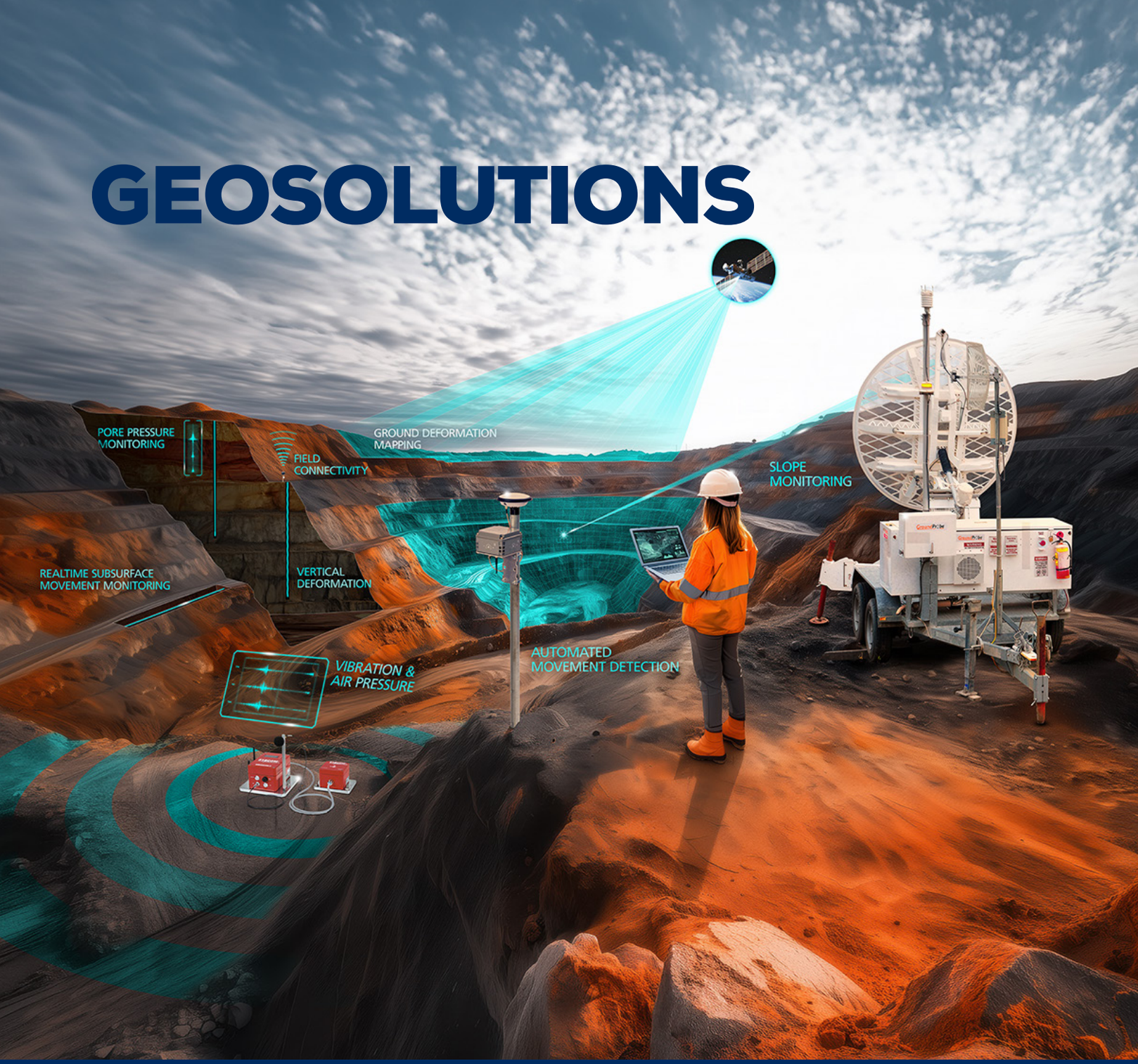
GEOSOLUTIONS



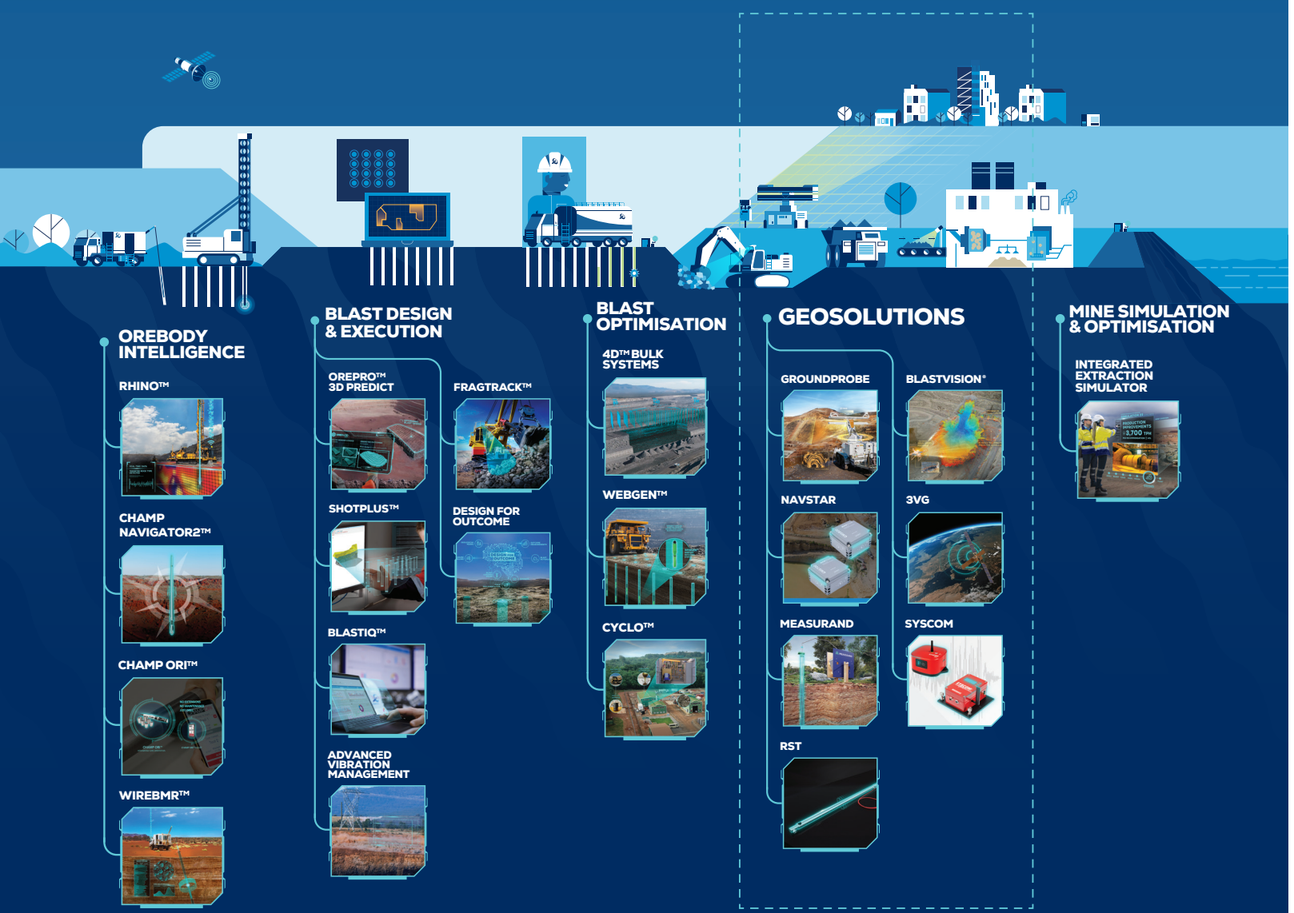
Orica Digital Solutions is a global leader in downstream geotechnical and structural monitoring for the mining and civil infrastructure sectors.

We provide our customers with the certainty they need to make critical decisions with confidence.

With extensive geographic coverage and robust support capabilities, we ensure that customers worldwide have access to cutting-edge monitoring solutions, backed by comprehensive technical support and expertise.

ORICA Digital Solutions

TECHNOLOGY SOLUTIONS FOR BLASTING AND BEYOND



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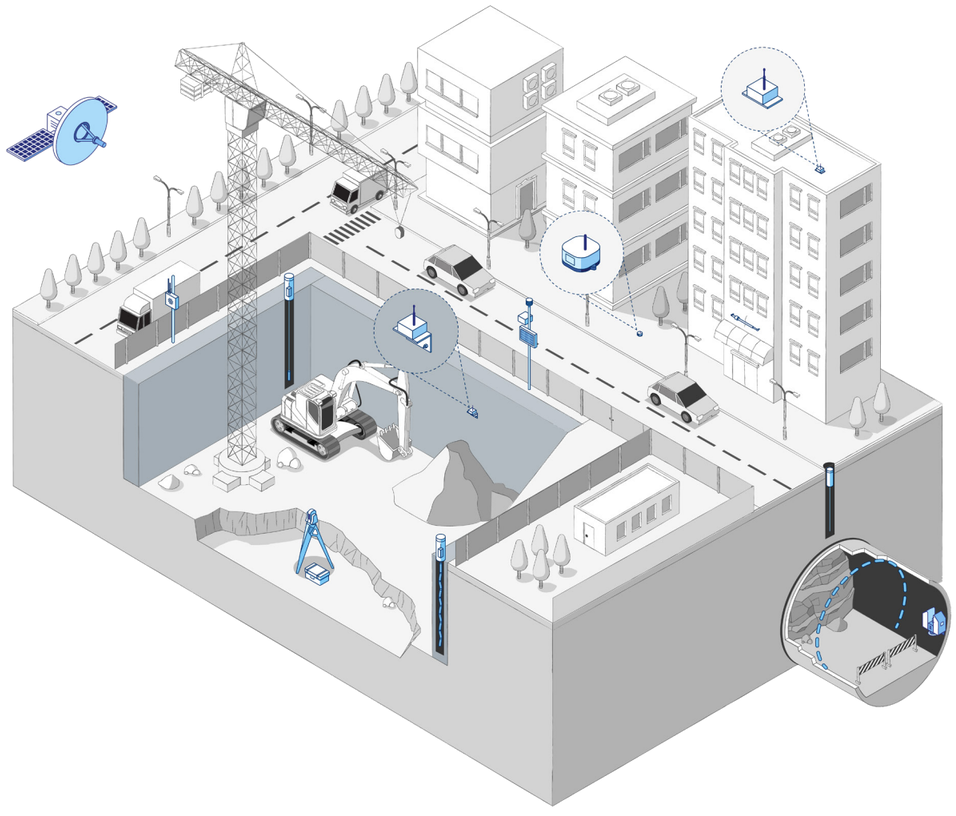


GEOSOLUTIONS

GLOBAL LEADERS IN GEOTECHNICAL, GEOSPATIAL AND STRUCTURAL MONITORING, PROTECTING PEOPLE, ASSETS AND ENABLING OPERATIONAL UPTIME.

We provide our customers with everything, from sensors to services. Our complete, end-to-end portfolio of solutions supports the entire mining, civil infrastructure and energy industries.

Our ecosystem brings together six of the world's most trusted monitoring brands—GroundProbe, RST Instruments, Measurand, 3vGeomatics, Syscom Instruments and NavStar, creating the most comprehensive portfolio in the industry.

Part of Orica Digital Solutions, Geosolutions is backed by a team whose expertise and global reach are grounded in Orica's 150 years of experience.

Why choose Geosolutions?

By combining long-standing technical expertise with tools designed for the realities of mining, infrastructure and energy operations, customers gain more than instruments. They have access to people who understand how ground and structures behave and who can help turn data into informed decisions

Backed by Orica's global network and long history in high-risk environments, we focus on giving teams the clarity they need to work safely and make safety-critical decisions with confidence.

GroundProbe rst MEASURAND 3vGeomatics SYSCOM Instruments NAVSTAR

GROUNDPROBE™

INNOVATIVE SOLUTIONS FOR MEASURING & MONITORING GEOHAZARDS.

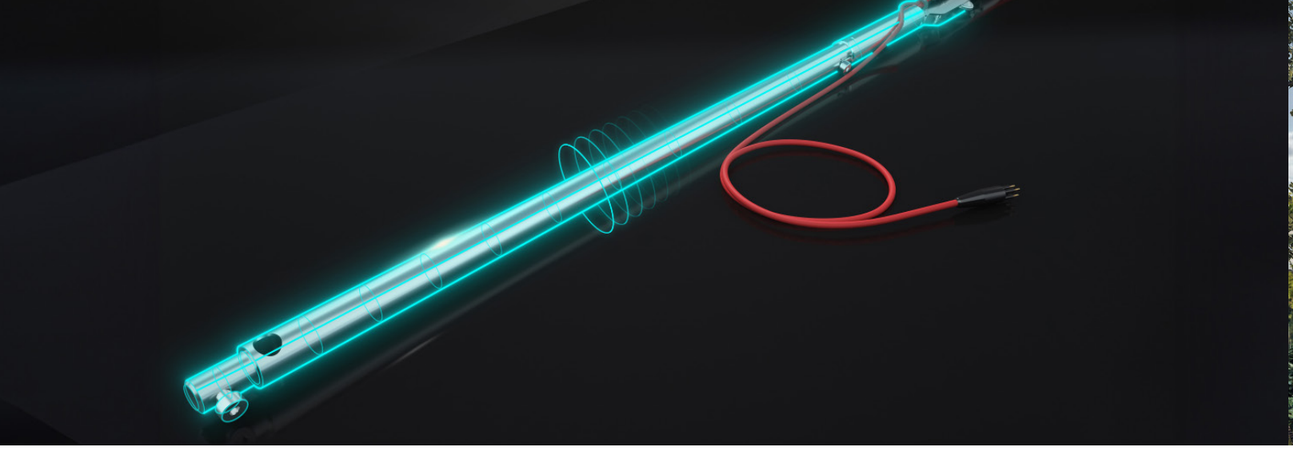
GroundProbe is a global technology leader specialising in real-time solutions for measuring and monitoring geohazards. We are the brand most trusted by mining and civil operators globally, giving them the certainty they need to make critical decisions with confidence.

For more than 22 years, we have created state-of-the-art technologies and software that deliver precise and reliable information to our customers, helping them better manage risk, maintain operations and production, and keep people and communities safe.

GroundProbe delivers sustainable improvements that:

- Drive cost efficiency
- Enhance productivity
- Assess and reduce environmental impacts
- Optimise outcomes for the entire operation

GroundProbe®



RST INSTRUMENTS™

MONITORING PORE WATER PRESSURE, WATER LEVELS, UNDERGROUND DISPLACEMENT WITHIN SOIL AND ROCK.

IN-PLACE INCLINOMETER

RST Instruments' MEMS Digital In-Place Inclinometer Systems (IPI) provide constant remote monitoring and early warning of movements, which is essential for protecting life and equipment. MEMS Digital In-Place Inclinometer Systems (IPI) are designed to measure lateral movement when remote and continuous monitoring is required.Each IPI employs MEMS accelerometer sensors housed inside a 28.1 mm (1.125 in) diameter, water-tight, stainless steel enclosure. The sensor body is rigidly connected to a 25.4 mm (1.0 in) diameter bay rod which establishes the length of the IPI. The sensors are read through a connectorized signal cable that chains together multiple sensors. A data logger is used to monitor the deflection of each sensor on the digital bus. If necessary, an alarm can be triggered when movement reaches a threshold rate or magnitude.

VIBRATING WIRE PIEZOMETER

The RST Vibrating Wire Piezometer provides excellent long-term accuracy, stability of readings, and readability under demanding geotechnical conditions.

Vibrating Wire Piezometers are the electrical piezometers of choice as the frequency output of VW devices is immune to external electrical noise and able to tolerate wet wiring common in geotechnical applications.

CASE STUDY | EXCAVATION AND SHORE MONITORING

North America | Urban construction risk mitigation

Challenge

Pier West engineers had to ensure they were not putting nearby infrastructure and buildings at risk during the project's excavation and shoring phases. They also needed geotechnical data to confirm design assumptions as construction proceeded.

Solution

RST collaborated with the developer and their geotechnical expert to develop an instrumentation plan. We supplied vibrating wire load cells and in-place inclinometers to monitor various shoring elements, including secant pile and cutter soil mixing (CSM) walls. IPI were installed at soldier pile locations along the shoring wall. Load cells were used at the same locations as the IPI to monitor tie-back anchor loading in real-time.

Results

The sensors provided real-time data while work was underway and our monitoring system ensured the excavation and shoring proceeded without damage to nearby rail lines or buildings. The data collected was of immense value to the project owners, they can prove that no damage was done to surrounding infrastructure during excavation.

To learn more about RST Instruments and how it can support your operations, contact your local representative or scan the QR code.

MEASURAND™

MONITORING DEFORMATION OF SOIL AND STRUCTURES LIKE DAMS, TUNNELS, WALLS AND BUILDINGS.

Measurand designs and manufactures ShapeArray, which is used to monitor deformation of soil and structures like dams, tunnels, walls, and buildings.

ShapeArray is an automated shape-measuring inclinometer-style instrument on a reel, which has set a new standard for ease of installation. ShapeArray data are available in real time, enabling engineers and designers to reduce risk and save money by making smarter, faster, decisions. Measurand's unique technology, developed over 25 years ago, makes ShapeArray the only patented geotechnical monitoring instrument of its kind.

CASE STUDY | US ROUTE 2 LANDSLIDE

North America | Geohazard monitoring

Challenge

Steep river banks and clay soil near highways have led to numerous slide events near Crookston, MN, over the past 50 years. In September 2003, a landslide in downtown Crookston between US Route 2 and the Red Lake River caused significant property damage, leading the Minnesota Department of Transportation (MnDOT) to investigate new monitoring solutions. The department had used traditional inclinometers, but was interested in automation and remote collection of data. A pilot project determined the viability of Measurand's ShapeArray to be installed in two roadway sections experiencing stress related to erosion and soil instability.

Solution

ShapeArray data revealed that soil movements at the Crookston East site were deeper than anticipated. With this new data, experts determined that the slope was no longer creeping, but rather a major failure was occurring. The MnDOT closed the westbound lanes of US 2 and detoured traffic north of the city on Monday, Sept. 15, 2008. Ten days later, a large progressive landslide occurred, dropping a 150 m section of highway three metres. The slide continued over several days. ShapeArray helped engineers ensure that no members of the public were hurt during the sliding event.

Results

ShapeArray survived unprecedented deformation during and after the event. The instruments continued to provide engineers with useful data until the slide forced the casing to move from their vertical down-hole position to a horizontal one. The system remains in place and provides valuable data to the MnDOT.

To learn more about Measurand and how it can support your operations, contact your local representative or scan the QR code.

3VG™

MONITORING DEFORMATION OF SURFACES THROUGH REMOTE SATELITE MONITORING.

Displacement DataStream is 3vGeomatics' advanced satellite InSAR monitoring service that rapidly updates displacement measurements after each new image acquisition. Displacement DataStream is the latest advance in InSAR processing that represents a new class of early risk identification.

3vGeomatics' processing strategies provide a denser set of measurement points across a site and deliver displacement and acceleration detections to save time and draw attention to important areas.

CASE STUDY | PIPELINE VEGETATED AREA MONITORING

North America | Early detection

Challenge

Geohazards exist on low-angle slopes, and slope displacement is often very subtle. Detecting and monitoring geohazards across thousands of kilometers of pipeline can be difficult. The pipeline right of ways are in remote locations; ground instruments and field visits can be expensive.

Solution

3vG analyzed radar satellite images acquired by ALOS-1 between February 2007 and March 2011. ALOS-1 is an L-band satellite whose radar waves penetrate through vegetation, and in some cases, light dry snow, to provide displacement information of the ground underneath.

Results

3vG demonstrated the value of InSAR as an additional tool for pipeline integrity managers focused on geohazards. An analysis of L-band radar satellite images acquired from 2007–2011 identified a land mass moving at a rate of 2–10 cm per year, prior to a landslide occurring in 2013 which led to a business interruption. Ongoing monitoring with regularly updated displacement reports can detect new risks that may develop and monitor known ones to help prevent geohazard induced pipeline incidents.

To learn more about 3VG and how it can support your operations, contact your local representative or scan the QR code.

SYSCOM™

VIBRATION AND SEISMIC MONITORING.

SYSCOM: MR3003 MOTION RECORDERS

The Syscom ROCK is one of the most advanced vibration recorders integrating highly innovative and proven technologies such as ultra-low power integrated components, state of the art LTE connectivity, and embedded SIM card. Thanks to the ROCK's autonomous design, it is fully operable without cables. This makes installation a quick and painless process."

The all-in-one solution, together with Syscom Cloud Software (SCS), delivers unrivaled ease of use, a rapid return on investment, and vibration monitoring compliance based on global standards. The ROCK may be used in a range of civil engineering applications/ projects—industrial vibrations, construction site monitoring, truck and rail traffic, piling, blasting monitoring, model verification.

CASE STUDY | CONTROLLED BLASTING MONITORING

Germany | Regulatory norm compliance

Challenge

A construction company with consultant partners needed to seal a former service water well used at a power plant. The well needed to be sealed in a way that prevented artesian groundwater from escaping at the surface as well as water from penetrating into the aquifer. They planned two defined explosions to perforate the well pipe at a depth of 25 m and then 15 m before backfilling. The blasts needed to conform with regulatory norms.

Solution

Autonomous vibration monitoring ROCK devices manufactured by Syscom Instruments were placed at four locations nearby—one at the power plant and three at a property north of the blast site. Data were wirelessly transmitted from the ROCK to the SCS cloud software to compare with the DIN 4150-3 norm and included on PDF reports sent to project stakeholders.

Results

Careful planning and execution allowed the blasts to be contained with no spillage or raising of artesian water. Blast monitoring with the ROCK confirmed the vibrations were within the limits defined by the DIN 4150-3 standard and in full compliance.

To learn more about Syscom and how it can support your operations, contact your local representative or scan the QR code.

NAVSTAR™

DEFORMATION MONITORING TECHNOLOGY AND SERVICES.

NavStar's GMS devices are compact, high-precision GPS/GNSS sensors that provide accurate three-dimensional displacement and tilt measurements for deformation. With no moving parts and the ability to provide 24/7 automated monitoring data in extreme climates, the NavStar's sensors are an ideal choice for monitoring slopes and structures such as open-pit mines,dams, landslides, and other natural hazards.

NavStar sensors can be activated in GeoExplorer with little to no configuration. Sensors will be 'online' with real-time mapping and graphing enabled within seconds of startup. GeoExplorer provides support for many different types of sensors and provides an industry leading integrated monitoring solution.

CASE STUDY | INTEGRATED OPEN-PIT MINE AND TAILINGS STORAGE FACILITY (TSF) MONITORING

North America | Regulatory Compliance

Challenge

Over several purchase and sales over a 10-year period, various owners of the Mount Milligan Mine made significant investments in instrumentation and data acquisition equipment, but these were never deployed. New owners and operators, Centerra Gold, along with consultants Knight Piésold, realized that those investments were not helping achieve regulatory compliance. They could not demonstrate to inspectors that they were taking steps to properly mitigate risk on the mines tailing storage facility.

Solution

A detailed discovery process and presented a full stack solution. By using GeoExplorer an integrated data visualization platform demonstrated how similar mines have used Motionary, 3vG's web-based InSAR data delivery platform to use satellite technology to monitor displacement across their whole project site. They presented how ShapeArray can be easily installed and automated for remote data collection. The demonstrated value of the comprehensive monitoring approach and built a program for implementation, meeting with the customer on a weekly basis to ensure the program's success.

Results

Navstar GeoExplorer software deployed on site.

To learn more about NavStar and how it can support your operations, contact your local representative or scan the QR code.

NAVSTAR

GEOTECHNICAL SPECIALIST SERVICES (GSS)

THE MOST TRUSTED EXPERTS IN GEOHAZARD MONITORING GLOBALLY.

Orica Digital Solutions' Geosolutions' Geotechnical Specialist Services (GSS) is your most trusted and experienced partner in managing geotechnical risk and slope stability across mining and civil operations.

With the strength of the world's largest team of geotechnical engineers and radar specialists, GSS delivers faster decisions and safer outcomes, all grounded in our deep expertise and built on an unparalleled, real-world experience.

Trusted by more customers than any other geotechnical monitoring service, GSS delivers long-term analysis across all geosolutions sensors and a range of third-party instrumentation. From our full suite of Slope Stability Radars (SSRs) to real-time radars from any vendors, GSS is also radar agnostic, allowing for 24/7, continuous monitoring.

All Geotechnical Sensors

GSS is fully sensor-agnostic, delivering comprehensive services across a wide range of geotechnical sensors and data types to ensure effective risk management and enhanced site safety. We seamlessly monitor and analyze data from both Geosolutions and third-party systems, aggregating information across platforms to provide actionable insights that drive critical decision-making.

Our team is proficient in all major industry software and aggregation platforms, including MonitorIQ® Next, Motionary, Affinity, and SCS.

Proven Multi-Sector Expertise

With the largest global team of geotechnical engineers and radar operators, GSS sets the industry benchmark for geotechnical monitoring. We maintain the world's most extensive library of wall failure records, enabling our experts to draw on thousands of slope failure analyses and incident investigations. This unparalleled knowledge base translates into sharper monitoring strategies and more effective risk mitigation for every site.

Multi-Sector Coverage

GSS supports some of the world's most complex and high-risk projects across mining and civil sectors. Our global services operate 24/7, combining onsite support with three dedicated remote monitoring centres located in Balikpapan, Santiago, and Belo Horizonte, ensuring continuous coverage and rapid response wherever operations are based.

To learn more about Geotechnical Specialist Services and how it can support your operations, contact your local representative or scan the QR code.

orica.com/digitalsolutions