E8 UDNYTTELSE AF PUNKTSKY TIL CLASH KONTROL

How we encourage using point cloud survey for a better designed project

RAMBOLL Bright ideas. Sustainable change.

CAN WE CHANGE WHAT WE RECEIVE HOW WE WORK AND HOW WE DO IT



SHORT ABOUT THE PROJECT TRACK RENEWAL COPENHAGEN - HØJE TAASTRUP

Renewal of existing main tracks

- 18 km double track
- 6 km additional single tracks
- 10 new turnouts
- Passes 9 stations

Elements of complication

- Existing track and elements along the corridor
- Narrow corridor
- Many restrictions



TRADITIONAL SURVEY

A traditional track survey is survey of points and a vector line between the points.

Our experiences with receiving data as this:

- Survey personal are required to survey everything that we need, 6 months from now. This results in many additional surveys
- If survey is named incorrectly then we will not notice this
- Expensive and time consuming. Requires a lot of planning and free space on the track and surroundings.





SOLUTIONS FOR SURVEY DATA

We investigated recommendations, experiences, and usability of different solutions.

We found that point cloud, with the right instruction, know-how and survey contractor, is the solution at the moment.

The technology for point cloud equipment have evolved much over the past 3 years and made more affordable.

- Density is better and collected quicker
- Relative accuracy is better

We presented the solution for Banedanmark, explaining the solution and documented the quality data.

We presented how we can lift the project using point cloud to a new level for Banedanmark, encouraging for a change in how survey is done

The solution was mobile survey done at 18km/h for all tracks



DIFFERENT TYPES OF SURVEYS

Traditional survey for track



- Traditional survey technic
- Limited visual experience
- Poor density
- Limited clash detection
- Good absolute accuracy <10mm

Simple point cloud



- Average basis of existing
- Fair density depending on speed
- Reasonable visual experience
- Cheep survey method
- Fairly good accuracy <50mm

Complete point cloud survey



- Dense survey in details
- High density
- Good visual experience
- Expensive survey equipment
- Fairly good accuracy <20mm



SOLUTION FROM CONTRACTOR

We partnered in 2016 with Italian SiteCo Informatica and they recommended a setup consisting of

- 2x LIDAR scanner at 45° out and up
- 360° camera

Mounted on the front of a maintenance train able to run at 18km/h

- Absolute accuracy is less than 20mm
- Density is 2.5cm between scan-lines
- Run the corridor in each direction





MANAGING THE DATA





QUALITY OF THE DATA EXAMPLES





360° IMAGES PR. 5M INTERVAL

One large time and cost heavy task on rail projects is a site visit of the whole sections.

And more important, managing the images and notes, and time spend looking for an image of a specific element.

Part of the survey is the 360 images of the surveyed track and shared in a GIS platform for easy access and with less chance of missing an image









HOW WE USE THE DATA

Banedanmark has a CAD Manual that encourage for better use of models and cross discipline interfaces.

Getting better survey as project basis is a key element in this

Based on this we can do better:

- Interface check
- Collision check
- Multidisciplinary model review







BENTLEY NAVIGATOR INTERFACE CHECK

With the improved focus on model production and using better existing data, then interfaces to existing elements is more manageable.

The Navigator model is an engineering BIM model

- 14 days model review sessions
- Redline comments and markups
- Platform for communication with the client for check of solution







COLLISION CHECK

Collision check can now be automated and made more visual using clash detection software.

We used a combination of Navigator* and SS4 cross section production

And we have found many more clashes compared to traditional survey





*Issue with Navigator v8i

MULTIDISCIPLINARY MODEL REVIEW

- Model review
- Design review
- Discipline interfaces
- Clash check
- Etc.





Our experiences of benefits for the project

- Minimizes the amount of additional surveys and pauses in the project
- Catenary have used the point cloud at many locations to check existing system and hanger lengths. And saved a lot of money and time
- Improves our design check
- Enhances our engagement in 3D models and how these are used
- If 3D model of existing is missing then it is most likely in the point cloud data and can be modelled.

What we recommend our client based on our experience

- Implement a project phase in early stages, when the content have been defined, to do a proper point cloud survey, before we start conceptual design
- Use the consultant to clear what is needed, and with a larger area than the bare minimum will limit the changes for additional survey
- Our way of clash detecting and dispensation approvel with our client, needs to be more efficient.





BENEFITS





OTHER EXPERIENCES USING POINT CLOUD ROSKILDE – HOLBÆK FOR AARSLEFF RAIL – CATENARY PROJECT



- Check location for new Catenary Masts
- Clash detection
- Signal sight analyse
- "site visit"

- Good density
- Absolute accuracy 50mm





OTHER EXPERIENCES USING POINT CLOUD GVUL FOR BANENOR, NORWAY – DESIGN ALIGNMENT



• High density

RAMBOLL

- Many GVUL points
- Absolute accuracy rail
 0-5mm

- 2 scanners and 1 only for rails
- Vectorising the rails for alignment design. Vertex pr. 1m
- Surveyed at 50km/h
- 200km done both directions in 5 nights.





Martin Laursen, Rail Aarhus MANL@Ramboll.dk

