Empowering a Digital Future with Quality Data

# Company Overview

Symroc is an Industrial Internet of Things technology startup located in Calgary, Alberta, Canada.

Symroc manufactures innovative ultrawide broadband vibration sensing systems combining the most advanced vibration sensor, wireless and real time digital connectivity and big data analysis.

Since 2014, Symroc has been working closely with governments and industry partners worldwide to provide digital industry solutions including but not limited to condition monitoring, preventative maintenance, natural disaster prevention and early warning to support the global industrial 4.0, digital disaster prevention and smart city initiatives.

National Research Council Canada | Conseil national de recherches Canada

UN-GGIM
UNITED NATIONS INITIATIVE ON GLOBAL GEOSPATIAL INFORMATION MANAGEMENT

Alberta IoT

TECTERRA
investing in innovation

Supported by National Research Council Canada     Member of United Nations GGIM PSN     Founding member of Alberta IoT     Tecterra Awards Winner 2020-2021

# The  Problem

There is no cost-effective, easy-to-deploy real-time remote operation solution for broadband vibration/ seismic monitoring and real-time structure displacement/stress monitoring over wireless networks
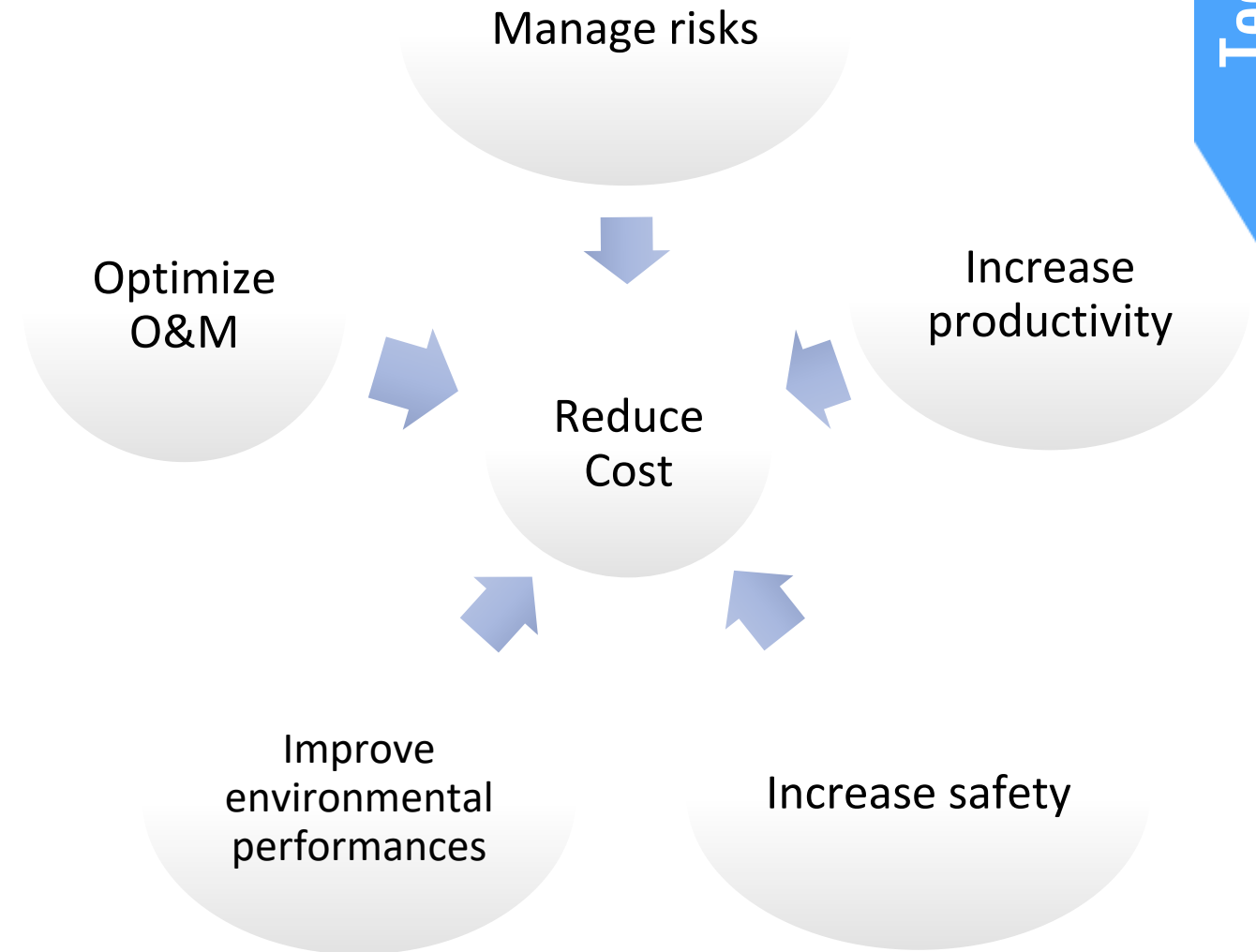
# Technology Innovation
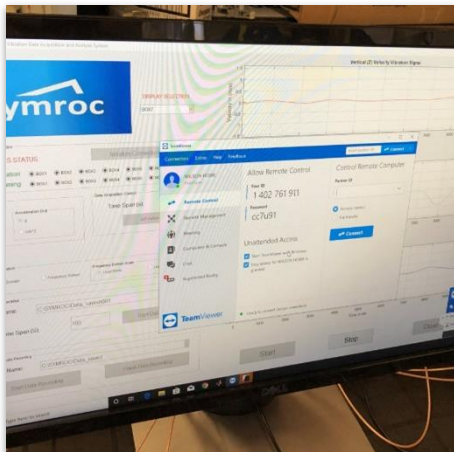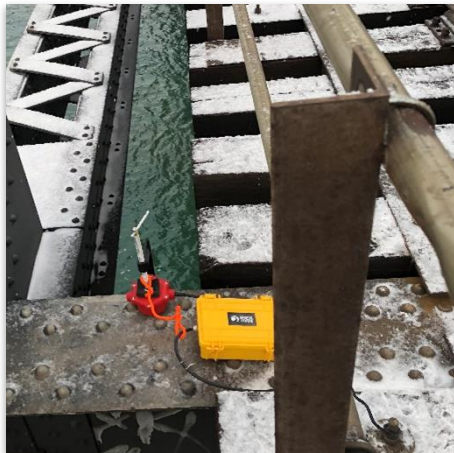
## Low Frequency Vibration (LFV)

- Low frequency vibration or seismic signals, typically below 20Hz, has wavelengths of a few meters to hundreds of meters
- Low frequency vibration signals are occurring around us all the time.
- The larger the object, the lower the vibration frequency.

## Why is LFV Monitoring important

- In earthquakes most of the energy occurs in the low frequencies.
- In infrastructure and facilities, most fatigue inducing vibration occurs in the low frequency range.
- Low frequency signals is an underdeveloped mine of information and previously cannot be utilized due to limited resolution and high noise level.

Manage risks

Optimize O&M

Increase productivity

Reduce Cost

Improve environmental performances

Increase safety

4

# System Features

## ✓ Best Sensor Performance

- Widest bandwidth coverage, 0.01 Hz–1600Hz, using 3dB criteria and with dynamic range above 120 dB value.
- Records triaxial acceleration, velocity and displacement signal simultaneously.
- Low self-noise, high sensitivity reduces false alarms

## ✓ High Quality Network Data for AI

- 32-Bit digital output can be converted into any format
- Compatible with most common AI, SAP, SCADA platforms,
- Integrates with GIS software
- Integrate easily with multiple sensors
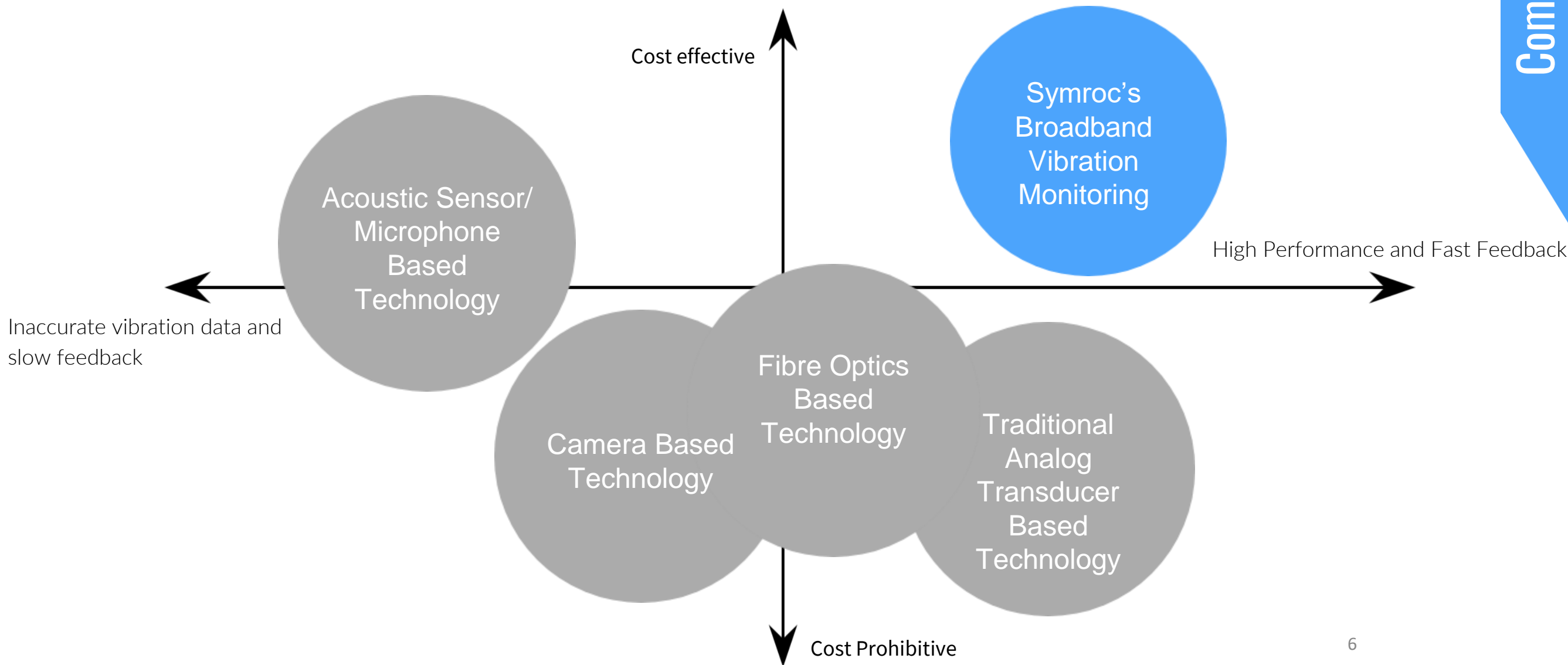- Edge computing ready

## ✓ Ease of Installation

- Low power consumption
- Compact sensor size
- Battery, plugged-in or solar powered
- Attached on any surface or easy install underground
- Built for outdoor, minimal maintenance
- Operational -40 to 70 degree °C

## ✓ Wireless, Real-Time

- Transmit data in near real-time, 0.5 second delay
- Wireless data transmission through mesh network, radio frequency, satellite, Wi-Fi, LTE, 3G, 4G, 5G or Bluetooth.
- Triaxial or single component setup

www.symroc.com

# Competitive Advantage

Cost effective

Symroc's Broadband Vibration Monitoring

High Performance and Fast Feedback

Acoustic Sensor/ Microphone Based Technology

Inaccurate vibration data and slow feedback

Camera Based Technology

Fibre Optics Based Technology

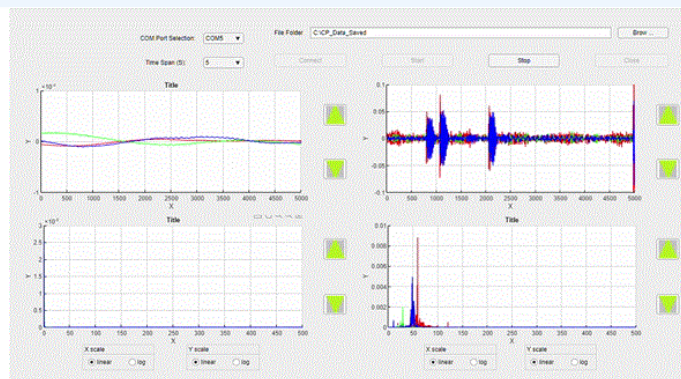Traditional Analog Transducer Based Technology

Cost Prohibitive

6

## Hardware

- Hardware package includes sensor units, data transmission units, and power units including solar panels, assembled in Canada, can be purchased or leased.

- A one-time installation service is included with each purchase or leasing agreement.

- Warranty, maintenance and after installation updates and customer service included.



## Software

- Symroc Software to view and process digital data in near real time included.

- Advanced software that allows data analysis, visualization and customized interactive interface available.
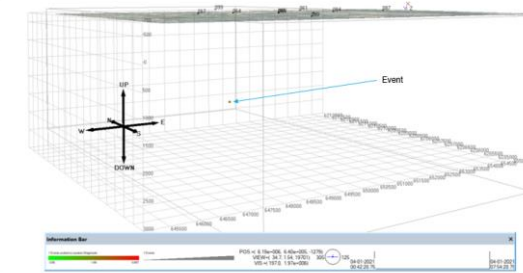


## Data Service

- Edge computing integration

- Processed data can be transmitted and stored in real time to Symroc's server or the client's own server or third-party cloud services (Google, Amazon etc.), and/or stored on periodically swapped SD cards.

- Depending on duration of installation, monthly data subscription model is also available.



Location – Side view

Event located at :
N: 6208530
E: 648891
Depth: 1500 m below surface level

# Major Markets

## Structural Health Monitoring

- Rail bridge displacement monitoring
- Buildings
- Large facilities, equipment
- Wind turbines, nuclear plants
- Dams, electric power infrastructure
- Mining facilities

## Preventative Maintenance

- Large industrial motors and compressors
- CNC machines and other complex industrial machinery
- Multi-phase flow measurement
- Medical equipment and laboratory monitoring

## Geotechnical Services Disaster Early Warning

- Earthquake Early Warning (EEW)
- Slope stability monitoring
- Induced seismicity
- 4D seismic subsurface structural mapping
- Volcanic activities
- Geothermal activities
- Glacier activities

8

# Structural Monitoring- Rail Bridge Displacement

## Problem

There's no real time remote condition monitoring for the bridge and pier
Displacement measurement can be difficult and expensive.

## Method

Temporary monitoring station setup on the bridge
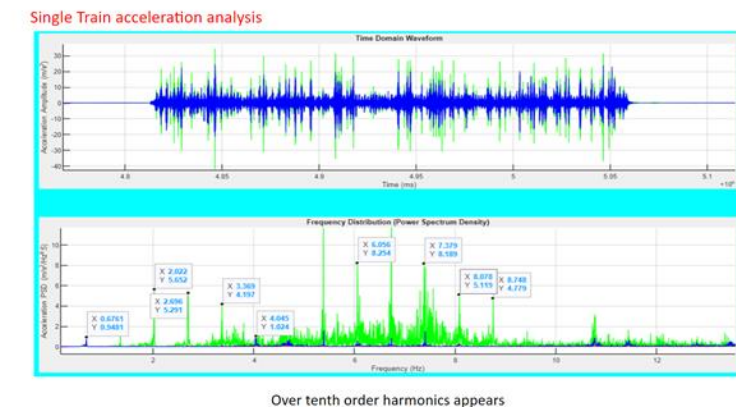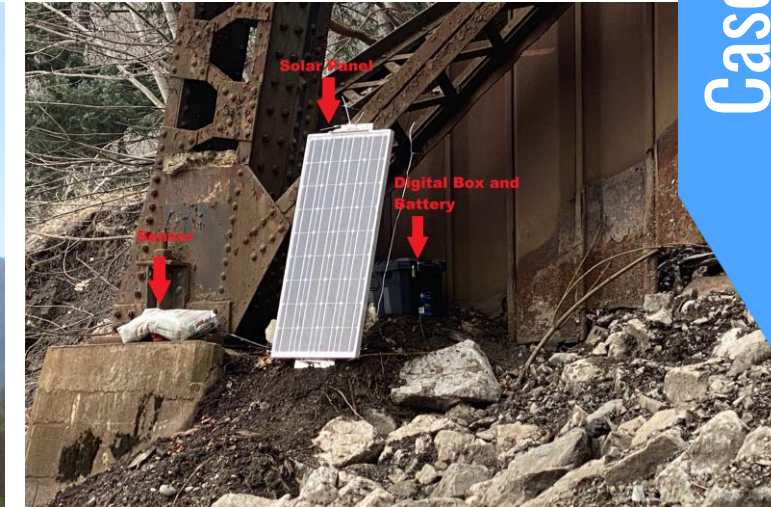Permanent station setup at bridge pier.
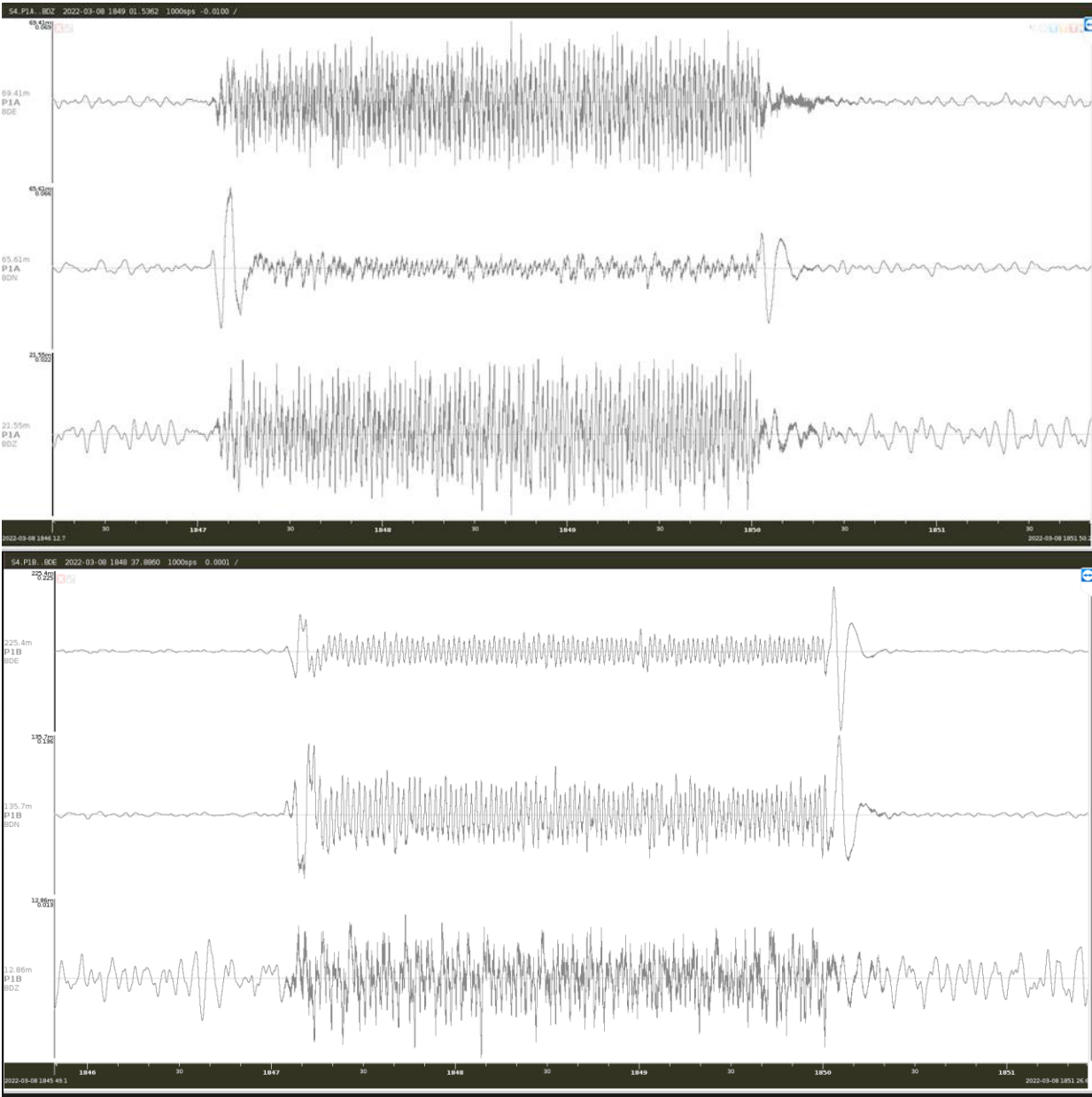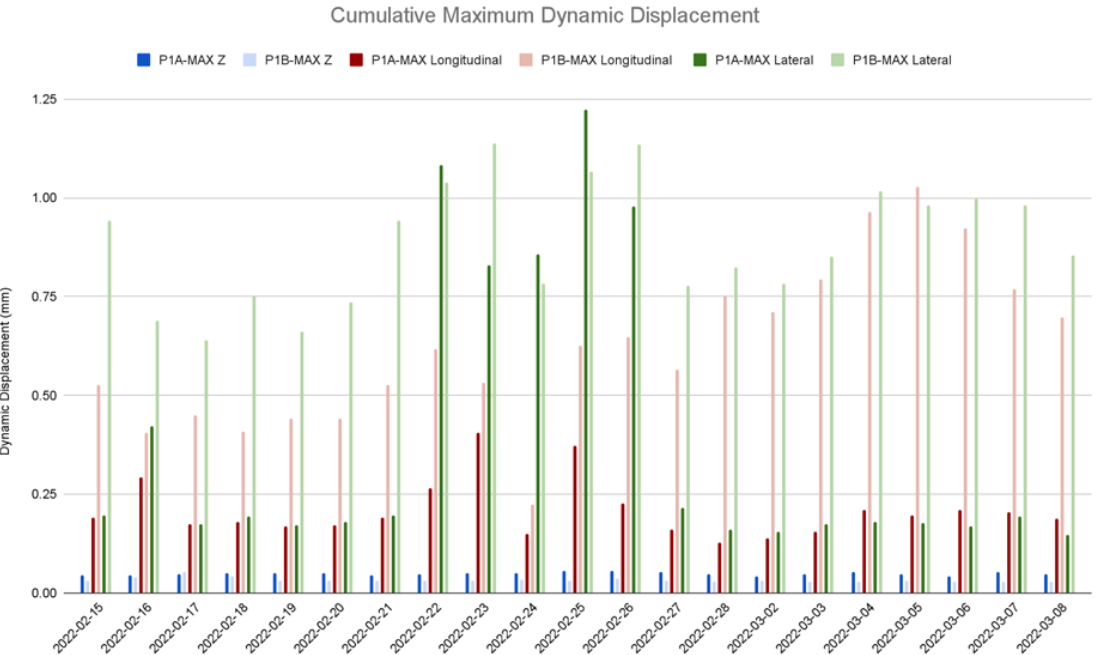
## Results

Benefit 1:  Cost saving
Displacement measured without any fixed base or Plug n Go scaffold to measure relative displacement.

Benefit 2: Capacity Optimization
The client used the condition information generated by Symroc's sensors to adjust train load and speed while ensuring safety.





Solar Panel
Digital Box and Battery



Single Train acceleration analysis
Over tenth order harmonics appears

9

# Structural Health Status Daily Report to Customer

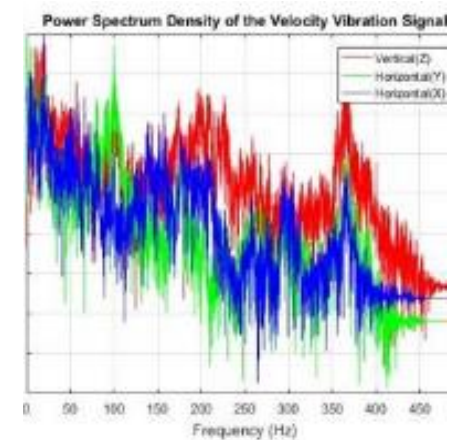# Facility Preventive Maintenance

**Problem**

Fatigue stress induced cracking in structures pipelines and facilities can cause expensive production loss and incidents.

**Method**

Monitoring vibrations frequency spectrum and displacement values in real-time for abnormal changes, to identify early indicators of key failure mechanisms for preventative repairs.

**Results**

Symroc's sensors recorded the vibration data at the lower frequencies in greater details than any other sensors on the market and allow for scheduled plant maintenance to minimize downtime.
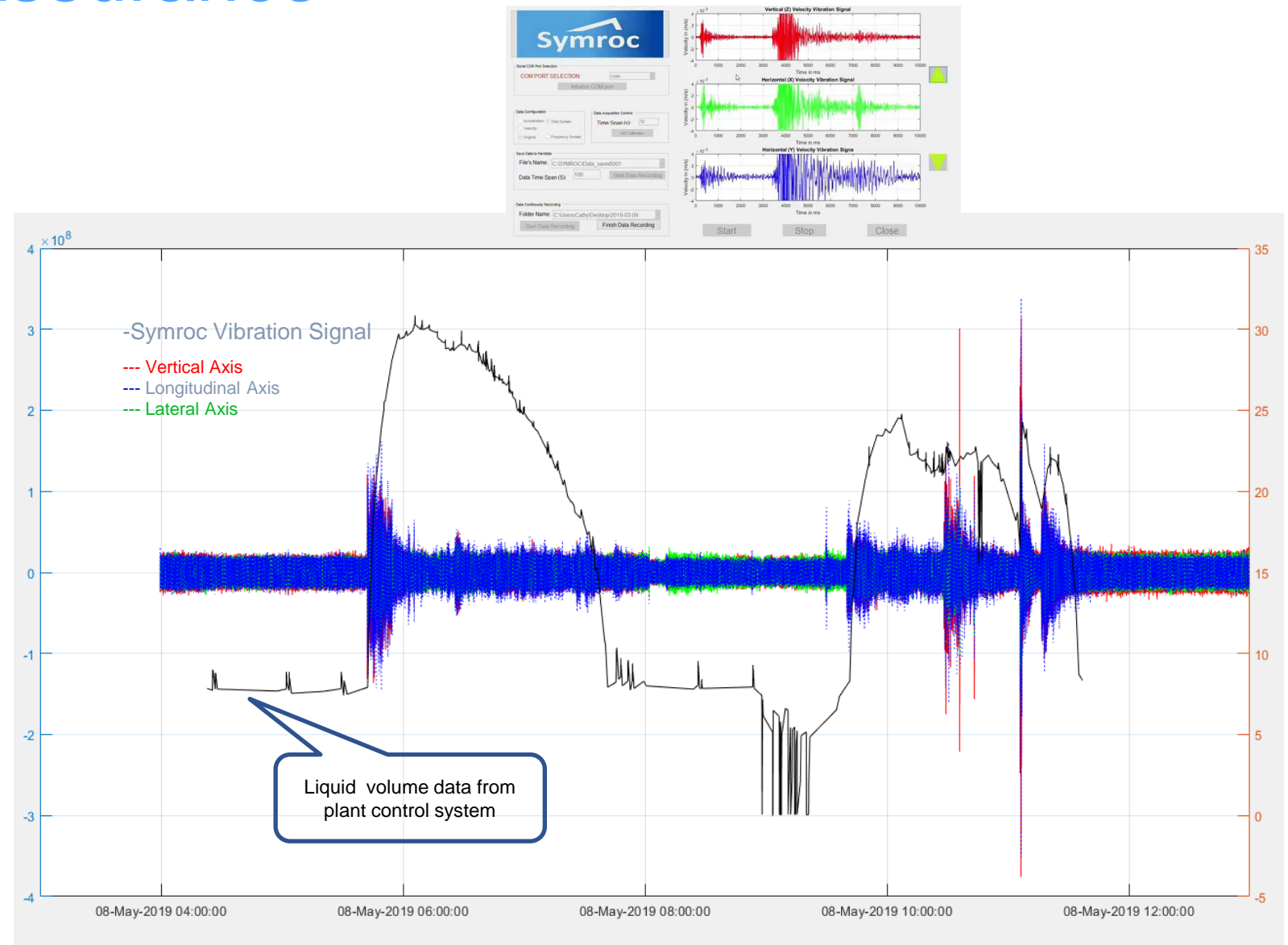


11

# Pipeline Flow Assurance

## Problem

Slug flow in gas pipelines and facilities can cause unplanned downtimes

## Method

Real-time detection and estimate of slug flow in gas lines. Plant operating systems can anticipate water slugs and change flow dynamics when integrated with PLC operating systems

## Results

Symroc's system captured slug flow patterns and generated volume estimate to allow plant operations for flow management to avoid production downtime



-Symroc Vibration Signal

--- Vertical Axis
--- Longitudinal Axis
--- Lateral Axis

Liquid volume data from plant control system
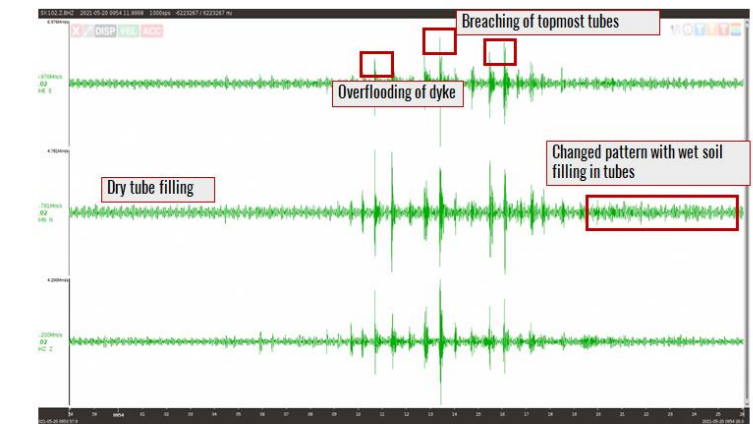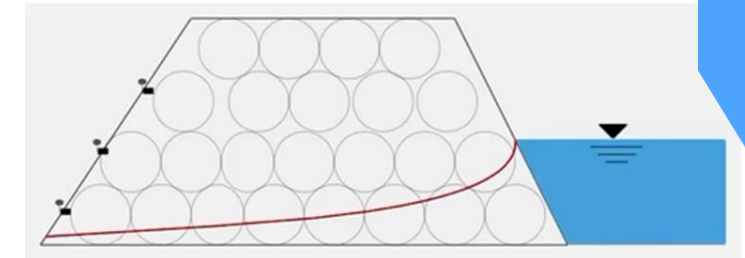
# Slope Stability- Dyke Monitoring

**Problem**

There's no cost effective instrument that provide real time vibration data for dyke integrity monitoring and breach early warning.

**Method**

- One system was installed on a test dyke in Germany in 2021.
- IoT soil moisture sensors were used in conjunction with Symroc's vibration sensor.

**Results**

- Tube filling become unstable as its moisture content increases.
- Data recorded on the two types of sensors showed high correlation, over short distances ca. 20 m (r = .84)
- Result shows Symroc's system can be used for slope stability monitoring and early warning.







13

# Induced Seismicity

**Problem**

Induced seismicity by operations such as hydraulic fracturing and wastewater disposal is a concern to stakeholders of energy operations.

Impact on facilities and pipelines by nearby activities
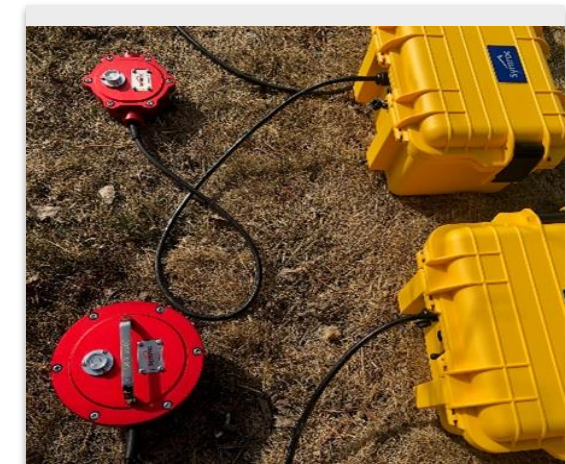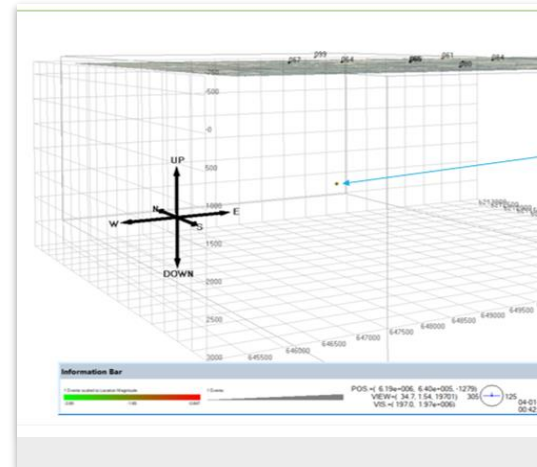
**Method**

Symroc installed a 36 sensors array in a remote part of NE BC. Powered by a solar panel connected to a battery. Has been in operation and providing results in real time since 2018.

**Results**

3 times more event picked up in a day than adjacent arrays.
Recorded smaller precursor seismic events that other sensors missed for large magnitude events (e.g., 4.5 Magnitude earthquake in 2018).
Detected Fukushima earthquake in Japan Feb 2021



14

# Power Transmission, Wind Farm, Solar Farm Opportunity

**Problem**

There's no compact, low-power remote wireless system for accurate real-time power transmission DLR (Dynamic Line Rating), real-time stress monitoring, analysis and response for wind turbine blades, towers, wind farm structures, Solar farm structures and utility transmissions line (thermal rating)
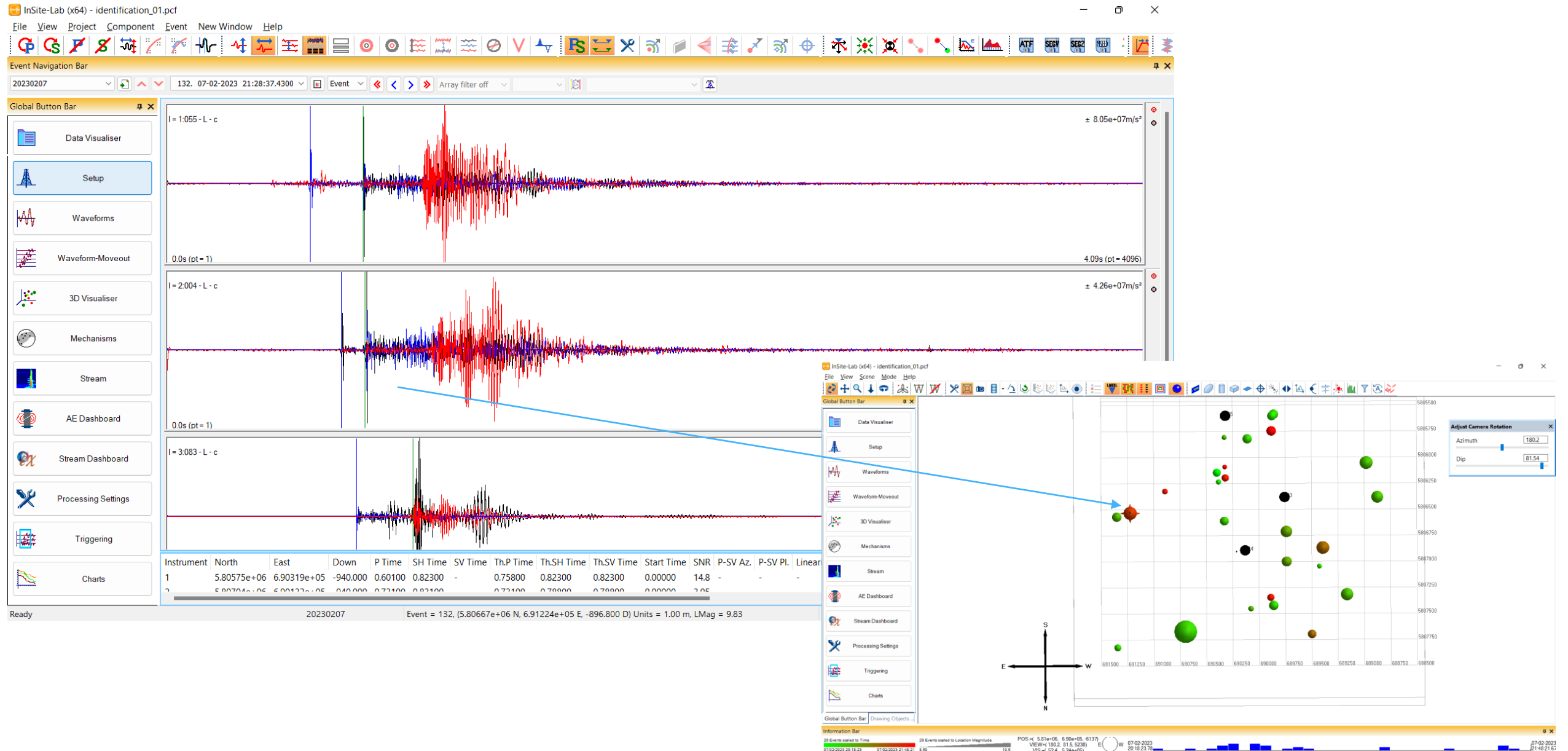
**Opportunity**

- Utility transmission line real-time monitoring and response to increase power throughputs

- Symroc real-time stress wireless remote monitoring and pitch response to reduce load impacts on wind turbine blades, towers, key bearing components to extend operation life and reduce maintenance costs
- Similar system to increase production efficiency at wind farms

**Growth Potential**

- This area will provide the highest growth potential with significant global market returns

# Defense Protection Example - located events

# Partnership Goals for the Mission

1. Seeking partners for vertical integration of total solutions -
   - Real-time railway, bridge and structural integrity monitoring for aging infrasture issues
   - Dyke, dam safety, flood, mudslide, landslide monitoring for disasters and risk malmanagement
   - Seismicity monitoring and early warning for protections and risk mitigations

2. Preferred partners – customs or solution providers who have a client base in the sectors (listed above) or influencers of the related markets

3. Preferred partnership – Joint projects and join ventures to bring complete solutions or services to target markets

# Customers and Partners

Canada, Europe, South America and Asia

# CONTACT US

🏠 https://www.symroc.com/

📞 1.403.456.0389

✉ torr@symroc.com

📍 #209, 7879 8St NE, Calgary, AB, T2E8A2