Viotel Smart Barrier
Case Study

Viotel's SMART Barrier solution monitors the state of health and real-time impact on a wide range of road barriers in current use and for future installations. The solution can be applied to the following types of barriers:

- Wire Rope Barriers
- Guard Rails
- Crash Cushions
- End Terminals
- Containment Barriers
- Worksite and Traffic Control
- Installations Safety Fences
- Protective Barriers.

At a Glance

This case study details the application of the Viotel Smart Barrier for the monitoring of Wire Rope crash barriers.

The Challenge

With many 100's to 1000's of kilometres of wire rope barriers installed on regional road networks, maintaining the effectiveness of safety barriers is proving challenging for road authorities. Operationally these barriers are demanding more management time and maintenance effort.

Flexible barriers need ongoing repairs and maintenance, such as checking the tension of wire rope barriers to ensure that they perform as expected. VicRoads estimates that unrepaired barriers can be up to 34 per cent less effective at reducing serious injuries and fatalities.

Gaining greater insight into the status of wire rope barriers is crucial to improving maintenance management, but traditional manual and siloed processes are unable to provide the detail necessary to enable this on a regional network level.

Real-time monitoring and data aggregation platforms that provide region or state-wide reporting on conditions on transport infrastructure are increasingly being viewed as a requirement to meet oversight requirements under tightening maintenance standards and increased stakeholder focus.

Critical to the effective maintenance and management of wire rope barriers is to be maintained in good repair with cables kept to a presribed tension. Access to realtime information to provide insights such as:

- Provide an auditable means of documenting repair and maintenance response times after vehicle impacts.

- Automate tension checking in each wire rope, to ensure compliance with manufacturer
- guidelines and governing bodies.

- Confirm the structural integrity of the barrier to contain and redirect vehicles.

- Ensure compliance with maintenance contract obligations.

How Wire Rope Barriers Work

Wire rope barriers are a flexible structure that absorbs the energy of vehicle impacts, In an accident

these barriers can assist in bringing a vehicle to rest in a controlled manner or
redirecting it away from oncoming traffic.

They are one of the safest forms of crash barriers with a relatively low installation cost, resulting in their widespread use. However, they have higher maintenance requirements than some other types of rigid steel crash barriers. Timely repair of impact is critical.
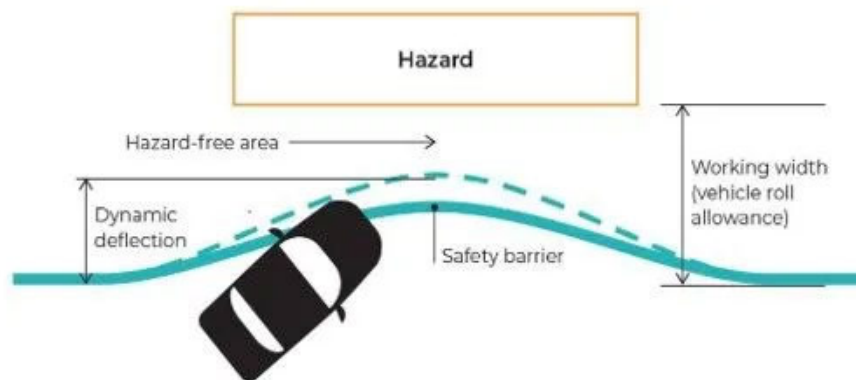
Manual Inspection

Manual inspection and testing require implementing extensive lane closures with attendant traffic management. Notionally, flexible safety barriers (should currently) receive:

- Drive-by visual inspections according to arterial Road Management Category as defined in the Road Management Plan - daily to weekly or fortnightly.

- A reactive inspection or repair after an enquiry or report of damage or a collision. A regular (Level 1) visual and cable tension and bolt check and adjustments (one or two years apart according to manufacturer's guidance).

- In some jurisdictions, a 10-year detailed visual assessment for corrosion, tension check, bolt check and any running repairs or replacement parts.

Manual checking and adjustment of cable tension

Viotel Smart Barrier Solution

A Viotel Smart Barrier network can reduce the number of manual inspections and tension checks, improve triaging and scheduling of maintenance, reduce delays from major damage, and minimise disruption and safety risks to workers and the public.

Smart Barriers advise network operators when cable tension warrants inspection or an impact has damaged posts, but the barrier remains effective. They record response rates and help provide accurate records of impacts. The Viotel Smart Barrier monitor is a safe, self-contained sensor pack that is discrete, simple to install and calibrate, powered without large conspicuous solar power facilities and with analysis power deployed in an app accessing internet-based data, transforms a barrier from a disconnected unintelligent asset to a networked live data device. It can:

- Measure cable tension over time. Alert the presence of an impact and the location and time.

- Advise of environment conditions and the impact on tension and conditions at crashes.

- Provide an auditable record of maintenance response time in restoring barrier functionality.

- Installation taking less than 5 minutes on a standard barrier with a rolling road closure.

Benefits

1. Real-time monitoring, reporting and vehicle impact alerting functionality that can facilitate reduce emergency response times and improved barrier effectiveness throught timely maintenance.

2. Eliminate unnecessary manual inspections and thereby reduce lane closures and traffic management costs.

3. Provide auditable data on barrier location and condition. Analytics capability to assess barrier maintenance effectiveness, vehicle impact frequency and location, maintenance response times.

4. The Viotel SMART Barrier system can be integrated with existing asset management systems and IoT platforms.

5. Subscription based SAS type model with reduced up-front deployment cost.

Viotel Smart Barrier Sensor

- Small, light, discrete but robust device, securely and readily mounted to a barrier.
- Built-in GPS location.
- Seismic sensors & detachable strain gauges detect tension changes and vibration in the cables.
- Provides real-time feed of information to
- operators via a smartphone app (as part of
- IoT), alerts associated with potential impacts on the barrier.
- Installed and calibrated quickly on-site.
- Solar-powered, self-contained, and designed to be set and forget for up to 5 years.
- Advanced alerting and reporting features.

Viotel Smart Barrier Node

Features

Viotel's Smart Barrier harnesses 'Internet of Things (IoT)' technology and features a barrier mounted sensor and telemetry device, which streams real-time data to the Cloud hosted via Amazon Web Services (AWS). The Smart Barrier sensor unit is self-contained with a long-life battery and integrated micro solar panel charger. Our d evices as quick to install using basic hand tools and require no wired connections.
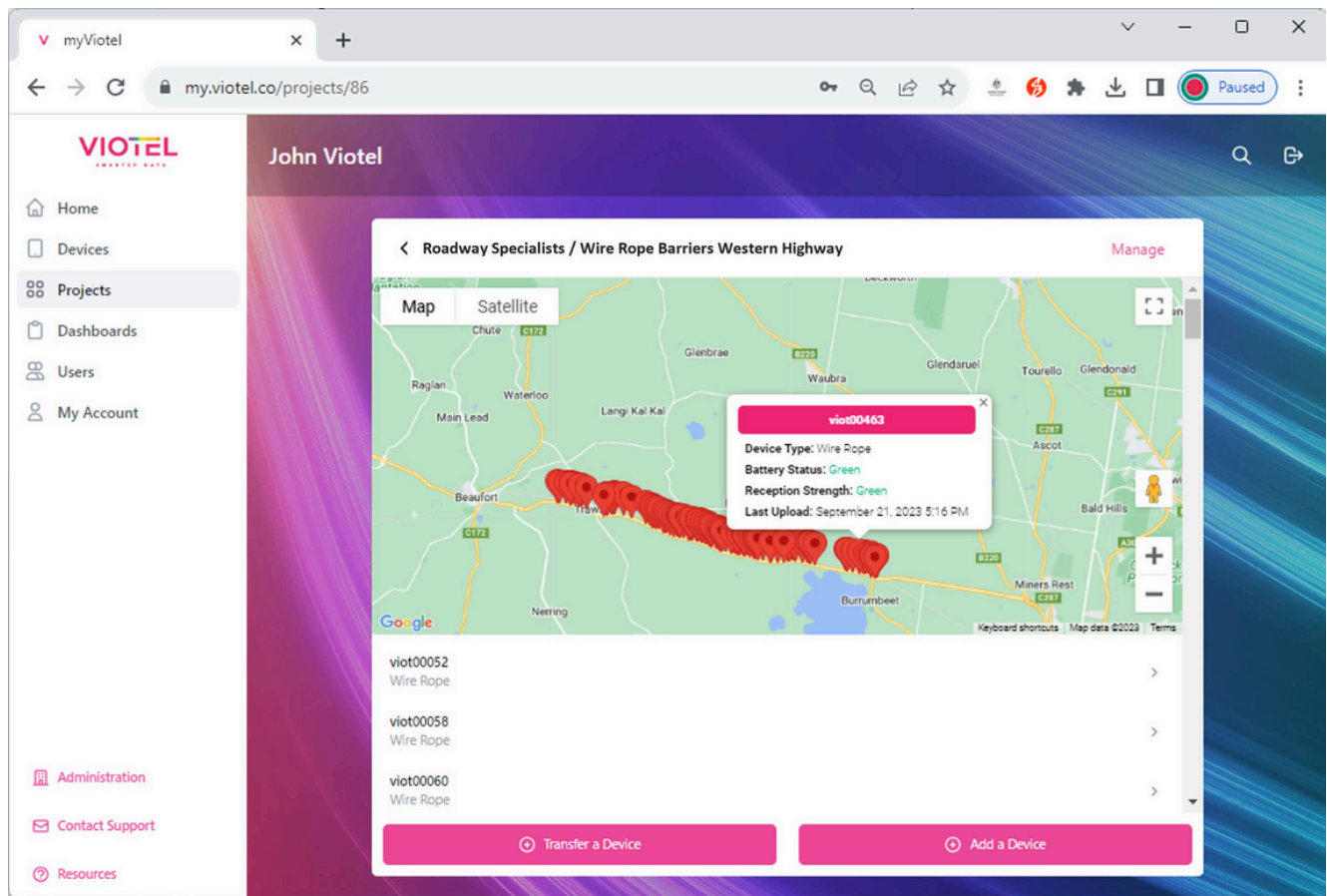
Installation on a wire rope barrier with detachable strain band

Strain band

Smart Barrier

myViotel Dashboard

Screenshot of the myViotel dashboard project overview

Viotel's myViotel device management and dashboarding software is used to configure devices, alerts and alarms with a user-friendly graphical interface. Device data can be connected via API to 3rd party asset management platforms. This allows automation of alert based maintenance work orders.

Alerts and Monthly Report

Vehicle impact alerts can be sent to mobile phones/emails of emergency response maintenance personnel and asset managers with links to Google Maps of the exact barrier location. The Viotel Smart Barrier system is configurable to other IoT platforms and asset management reporting systems.

Viotel's alerting engine takes 30 seconds from impact to deliver an alert to the end user. Live traffic data latency from other sources can take up to 10 minutes as confirmed during our device field trials.

Sophisticated crash detection from the Viotel Smart Barrier Node can be used to confirm actual crash data, detecting what field operators cannot see from visual inspection alone.

An impact event has been detected
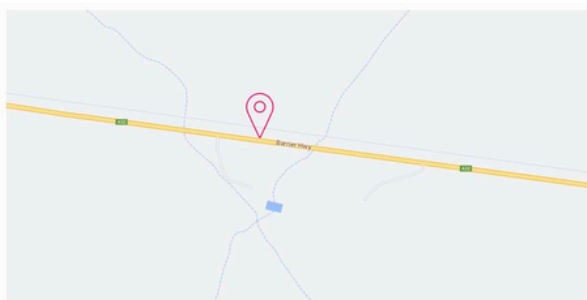
Roadway Specialists   21:04:55 (AEST)

At 21:04:50 (AEST), we calculated an Impact Trigger Ratio spike reaching a value of 48.88 **(significant)**.

Impact Trigger Ratio:

- **Normal Operation:** < 10
- **Small:** 10 - 20
- **Minor:** 20 - 40
- **Significant:** > 40

Device: viot00454 (Wire Rope)
Project: Westbound Median

You are receiving this email as you have been listed as an interested party for when a Device enters an Alert State.
All Impact Trigger Alerts are subject to on-site confirmation of the type and severity of impact.
Alerts from this device will be suspended for 5 minutes, while we prepare an automated barrier status report.

Impact Alert Email   *Monthly Report Email*

Results

Safety:

- Dramatically increasing safety of the system, public and road technicians.

- Reduces potential for fatal accidents through correct maintenance and quick response.

- The ability to meet and exceed the Austroads and major jurisdiction guidelines.

Risk:

- On-demand and live information on the state the barrier, crash alerting.

- Documented asset condition for legal and compliance purposes.

- Minimise road closures for manual maintenance.

Strategic Management of Assets:

- Provide reliable data on accidents (frequency, time and location) and barrier condition.
- Significant cost saving through optimising of the maintenance schedules and associated costs.
  Monitor remote for when an impact has damaged posts but the barrier remains
- effective

Adopting modern asset management aproaches using IoT allows you to manage the asset condition to a service level that presents significant cost savings, versus routine/time based maintenance or not doing it at all.

An independent study highlighted significant safety, cost and disruption benefits of the Viotel Smart Barrier:
"Over a 10 year evaluation period, the devices generate sizeable benefits on rural roads with 5 year inspection cycles and all roads in urban environments under 2 yearly or 5 yearly inspections. The benefits understandably increase with the amount of safety barrier installed on a road section and with the volume of vehicles present."

VIOTEL
SMARTER DATA
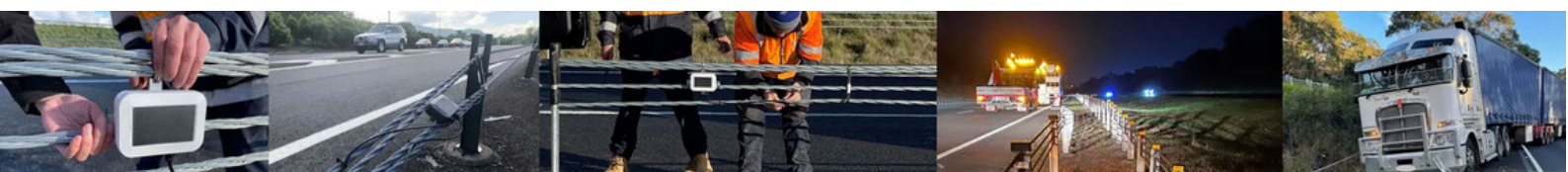
About Viotel

Our mission is to empower businesses with better data for better decisions. At Viotel we believe knowledge is power and understand the critical role data plays in managing risks, identifying opportunities and protecting business assets. Using 'plug and play' Smart Box technology, coupled with the power of Amazon Web Services, Viotel has created a data ecosystem. We believe in making smart technology smarter.

By continually investing in new technology and collecting and analysing data in real-time, our cutting- edge solutions empower businesses to identify cost savings, increase productivity, streamline maintenance, increase OHS, monitor assets from any location and respond faster to emergencies.

Viotel currently has operations support in Australia and New Zealand.

VIOTEL
SMARTER DATA

CONTACT

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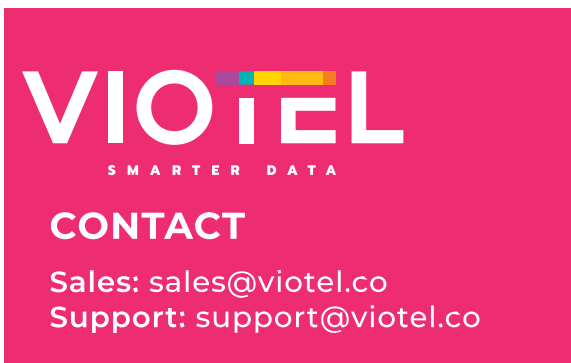
Our Resonance

Resonance describes the phenomenon of increased amplitude that occurs when an external force or a vibrating system is equal or close to a natural frequency of the system on which it acts.

Leveraging decades of experience in earthquake analysis and monitoring of mining seismicity, Viotel has a deep understanding of resonance and has developed a unique series of asset management solutions involving monitoring and analysis of vibrations and waveforms.