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Danish Road Directorate Digitally Delivers Its Construction Planning and Operations with SYNCHRO™ 4D

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The Danish Road Directorate (DRD) manages the national road network in Denmark, which includes expressways, main roads, and bridges. It is comprised of 3,835 kilometers of roads, of which 1,249 kilometers are motorways.

The DRD's responsibilities include planning, construction, operation, and traffic administration and management. The organization conducts studies and plans to determine where new roads will be built, as well as where increased traffic safety or capacity are needed on the national road network. It also constructs new roads, roundabouts, cycle paths, and bridges; puts up noise barriers; and develops the existing road network.

The DRD is currently working on their new Infrastructure Plan 2035, which will require many years of work on both large and small projects, green fields, expansions, and maintenance. All projects that are part of the plan must focus on sustainable, greener solutions with increased digitalization. In addition, the recent COVID-19 pandemic and the war in Ukraine have created unpredictability regarding prices and delivery. This volatile landscape has heralded the use of digitalization for new projects.

DIGITALLY DELIVER PROJECTS ON TIME AND WITHIN BUDGET

Digital delivery means using models, information, and supporting tools to help complete a project. For the DRD, using digital construction workflows ensures increased efficiency by digitally supporting the quality of project documents and workflows. It can provide detailed knowledge of the surrounding conditions and easy access to project documents, resulting in fewer surprises in the execution phase. In addition, there is access to the latest data in the office and the field with in-depth insight into the timing and finances of the projects.

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New BIM requirements are defined in information and communication technology (ICT) guidelines. Each project must be based on a 3D BIM model, with requirements for property data, classification, and level of detail. Throughout the project, the team must use the BIM model for all digital communication with other stakeholders. To meet these communication goals, the DRD will use SYNCHRO 4D as a platform. The solution enables the team to construct, plan, and track its projects based on a construction model.

SYNCHRO 4D is a real-time cloud solution that enables digitally enhanced construction planning and operations. As the only platform that interoperates with all significant 2D/3D modeling and scheduling capabilities in the market, it can handle all construction projects—from simple to the most complex. The application allows users to take advantage of virtual construction, planning, and model-based workflows. With a 4D digital construction management platform, it is possible to combine 4D authoring capabilities and third-party software to use applications designed for each unique role in the project delivery process, whether planning work sequences, digital rehearsals, or tracking progress in the field.

Svend Kold Johansen, Director, geomatics and land acquisition at the DRD, explained that the application is helping manage the cost and delivery of large infrastructure projects, saying, "Implementation of the higher BIM-level just now give us two main advantages, 1) the design is based on an informative 3D model with clash control gives a more complete project and 2) the information flow and communication in the construction phase is based on the 3D model in SYNCHRO, and increases efficiency during the construction. In the near future, our next step will be 4D and 5D, where the parametric ability of SYNCHRO will allow us to extract key quantities and costs for entire projects. This allows us to manage the accurate payment of subcontractors according to progress and delivery of the project."

LEADING THE INDUSTRY INTO THE AGE OF DIGITAL DELIVERY

As a governing leader in the market, DRD's recommendations will have a ripple effect throughout the market onto contractors. For DRD, there are four main benefits of adopting digital construction workflows: savings in time, resources, the economy, and quality.

"Initially, we began moving from analogue to digital, and now, we have raised the level for BIM in road, rail, and bridge construction in Denmark," said Johansen. "We have a beta cooperation between the main infrastructure owners in Denmark, and also collaborating with organizations of contractors and consultants. At the commencement of construction for each project, we demand the BIM level in all contracts."

OVERCOMING CONSTRUCTION CHALLENGES IN THE DESIGN PHASE

By utilizing BIM and digital construction workflows, teams can avoid common issues that can plague construction projects, which were not usually discovered until work is in progress in the field. Now, these problems can be solved during the design stage, keeping the project on time and within budget. Another significant benefit is improved communication and digital worfklows. Large infrastructure construction projects feature a diverse range of stakeholders, and digital communications make these workflows more efficient.

"We want to start with the existing condition in a digital format because when you construct the full 3D model, you must know the existing condition," Johansen said. "For example, if a bridge is reconstructed, you can share a digital model of the bridge in its current state. With this, you can make the complete model of the new design and click on the modern elements and get information. […] In the construction phase, everyone is working on the same dynamic model, which is constantly being updated. This is opposed to the traditional method based on drawings and revision numbers. We can now support an updated model for everyone working on the project, wherever they are in the field. This means when anyone has an issue, they must use this communication platform so that this information is saved and accessible to everyone working on the project."

MOVING BEYOND BIM AS A COMMUNICATION CAPABILITY

Promoting the elevated use of BIM in processes with external partners on major projects in Denmark is a bold step for the DRD. Their recommendation of using SYNCHRO 4D as a platform for digital communication will have a ripple effect throughout the market, including architectural, engineering, and construction contractors.

The need for efficiency will consequently drive the need for automation. Ultimately, it will depend on standardization among key stakeholders in complex projects. The DRD recognizes the importance of guiding the market to increase usage of modern technology to ensure that resources are being optimally used.

However, before they can progress to the next stage of BIM deployment, they need to lock in the data standard, informatics, and software product.

"Everyone is talking about open formats and working across different platforms, which is very difficult today and will depend on the software developers," Johansen said. "We also have a close relation to the buildingSMART and IFC formats, but it is not a complete solution; it is just a part of it. That will be the next step, and then it will be a full integration of 4D and 5D."