ba-nettverket

Nettverkstreff 20. april 2023
Tunnelkonstruktioner

“Amberg Tunnel - Tunnel Surveying Simplified”

Philippe Matter
Sales Manger Underground

Business Areas of Amberg Technologies

Rail / Metro

- Track Planning & Design
- Ballasted Track Construction
- Slab Track Construction & Maintenance
- Track Geometry Assessments
- Scanning & Clearance Gauging

Tunnel / Shafts / Mining Underground Space

- Tunnel Excavation Guidance
- Profile Measurements & Stakeout
- Undulation
- Layer Thickness control
- Surface Inspection

Underground Seismic Prediction

- Geological Prediction during Tunnel Excavation
- In-Situ Data Acausition
- Scientific Data Analysing
- Risk Managment

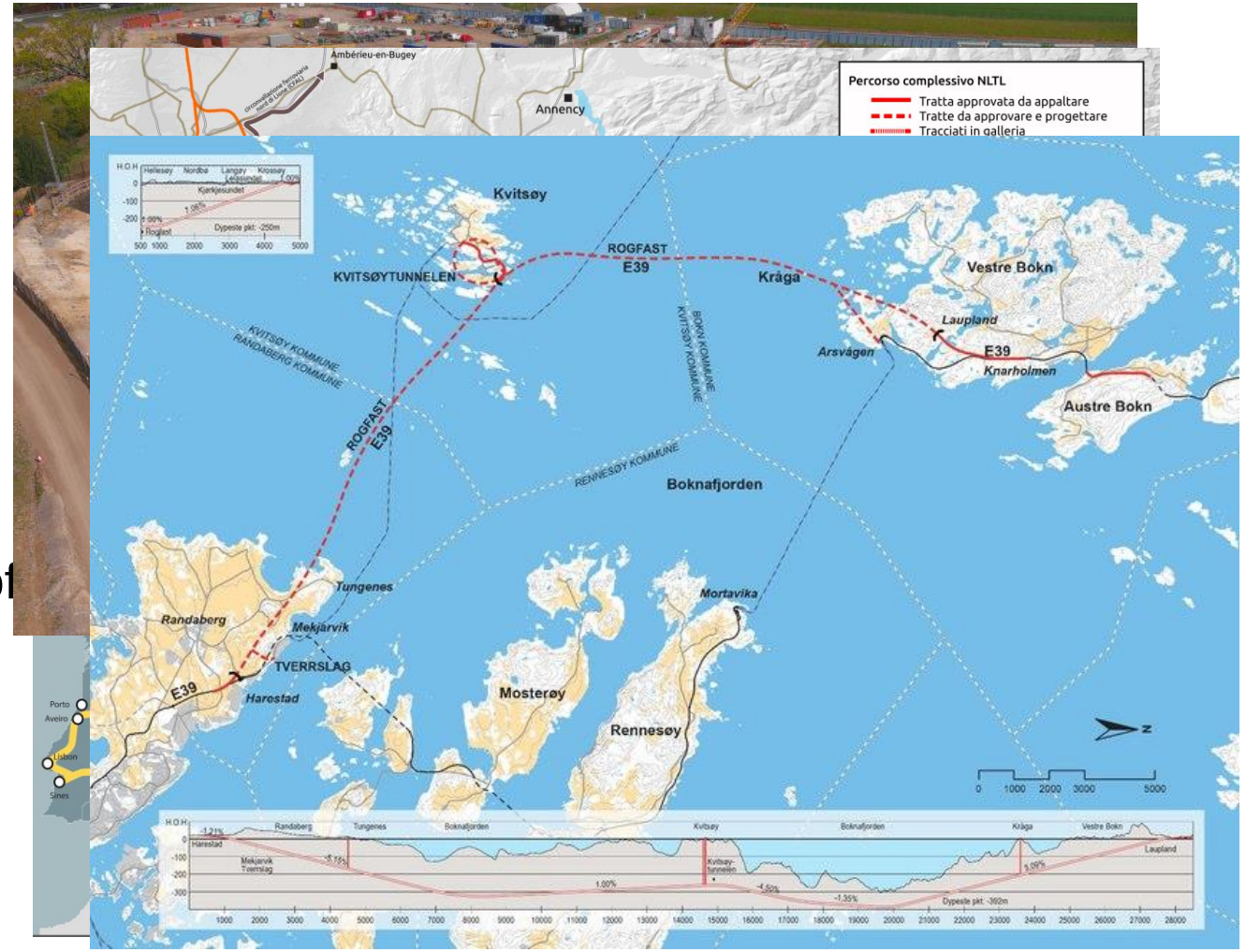
Tunnelling Today – New Challenges

How to overcome those challenges?

Tunnelling Europe – 2023

Projects in execution

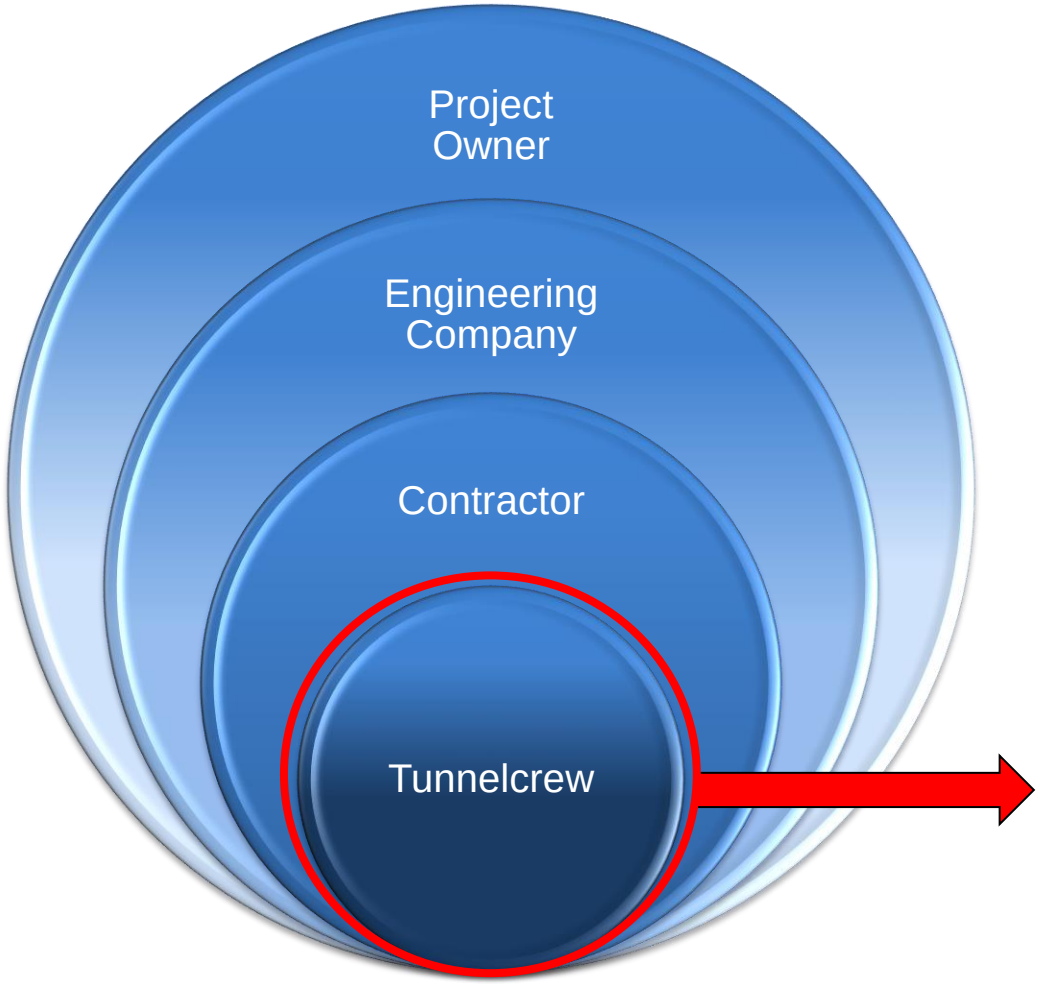
- **HS2 – High Speed 2**
  - 51 km Tunnels – 4 new stations
- **TELT – Tunnel Euralpin Lyon Turin**
  - 57.5 km Base tunnel – Total 164 km of
- **Grand Paris – Four new line for Paris**
  - 150 km of tunnels – 68 new stations
- **Rogfast - 25 km of new twin tunnel**
  - 65 km tunnel / Drill & Blast !



What have they in common?

- **Highly mechanized**
  - TBM / special machines
- **Special Excavation Solutions**
  - Injection / ground freezing
- **Highly skilled workforce**
  - New technology / BIM ….

Where are the bottle necks?

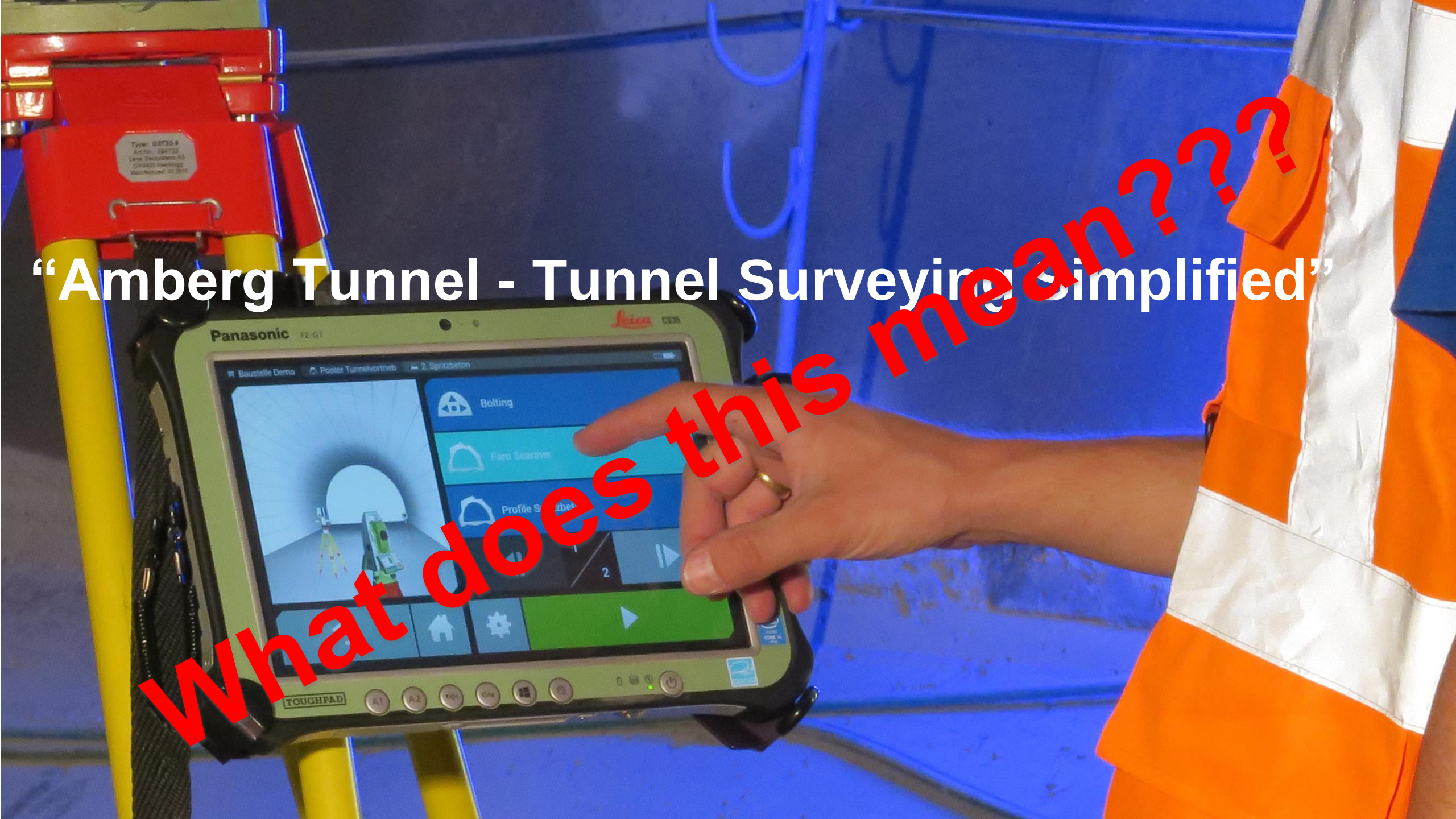


People & Knowhow

…… people with knowhow!

…….people with tunnelling expertise!

How to overcome those challenges

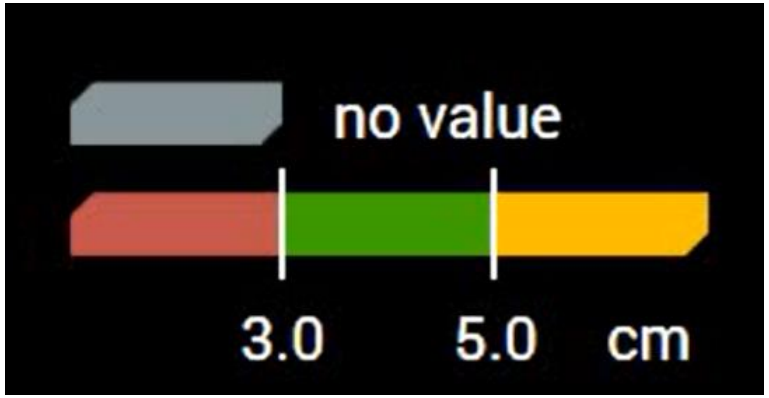

“Amberg Tunnel - Tunnel Surveying Simplified”
What does this mean???
Panasonic
Bolting
TOUGHPAD

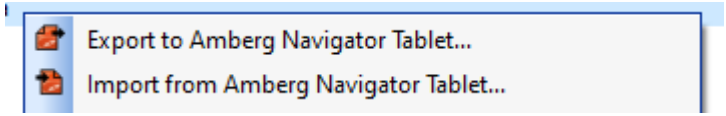
Outsource Survey to Production

Amberg Navigator – THE On-site survey tool for the tunnel crew (engineers)

Tunnel Surveyor - Open questions

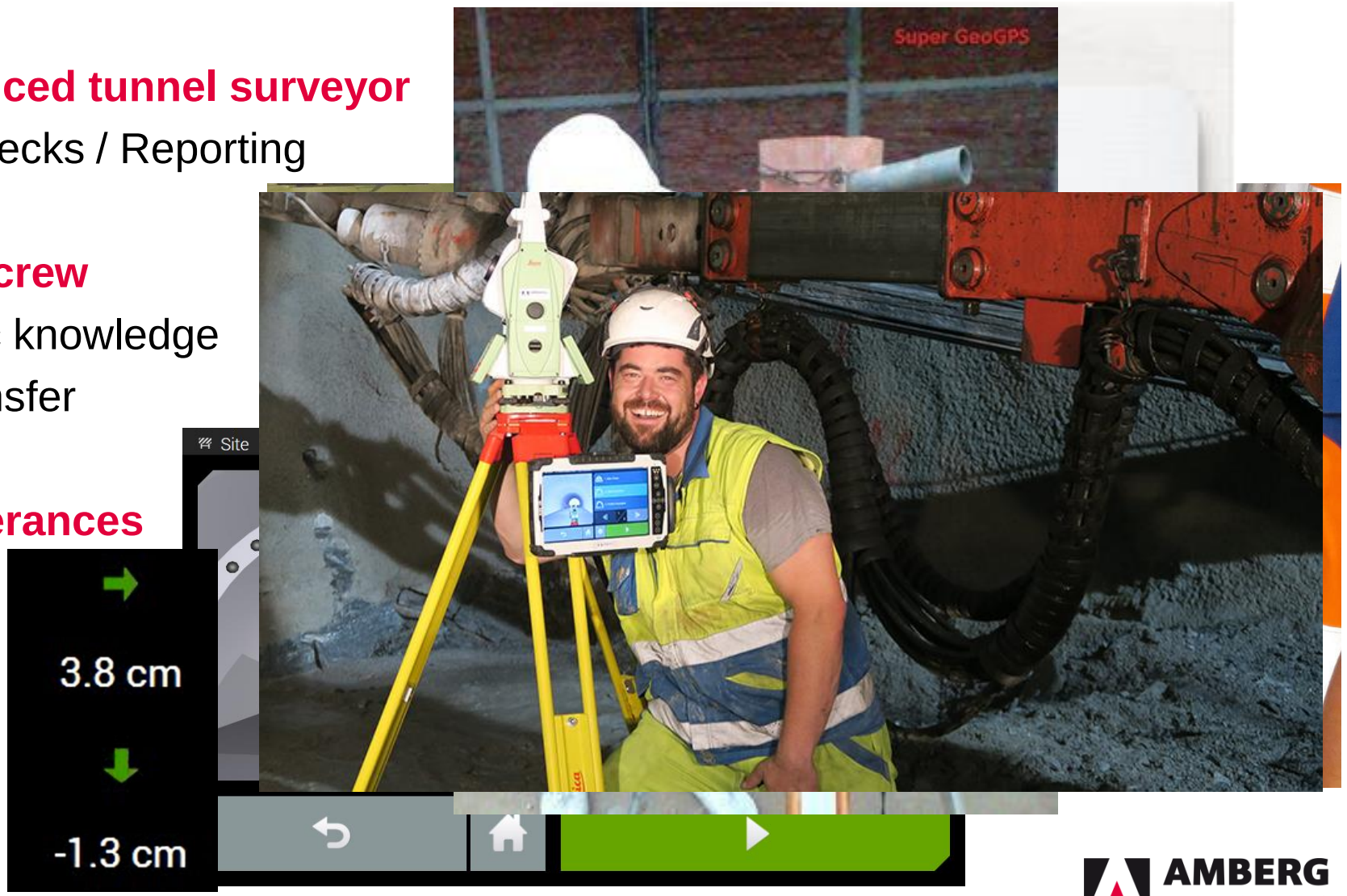
- **Is the person in charge competent?**
- **Can I lock the settings / tollerances?**
- **Survey data – where are they stored?**





Peace of mind – How do we reach that stage?

- **One skilled / experienced tunnel surveyor**
  - Project / Task / Q-checks / Reporting
- **Motivated tunnelling crew**
  - Foremean with basic knowledge
  - Easy knowledge transfer
- **Predifined tasks / tolerances**
  - No space for errors
  - Graphical indicators



Amberg Tunnel

How does it fit in a construction workflow?

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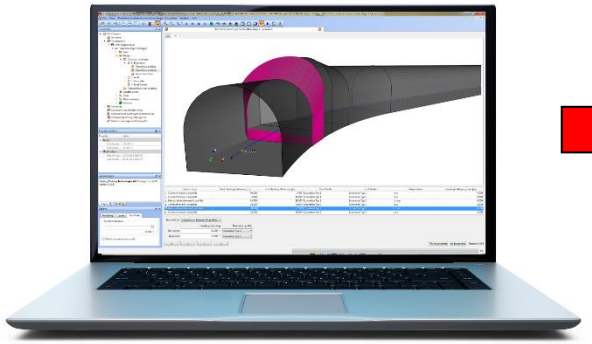
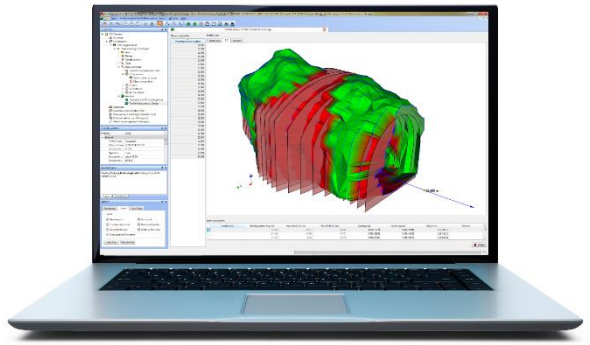
Workflow





Office Preparation
Amberg Tunnel Office

- Project setup
- Design – Axes, profiles
- Control points definition
- Define tasks for field crew
- Transfer data to field

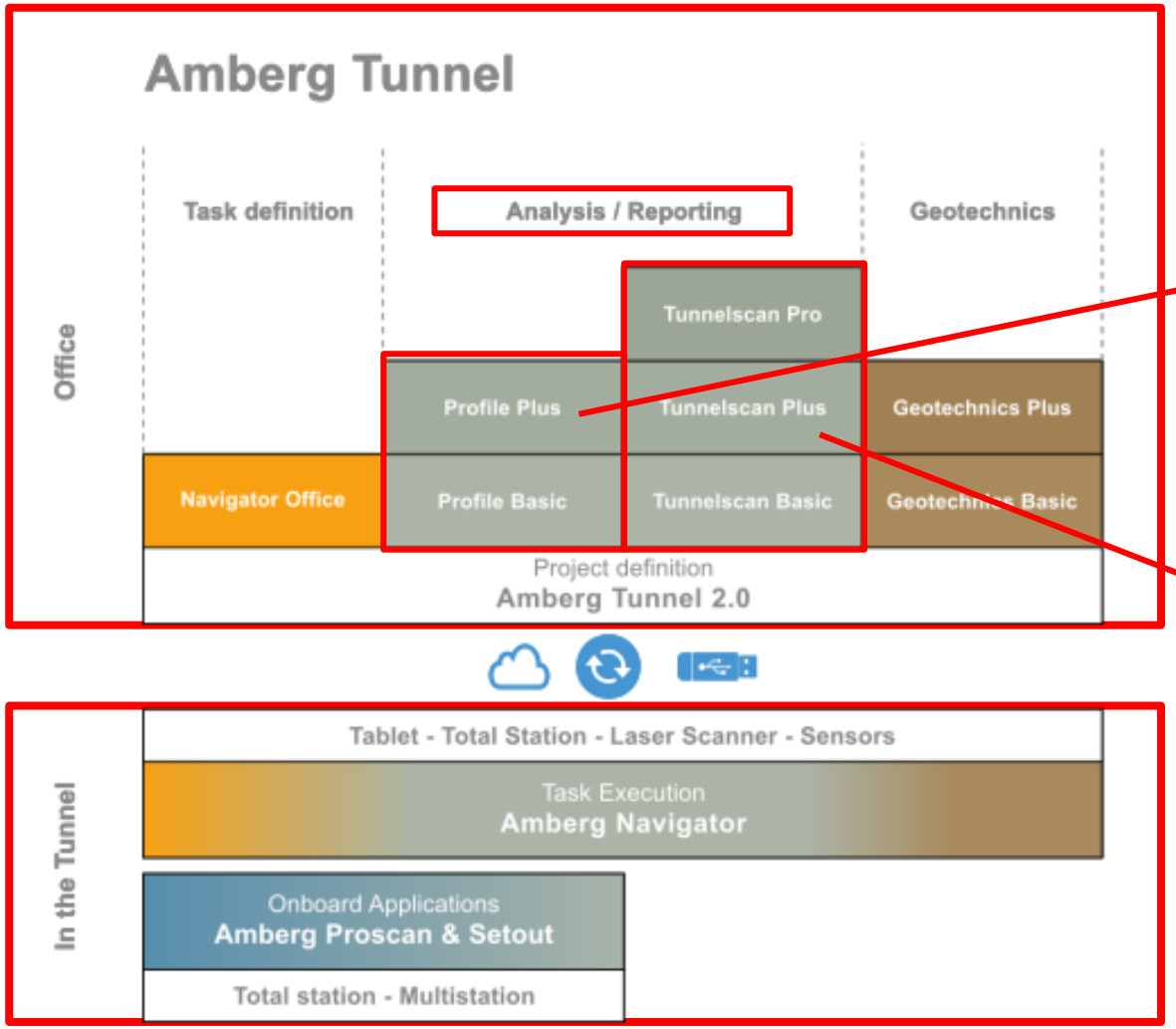
Field Survey
Amberg Navigator

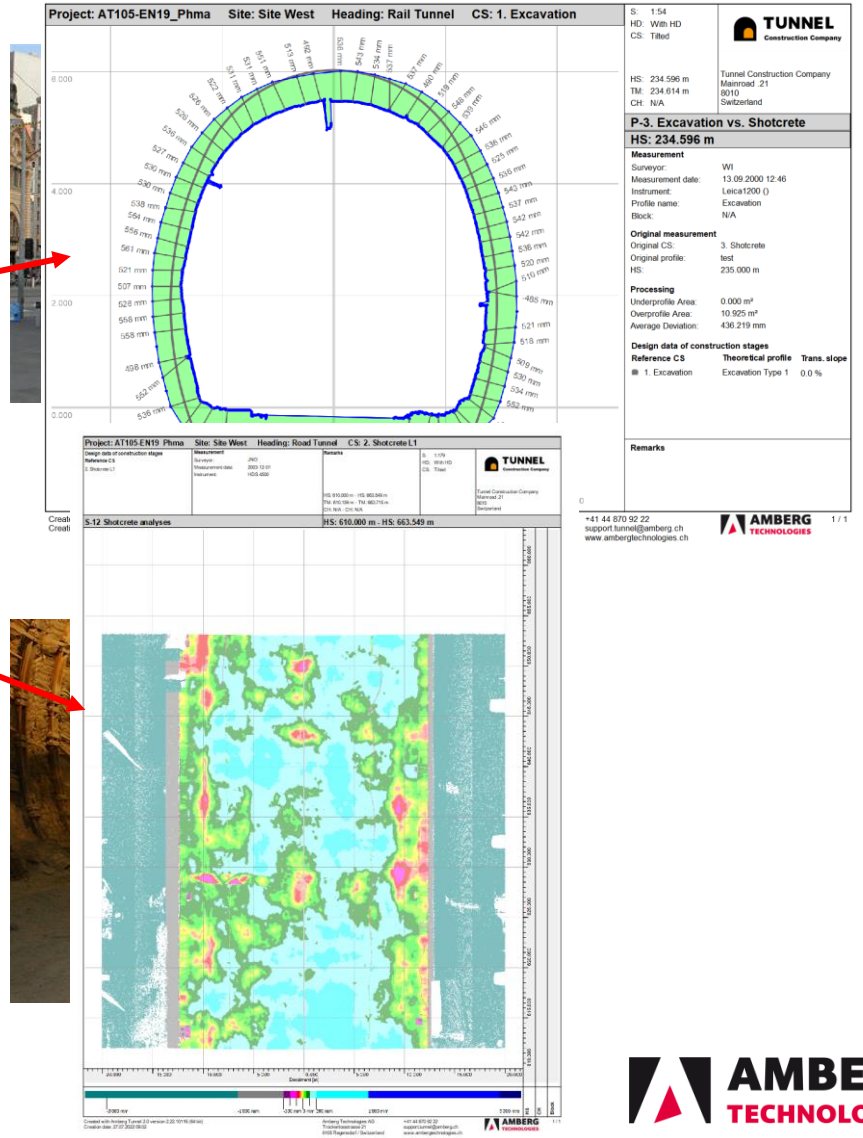
- Automatic positioning
- Execute, predefined tasks
- Stake out, profiling, convergence
- Results shown in real time
- Export measured data

Office Deliverables
Amberg Tunnel Office

- Efficient data evaluation
- 3D Visualization - profiles, scans, geotechnics reports
- Over/underbreak, volumes
- Flexible exports

Amberg Tunnel – Product portfolio





Amberg Tunnel

Tunnelling Methods

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Tunnel construction methods

- Tunnel boring machines (TBM)
- NATM / SEM (New Austrian Tunnelling Method / Sequential Excavation Method)
- Drill & Blast
- Pipe Umbrella
- Roadheader
- Others

Amberg Navigator

Tunnel Survey Simplified – Survey executed by the tunnelling team!

AMBERG TECHNOLOGIES

Amberg Navigator – On The Job Site

3 Categories of Tunneling tasks

Setting Out

Excavation Control

Quality Control

Amberg Tunnel – Navigator / Application

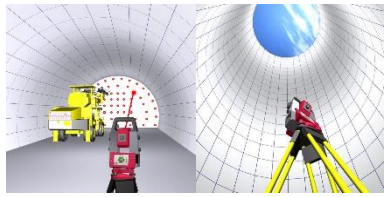
Amberg Navigator
Amberg ScanControl

Tablet (Laser Scanner / Leica MultiStation /

AMBERG TECHNOLOGIES

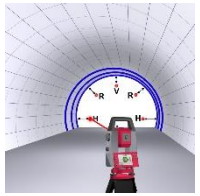
Navigator Tasks – Setting Out

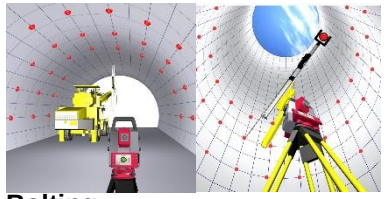
13 Individual Set-Out Tasks

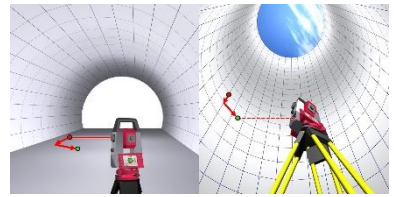

Blast pattern

Rockbolts

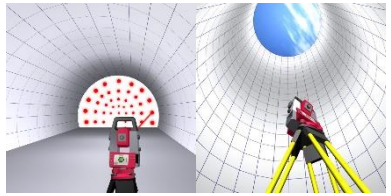
Pipe umbrella

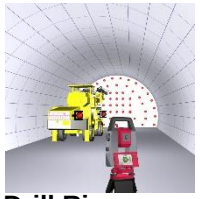

Arch


Bolting


Stake out

Contour

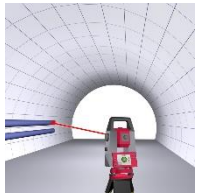

Dome face


Drill Rig

Tunnel saw

Formwork

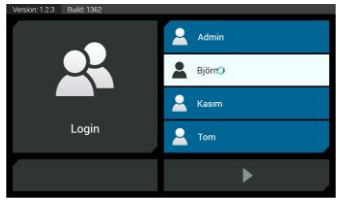
Tunnel disc

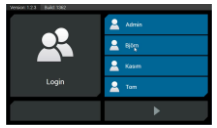

Infrastructure

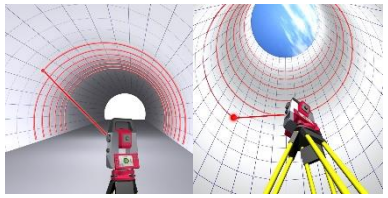
Navigator Tasks – Excavation Control

Profiling

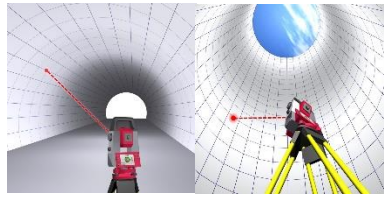
7 Individual Excavation Control Tasks



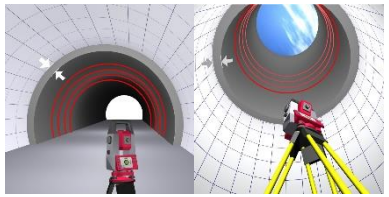




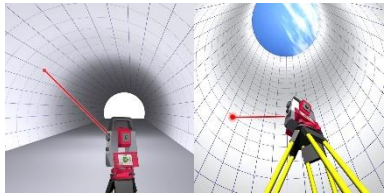
Profile measurement



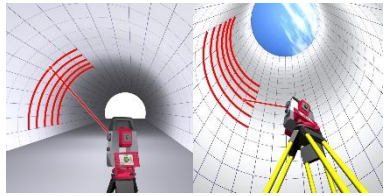
Point check



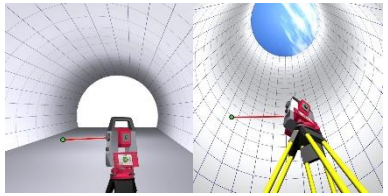
Layer thickness



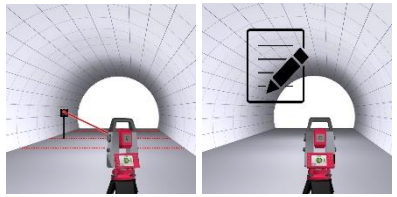
Single point



Profile free



Measure absolute



Pole

Documentation

AMBERG TECHNOLOGIES

Navigator Tasks – Quality Control

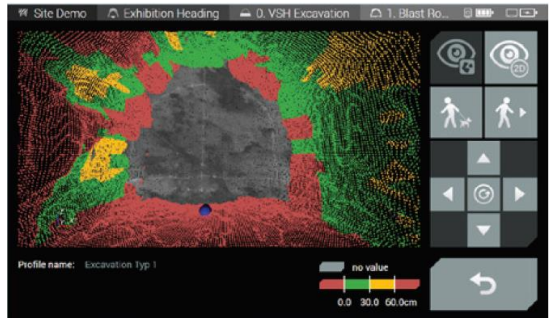
4 Scanning Tasks

Area scan

Line scan

Blast Round Scan

LT Scan



Amberg Tunnel / Navigator - What is the value?

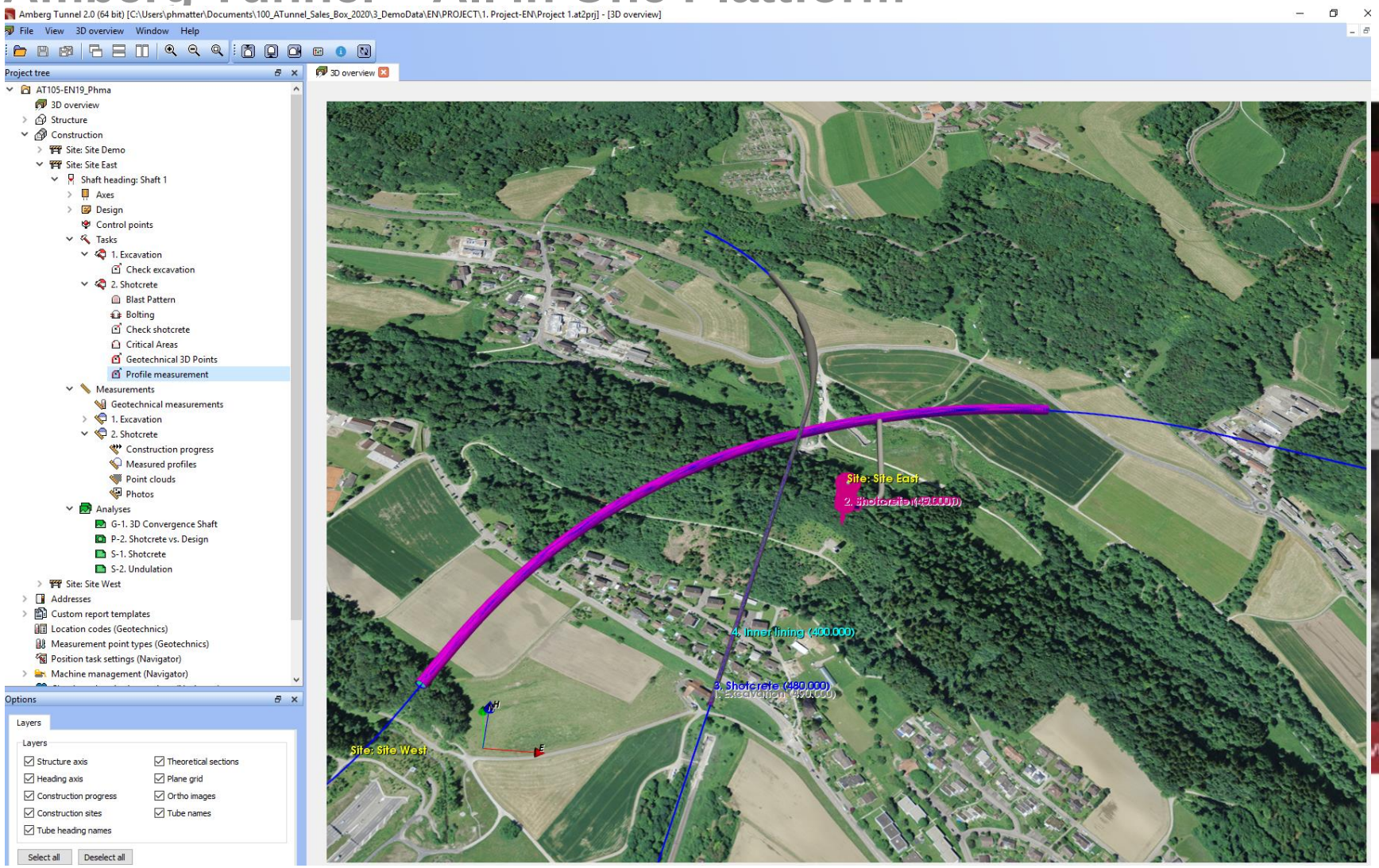
- Time saving – on the duration of the project a fast ROI

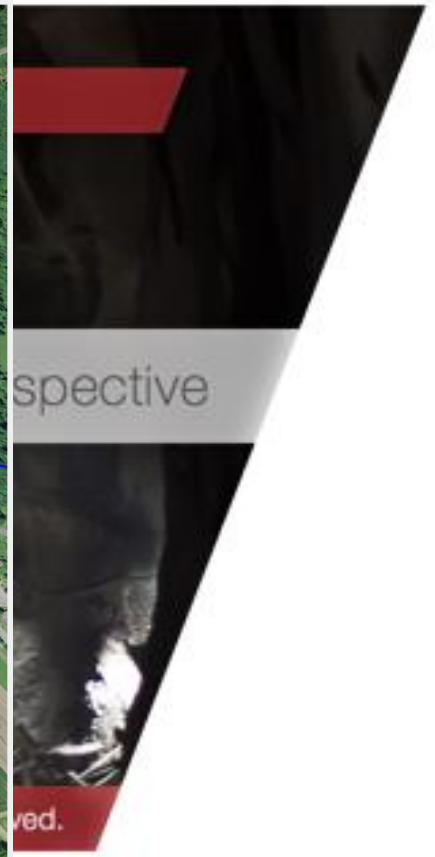
- Error free - Peace of mind throughout the project

- Consistency – Pre-set workflows for daily routine

- Cost saving – on a three shift construction only one surveyor needed

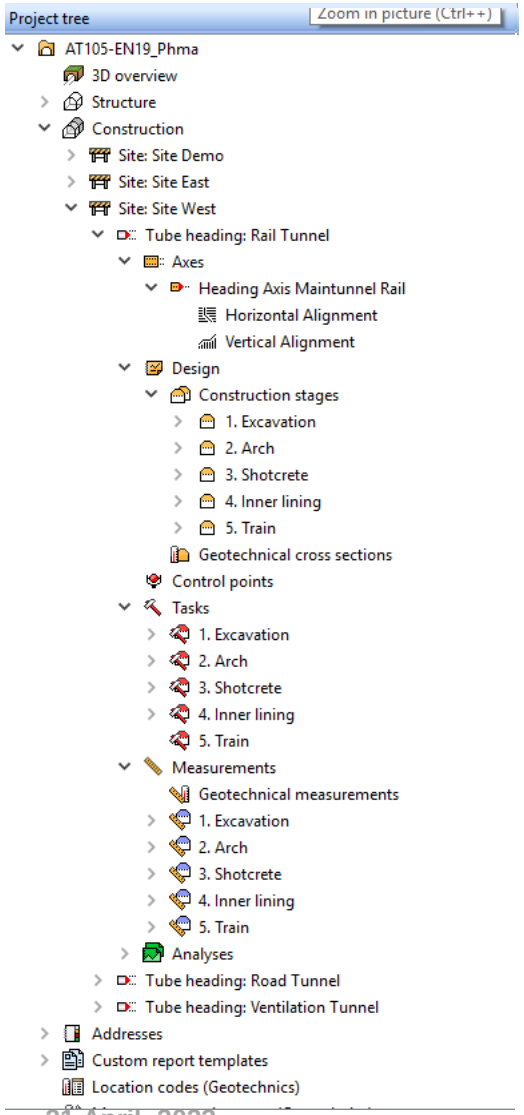
Amberg Tunnel – All in One Plattform

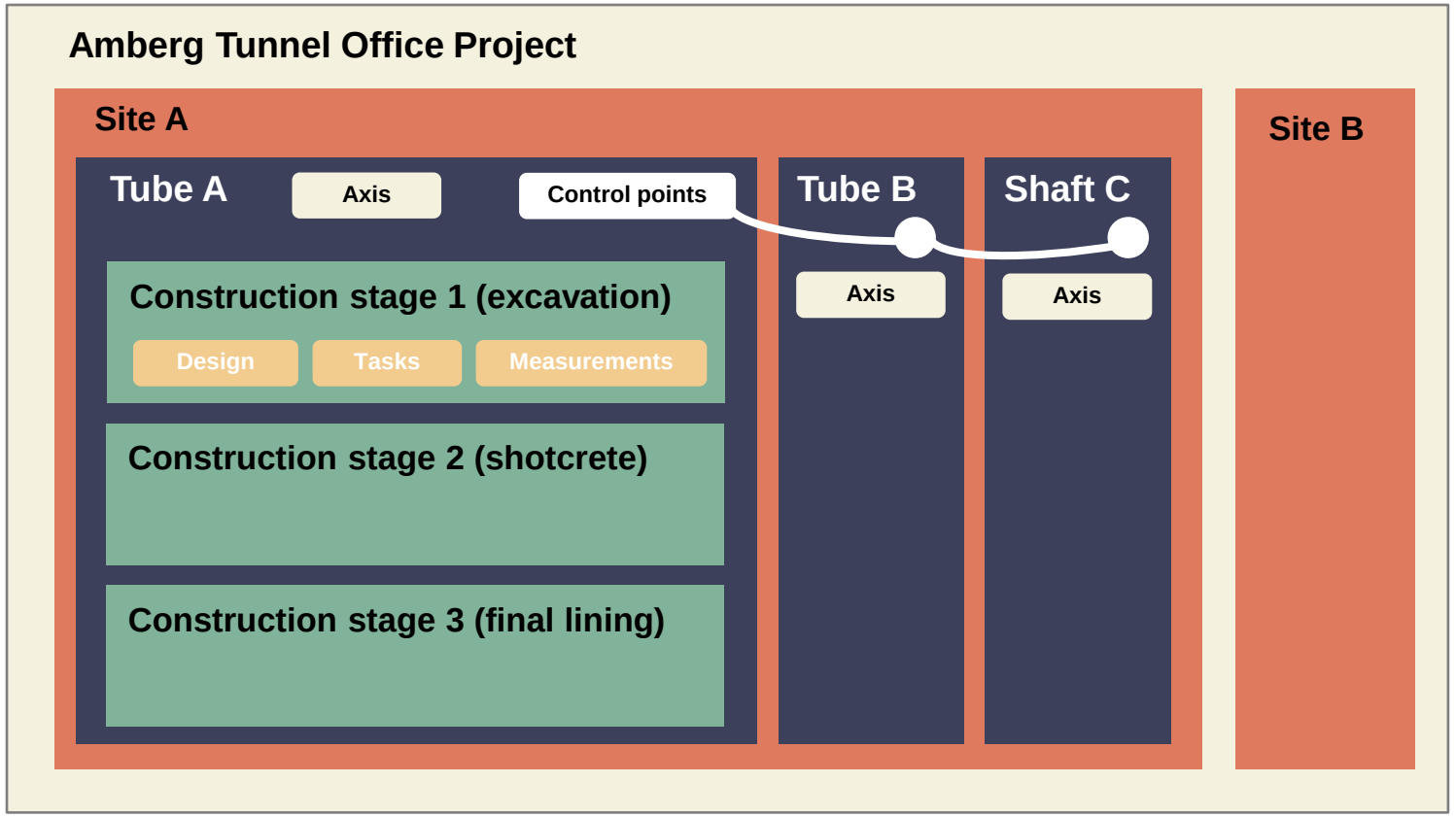




AMBERG TECHNOLOGIES

Amberg Tunnel – All-in-One Plattform





Amberg Tunnelscan

Adding value to your scan data

AMBERG TECHNOLOGIES

Amberg Tunnel – Navigator / Application

Amberg Navigator
Amberg ScanControl

Tablet (Laser Scanner / Leica MultiStation /

Navigator Tasks – Quality Control

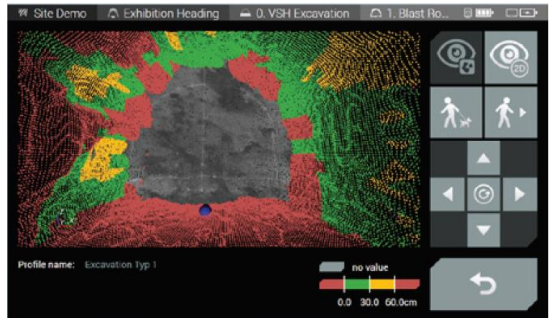
4 Scanning Tasks

Area scan

Line scan

Blast Round Scan

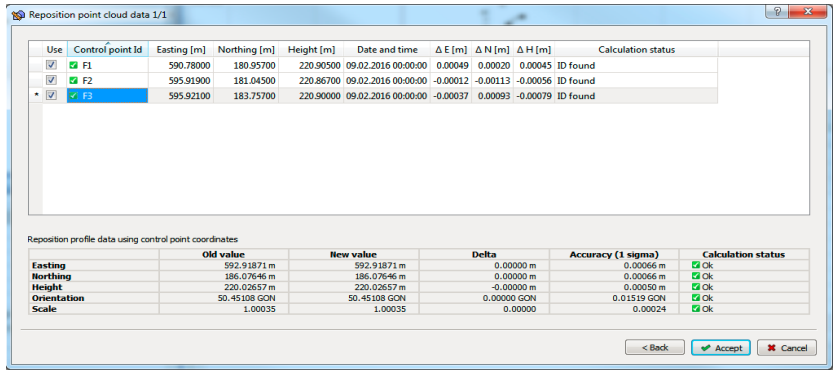
LT Scan

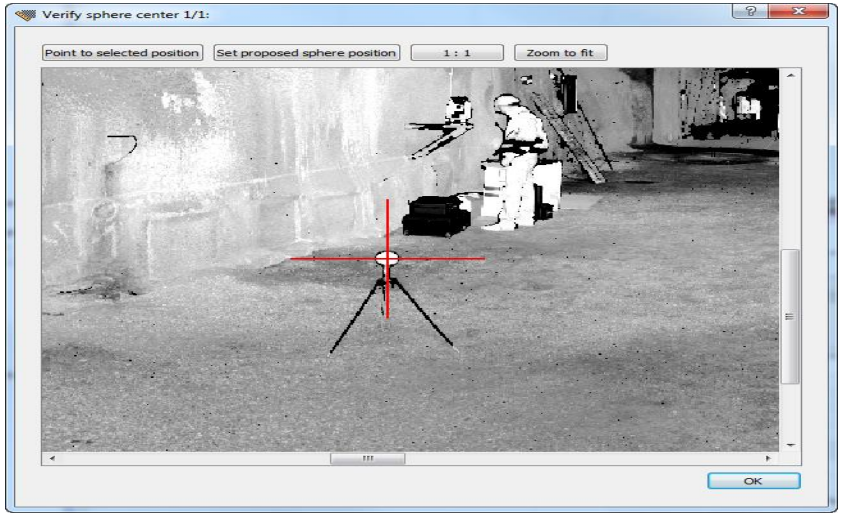


Amberg Tunnelscan – Data import

Features

- Import of point cloud data
  - Leica MultiStation
  - Leica RTC360
  - Leica BLK360 G1/ G2
  - Z&F
  - FARO
  - PCD/LAS/LAZ
  - ASCII (PTS. XYZ, …)
- Reposition of APM™ measurements
- Reposition of instrument resection
- Export of point cloud to *.pts

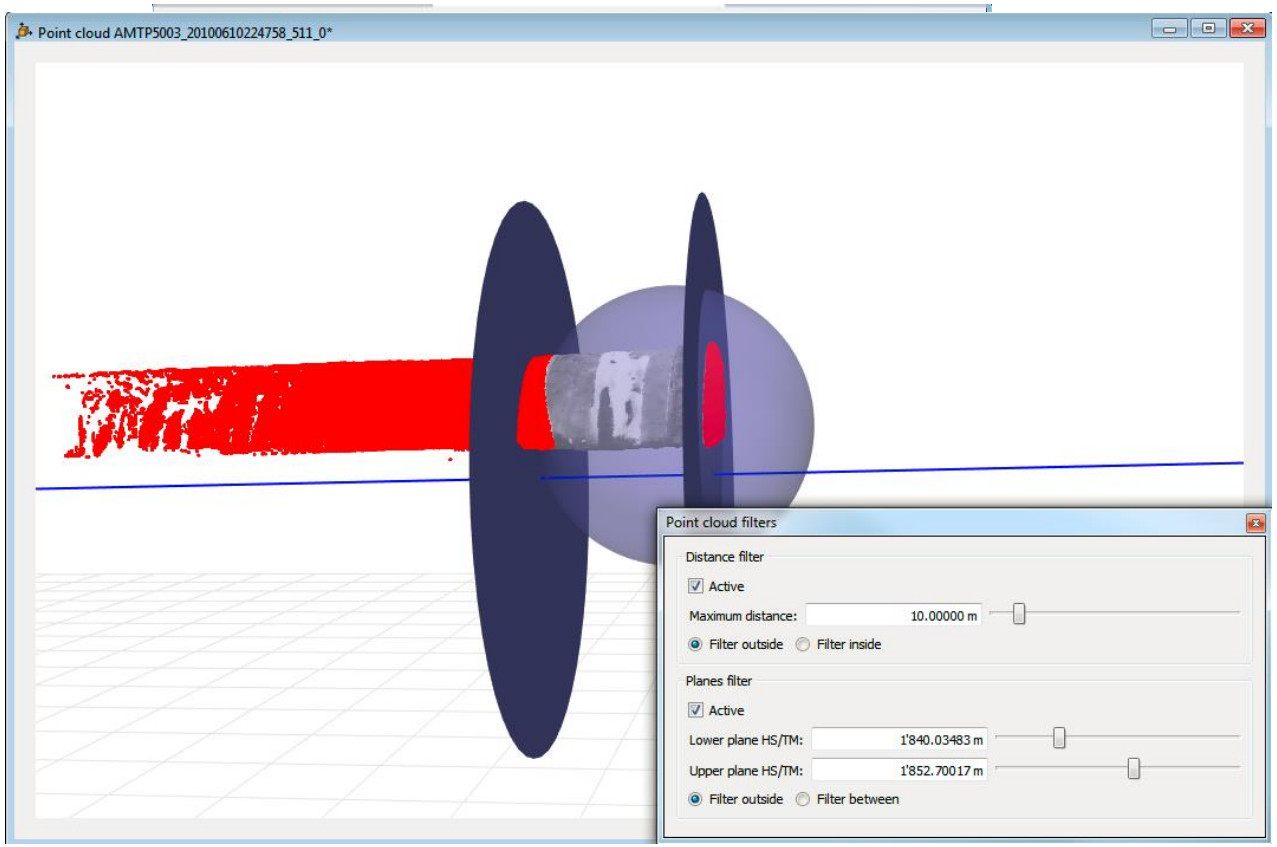




Amberg Tunnelscan – Data import

Features

- Visualise point cloud in 3D
  - Reflectivity Scan
  - True colour Scan
- Intelligent filters
  - Distance from Scanner
  - Section based filter
  - Resampling
- Copy & paste of point clouds data



Amberg Tunnelscan - Positionig

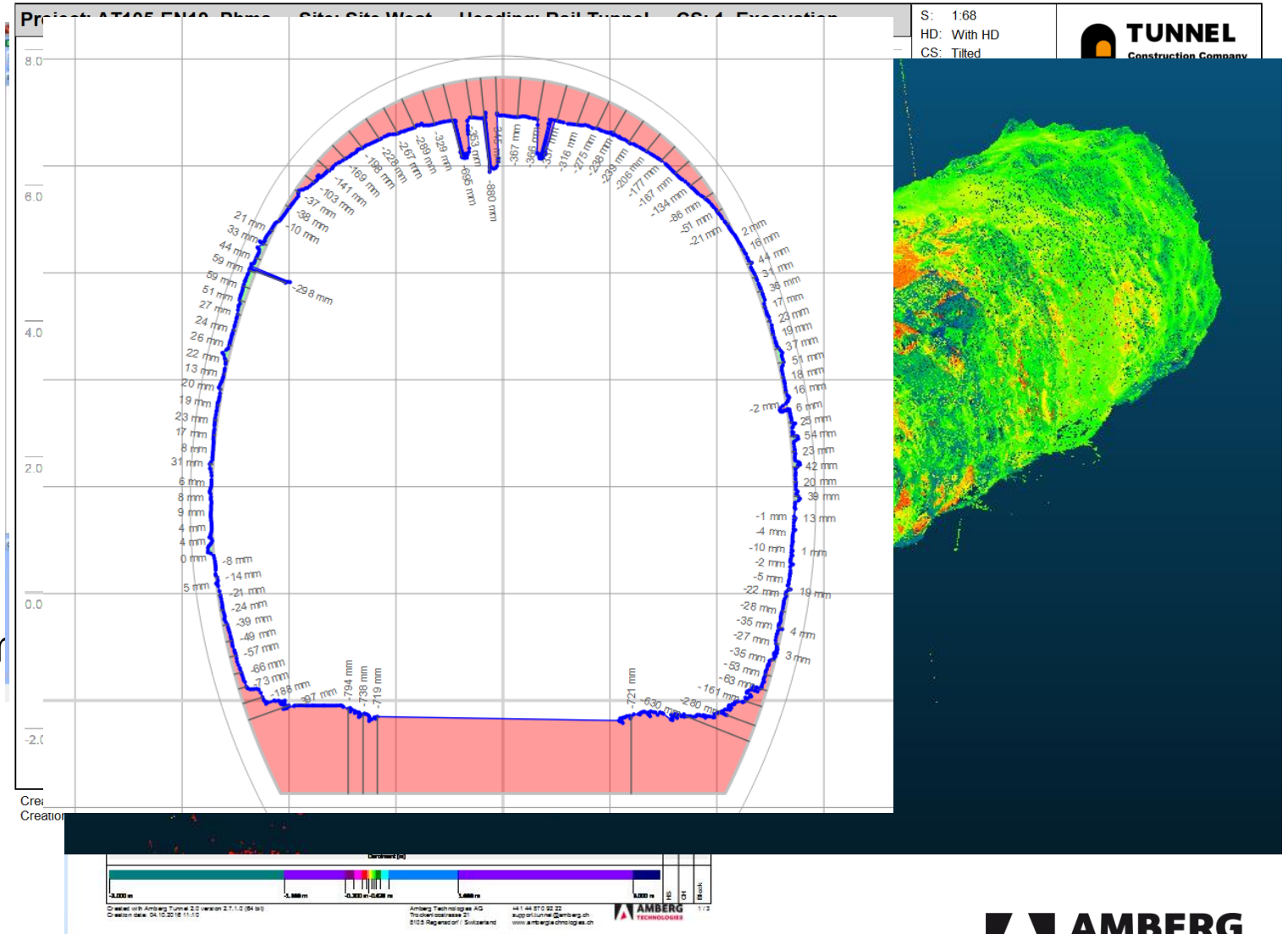
Positioning methods

- APM™ Method
- B&W targets registration
- Multiple targets
  - Position of scanning data with checkerboards or sphere targets
- Supported scanner data for positioning
  - Leica RTC360
  - Z & F
  - FARO
  - Leica BLK360 G1 / G2

Amberg Tunnelscan – Line scan analyses

Amberg Tunnelscan Basic

- Merge the scans automatically
- Display result in 2D / 3D maps
- Calculate volumes
- Print reports
- Export profiles
- Export PTS files for BIM System

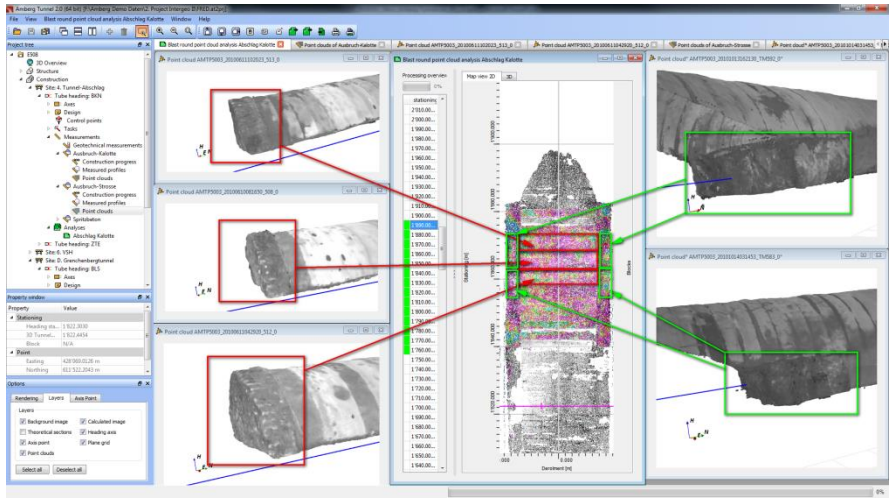


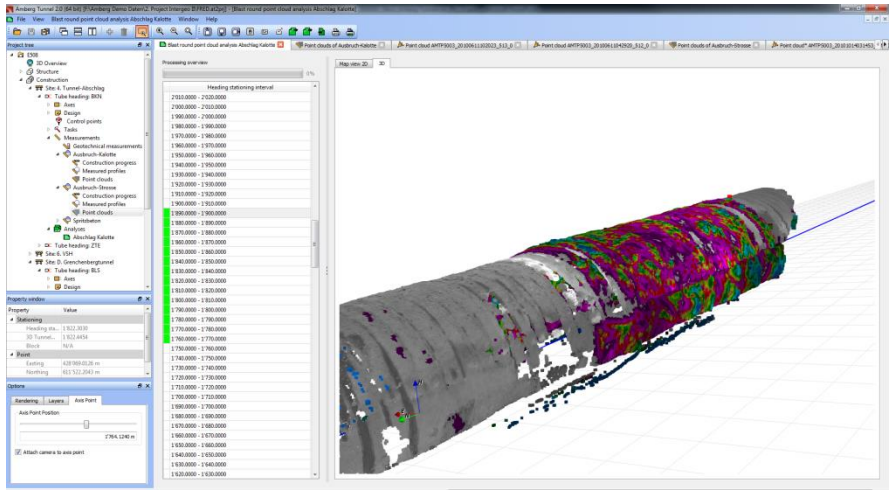
Amberg Tunnelscan – Blasting round scan

Amberg Tunnelscan Plus

- Merge scans areas from different construction stages
- Document the stages with a few clicks

- Create reports for:
  - Applied shotcrete volumes
  - Coloured 3D / 2D map view
  - Extract profiles
  - Export profiles / analysed pointcloud

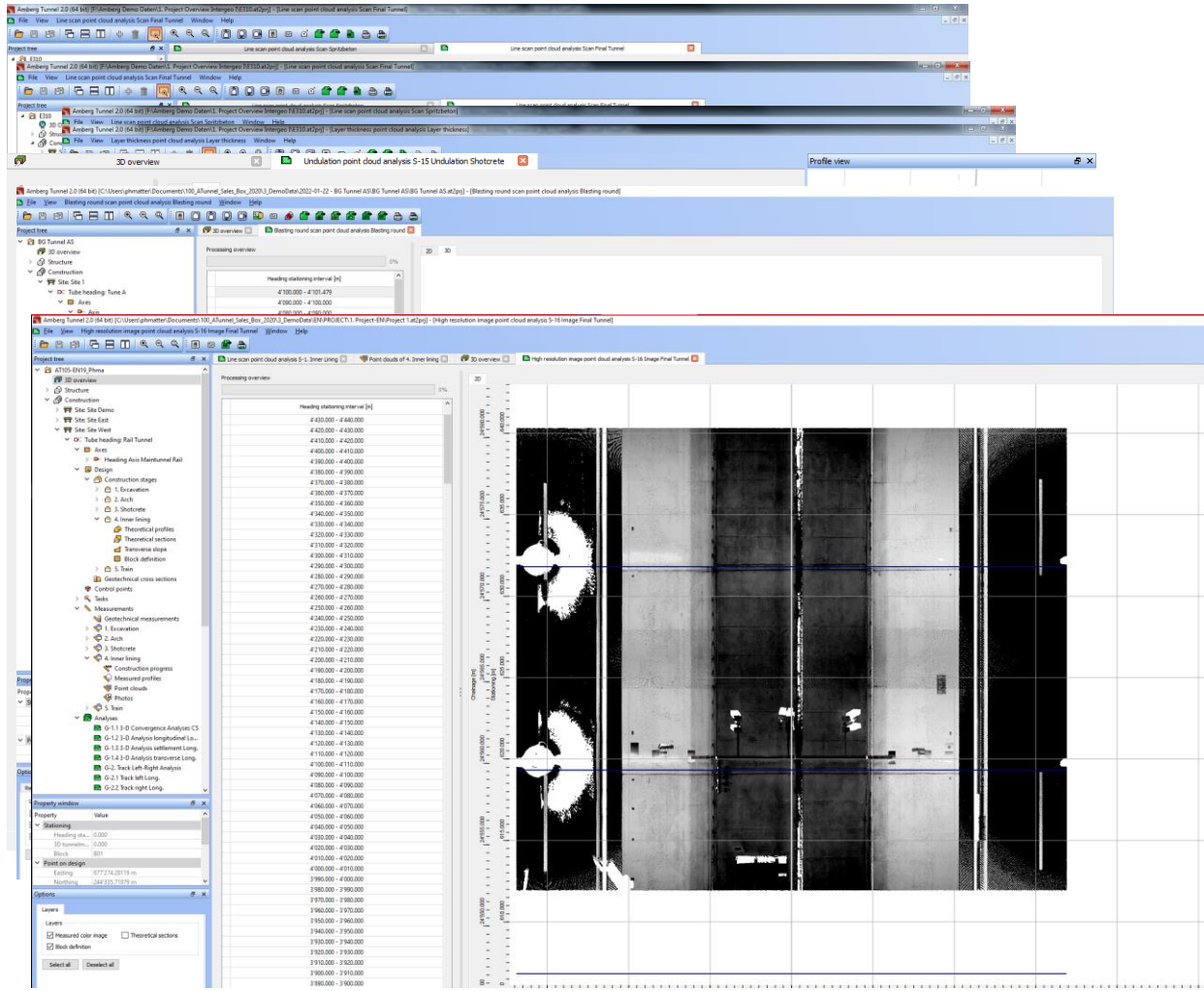




Amberg Tunnelscan – Analysis and reporting

Examples

- Final tunnel scan 2D results
- Final tunnel 3D results
- Shaft scan results
- Layer thickness result
- Undulation / surface smoothness
- Cloud2Cloud registration
- High Resolution Image



HS2 – High Speed 2 - UK

What does the head of survey say?

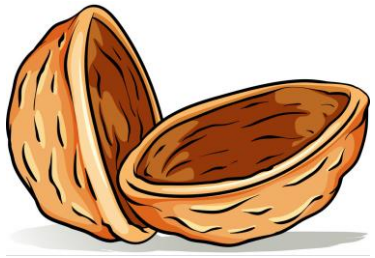
Without Amberg Navigator, what implications would it have?

- More surveyor needed – a rare specie these days!
  - ..would need 16 site based 3 office based surveyors!
- More intensive input and on-site support needed
- At least 50% more cost on the survey side

What is the greatest benefit using Amberg Navigator?

- Don't need surveyor at the face
- Short learning curve – Easy knowhow transfer within team
- Split work Production using Amberg Navigator
  - Survey team creating the process and hand over to production

…in a nutshell



- ✓ **Your digital tunnel survey team**
- ✓ **Free up your resources**
- ✓ **Cut your survey cost**

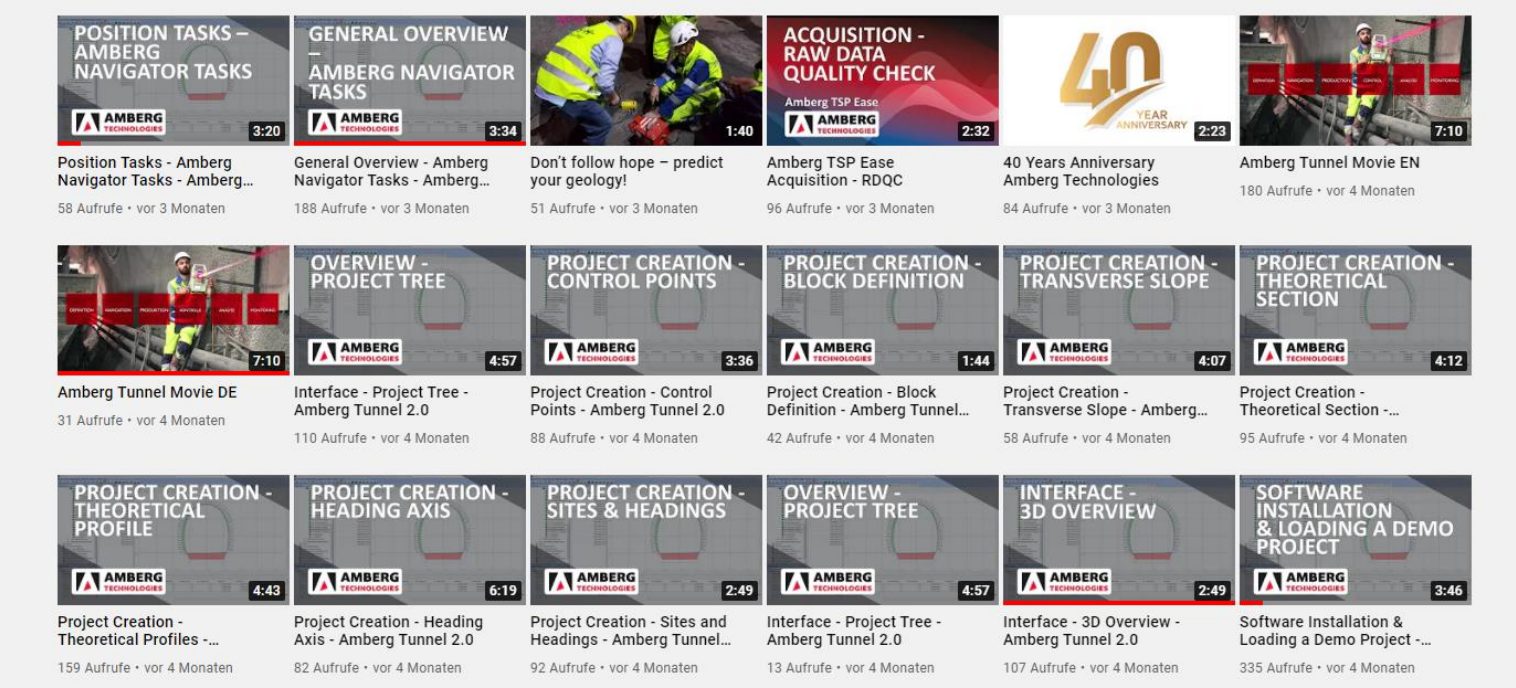
Value Proposition - Customer Benefits

What are the main benefits for a contractor / user?

- All-in-one platform – one source based information → ***minimising errors in the field***
- Efficient workflow – time saving/same platform → ***competitive advantage***
- User friendly – no need of surveyor in every step → ***economies on expensive staff***
- «Real-time» processing – seamless workflow → ***reduced production costs***
- 40 years of tunnel survey - we're the leader in our niche → ***comply with todays standard***

….more information

- www.ambergtechnologies.ch
- **Youtube**



Amberg Technologies

- **40 Years dedicated to our customers success**
- **The first choice for Rail and Tunnel Survey**
- **We develop close to our customers**
- **We are a passionate about what we do**

Tunnelling is not always that difficult……

Q&A