![VIOTEL — SMARTER DATA]

SMART Structural Health Monitoring Solutions

The Challenge

With many 1000's of buildings, bridges, dams of differing ages, design standards and structural condition, it is difficult for asset managers to prioritise maintenance works or to make key decisions regarding structural condition and public safety following adverse loading events such as earthquakes, storms or deformations resulting from construction activity.

Over the life of a building, dam or piece of transport infrastructure, unfavourable loading conditions may present risks to the structural integrity of the asset and in extreme situations can pose a risk to public safety. Building designers, construction managers and owners are increasingly turning to monitoring to confirm design performance and structural health. This is particularly the case for high-rise buildings where complex loading may occur due to wind loading, seismic response or post construction settlement.

Some form of inspection or manual monitoring is often the go-to solution for risk management and compliance, adopted by asset owners and managers to provide early warning of deteriorating conditions or confirmation that remedial works are functioning as designed.

Many asset managers are still reliant on manual systems such as traditional surveying techniques, physical inspection and manually read instruments. Operationally these monitoring systems are demanding more management time and maintenance effort. Access constraints may also prevent key elements from being physically inspected.

The work health and safety (WHS) risks associated with sending personnel into the field, working in confined spaces, at heights, over water or adjacent to active transport corridors is becoming difficult to justify as societal expectations of what is an acceptable WHS risk has changed. The recent situation with COVID-19 has highlighted the future challenges of maintaining field based manual structural health monitoring systems and undertaking physical inspections.

The Liability Gap

With periodic measurement systems requiring manual field measurements or manual data processing there can be a significant liability gap created between the instance of ground movements, structural cracking or other leading risk indicators, and the reporting of the field measurements in an actionable format to asset managers. This liability gap can become more significant where an asset owner has out-sourced maintenance to a third party yet retains statutory accountability for the provision of safe infrastructure to the public.

Gaining greater insight into the structural health of infrastructure is crucial to improving maintenance management and public safety, but traditional manual and siloed processes are unable to provide the detail necessary to provide these insights in a timely manner.

Real-time monitoring, data aggregation and alerting platforms are increasingly being viewed as a requirement to meet oversight requirements under tightening maintenance standards and increased stakeholder focus.

Critical to the effective structural health maintenance and management of infrastructure is ready access to real-time information such as:

- Location, Time, date
- Deformation of structures
- Crack measurements
- Pre/post tensioned strand/bar loads
- Strain in key members
- Tilt
- Settlement

- Video surveillance
- Live Loads
- Weather conditions
- Seismicity
- Ground movements
- Groundwater levels
- Seepage
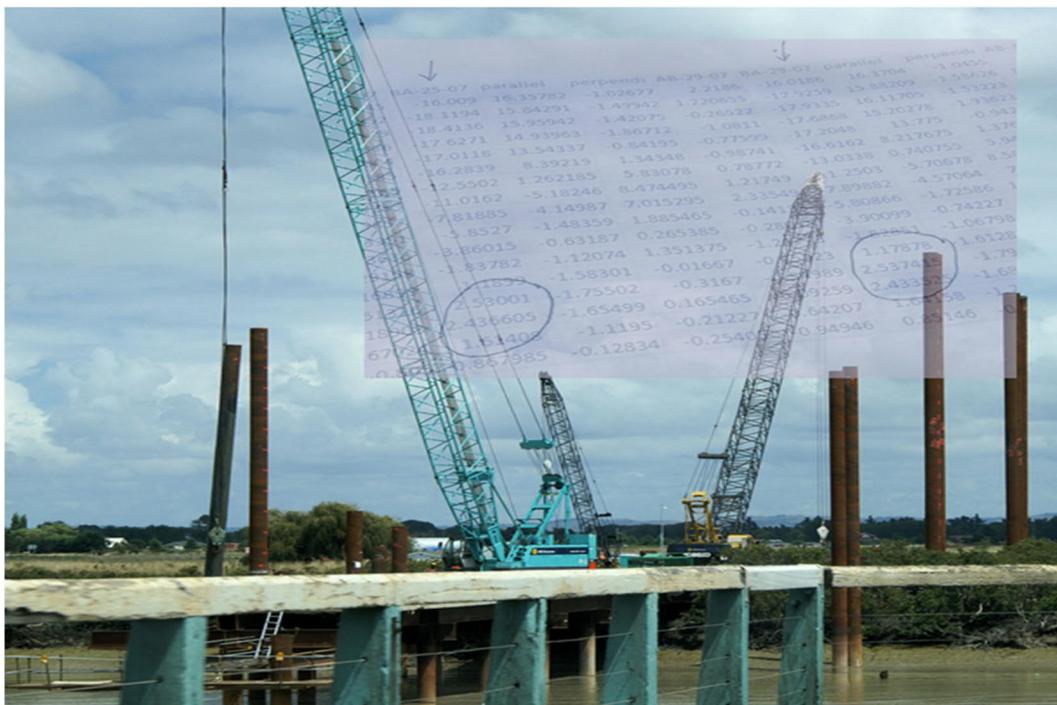
Our Solution

Incorporating Internet of Things (IoT) technology, a Viotel SMART Structural Health network can reduce the reliance on manual inspections, improve triaging and scheduling of maintenance, reduce delay time from hazard alert to risk mitigation action, minimise disruption and safety risks to workers and the public.

SMART sensors provide real-time monitoring and advise network operators when leading indicators reach key thresholds, associated with structural condition, sufficient to warrant safety actions, inspections or maintenance.

Data Analytics functions enable structure specific algorithms to be developed by structural engineers and incorporated into alarm and control systems such as:

- mobile phone alerts for building evacuation & return to work in event of an earthquake
- triggering traffic control stop lights / barriers for bridge structures
- triggering evacuation alarms
- turning on/off pumps
- opening/closing values or control gates
- mobile phone/email alerts to maintenance personnel

Our systems are easily configurable to record action response rates and help provide auditable records.

Our proprietary SMART sensors include:

- IoT Piezometer – ground water levels
- IoT Tilt meter – ground / structure movement
- IoT Accelerometer – seismic response / wind load movements / construction vibration
- SMART Box – IoT datalogger compatible with most types of structural & geotechnical sensors such as crack meters, extensometers, strain gauges.

The Viotel SMART units are safe, self-contained IoT sensor packs which are discrete, simple to install and calibrate, powered with mains / battery &/or solar power and with analysis power deployed in Cloud / Edge computing. An app accessing internet-based data, transforms a sensor from a disconnected unintelligent asset to a networked live data device.

Viotel SMART Structural Health Monitoring Systems have been applied to monitor the structural health of art galleries, office buildings, wharfs and bridges.
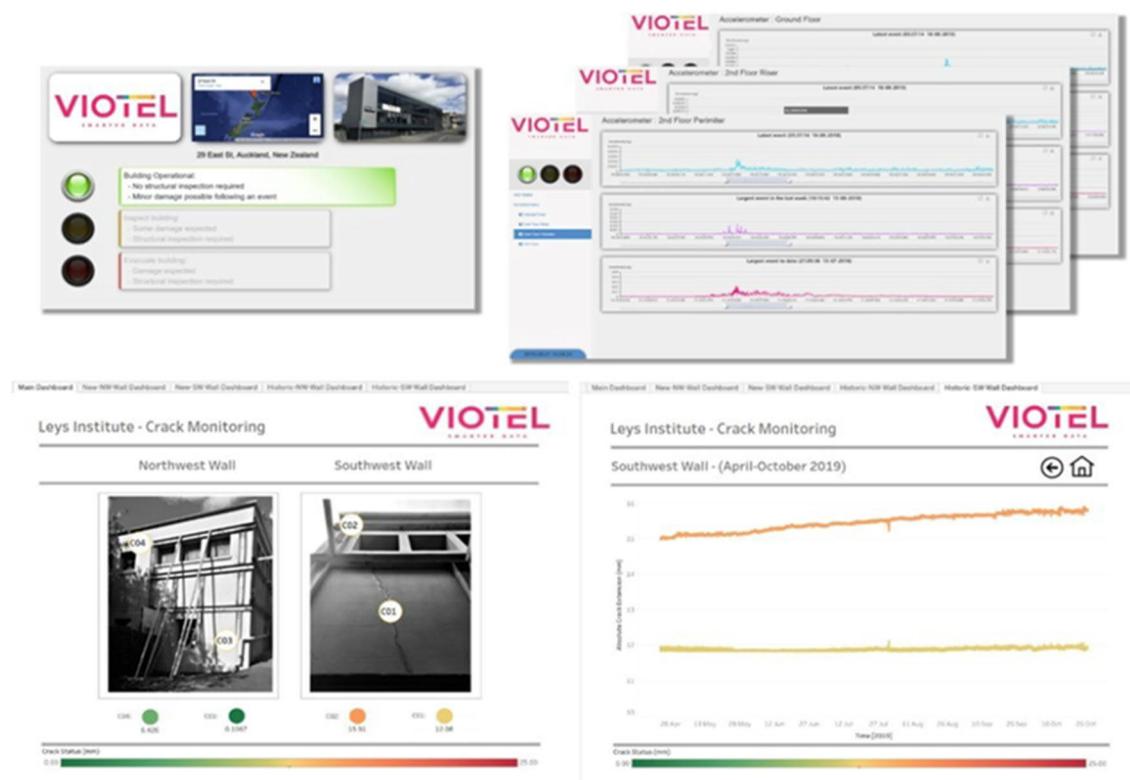
Benefits

1. Real-time monitoring, reporting and automated alerting functionality that can facilitate reduced emergency response times and improved asset management through timely maintenance.
2. Real-time monitoring to provide design verification during construction of high-rise buildings.
3. Cloud data hosting with configurable interrogation dashboards
4. Reduced manual inspections and thereby lower WHS risks and costs.
5. Analytics capability for assessment of key leading indicators
6. The Viotel SMART system can be integrated with existing asset management systems and IoT platforms.
7. Subscription based SAAS type model with reduced up-front deployment cost.

Features

Viotel's SMART geotechnical & structural health monitoring system harnesses 'Internet of Things (IoT)' technology and features sensors and telemetry device, which streams real-time data to the Cloud hosted via Amazon Web Services (AWS). The SMART sensor units are self-contained with each unit able to operate as IoT device.


Viotel SMART System

- Built in GPS location.
- Provides real-time feed of information to operators via a smartphone app (as part of IoT), alerts associated with key leading indicator thresholds or programmed algorithms.
- Installed and calibrated quickly on-site 'plug & play'.
- Cloud hosting / Edge computing
- Control capability – not just monitoring

Viotel's key advantage lies in the flexibility of our data management system. Clients are NOT tied into monolithic silos requiring multiple applications to look at different datasets - Viotel understands that your data is YOUR data, and we will help you to integrate our data sensors into your management systems. Or, we can customize a dashboard for you, or provide a preconfigured standard dashboard, - it's your choice. And, because our systems are IoT-based, our dashboards can give you control over field-based equipment such as to switch warning lights, turn on pumps etc. For mission-critical applications where telemetry systems add another layer of risk, we offer edge-computing, so that critical decisions are made and alarms triggered locally, without the data having to leave the site.
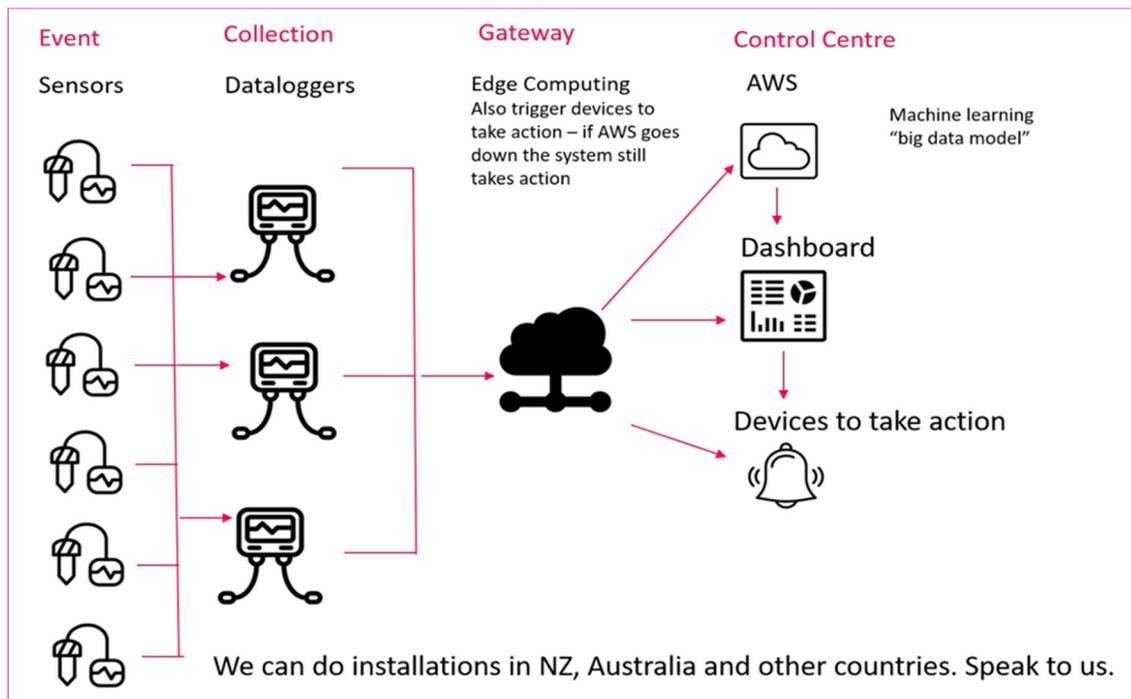
Data are stored within the station and also streamed to the cloud using either mobile phone/data (low-power CatM1), LoRa or satellite networks. Viotel's cloud platform has been built in partnership with Amazon Web Services, using high security certificate exchange to validate connections and encrypted data flows.

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 have operations support in Australia and New Zealand.

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