

## Automotive and transportation

# Solaris Bus & Coach

Heading for success in a Solaris bus

### Products

NX, Teamcenter

### Business challenges

Continuous innovation  
Developing technologies for greater safety and less environmental impact  
Dynamic growth  
Expanding international presence

### Keys to success

Vision, experience and enthusiasm  
Use of leading-edge IT solutions  
Implementation of NX and Teamcenter

### Results

Faster development and higher quality  
Simplified modeling and editing of complex designs  
Improved collaboration and concurrent engineering  
Engineering data used throughout the company's operations



### NX and Teamcenter software solutions help Solaris design innovative public transport vehicles

#### One of Europe's leading manufacturers of modern city transport vehicles

Solaris Bus & Coach (Solaris) is a family enterprise founded and owned by Solange and Krzysztof Olszewski. The company is a Polish manufacturer of city buses, intercity and special coaches, as well as trolleybuses and trams, and holds a leading position in the European market. Since production began in 1996, the company has manufactured over 12,000 buses traveling on the roads of 29 countries.

Following the completion of the first contract for the supply of 72 buses to the municipal transport operator in Poznań, Solaris soon became the leader of the Polish low-floor city bus market and launched its products in foreign markets. The combination of the company owners' vision and experience with the enthusiasm of a young crew resulted in excellent organization and working conditions that fostered continued success.

Today, Solaris is one of Europe's leading manufacturers of modern city transport vehicles. Its four factories situated in the Greater Poland region employ more than 2,300 staff, with 500 additional employees working at foreign locations.

“Siemens solutions have greatly facilitated our work, especially in configuring a vehicle for the needs of a specific contract.”

Łukasz Baranowski  
Senior Designer  
Solaris Bus & Coach



One of the company's key business objectives is to develop state-of-the-art technologies that support increasingly greater levels of safety for drivers and passengers alike, while minimizing the adverse environmental impact of municipal transport vehicles.

#### Looking for ways forward

The history of Solaris is filled with success and is marked by an uninterrupted growth of sales. Last year, the company saw major sales growth and has maintained, for the twelfth time, the position of the leader of the Polish city bus sector. The Bolechowo-based manufacturer has been reporting record results in foreign markets as well. In total, the company sold 1,380 buses and trolleybuses, beating its 2013 results, when 1,302 units were delivered. Of the contracts completed last year, almost 80 percent (1,100 units) of the products were supplied to foreign customers.

Demonstrating that the company does not rest on its laurels, at the beginning of 2015 it signed another contract with a public municipal operator from Ostrava for the supply of 105 buses.

“When I started working for Solaris, the company was completing one bus per week. Today, up to eight finished vehicles leave our factories every day,” says Tomasz Broniarczyk, deputy director for production. “This makes a great difference. Such dynamic growth required the company to introduce in-depth changes to its relations with suppliers and forced us to continuously look for ways to realize greater productivity at each stage of the process, from design to sales.”

The rapid growth has forced the company to implement an information technology (IT) system for logistics management and advanced tools supporting the process of designing and engineering new vehicles.

“NX helps us design better products faster, allows us to simulate their operation and makes production easier.”

Tomasz Broniarczyk  
Deputy Director for Production  
Solaris Bus & Coach



Each vehicle made by the company consists of several thousand (in some cases, more than 12,000) different components. Solaris has to ensure the delivery of all components to a single location at the right time, and then appropriately manage all processes at the company. Therefore, the company has implemented SAP® software for logistic management.

Growth of the company and requirements of the market have also triggered changes in the new vehicle design and engineering process. Solaris has been continuously expanding its product range. In 1994, it introduced the first low-floor bus to the Polish market and, in 2006, it unveiled Europe's first series-produced hybrid drive bus. The new products that are broadly recognized in the global markets are a result of the solid work of Solaris' engineers.

#### **Effective support from Siemens PLM Software**

In 2009, Solaris decided to implement NX™ software for product development and Teamcenter® software for product lifecycle management (PLM) from Siemens PLM Software as a platform supporting the 3D design process.

"We partner with many design offices that have their own standards and solutions," explains Tomasz Graczyk, PLM manager at Solaris. "We are working in an environment in which millions of objects are designed in

numerous versions. We are also dealing with 3D and 2D relations. The same data is used in the context of different projects and products. NX and Teamcenter systems enable us to manage that key data. The tools are indispensable for our outstanding engineers, and enable them to meet the high expectations they are facing."

"The frame of a city bus is a welded unibody structure made of corrosion-resistant steel," says Łukasz Baranowski, senior designer at Solaris. "The skin panels are made of the same material. A wide array of elements made of different materials is used for the final assembly of the buses. These include steel, aluminum, plastic and glass components. Therefore, while working on a new vehicle, a large number of documents are created, edited and reviewed. Owing to the Teamcenter solution, we can work in the same environment."

NX is a unified platform that combines advanced, built-in computer-aided engineering (CAE) functionalities with other popular solutions in a single, native environment. NX includes an extremely robust set of advanced design tools for even the most complex shapes. It offers best-in-class surface modeling functionalities employing all the advantages of synchronous technology. The system offers easy-to-use simulation solutions based on geometric models that provide designers with access to the results of advanced simulations.

**"Thanks to the concurrent design capability, the engineering design of a new product can be completed much faster; it can be analyzed in terms of process feasibility and relevant changes can be introduced."**

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Solaris Bus & Coach

“Siemens solutions have greatly facilitated our work, especially in configuring a vehicle for the needs of a specific contract,” says Baranowski. “First, an engineering bill of materials (BOM) is compiled in NX based on the specification agreed upon with the customer. Then, it is sent to the Środa Wielkopolska plant for the creation of a production BOM, also in Teamcenter. Next, the production BOM is sent by means of workflow processes to the SAP system. In the case of customer-specific requirements, we check the feasibility of such a request in engineering and technological terms. If feasible, the engineering design is developed in NX and included in the part list in Teamcenter. The order and execution follow.”

“The NX software includes new technology for modular design that simplifies the modeling and editing of complex designs,” Baranowski continues. “It allows the designs to be divided into specific functional



elements. This makes it possible for numerous designers to work simultaneously, and enhances the re-use and replacement of the design's elements, as well as the modification and updating of entire designs.”

The capabilities of Siemens solutions can be seen in every aspect of the company's operation. “NX model visualization enables

the shop floor personnel to view the element being manufactured at any time," says Baranowski. "With accurate visualization, even people with poorer spatial imagination skills can easily see and assess details."

### Other innovative projects

Solaris does not intend to slow down in the future. In addition to launching series production of a new Solaris city bus, the company is planning to introduce other new products. The most interesting projects include work on the design and construction of the first double-articulated electric bus with a hydrogen fuel cell that increases its operating range. The vehicle is being developed in partnership with the Technical University of Poznań and the Technical University of Warsaw, with financial support from the National Centre for Research and Development offered under the InnoTech program.

"It will be a double-articulated bus with a length of 24 meters," says Piotr Malaca, team leader for the mechanics at Solaris. "It is to be driven by electric motors fed from batteries charged with electricity from an external source and, if necessary, with additional energy generated by a hydrogen fuel cell installed in the vehicle."

"NX and Teamcenter software supports the creation of new, innovative products such as the 24-meter bus," says Baranowski. "Thanks to the concurrent design capability, the engineering design of a new product can be completed much faster; it can be analyzed in terms of process feasibility and relevant changes can be introduced."

In addition, Siemens PLM Software tools support the development of many vehicle options and versions. Division of the engineering design into versions that can be quickly modified with NX or used to create new solutions greatly reduces the time



required to prepare a design that matches the customer's expectations. "Individual components and assemblies are designed and positioned at an appropriate location within the coordinate system, which allows the final product to be assembled and designed faster," Baranowski explains. "Synchronous modeling, in turn, accelerates modifications of details that have been migrated from the previous CAD (computer-aided design) system."

### New, more powerful capabilities

NX and Teamcenter help Solaris engineers design innovative public transport vehicles. "The key advantage of NX is that it dynamically accelerates the design process," says Broniarczyk. "It is a tool that makes our concepts and ideas a reality in a simple way. We would probably achieve similar results by using traditional methods, but this would obviously extend the completion time, and would involve the effort of more people. NX helps us design better products faster, allows us to simulate their operation and makes production easier."

By using NX and Teamcenter, the company can achieve much more. It is a coherent environment, where various experts can engage in the project by communicating and discussing issues related to its development.

## Solutions/Services

NX

[www.siemens.com/nx](http://www.siemens.com/nx)

Teamcenter

[www.siemens.com/teamcenter](http://www.siemens.com/teamcenter)

## Customer's primary business

Solaris Bus & Coach S.A. is a major European producer of city, intercity and special-purpose buses, as well as low-floor trams. Since the start of production in 1996, more than 12,000 vehicles have left the factory and are running in 29 countries. [www.solarisbus.com](http://www.solarisbus.com)

## Customer location

Bolechowo  
Poland

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According to Malaca, the use of Siemens PLM Software tools has dramatically reduced the number of errors in the design process: "Thanks to the integration of work and introduction of the Teamcenter common document exchange environment, thorough verification enables us to eliminate errors early in the design stage. This applies to both single elements and the entire production process. It is also worth stressing that each new software release offers more and more functions that translate into higher effectiveness across our operations."

NX and Teamcenter effectively support change management. As it is possible to save a design together with a related drawing, making changes and supervising them is a very simple and quick process. Use of the synchronous modeling functionality of NX enables easy modification of specific details, even if no operation history is available. Engineers can use NX to modify details of models imported from other CAD systems, or components from subcontractors. For its part, the use of Teamcenter makes it possible to quickly modify the production BOM and compare several change versions in a 3D graphical format.

NX also supports the operations of other departments at Solaris. "Thanks to the ability to save 2D documentation in PDF and DXF formats using NX, the production department always has access to up-to-date documentation," says Baranowski.

In addition, NX enables files to be generated in the lightweight, CAD-neutral JT™ data format, which has become indispensable for the manufacture of buses at the Środa Wielkopolska plant. It is used by all units, from production preparation for the creation of a parts list, to logistics for cooperation with suppliers, to the shop floor manager, who can see how a given element is designed and how it should be made. Therefore, the JT format reduces bus production lead time, especially in the case of prototypes. NX includes capabilities for generating Virtual Reality Modeling Language (VRML) Geography .geo files used by Solaris' subsidiaries or outside suppliers for producing components with laser cutting technology. In addition, NX supports purchasing and logistics by creating objects in Teamcenter that provide a basis for ordering individual elements using the SAP system.

"It is our objective to be a role model as far as quality and reliability are concerned," says Graczyk. "When we were designing the new Solaris Urbino, we took into consideration the expectations voiced by customers from 30 European markets. The Siemens PLM Software solutions have helped us meet those challenges."

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