SYPERION

SLOPE MONITORING

LANDSLIDE WARNING SYSTEM

www.syperion.de

ABOUT US

SYPERION offers high-quality engineering services as well as special-purpose solutions in the field of laser measurement and video metrology. Innovative measuring systems are created by integrating optical sensors, using laser scanners and video metrology systems. Our technologically advanced products and methods are developed for challenging industrial projects.

We offer

- **Innovative measuring systems with integrated laser scanners**
- **Metrological special-purpose solutions for quality assurance and process measuring systems**
- **Software customisation for your special requirements**

We work in enduring and faithful partnerships with our customers and contractors. Together we develop practical and profitable ways to incorporate 3D measuring technology in complex business or production processes.
Through this, we generate long-term benefits and competitive advantages for our clients.

In addition to the products and applications presented in this brochure, we develop special solutions tailored to your requirements.

We will find the optimal solution for you, too –
Please contact us!

MONITORING THE STABILITY OF SLOPES AND DUMPS

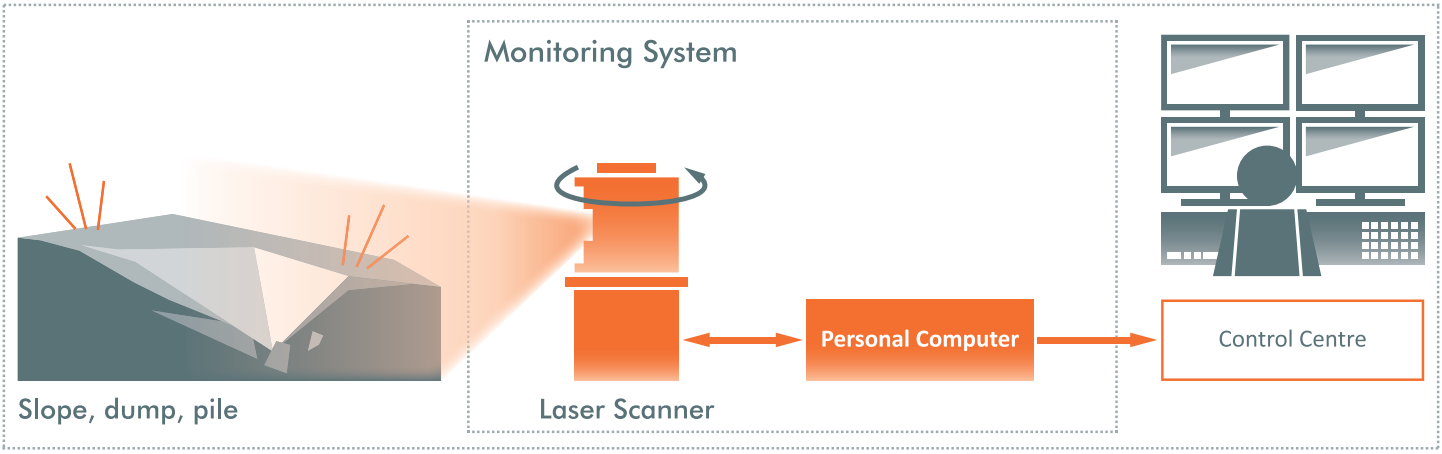
Landslide Warning System

Through extensive ground works the surface of landscapes and the shape of its slopes are changed. The observation and evaluation of deformations are indispensable precautions to ensure the stability of slopes. Monitoring slopes, fractures and soil movement helps to detect and possibly to prevent dangerous landslides or avalanches.

Since 2013, Syperion has developed and distributed a new and robust system to monitor slopes permanently and in real time. Based on a long distance 3D laser scanner by *RIEGL* the system detects fractures within seconds from a distance of more than 4 km.

The system automatically distinguishes between the movement of the slopes and the irrelevant movement of technical equipment such as bulldozers, trucks or heavy mining equipment. In case a fracture has been detected, an alarm message will be sent to the control centre in order to save persons and equipment.

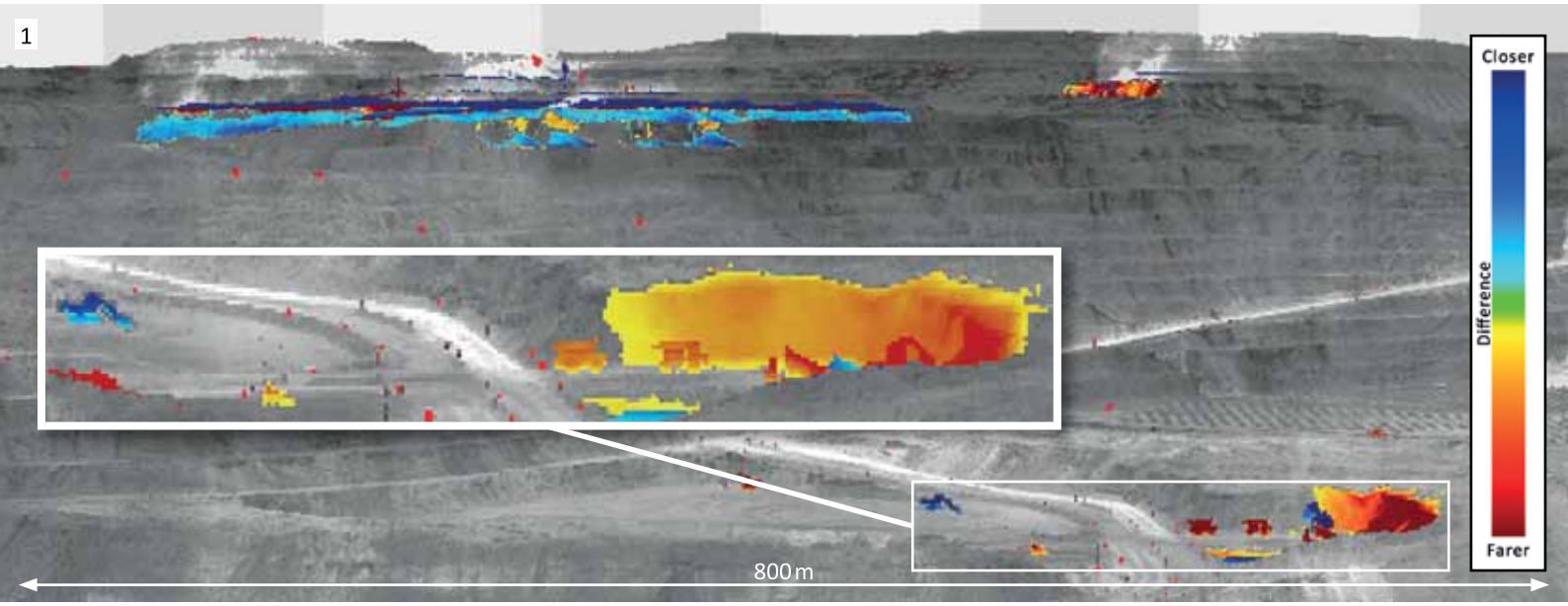
In addition to the monitoring purpose, the system provides precise data about the mine like measuring volumes in specific areas, so that reliable decisions can be made.

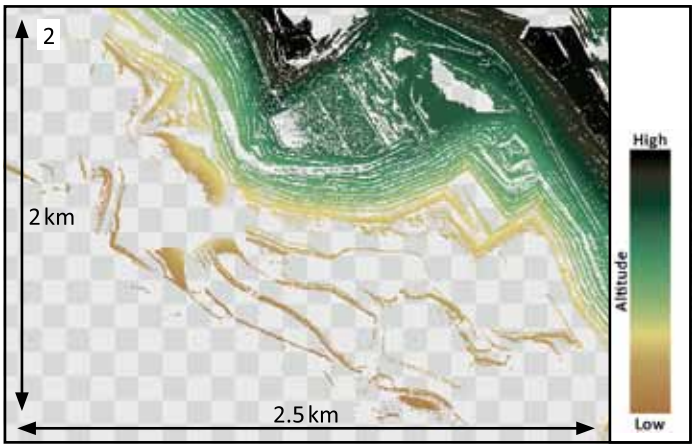


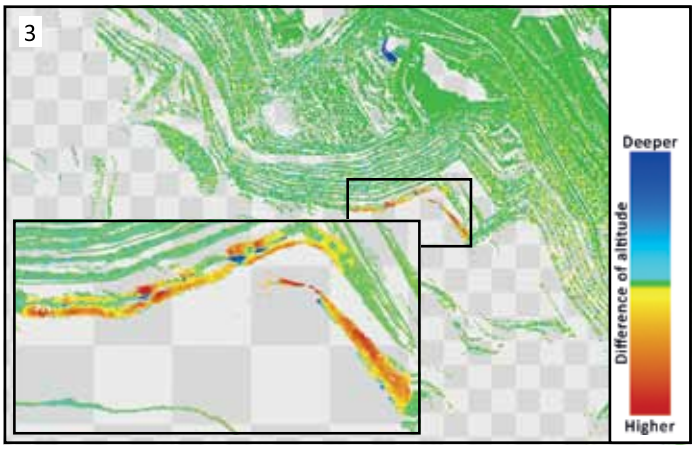
EXAMPLE OF MEASUREMENT PROPERTIES

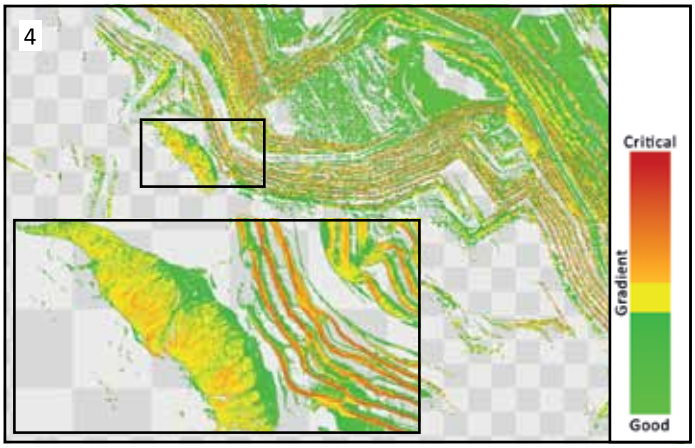
Measurement properties in combination with 3D laser scanner type *VZ4000* by *RIEGL*:

- The maximum measurement range is up to 4,000 m for natural targets
- The accuracy of the measurement is about 15 mm, the precision is 10 mm
- The beam divergence is 0.15 mrad, resulting to a beam diameter of 15 centimeters @ 1 km distance
- The laser product classification is »class 1«, i. e. eye safe









KEY FEATURES

- Processing of scanner data in a grid from the scanner's point of view (horizontal view)
- Processing of scanner data in a grid from a bird's eye view (vertical view)
- Handling the scanner data in different resolutions of the grid
- Long-term evaluation of scanner data over a certain period of time
- Analysing distance, altitude, gradient, reflectance and velocity/speed
- Tracking of reference points and control points over a certain period of time to provide precise information about the slope at a specific location
- Analysing areas over a certain period of time to provide precise information about regions

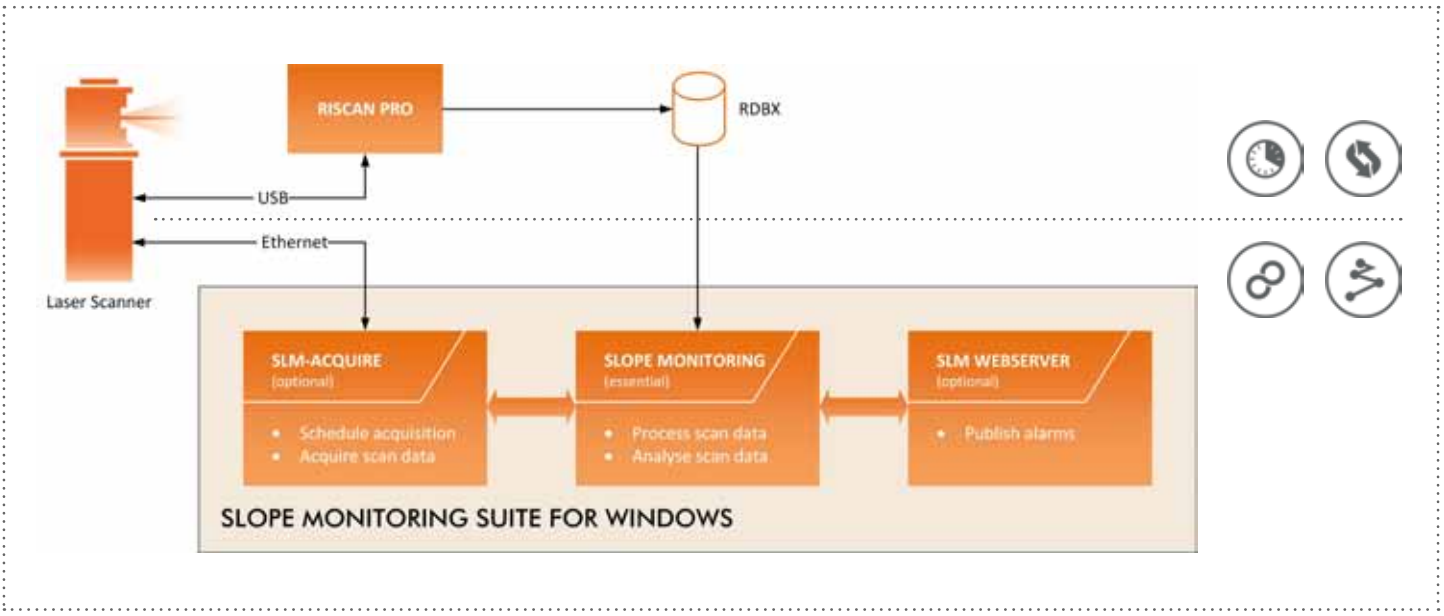
UNIQUE SELLING PROPOSITIONS

- Data analysis takes place in two data sets (other programs offer only the horizontal data set):
  - Vertical
  - Horizontal
- The vertical grid analysis allows the calculation of the 2D-angle of the landscape, we call this Gradient
- The vertical grid calculation offers the possibility to determine the correct volume in a specific area
- Processing data from multiple scanners in one epoch
- Improving the scanner data by removing technical objects like excavators, dumpers, bulldozers in an automatic manner
- Perpetual license model

Horizontal view: Image (1) shows the differences between two epochs at different working places in the horizontal view.
Vertical view: Image (2) shows the altitude of one epoch, (3) shows the difference between the epochs and (4) shows the gradient of the landscape.

SLOPE MONITORING SYSTEM DESIGN

For a monitoring purpose the following design is proposed:
The design is separated by the type of monitoring. For »periodic« or »revisited« monitoring the scanned data can be imported from the scanner via USB and *RiScanPro* to our *Syperion SlopeMonitoring* software. For »permanent« or »mobile« monitoring an ethernet connection is mandatory.



TYPES OF MONITORING

PERIODIC MONITORING

At PERIODIC MONITORING, the location for setting up the scanner is visited at intervals. The position of the scanner is defined by a mounting device, firmly anchored to the ground. The position and orientation of the scanner show good repeatability between measurements. This allows fast measurements with low demands to the infrastructure.

REVISITED MONITORING

At REVISITED MONITORING, the location for setting up the scanner is visited at intervals. The laser scanner is positioned at a stable installation location. This enables fast measurements with low demands to the infrastructure. A comparability between the measurements is achieved by constant measuring points.

PERMANENT MONITORING

At PERMANENT MONITORING, the laser scanner is installed at a fixed location and is not moved between the individual measurements. The result of the monitoring is generated in real time and a high degree of automation can be guaranteed.

MOBILE MONITORING

At MOBILE MONITORING the scanner is mounted directly on a slowly moving large device, such as an excavator. The scanner moves with the object, detects the surroundings of the large device and immediately reports movements of the slopes.

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