

Photonics Sensing Solution

for
predictive maintenance, anomaly
detection and asset monitoring

In harsh environment



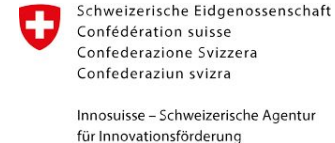
Contact: nicolas.abele@miraex.com

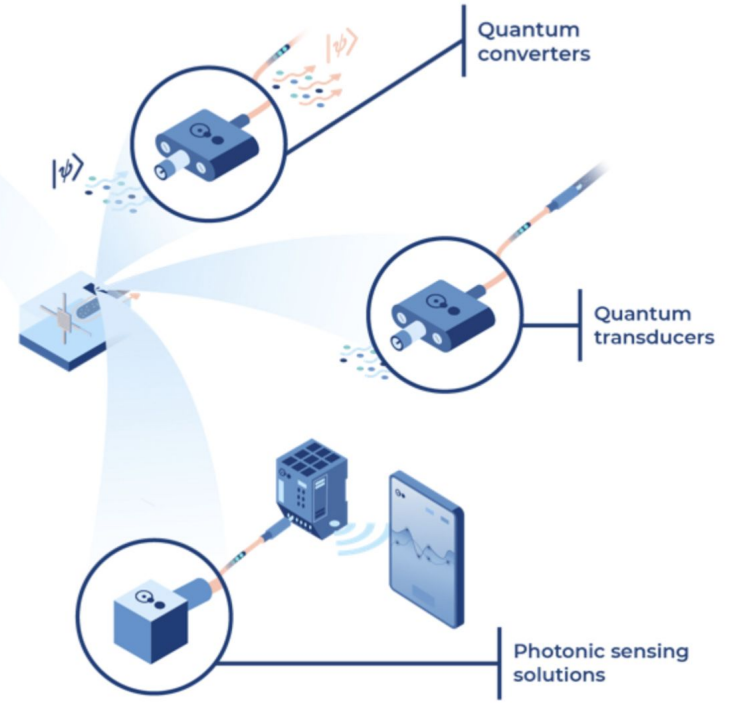
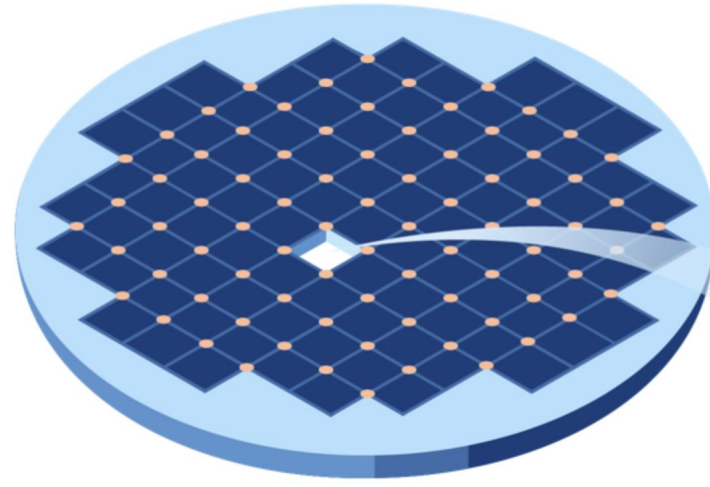
Company

- Located in Lausanne, Switzerland. Spin-off from **EPFL**
- Resulting from years of development in the field of photonic sensors, quantum optics and data analytics
- Developing & selling **full-stack** photonics and quantum products
- Technology Award winning company:



EPFL Innovation Park, Bâtiment L
CH-1015 Lausanne, Switzerland.
<http://miraex.com/>





Miraex patented technology is at the confluence of semiconductor, Micro-Opto Mechanical Systems & Machine learning AI

Core Technology using photons instead of electrons



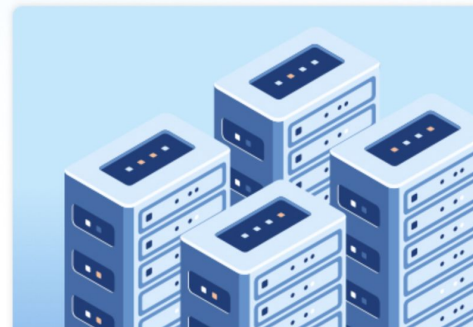
Industrial solutions

Access the data no one else can.
Miraex solutions allow you to make data-driven maintenance decisions, reducing costs and optimizing productivity.



Aerospace Security & Defense

Detect the undetectable.
Either because the conditions are too harsh. Or because the signal is too small.



Quantum Networking and Computing

Solve the unsolvable.
Connecting quantum devices at the scale to unleash the exponential power of quantum computing and the quantum internet.

Photonics Sensing Solution

Access the inaccessible



Industry and agritech 4.0 is about predictive maintenance, real-time asset monitoring and anomaly detection across all verticals

Lack of solutions for extreme environments

Extreme environments

are found in any industry



Magnetic-Field



RFI/EMI Immune



Radiation



High Voltage



Extreme Temperatures



Water-proof



Chemical, Corrosive



High Pressure



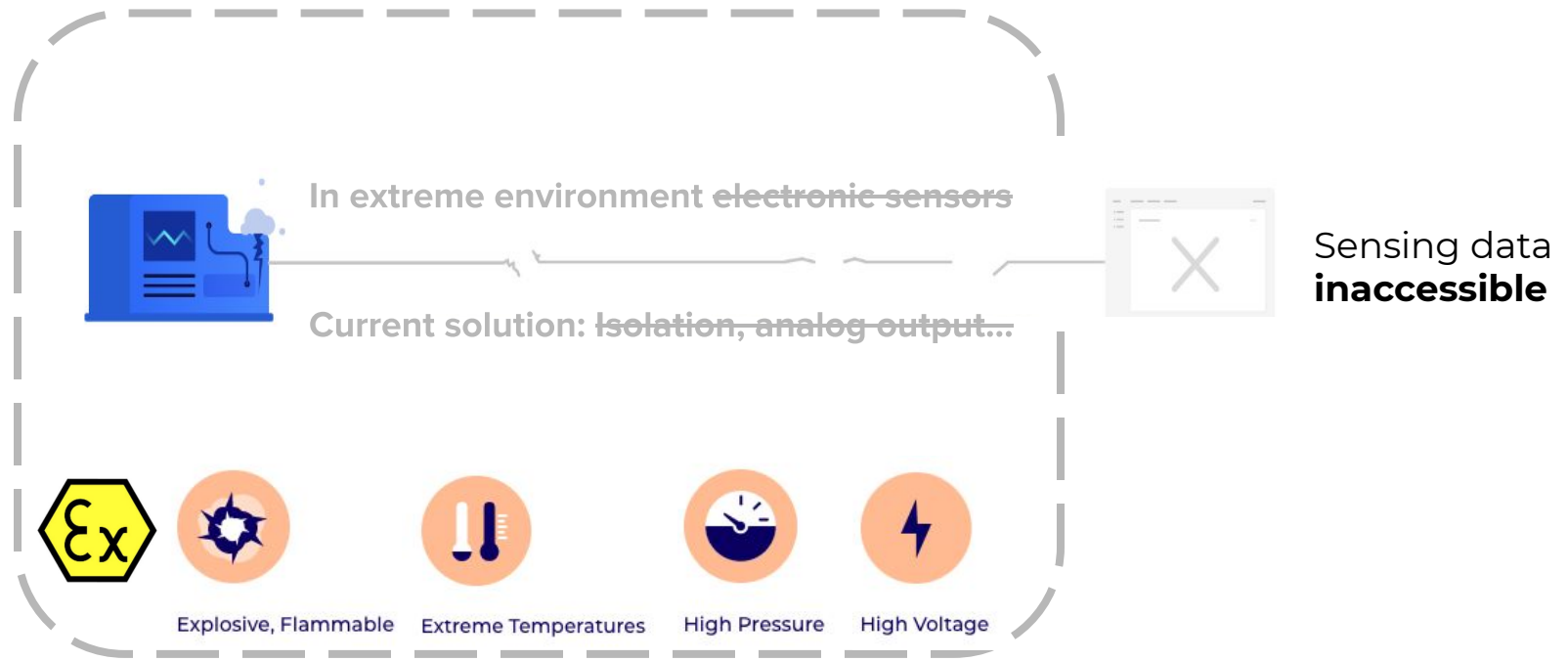
High shock



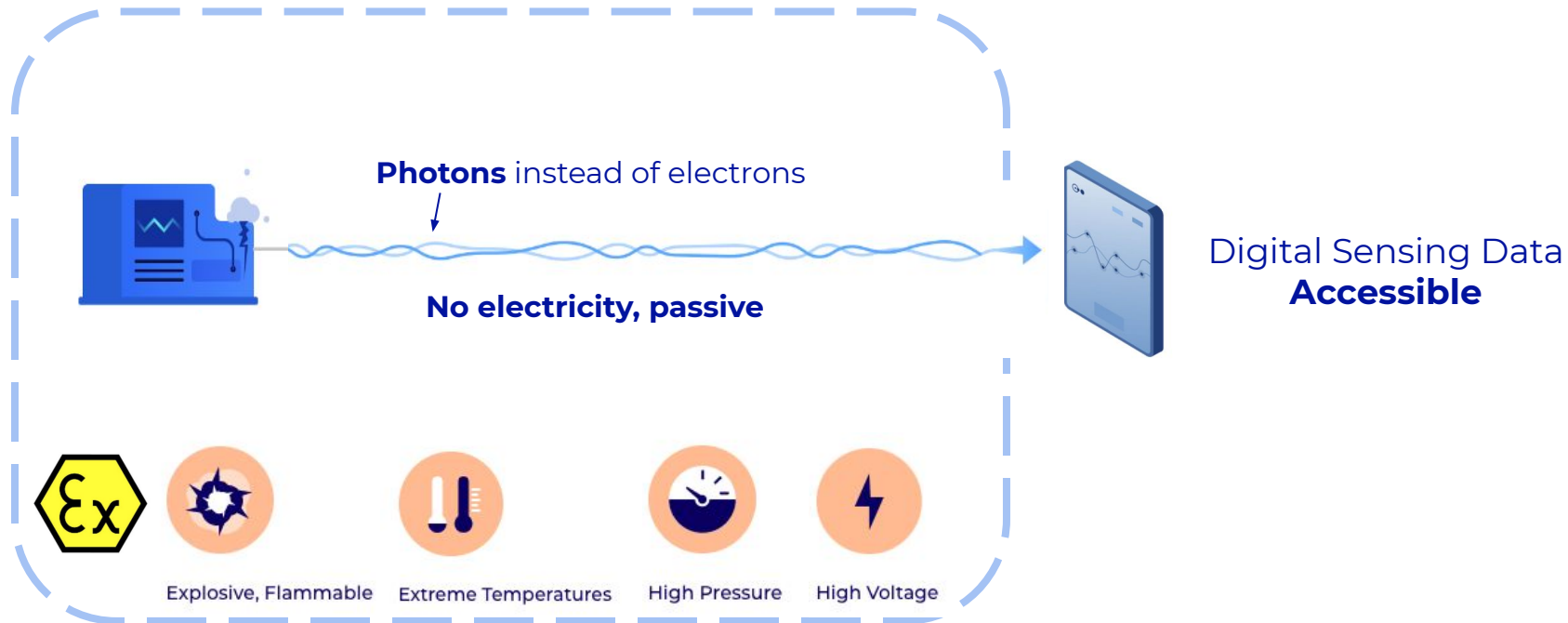
Explosive, Flammable



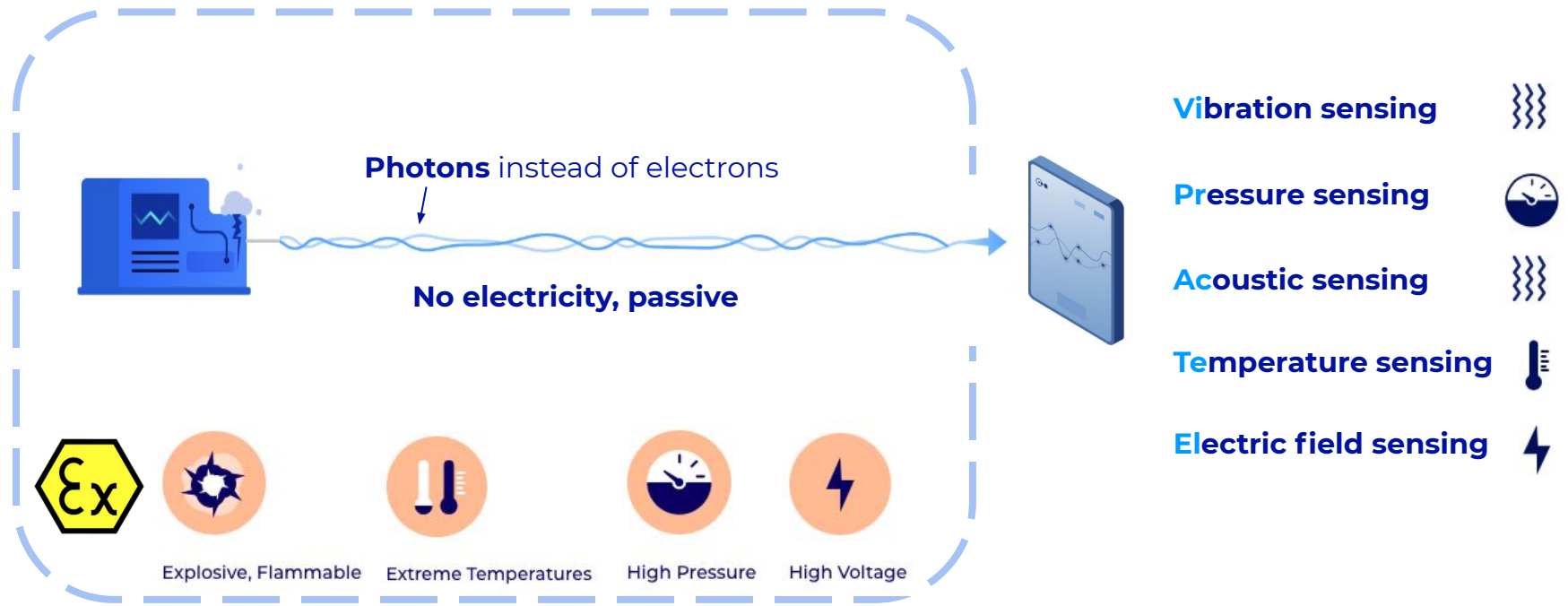
Inaccessible sensing data



Solution: Pure photonics, no electronics at sensing point



What is measured?



Extreme environments

Photons instead of electrons

Extremely sensitive

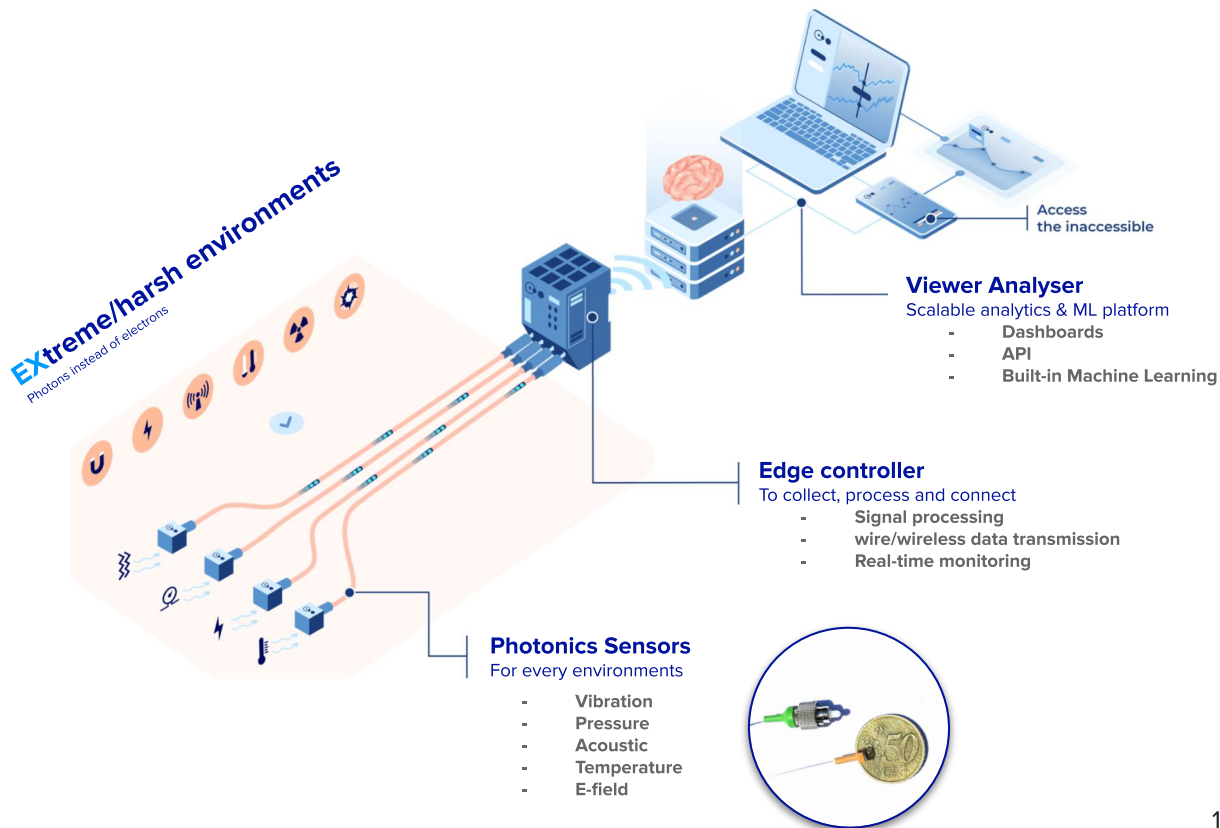
More sensitive means earlier & better predictions

Extremely small

Small (mm) means closer to the asset

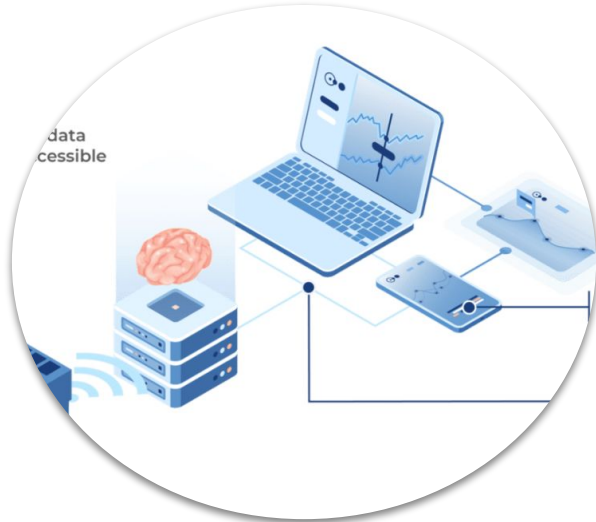
Extremely Smart

Machine learning co-designed with sensors

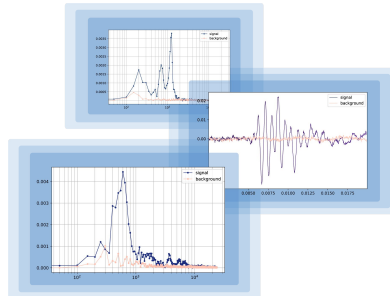


EXtremely Smart

- Machine learning **co-designed** with sensor



Web-based dashboard
& API



Confidential

Scalable analytics & ML Platform



for actionable insights

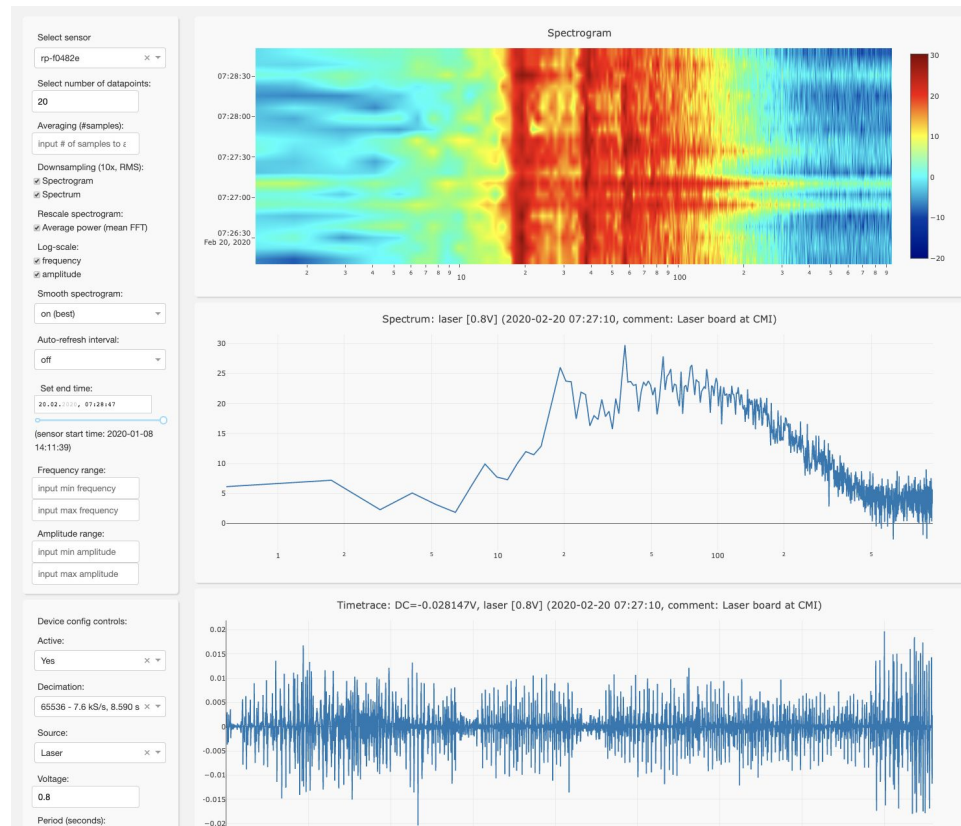
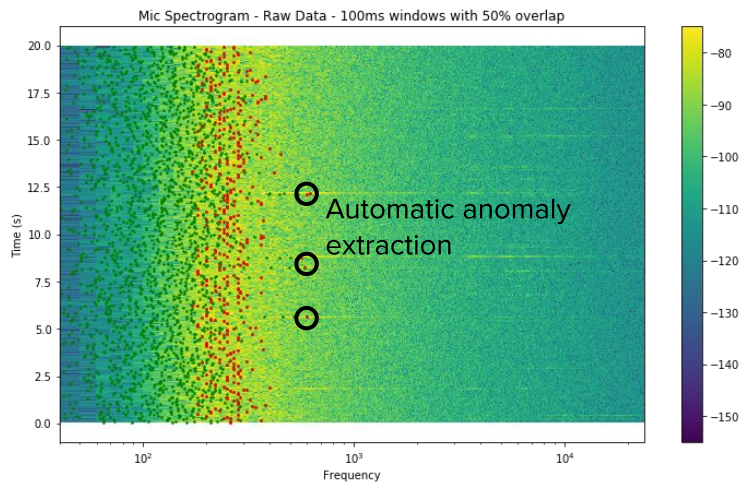
Web-based dashboards
API access and integration
Built-in machine learning
Scalable to millions of sensors
Encrypted customer information
“Over the air” SW/FW update
Customisable

Use cases: anomaly/event detection,
condition monitoring,
predictive/preventive maintenance

Anomaly extraction from sensor dataset. Anomaly frequency, temperature or acoustic **signature** matching

Technology

Miraex supervised and unsupervised machine learning



Predictive analytics to support cost-effective maintenance decisions in extreme conditions.

Benefits for operation



Operational Cost reduction



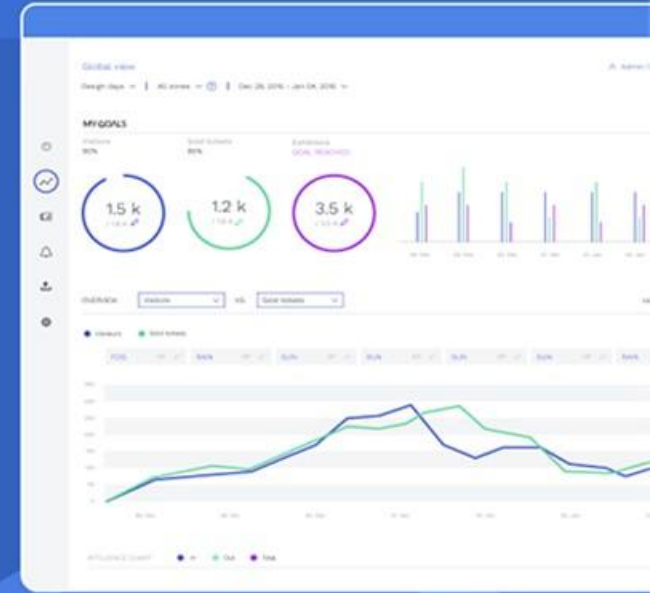
Reduction in loss of failures



Reduction of inspection time



Increase in throughput



Case: Extend asset lifetime

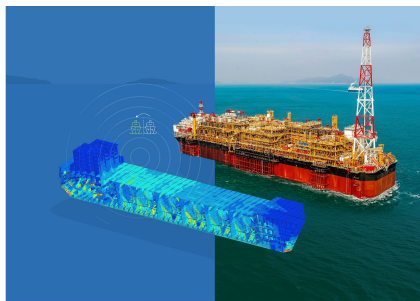
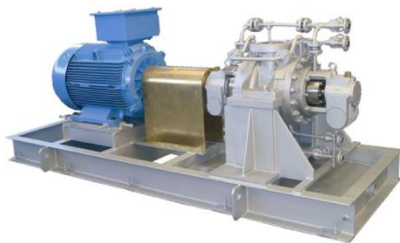
- Move away from threshold-based lifetime
- Unsupervised machine learning model to allow natural drift

Case: Reduce operating/maintenance cost

- Move away from planned maintenance
- Predictive maintenance on need based

Miraex benefits

- **Turn-key (HW/SW)** solution provider
- Installation **simplicity**
- Sensor performance, capable of sensing in noisy environment
- **ATEX** sensor
- **Machine learning** algorithm to continuously improve yield and adapt to various equipment of same type
- Robust **closed loop** control
- Simple integration in any existing digital platform



Model

Sensing-as-a-service. **No HW upfront cost**
 Selling smart processed data with monthly subscription
 Improve efficiency and reduce down-time since

Case: Closed-loop control in cryo

- Cryo compatible vibration sensor
- Performance optimization

Miraex benefits

- **In-equipment** measurement
- Installation **simplicity**
- **Edge computing** (local) for simple closed-loop implementation

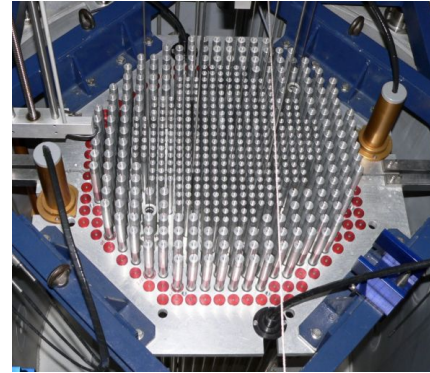


Case: Enable anomalies detection and predictive maintenance in radiation

- Sensing Inside the heart under extreme radiation
- Sensing in extreme high voltage conditions

Miraex benefits

- **Turn-key (HW/SW)** solution provider
- Installation **simplicity**
- Sensor performance, capable of sensing in extreme environment
- **Radiation immune** sensor
- **Machine learning** algorithm to continuously improve yield and adapt to various equipment of same type
- Robust **closed loop** control
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**Miraex is a leading full stack HW-SW
solution provider for**

Accessing the inaccessible

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