



Smart Turnout

Vibration-based turnout condition monitoring



Problem description

Reactive and time-based maintenance

We see the need to shift from a reactive and time-based maintenance to predictive and condition-based maintenance for a more efficient maintenance but also to optimize asset lifespan.

Solution description

Reactive and time-based maintenance

Our solution is an IoT device monitoring vibration at the level of the crossing’s nose. It enables the detection of impacts from wheelsets on the infrastructure.

Our solution allows to identify which turnouts behave abnormally at a glance by providing a dashboard with above threshold behavior. It allows as well to anticipate evolution of degradation and plan maintenance.

By checking the return to nominal condition, you can confirm the maintenance job effectiveness.

Overall, our solution enables better planning of maintenance activities by adjusting the execution of track jobs.

How it works

Main Features

- › A **cockpit dashboard** to identify your critical assets at a glance and where to deploy maintenance. The proposed alarm threshold can be adjusted to reflect your need of availability
- › The **Monitoring of Vibration and Displacement** to check the evolution of these parameters to anticipate a possible failure
- › The **recognition of train types** to allow you to visualize measurements on a class of train to get more accurate insights
- › The **train speed measurement** to provide an additional factors to get more relevant insights
- › **Battery and 4G strength analysis** for administration of the sensors’ fleet
- › Outside temperature

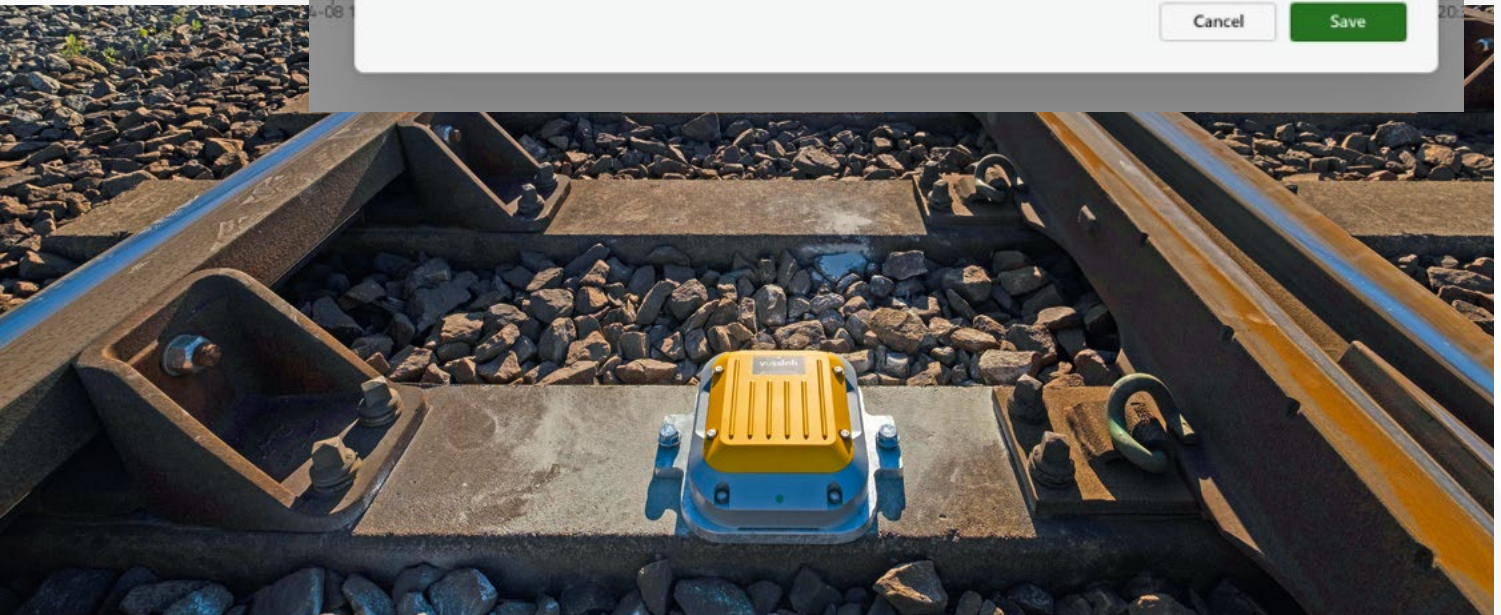
Hardware

Our solution is composed of 2 wireless devices, to avoid complex installation and risks of failure due to damaged cable.

One sensorbox is fixed to the bearer monitoring vibration at a high frequency. The battery-powered device is transmitting data packets to the gateway with a Bluetooth low energy protocol. The transfer of data is done periodically or more frequently depending on the desired balance between battery life and response time (to be defined according to the customer need).

The gateway is also battery powered and transmits information to the cloud to ensure analysis.

All data transfers are encrypted to ensure safe operations and decrypted only in the cloud.



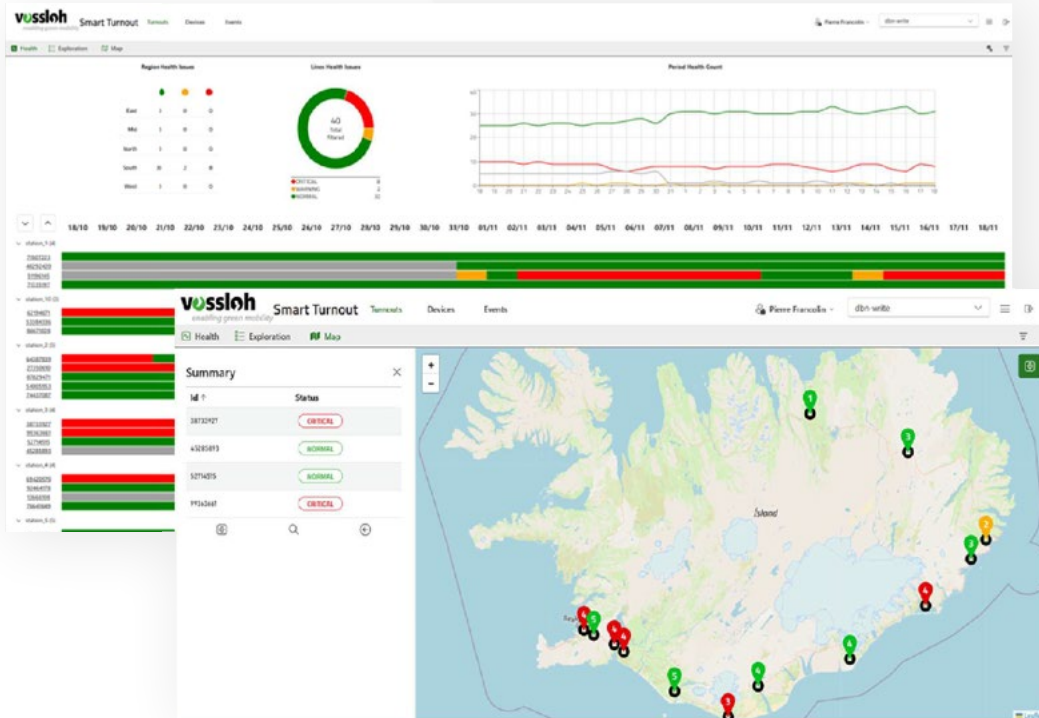


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Additional Features

- 24/7 Monitoring: Dynamic, online condition analysis of turnouts under load
- Predictive Insights: Anticipate degradation to schedule timely, cost-effective interventions
- Enhanced Safety: Reduce manual inspections and prioritize resources efficiently
- Train and Speed Recognition
- Identifies train types and speeds to provide contextual maintenance data
- Custom Analytics (Data Labs)
- Develop bespoke algorithms for specific customer needs using real track data



- Customizable dashboards to visualize health of the turnouts using condition indicators



Sensor Box
Capture turnout vibrations data



IoT Box
Forward sensors data to AWS



STO Vossloh
Cloud platform based on AWS

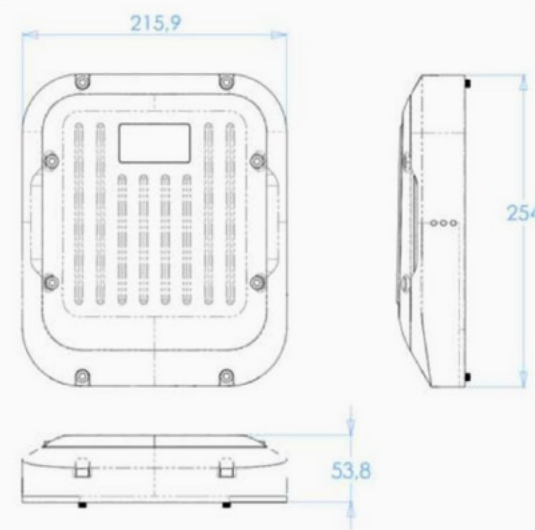


User interface
Web interface
Raw data download
Asset management interface

Upcoming Features

Advanced algorithms identify trends and provide alerts for critical events, such as:

- Poor ballast tamping
- Weld repair quality issues and crossing nose degradation



Sensor Box

Dimensions	215.9 x 254 x 53.8 mm
Weight	2.3 kg
IP Rating	IP67
IK Rating	IK08
Connectivity	BLE (paired with IoT Box)
Data output	Raw acceleration data
Measurement range	±200 g (accelerometer)
Sampling rate	Up to 6400 Hz
Mounting method	Glued/screwed plate mounting
Power	3.6 V / 11.6 Ah battery pack (serviceable)
Battery life	5 years (depends on data transmission volume)
Operating Temperature	-45°C to +65°C

IoT Box

Dimensions	190 x 180 x 140 mm
Weight	7 kg
IP Rating	IP68
Connectivity	4G LTE, BLE (paired with Sensor Box)
Mounting method	Metal pole mounting
Power	2 x 14.4 V / 17 Ah battery pack (serviceable)
Battery life	2.5 years (depends on data transmission volume)
Operating Temperature	-45°C to +65°C