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The Köhlbrand Bridge in Hamburg (c) HPA, Martin Elsen

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Digital Twin in Action: The Köhlbrand Bridge

Munich / Hamburg – April 25, 2023 – Two Nemetschek Group solutions have been instrumental in developing a digital twin of the Köhlbrand Bridge in Hamburg, Germany. Both Allplan and Solibri were used to create and review the model that formed the basis of the smartBRIDGE Hamburg digital twin project. As a result, the Hamburg Port Authority (HPA) has been able to implement predictive – rather than reactive – maintenance for this critical infrastructure asset.

Built in 1974, the Köhlbrand Bridge is Germany's second-longest road bridge

as well as one of its busiest. The cable-stayed bridge serves around 36,000 vehicles per day, thus playing a crucial role in the local economy. “The HPA is the bridge’s operator, so we wanted to find a way to maintain and operate the bridge more effectively. After recognizing the potential of digital twins to assist with this goal, we initiated the smartBRIDGE Hamburg project in 2019”, says Jens Meier, CEO of HPA. Using OPEN BIM, ICF and the BIM Collaboration Format (BCF), Allplan and Solibri helped make this aspiration a reality.

Building Together with BIM

The age of the bridge and the amount of daily traffic it supported meant that continuous real-time monitoring was the best way to identify repairs and minimize disruption to traffic. Without this, issues could go undetected and lead to larger problems that could affect the safety and operation of the bridge.

A BIM model of the bridge was designed from scratch, as there were no existing models due to the age of the bridge. Multiple BIM applications were used for this, including Allplan, which enabled a highly detailed model of the bridge to be created. The entire bridge structure as well as its individual components could be clearly visualized in the comprehensive model that was created.

Despite being an as-built model, the design process still required a BIM Execution Plan (BEP) and agreement between all parties on the element taxonomy and Level of Detail (LOD) requirements. “However, the use of OPEN BIM – which is a core functionality of Allplan – made managing and exchanging data between different parties and applications possible, as well as efficient”, explains Detlef Schneider, CEO of ALLPLAN.

On a project such as this where multiple solutions are coming together, ensuring consistency and compliance with the BIM requirements is a difficult task. Or it would be, without a solution like Solibri. “Here, the model checking solution was able to add value by ensuring that models complied with the requirements outlined in the BEP and other quality standards”, says Ville Kyytsönen, CEO of Solibri. This gave the Hamburg Port Authority the assurance that the model was correct before being used as a digital twin.

A Practical Example of a Digital Twin

With a solid basis for their digital twin set up, the Hamburg Port Authority were able to then integrate IoT sensor data and traditionally collected bridge

inspection and maintenance data with their bridge model. Over 500 IoT sensors were connected to a digital sensor in the bridge model, providing the real-time monitoring that the Hamburg Port Authority desired and automatically issuing alerts if problems are detected. Both sets of data were then made available to the asset management system of the bridge, enabling predictive maintenance to be better planned and executed.

“Often, it is difficult to find examples of digital twins being implemented fully, as they are intended to be. The smartBRIDGE Hamburg project shows the practical application of a digital twin in a real-life context, demonstrating just how valuable digital twin technology can be,” says César Flores-Rodríguez, Chief Division Officer Operate & Manage and Digital Twin. “Furthermore, our portfolio of OPEN BIM solutions means that Nemetschek can support this emerging technology across the entire AEC/O value chain.”

Planning Ahead with Insight-led Decisions

As well as the continuous monitoring of the bridge structure, the digital twin also enables various simulations to be undertaken. This way, when the Hamburg Port Authority have detected a problem, they can also test different solutions and scenarios and assess the results prior to implementation. For an infrastructure asset as essential as the Köhlbrand Bridge, these insights are vital for ensuring safety and minimizing disruption. Clearly, a digital twin has been the key to ensuring these two goals are met, and will no doubt play an instrumental role in enabling data-driven operation and maintenance of the bridge for the foreseeable future.

Learn more about Allplan, the leading BIM software for the AEC/O industry, at www.allplan.com, and Solibri, the market leader in model checking software, at www.solibri.com.

About the Nemetschek Group

The Nemetschek Group is a globally leading software provider for digital transformation in the AEC/O and media industries. Its intelligent software solutions cover the entire lifecycle of building and infrastructure projects and enable creatives to optimize their workflows. Customers can design, build, and manage buildings and infrastructures more efficiently and sustainably and develop digital content such as visualizations, films and computer games more creatively. The software provider is driving innovations such as digital

twins as well as open standards (OPEN BIM), and sustainability in the AEC/O industry, constantly expanding its portfolio by also investing in deep-tech startups. Currently more than seven million users worldwide are shaping the world with the customer-focused solutions of our four divisions. Founded by Prof. Georg Nemetschek in 1963, the Nemetschek Group today employs around 3,600 experts globally.

Publicly listed since 1999 and quoted on the MDAX and TecDAX, the company generated revenues amounting to EUR 801.8 million and an EBITDA of EUR 257.0 million in 2022.

About ALLPLAN

ALLPLAN is a global provider of BIM design software for the AEC industry. True to our “Design to Build” claim, we cover the process from the first concept to final detailed design for the construction site and for prefabrication. Allplan users create deliverables of the highest quality and level of detail thanks to lean workflows. ALLPLAN offers powerful integrated cloud technology to support interdisciplinary collaboration on building and civil engineering projects. Around the world, over 500 dedicated employees continue to write the ALLPLAN success story. Headquartered in Munich, Germany, ALLPLAN is part of the Nemetschek Group, which is a pioneer for digital transformation in the construction sector.

About Solibri

Solibri is the leader in BIM Quality Assurance and Quality Control. Providing out of the box tools for BIM validation, compliance control, design process coordination, design review, analysis, and code checking. Solibri’s corporate message is to develop and market quality assurance solutions that improve the quality of BIM-based design and make the entire design and construction process more productive and cost effective. Solibri’s customers include major building owners, construction companies, architects, and engineering firms in more than 70 countries. Solibri is part of the Nemetschek Group.

About Hamburg Port Authority

Since 2005 the Hamburg Port Authority has been providing future-oriented port management services offering one face to the customer. As an institution under public law, the HPA is in charge of paving the way for the efficient, resource-friendly and sustainable implementation of infrastructure projects in the port. The HPA is the contact point for all kinds of questions concerning the waterside and landside infrastructure, the navigational safety of vessel traffic, port railway facilities, port property management and the economic conditions within the port area. The HPA ensures the provision of land as required, carries out all statutory duties placed on it and provides port industry services. www.hamburg-port-authority.de

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