



Industrial machinery and heavy equipment

Plasser & Theurer

Leading manufacturer uses digital twin created in Solid Edge to produce innovative rail construction infrastructure and maintenance equipment

Product

Solid Edge

Business challenges

Improve development of complex track construction and maintenance machinery

Reduce time needed for customization

Visualize design options during sales

Keys to success

Use Solid Edge for design and development work

Perform preliminary dimensioning using Solid Edge FEM capability

Leverage updated versions of Solid Edge

Use digital twin created in Solid Edge for design verification, sales and training

Results

Produced cutting edge rail infrastructure construction and maintenance equipment

Reduced time needed for alien CAD file import by 8X

Accelerated automated drawing creation by more than 7.5X

Enabled large modular assembly design

Siemens PLM Software solution enables Plasser & Theurer to reduce nonproductive tasks and remain a market leader

Smart rail transport infrastructure maintenance

Rail transport is an efficient, reliable and clean way to move freight, and a safe, comfortable and often fast option for passenger travel. Freight trains can haul several thousand tons of cargo, and contemporary high-speed passenger trains travel at speeds of up to 350 kilometers per hour (km/h).

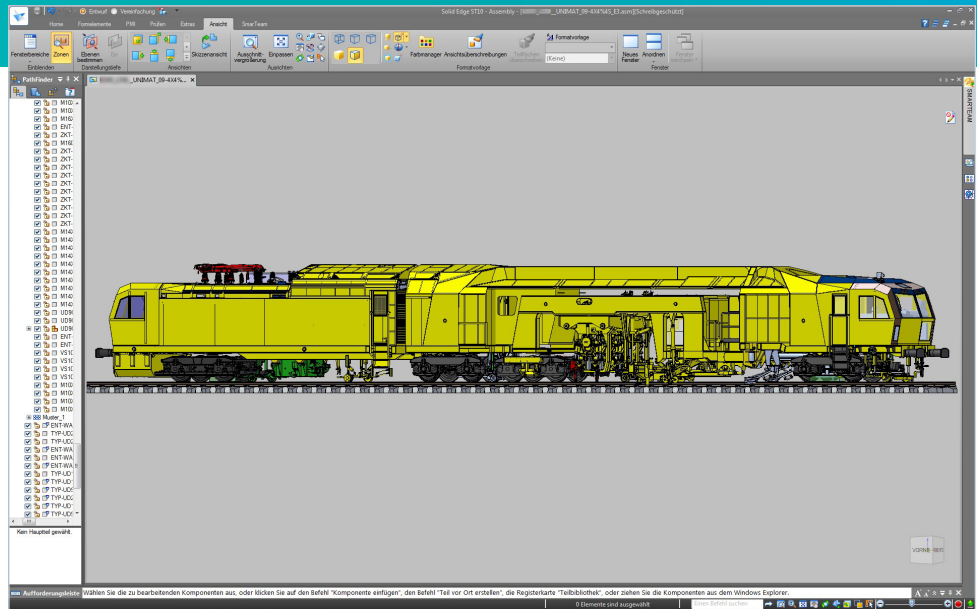
To achieve this in an energy-efficient manner, rail transport systems rely on the movement of steel wheels on steel rails to guide vehicles with little frictional resistance. These rails are usually installed on sleepers and ballast to form the railroad tracks. Since ballast is crushed or moved by the weight of trains passing over it, replacing sleepers and releveling ("tamping") is required from time to time. Until the 1950s, realigning and grinding the tracks as well as correcting vertical and horizontal irregularities was hard manual labor for large teams of trackmen.



The Unimat 09-4x4/4S E³ from Plasser & Theurer is the world's first universal ballast tamping machine with hybrid drive technology. Compared with its diesel-powered predecessors, it considerably reduces both the noise and cost of track maintenance. All images: Plasser & Theurer.

“The gain in performance is spectacular. We can now create a three-view drawing in less than 20 minutes, which had previously taken nearly 2½ hours; and the time needed to import a complete diesel engine went from two hours to 15 minutes.”

Gerald Gürtler
CAD Administration Manager
Plasser & Theurer



Using Solid Edge, Plasser & Theurer engineers created a digital twin of the Unimat 09-4x4/4S E³ tamping machine.

In 1953, Plasser & Theurer launched the world's first hydraulic track-tamping machine, paving the way for mechanized, rapid and efficient track maintenance. The company has since become a global market leader, supplying machines for practically all work processes required for the construction and maintenance of railroad tracks and catenary (the overhead wire supplying electric trains with energy). The comprehensive product spectrum ranges from single, compact machines to track renewal trains that are up to 2.7 kilometers (km) long. Headquartered in Vienna, Austria, Plasser & Theurer caters to customers in more than 100 countries. Plasser & Theurer machines were used to lay the tracks on which a French TGV (high-speed electric) train set the current world record for conventional train systems at 574,79 km/h.

Holding more than 2,000 patents, Plasser & Theurer combines leading-edge technological innovation with time-tested components to provide high levels of efficiency and reliability. The company's flagship track and siding tamping machine is the Unimat 09-4x4/4S. Available as a hybrid or fully electric machine aside of a conventional diesel-powered version, it can help lower maintenance budgets and reduce noise and emissions.

Using Solid Edge to create highly complex machines

To provide timely service to customers, Plasser & Theurer operates a worldwide network of service bases, repair workshops and spare parts warehouses. To meet often unconventional requirements without compromising quality, the company designs and produces most of the components at the company's main engineering and production facility in Linz, Austria. In addition to the structural parts and patented track-working mechanisms and tools, this includes gearboxes and electronic control systems.

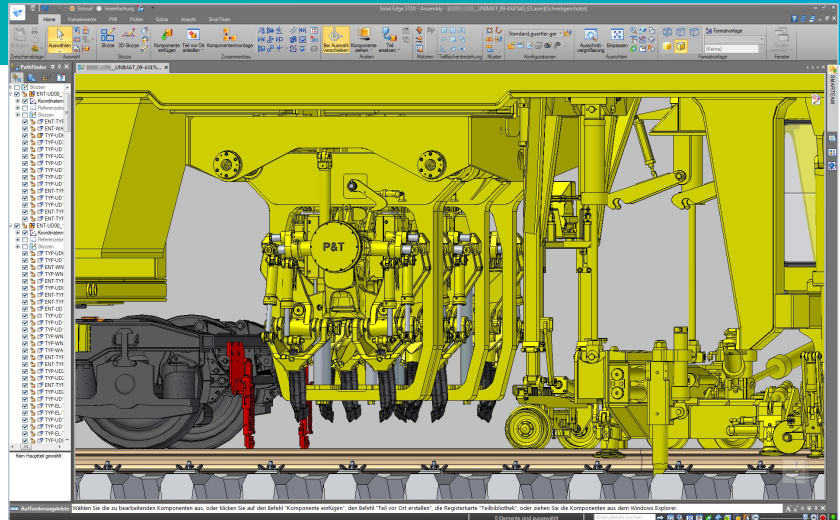
Plasser & Theurer machines come with a high level of mechanical complexity. In most cases, they are tailor-made solutions designed to meet customers' specific requirements, including regulatory compliance, which often varies from country to country. To facilitate this at an affordable cost, 140 design engineers develop modular designs using Solid Edge® software from product lifecycle management (PLM) specialist Siemens PLM Software for computer-aided design (CAD) and simulation.



At the core of the tamping machine are vibrating tamping tines packing the ballast under the sleepers to produce a stable sleeper track bed, a method Plasser & Theurer invented in 1953.

“We started testing Solid Edge for CAD in 1995, making it our sole system for all mechanical design in 2005,” says Gerald Gürtler, who was a design engineer at Plasser & Theurer for many years before he became the company’s CAD administration manager. “This 2D/3D CAD software supported our growth in terms of both the number of design engineers and product diversity.”

Presales engineers use this easy-to-learn software for creating product sheets for customer consulting. Design engineers use



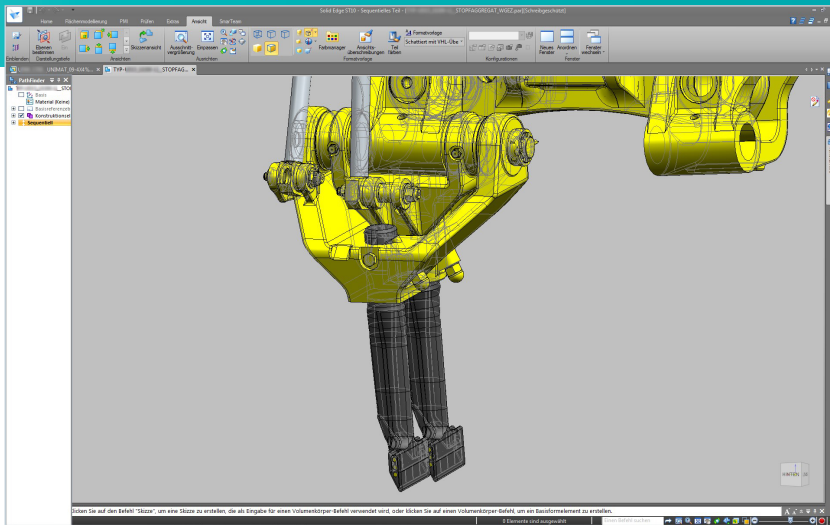
Using Solid Edge for design and engineering work, Plasser & Theurer engineers create modular designs with more than 100 configuration options and over 35,000 parts per machine.

Solid Edge to create 3D models of the parts, assemblies and machines. They use the software’s finite element method (FEM) strength analysis capability for preliminary dimensioning. They also export the models they create to a separate numerical analytics department at Plasser & Theurer.

Use of Solid Edge at the Plasser & Theurer design offices is not limited to creating the company’s products, but also extends to designing tools and fixtures required for their production.

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CAD Administration Manager
Plasser & Theurer



Plasser & Theurer combines leading-edge innovation with time-tested core components like the tamping tines that frequently undergo design improvements.



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Easy-to-use software for future engineering challenges

With 140 licenses, Plasser & Theurer is among the largest users of Solid Edge in Austria. The easy-to-learn software supports the growth of the owner-managed family business, as new design engineers require only minimal training to become productive. "We also benefit because the engineering schools and universities are using Solid Edge for education," says Gürtler. "Dozens of interns we employ every summer start working without requiring software training."

As many parts used to build Plasser & Theurer vehicles and maintenance mechanisms are typically made of sheet metal, the company also benefits from the comprehensive set of features for automated sheet metal design in Solid Edge. "With its unparalleled sheet metal functionality, Solid Edge streamlines our sheet metal product development process," says Gürtler. "This helps us to reduce design time and costs without compromising quality."

A design engineering department this size poses a challenge when it comes to updating or upgrading. "Interdisciplinary collaboration between engineers in our eight design offices requires a parametric,

history-based design," says Gürtler. "Since we were very satisfied with Solid Edge as it was and had no plans to utilize synchronous technology, we decided in 2009 to continue with the current version."

Upgrading boosts engineering productivity

Although the software fulfilled its purposes and continued to work well for many years, this had its drawbacks. Although designs kept getting richer in detail, the company's design engineers were unable to benefit from the performance improvements that came with new Solid Edge releases. The existing software version also did not take full advantage of many of the features of contemporary operating systems. "While tamping machines typically have around 35,000 CAD assembly parts, a track renewal train can have more than 200,000," says Gürtler. "Over time, this led to performance issues when creating high-quality drawings or importing third-party CAD data of complex externally purchased parts."

Consequently after 10 years, Plasser & Theurer management decided to re-enter into a service contract with Siemens PLM



Plasser & Theurer uses data from Solid Edge to create the digital twin used for mixed-reality operator training in the tamping simulator

Software, updating to the latest version of Solid Edge. "Recent versions of Solid Edge are optimized for speed and performance; for instance, by taking advantage of multi-core processors," says Wolfgang Hackl, managing partner of Siemens PLM Software implementation partner, Ing. Wolfgang Hackl CAD/CAM, which supported Plasser & Theurer during the transition phase. "When working with large assemblies, Solid Edge also allows users to place drawing views and turn off all the components that are not essential for viewing."

Since Plasser & Theurer has a full order book, interrupting regular operations was not an option. The aim was to upgrade to

the new configuration with an upgraded version of the pre-existing product document management (PDM) system for 240 clients in a weekend. Although according to internal research upgrading manually would take 1½ hours for each client, the CAD and IT administration group managed to make the transition in less than five hours.

"The gain in performance is spectacular," says Gürtler. "We can now create a three-view drawing in less than 20 minutes, which had previously taken nearly 2½ hours (reducing the time needed by 8X); and the time needed to import a complete diesel engine went from two hours to 15 minutes (reducing the time needed by

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Solutions/Services

Solid Edge
siemens.com/solidedge

Customer's primary business

Plasser & Theurer is an Austrian manufacturer of rail track maintenance and track-laying machines. The privately owned company has supplied more than 16,300 heavy-duty machines to customers in 109 countries since it was established in 1953. It has about 4,000 staff worldwide, including 1,900 in Austria.
plassertheurer.com/en

Customer location

Vienna
Austria

Solution Provider Partner

Ing. Wolfgang Hackl CAD/CAM
cadcam-consult.com



Using the digital twin of the tracks as part of the Plasser Smart Maintenance initiative facilitates continuous target performance comparisons and further automation.

more than 7.5X).“ Reducing the time required for nonproductive tasks boosts the productivity of Plasser & Theurer engineers, helping the company maintain its position as a market leader.

Digital twin goes a long way

Plasser & Theurer uses the digital twin for operator training in a mixed-reality environment. Operators in a life-size replica of the machine's operator cabin use real original control systems to work virtual tracks using the digital twin of the tamping mechanism. This allows customers to train their operators without needing real equipment and time slots on real rails,

without fear the trainees will damage tracks or equipment. It also facilitates trying out different configurations before making the investment decision.

Plasser & Theurer's digitalization efforts do not stop there, though. “Using track recording measurement data from our machines and the services of our digitalization subsidiary, P&T Research, infrastructure companies can create a digital twin of their tracks,” says Gürtler. “They can try out and optimize maintenance for particular sections of track in virtual reality before actually going there.”

Siemens PLM Software

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siemens.com/plm

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