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Predictive Maintenance

Applying Predictive Maintenance in Midstream Operations

/ code academy

Agenda

- General Information
- Key Definitions
- Behind the Model
- Model Results
- Business Applications

General Information

Predictive Maintenance

- Predictive maintenance uses **data analysis** to identify operational anomalies and potential equipment defects, **enabling timely repairs before failures occur.**

- Under **predictive maintenance**, the **rate of equipment failure declines**. The potential of catastrophic failure decreases. Operation and maintenance **costs plummet** and **productivity increases**.

- Assets **stay operational for longer** extended periods. Unplanned **downtime becomes the rare exception** - not the norm.

Key Definitions

Maintenance

Maintenance is the act of keeping property or equipment **in good condition** by making repairs, correcting problems, etc.

Reactive Maintenance

corrective maintenance that happens after a breakdown

Preventative Maintenance

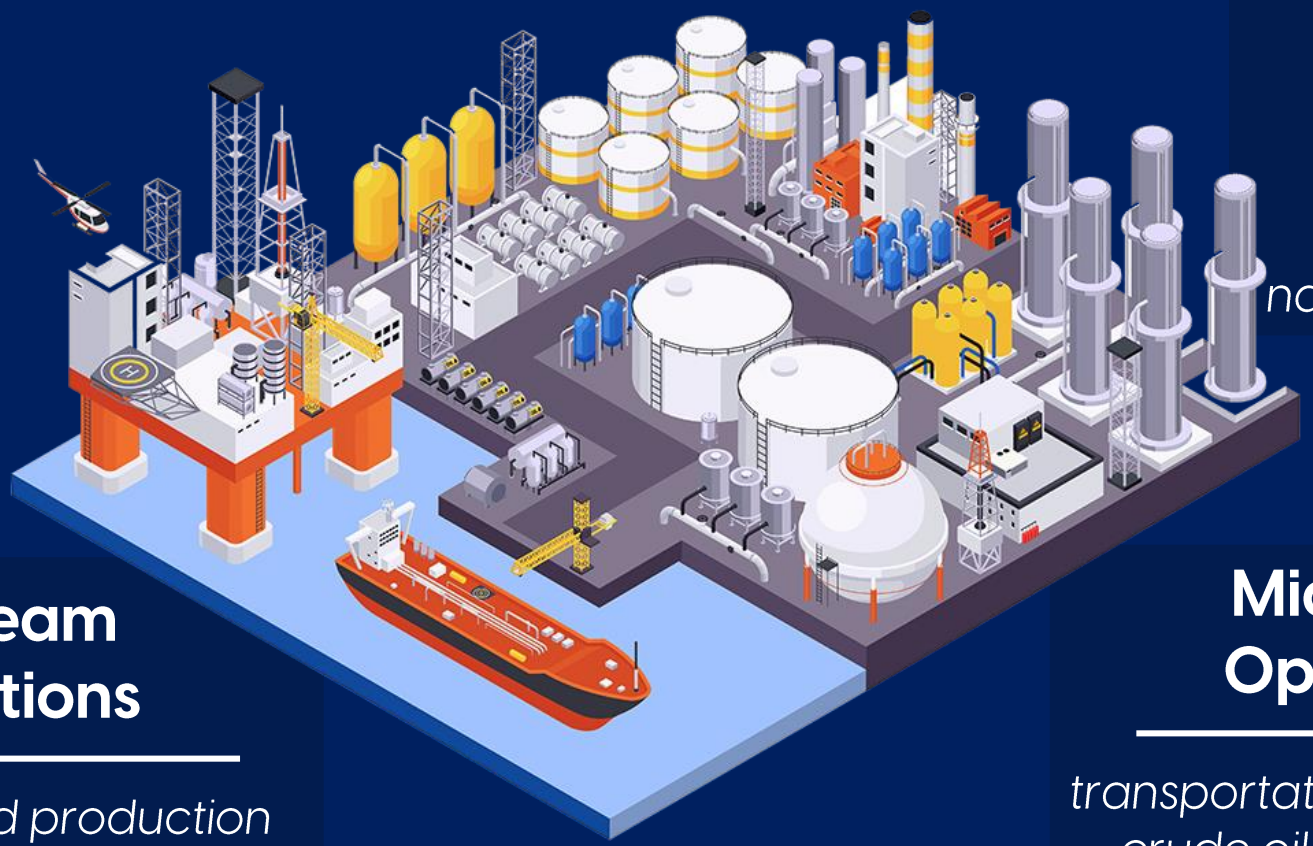
regularly performed maintenance to reduce failures

Predictive Maintenance

using sensors and software to predict future failures

Key Definitions

Segments of Oil and Gas Industry



Upstream Operations

exploration and production of crude oil and natural gas

Midstream Operations

transportation and storage of crude oil and natural gas

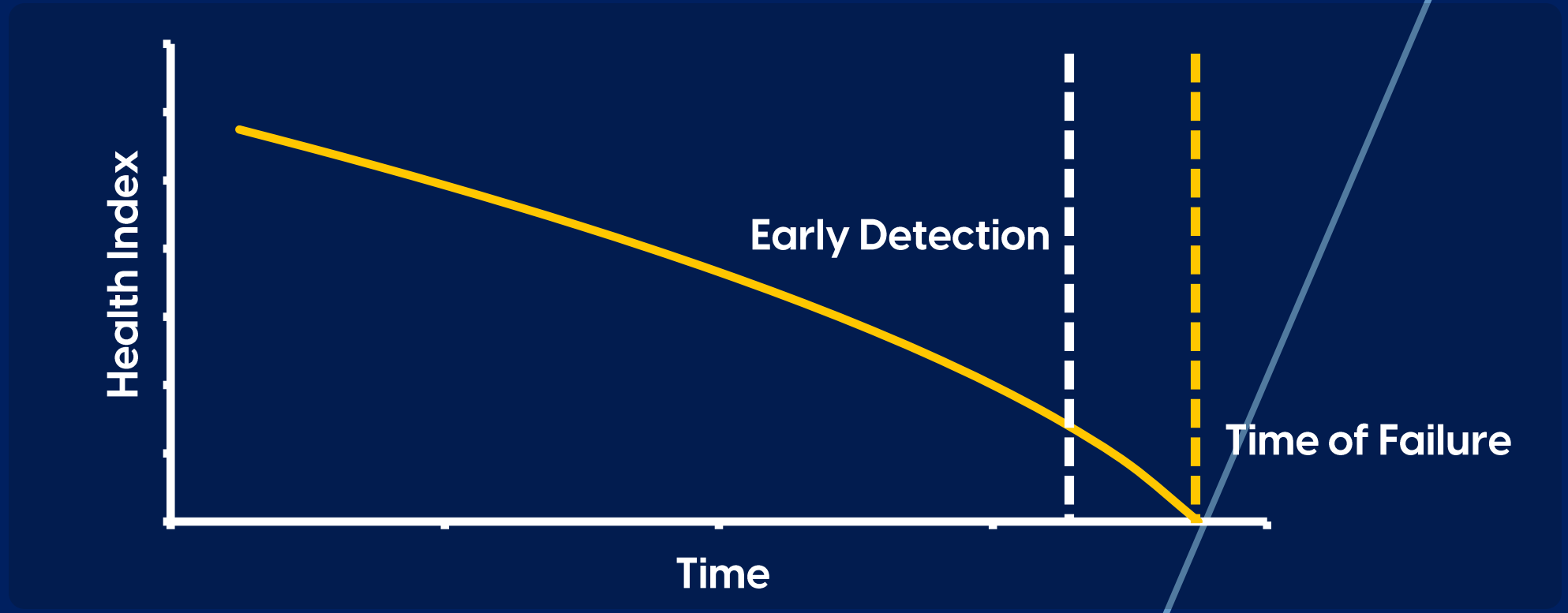
Downstream Operations

conversion of crude oil and natural gas into finished products

Behind the Model

Model Explanation

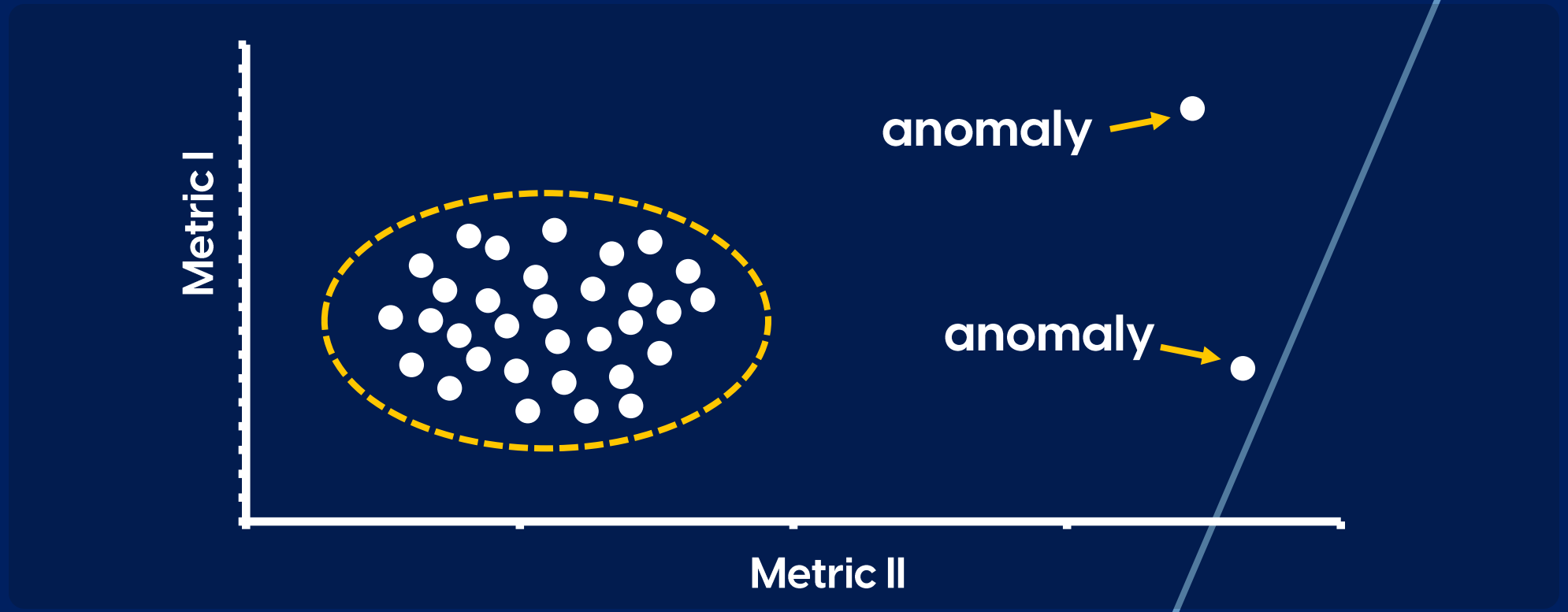
It is **100% certain** that the **machine will break down** sometime in the future. **Machine learning models** are trained using historical data to **detect any abnormal behaviour** that could indicate **early signs of failure**.



Behind the Model

Anomaly Detection

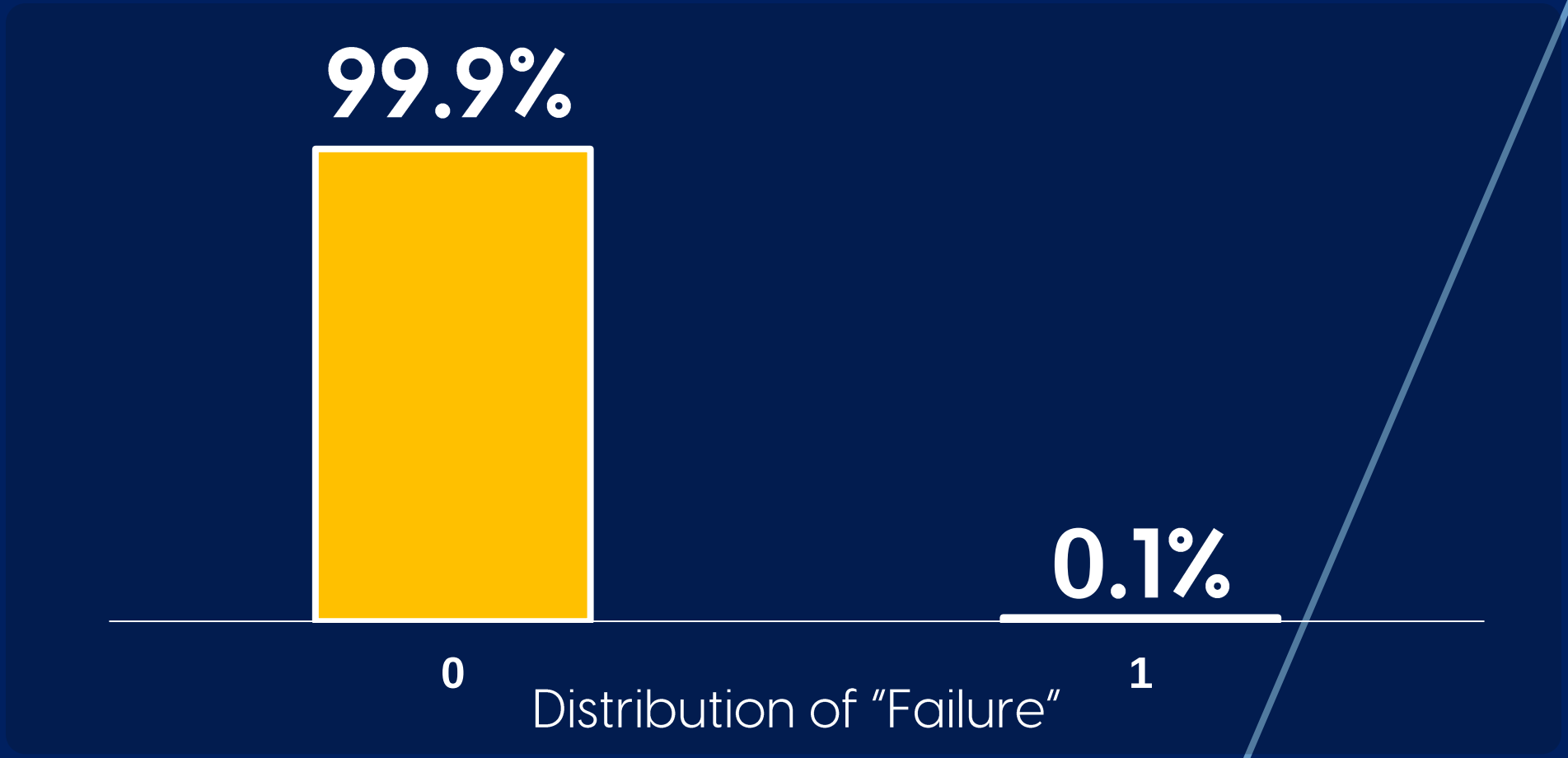
Anomaly detection is used to **identify unusual patterns or observations** in data that **do not conform to expected behavior**.



Behind the Model

Why Anomaly Detection?

Anomalous observations are often very rare as seen below.



Behind the Model

Why Anomaly Detection?

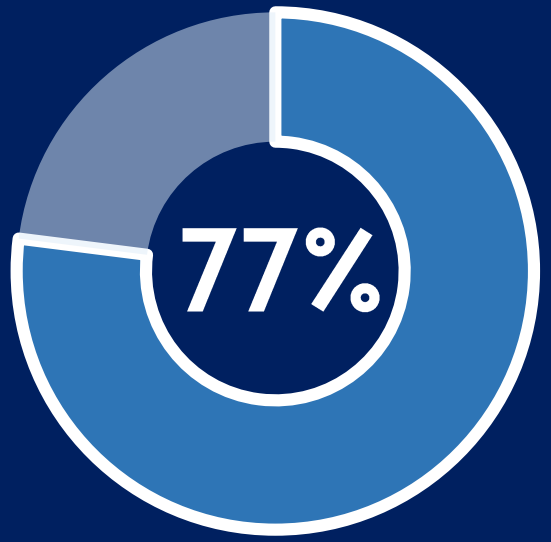
- Anomalous observations are **often rare** ones.
- Dataset is expected to be **imbalanced**.
- It is not possible to accurately predict performance using classification, **values may vary**.

Model Results

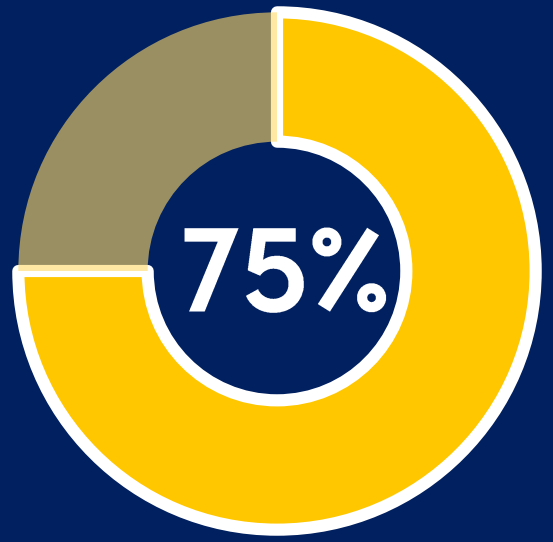
Predicative Maintenance Model

Anomaly Detection Model Accuracy

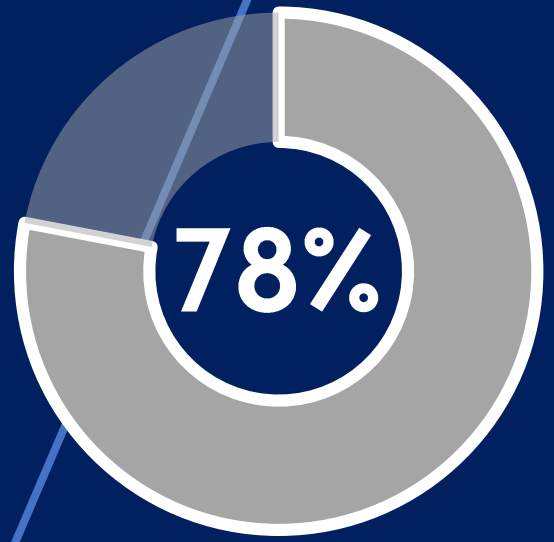
Isolation Forest



Local Outlier Factor



Elliptic Envelope

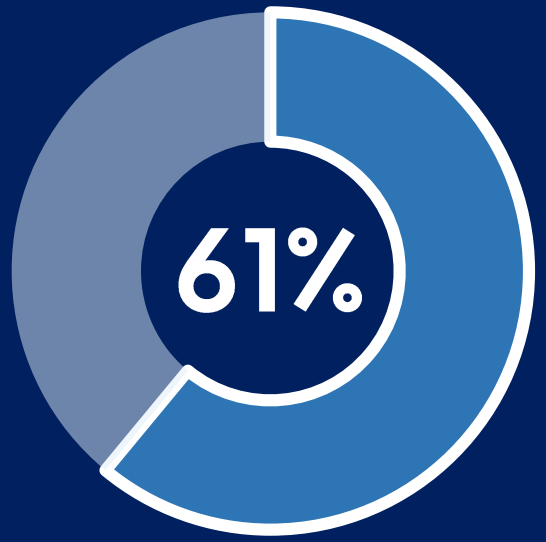


Model Results

Predicative Maintenance Model

Anomaly Detection Model Precision

Isolation Forest



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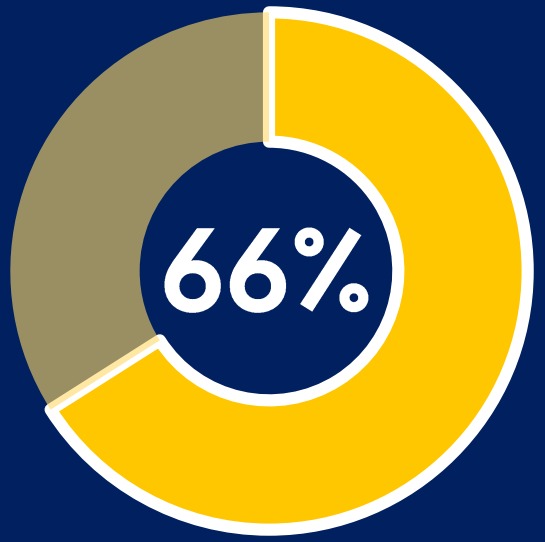

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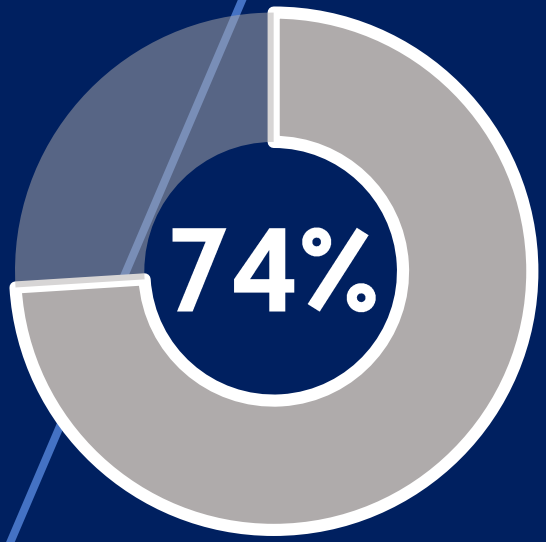


Business Applications

Where can it be used?

- Pipeline **drag reducing agent** optimisation
- **Lockout pressure** optimisation
- Bearing **failure prediction**

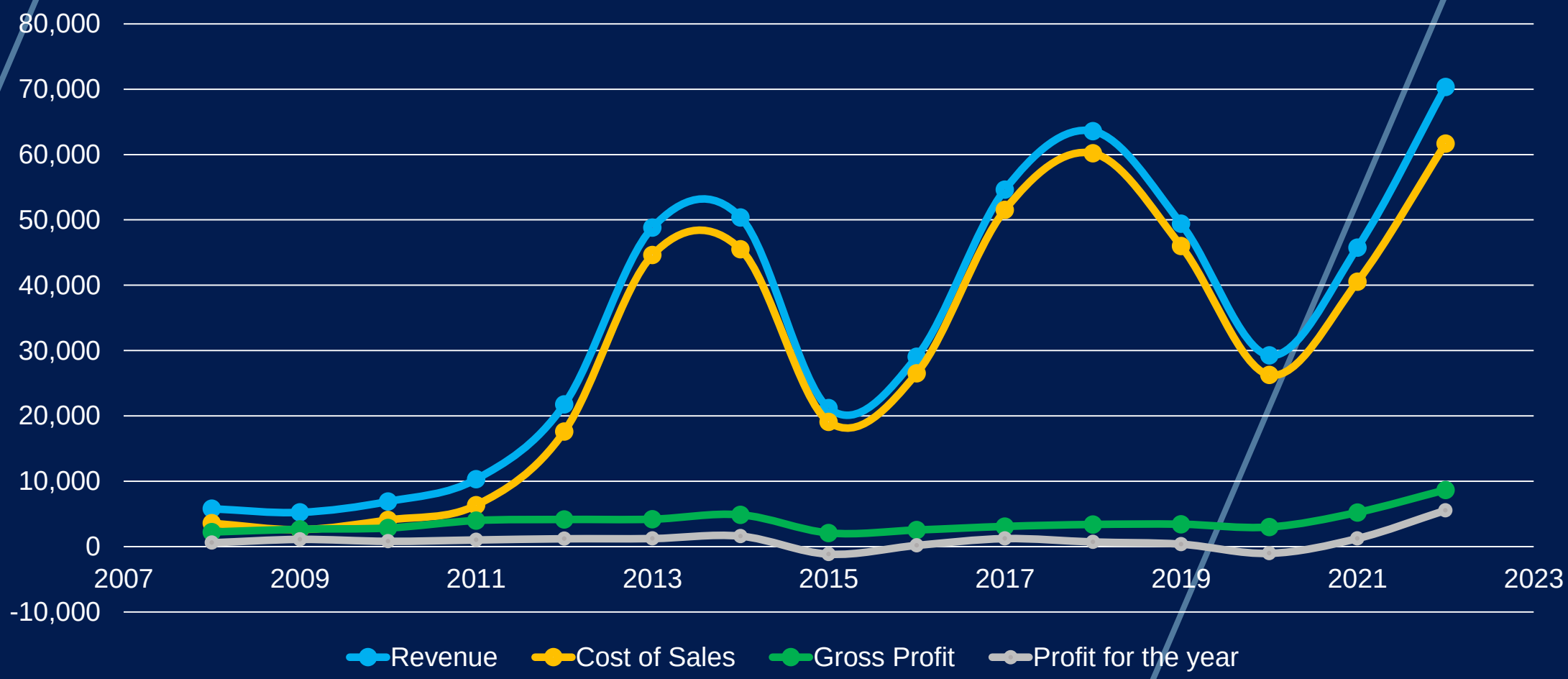
Business Applications

Business Applications for Azerbaijan

- SOCAR Midstream Operations LLC took over the **technical operatorship of South Caucasus Gas Pipeline** in 2020.
- Azerbaijan's location as a **Middle Corridor** country.
- Some Western businesses are now **wrapping up their operations** or **transferring them to SOCAR**.

Business Applications

Balance Sheet in USD - SOCAR



Business Applications

Why Now is the Time?

- Make use of what you have - **lots of data**
- Lead, don't follow - **big corporates are already taking action**
- Eliminate your most common challenges

Business Applications

Transformation

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It requires:

- **Using existing sensors** and/or instrumenting assets with sensors

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- **Optimized recommendations** for planned maintenance

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