GEODATA

We turn data into information.

High-precision NATM tunnelling through advanced surveying and monitoring technology

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Introduction to Geodata

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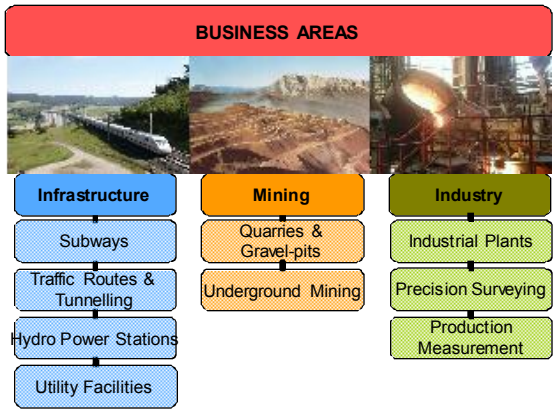
Activities

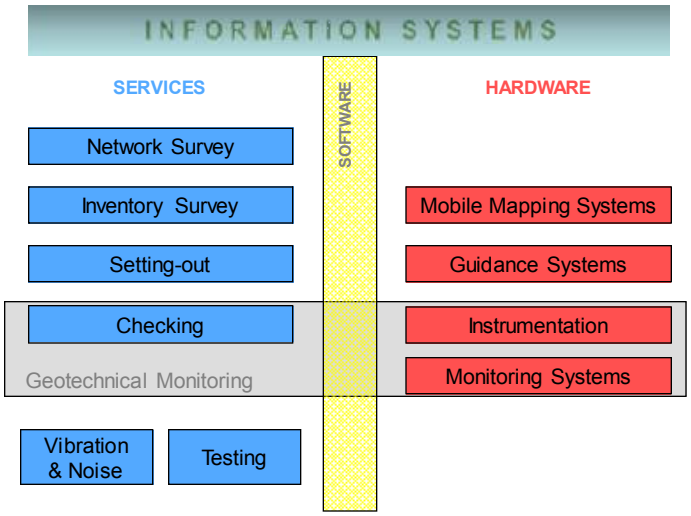
- Surveying
- Monitoring
- Instrumentation
- Software

Customers

- Contractors
- Government authorities
- Engineering companies
- Manufacturing Industry



Integrated Tunnel Surveying and Monitoring



Network and control survey

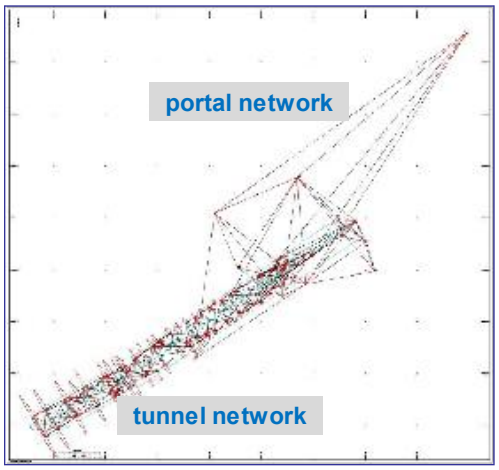
Many years of experience required for planning, measuring and analysis of large fundamental networks for tunnel construction.

GPS-measurement for a tunnel network (Pir Panjal, India)

Network and control survey

Many years of experience required for planning, measuring and analysis of large fundamental networks for tunnel construction.

Sketch of a network with error ellipses



Network and control survey

- Network prognosis computations to minimise the alignment error
- Preliminary networks
- Final networks

Control of the tunnel network for excavation (Tunnel Chain Perschling, Austria)

Network and control survey

- Measurement of azimuths using a fully automated gyroscope system
- Possibility of centric and eccentric setups assures great flexibility in adapting to difficult conditions (inclined shafts, etc.)

Gyro-measurement in a subway tunnel (Metro Sofia, Bulgaria)

Heading control and construction survey

- Free stationing
- Heading survey
- Check of profile

Heading control of side-wall drifts during construction (Lainzer Tunnel lot 31, Vienna, Austria)

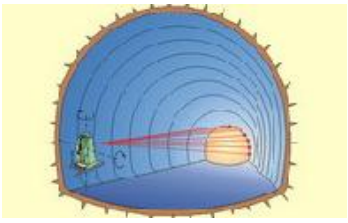
Heading control with motorised laser

- Highly accurate provision of the planned profile
- Fast installation and simple operation. No laser setting out lists required
- Instant profile control on site
- Remote operation (WLAN display)

Setting out of drill holes by WLAN-Interface

Heading control with motorised laser

fixed installation of the total station



Setting out of drill holes by WLAN-Interface

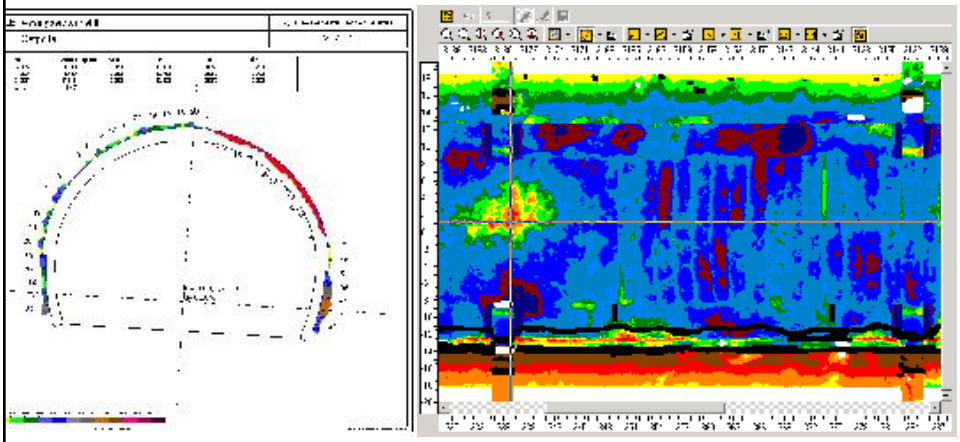
Profile check with tunnel laser scanner

- 3-dimensional digital object registration (geometry and image) using a laser scanner in the 1-200 m measuring range
- Fast, simple and complete survey, independent of lighting or surface characteristics
- High reliability and accuracy (± 5 …10 mm)

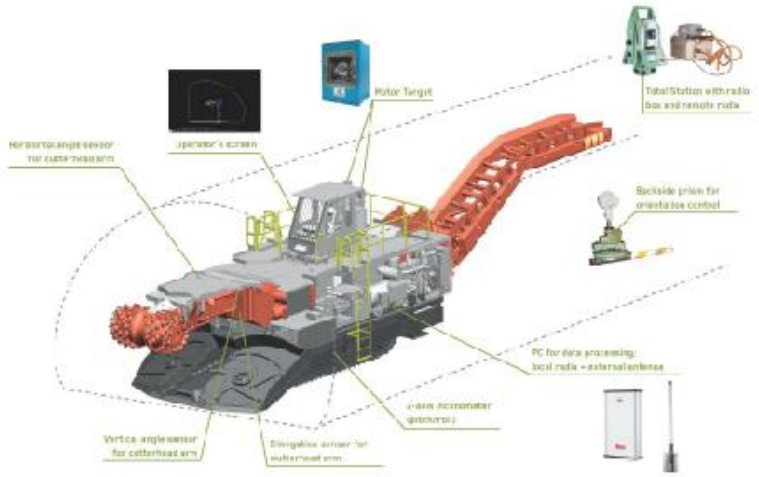
Laser scanner on a vehicle in the heading area (Tunnel Kirchdorf, Austria)

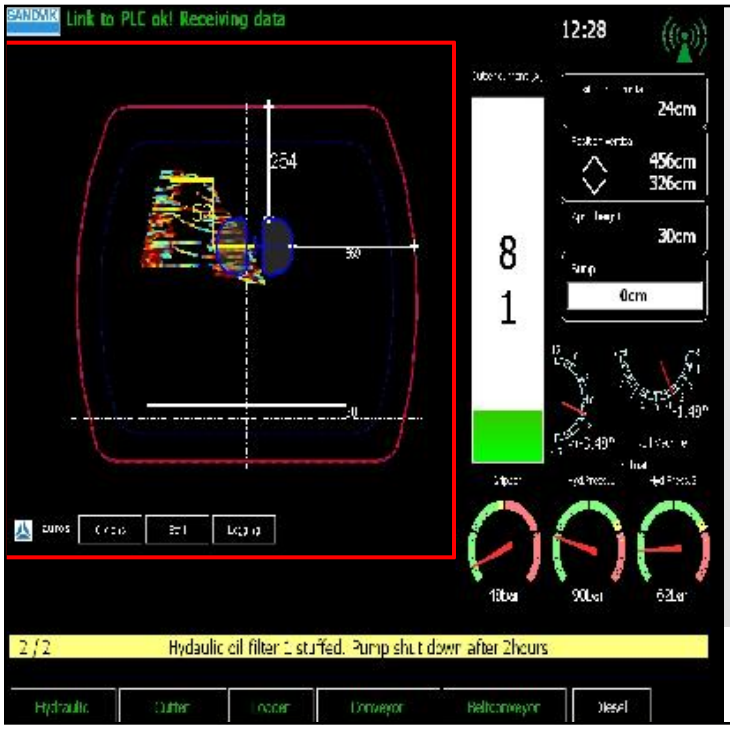
High-precision NATM tunnelling through advanced surveying technology

Profile check with tunnel laser scanner



Roadheader guidance system





This is the main operator screen on a Sandvik MT Series Roadheader. The guidance system takes the top left part of the screen. For clarity only this area is shown in the following slides

Why is monitoring so important?

Optical 3D displacement monitoring

- Determination of absolute displacements with high precision
- Flexible measurement setup avoiding interference with construction activities
- Requires special software for high-quality measurements and analysis

3D-displacement measurements with free stationing during excavation

Optical 3D displacement monitoring

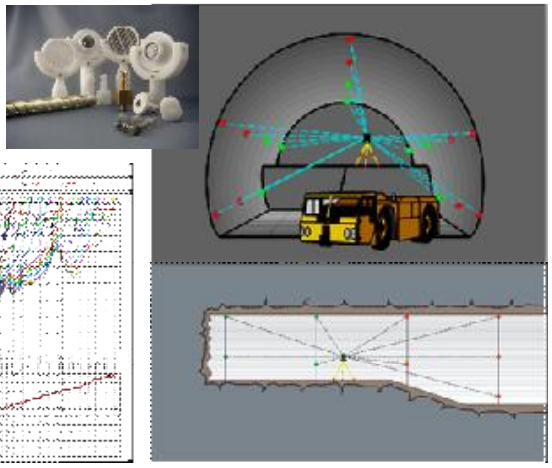
- installation of points in the lining close to the face
- arrangement in measuring cross sections
- typical arrangement of 5 – 7 monitoring points per cross section

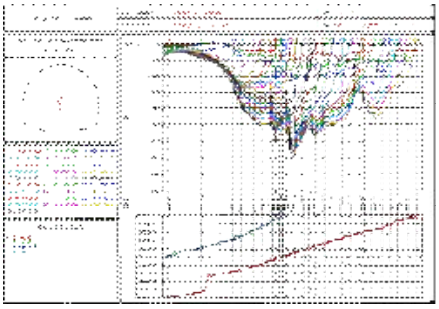
typical arrangement of points in alpine railway tunnel

typical arrangement of points in urban metro tunnel

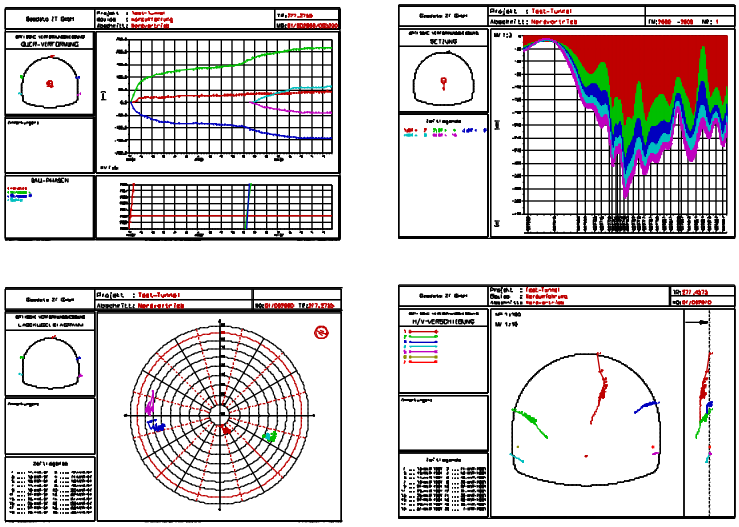
3D displacement monitoring

- Determination of absolute 3D displacements
- Flexible measurement setup





Optical 3D displacement monitoring



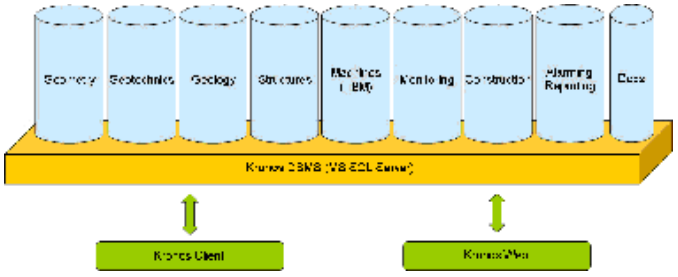
Tunnel information system

Workflow:

Data Categories

DBMS

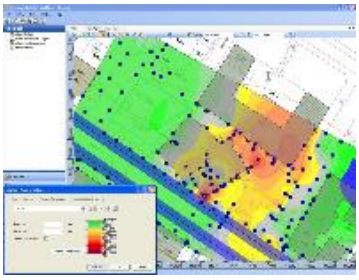
User Interfaces



Alarm and reporting system

- Alarming service
- Check of data quality, monitoring network integrity and the rapid discovery of all kinds of critical situation
- Notification by mail and SMS through the alarming service

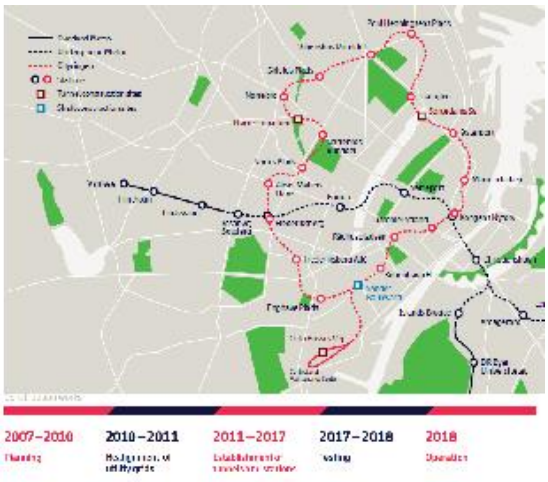
- Relevant information is displayed on-line in overview maps



Metro Thessaloniki

- under construction since 2007
- 2 x 9.5 km of line TBM twin tunnels and NATM
- 13 center platform stations

Cityringen – Copenhagen, Denmark



Budget: 2.9 Billion Euro

15.5 km of TBM twin tunnels, partly in the historical center of Copenhagen

17 underground box stations, 62m long

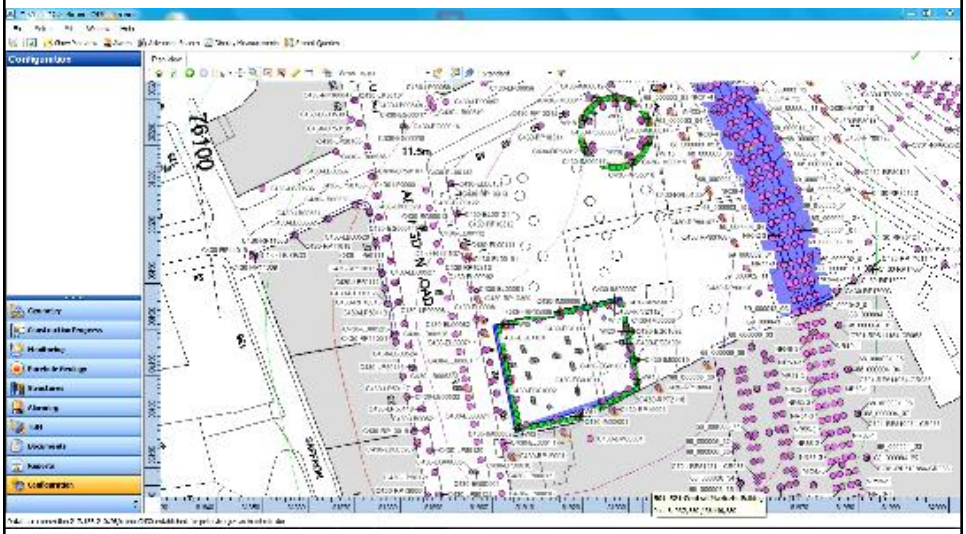
5 shafts, 4 crossovers

tunnel track at depth of approx. 10-35 m

Client: Metroselskabet

Contractor: CMT
- Salini
- Technimont
- S.E.L.I.

Crossrail – Farringdon station, England

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