td>Gas Locking</td>
<td>Anomaly Detection: ML can identify sudden changes in pump parameters that indicate gas interference or locking.</td>
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<tr>
<td>Electrical Failures</td>
<td>Predictive Analysis: ML can anticipate potential electrical failures based on trends in power quality and motor conditions.</td>
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<tr>
<td>Corrosion</td>
<td>Predictive Analysis: ML can predict corrosion rates based on parameters like water cut, gas composition, and temperature.</td>
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<tr>
<td>Downhole Vibrations</td>
<td>Anomaly Detection: ML can monitor equipment vibration patterns to detect early signs of misalignment or wear.</td>
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<tr>
<td>Poor Design or Incorrect Sizing</td>
<td>Predictive Analysis: ML can anticipate optimal equipment designs and sizes based on historical performance data and reservoir conditions.</td>
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<tr>
<td>Scale and Paraffin Buildup</td>
<td>Predictive Analysis: ML can anticipate scale or paraffin deposition risks based on fluid composition and temperature changes.</td>
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<tr>
<td>Downhole Pressure and Temperature Fluctuations</td>
<td>Predictive Analysis: ML can forecast pressure and temperature fluctuations based on current reservoir conditions and injection/production rates.</td>
</tr>
<tr>
<td>Mechanical Wear and Tear</td>
<td>Predictive Maintenance: ML can predict when components are nearing the end of their useful life based on performance metrics and usage patterns.</td>
</tr>
<tr>
<td>Cavitation</td>
<td>Anomaly Detection: ML can detect early signs of cavitation by monitoring pump performance metrics and fluid properties.</td>
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Why CDOs, Architects, and IT/OT Managers in Industrial Enterprises Have One of the Most Dangerous Jobs in World

Welcome to POC & Pilot Purgatory

Successful PoCs & Pilots

End of the (Windows) .NET Framework

Operations (Money Making Side)

- Operational Systems and Applications
- Historians
- SCADAs
- Industrial Assets

IT Cloud (Smart AI/Analytics Side)

- Cloud Apps & Platforms
- AI/Machine Learning
- Business Intelligence
- Predictive Analytics
- Enterprise IT
- Data Warehouse
- Event Bus
- Data Lake
Step 1: Why and why now?
Making a business case
How AI-Optimized Industrial Plants Benefit each Stakeholder in Your Company

What do executives and shareholders want?
- Improve business and value of shares
- Increase profits now and in the future
- Maintain a great reputation and standing
- Invest in advancements that change the game

What does operations want?
- Access all equipment and production data in one place
- Rapid onboarding of new assets
- Provide high quality, actionable recommendations
- Increase production, reduce downtime
- Avoid spend as much as possible

What does finance want?
- Do more, spend less
- Increase profits
- Drive down expenditures
- Balancing budgets
- Support business efforts and goals

What does IT want?
- Modernize infrastructure and capabilities
- Easy maintenance
- Deploy scalable tools systems, and applications
- Support and advance the workflows
Step 2: Pick one! Use Case Discovery and Identification
Identify 1-3 business challenges and size the financial and productivity impact and ROI when solved

1) Attempting to build a industrial data lake addresses all possible use cases. (This is often driven by business consulting firms that spend an excessive amount of time compiling use case lists involving the entire organization.)

2) Having no use case at all and adopting the mindset of putting all data into the cloud first, then discussing potential applications with users.
Step 2: Pick one! Use Case Discovery and Identification
Identify 1-3 business challenges and size the financial and productivity impact and ROI when solved

What if we could onboard new industrial assets quickly?

What if we could drive down expenditures and increase profits?

What if we could modernize out IT infrastructure and capabilities?

What if we could get high quality, actionable recommendations to increase production, reduce downtime?

What if we could change the game and increase shareholder value?

What if we could access all equipment and production data in one place?

What if we could deploy scalable, open tools systems, and applications?
Systems Architecture Development Process

### Functional Architecture
- **Goal:** What components are needed to deliver business purpose, value and scope for TBD
- **Specifies:** Definition of components & their purpose, role & relationships

### Logical Architecture
- **Component Design**
- **Goal:** Which technologies are best suited for implementing each component for a TB MVP/POC
- **Specifies:** Choice cloud cervices, applications, process and data flow

### Physical Architecture
- **Instance Design**
- **Goal:** What/where to implement the instances of technologies/apps and their interactions
- **Specifies:** Naming for server, services, networks, accounts, IP addresses, IAM, etc.
Industrial Data Lake Functional Architecture

How PI / PI AF Analytics + Twin Talk + Cloud-based AI/ML Analytics Enable Rapid Implementations and Iterations of MVPs as well as Production Deployments

1. Data Model Management
   - Single Source of Truth

2. Data Ingestion & Curation
   - real-time aggregated backfill
   - 1M/sec ~200ms
   - 4M

3. Data Storage, Processing & Analytics
   - AVEVA Data Hub
   - AVEVA Data Hub
   - AI/ML Libraries
   - Databricks
   - Snowflake

4. Apps & Visualization
   - AVEVA Data Hub
   - Grafana
   - PowerBI

Data Ingestion & Curation Layer

- raw data
- contextualized data
- curated data

Data Storage

- raw data
- contextualized data
- curated data

Curated Data Storage

- Curated Semantic Data Model
- Curated Time Series Data

Industrial Asset Models & Hierarchies

- Hierarchy and Rules Engine
- Analytics & ML Engine

Industrial Data Lakehouse

- Digital Twin Builder
- Dashboards, App Builder

Application Layer

- Systems & Databases
- SAP, MES, EAM, SQL Servers, ...

Raw Data Sources

- Traditional IT Systems
  - Financial Systems
  - Transactional Systems
  - Engineering Systems

- Operational Systems
  - SCADA
  - PI Historians
  - OPCUA, CSV, etc

Data Ingestion & Curation

- Data Contextualization
  - Metadata Enrichment
  - Data Governance
  - Data Acquisition

Data Processing

- Traditional Data Stores
  - AVEVA AF Servers, PI Archive Servers
Reference Architecture for Industrial Data Lake - Analytics and ML using SnowFlake
PI-Enabled Data Pipelines via Snowflake SQL API into tables

Twin Talk

OSI AF & PI Data Archive Servers

Twin Talk

OSI AF & PI Data Archive Servers

Twin Talk

TwinTalk Service Account

Role (SELECT, INSERT)

Snowflake Direct API Inserts

Snowflake Tables

Snowflake Web Console

Customer Preferred Analytics Apps and Visualization tools

AI & ML Libraries, apps & platforms

Web App

Power BI
Step 3: How to successfully get from use case to MVP

8-Week Implementation Roadmap

Kick-Off/Planning
Process, Team, Roles and Responsibilities
Identify and define Business Value Use Case

Security
Implement Data Security: Firewalls, Process, etc.
Security governance process

AI Optimizations
End-to-end testing of data delivery chain.
Support configuration of AI cloud analytics tools and validate analytic models.

Go-Live
Business Value Validation
Document customization of blueprints & processes

Sprint 1
Kick-Off/Planning

Sprint 2
Security

Sprint 3
AI Optimizations

Sprint 4
Go-Live

Sprint 5

Sprint 6

Sprint 7

Sprint 8

Architecture
Define Tags, Volume, Frequencies.
Customize CA Blueprint
Sample Data to Create analytics models

Data Management
Implement Data delivery pipelines
Implement data governance
Set up Data Lake

Optimize
Optimize deployment
Support creation dashboards, anomaly detection, alerts

Transition Operation
Knowledge transfer to operations team
Hand-over to operate data management to IT ops team

Step 3: How to successfully get from use case to MVP

8-Week Implementation Roadmap
Step 4: How to Unlock the Promise of AI Optimized O&G Assets

Rolling MVP out into Production
Plan and deliver an app or system to business and/or operational users

1. Build out Staging and Production Environments
2. Identify and work with ”Friendly” power users on improving MVP to meet production requirements
3. Develop and execute phased roll out strategy that incentivizes first movers and supports “laggards”
## Challenge

- Pivot legacy operations technology infrastructure to a cloud-based stack
- Reducing Emissions: Become a net zero company by 2050 or sooner
- Cloud-based analytics platform to scale to 4 business units

## Solution

- Production Monitoring & Surveillance Solution
  2. Pick one! Use Case Discovery and Identification
  3. 8-Week Implementation Roadmap
  4. Roll MVP out into Production

## Benefits

- Aggregates data from thousands of wells across multiple geographic locations into a central location for analytics and machine learning.
- Enabled proactive maintenance to avoid downtime.
- 45% reduction in IT and OT Total Cost of Ownership (TCO)
Thank You!

Learn More about Unlocking the Promise of AI-Optimized O&G Assets for Your Company

Questions?

Please wait for the microphone.
State your name and company.

Please remember to...

Navigate to this session in the mobile app to complete the survey.

Matt Oberdorfer
CEO, EOT