

## Automotive and transportation

# Crosscity Engineering

New bus stands out – advanced design, smaller size and lower weight

### Products

NX, Teamcenter

### Business challenges

Unify state-of-the-art product development and engineering preproduction

Reduce curb-to-payload weight ratio

Establish long-term relationships with suppliers

### Keys to success

Deploy NX and Teamcenter

Fuse development/ engineering operations

Automate engineering preproduction

Utilize engineering know-how in industrial design

### Results

Suspension and steering gear checked for kinematic performance

Shortened computing times

Structural problems revealed and fixed

Mechanism development time reduced

Vehicles built quickly and easily, e.g., less than two hours spent checking the preliminary design of a windshield washer



## Crosscity Engineering develops innovative transport vehicle

### A one-of-a-kind bus

Crosscity Engineering LLC is using product lifecycle management (PLM) technology – including NX™ software and Teamcenter® software – from Siemens PLM Software to develop a new small-class, low-floor bus. These modern passenger transport vehicles are in demand by the fixed-route transportation sector. Carriers and potential passengers alike are interested in the development of higher-performance, fuel-efficient buses.

“The bus we are developing stands out because of its more advanced design, smaller size and lower weight as compared with similar buses,” says Rodion Suleimanov, chief designer of Crosscity Engineering. “The weight of this bus has

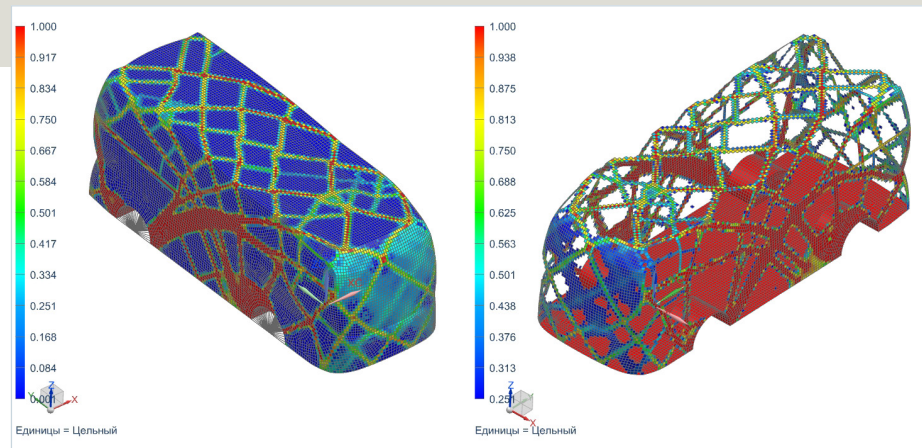
reached a record-breaking low. The bus features a number of innovations, with its structure and most assemblies developed from scratch.”

To create competitive products, Crosscity Engineering unified project development in accordance with current standards. This meant automating engineering preproduction and using industrial design engineering know-how to lower the bus’s curb weight while increasing its payload capacity to accommodate expected passenger usage. At the same time, the company needed to establish long-term relationships with suppliers, and did so.

The company’s engineers knew it would be difficult to create a quality product and manage production without a state-of-the-art PLM system. So they closely investigated and tested virtually all existing PLM solutions. The principal weakness in most

“NX motion simulation is an excellent tool that helps us uncover kinematics issues early and check the powertrain. Mechanism development time has been cut dramatically.”

Andrey Zabolotnikov  
Design Engineer  
Crosscity Engineering



of the solutions they studied was that they were complex and could not be used to edit Class A surfaces created using industrial design software.

The engineers chose NX for computer-aided design/computer-aided manufacturing/computer-aided engineering (CAD/CAM/CAE) and Teamcenter for product data management (PDM). These solutions were selected because the engineers were convinced that the Siemens PLM Software products would enable the company to address all its challenges. Furthermore, the software would relieve designers from common problems, such as exchanging data between various software modules, duplicating data, exporting data, etc.

The experts also appreciated the high efficiency of the solutions, such as the ability to build highly robust models using NX.

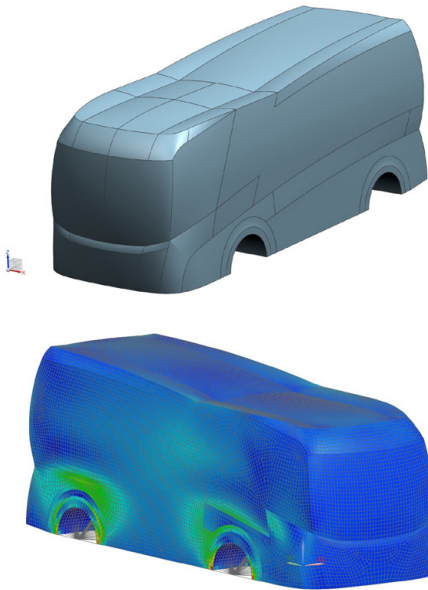
“In addition to the functional advantages of the software, our choice was bolstered by the support provided by the Russian office of Siemens PLM Software,” says Suleimanov.

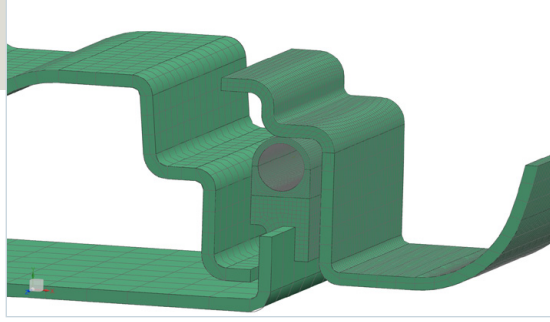
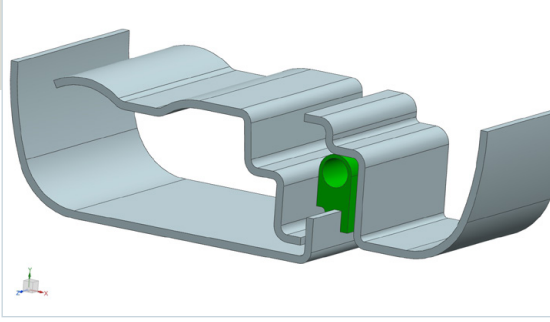
#### Optimizing processes using NX and Teamcenter

Fifteen team members are currently working on project development, preliminary design, engineering analysis and documentation. They are also working on cost analysis, creating and managing part inventories and working with suppliers who will manufacture various assemblies. This stage of the project will be considered complete when the group delivers an operational, full-scale bus prototype for physical testing.

“NX motion simulation is an excellent tool that helps us uncover kinematics issues early...”

Andrey Zabolotnikov  
Design Engineer  
Crosscity Engineering





NX and Teamcenter are used in design, engineering and preproduction. Engineering designs are simulated using NX CAE solutions for engineering analysis. "What our engineers liked about the CAE module and the NX package as a whole was the ergonomics – the simple and easy-to-use functions, menus and settings," says Nikolay Pridvorov, design engineer on the engineering analysis team at Crosscity Engineering. "All this speeds up the creation of both the design and finite element models."

With NX Body Design, engineers now quickly and easily build a vehicle, and analyze and check its structure against related norms, standards and regulations. For example, no more than two hours were spent checking the windshield wiper preliminary design, utilizing kinematics to optimize cleaning efficiency and mirror positioning.

Using NX Motion Simulation, the bus suspension and steering gear have also been modeled and checked for kinematic performance. Linear kinematics was studied in the modeling mode for which the main sizes and suspension angles had been set. Dynamic analysis was used to calculate loads for suspension joints and steering gear. The NX CAE modules not only helped shorten computing times, but also helped engineers uncover and fix problems with the structure.

"NX Motion Simulation is an excellent tool that helps us uncover kinematic issues early and check the powertrain," says Andrey Zabolotnikov, a design engineer on the undercarriage design team at Crosscity Engineering. "Mechanism development time has been cut dramatically."

## "From a concept to the beginning of production, NX helps us develop products within 15 months."

Rodion Suleimanov  
Chief Designer  
Crosscity Engineering

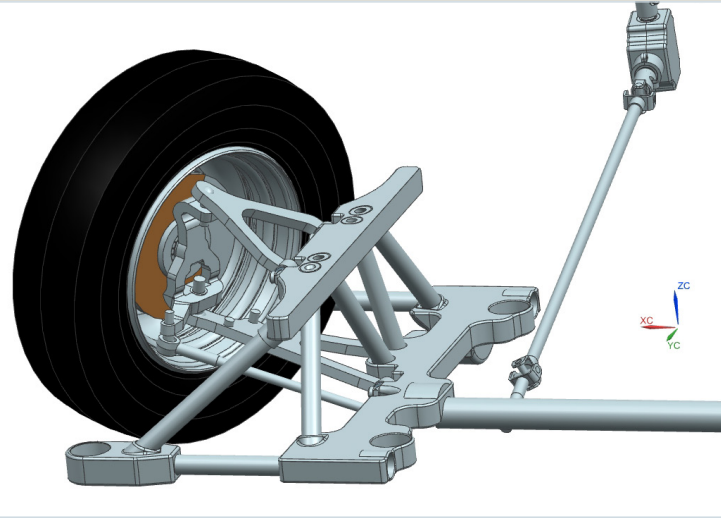
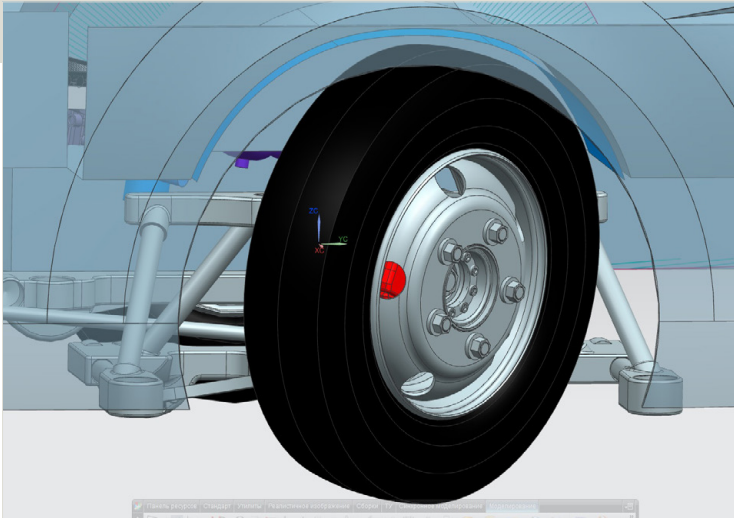
NX was also used to optimize door sealing, enabling engineers to examine the contact area between the door panel and the seal, as well as the seal's behavior during deformation. To obtain the parameters, a finite element model and a computational model with all boundary conditions were created. "We studied sealing behavior when the door is being closed and obtained the specific pressure value in the contact area," says Suleimanov. "We were then able to more efficiently approach the development of the door drive and selection of its operating forces, which will result in optimized shape and size and longer sealing life."

Using Teamcenter enables Crosscity Engineering to maintain connections for all the process stages using WAVE inter-part linking technology. "Technical design errors connected with outdated data are virtually eliminated. We work through several variants that significantly differ in their concept and layout," says Suleimanov. Systems and assemblies developed by different departments closely interact with and influence each

"From a concept to the beginning of production, NX helps us develop products within 15 months. Based on the stages we have executed so far, the work is being carried out ahead of a schedule."

Rodion Suleimanov  
Chief Designer  
Crosscity Engineering





## “Siemens PLM Software’s tools enable us to make bold and innovative ideas come true quickly with the highest possible quality.”

Rodion Suleimanov  
Chief Designer  
Crosscity Engineering

other. For example, preliminary vehicle layout is determined at a draft design stage, including ergonomics, visibility, assembly and unit locations, and shape-forming body surfaces.

During the engineering design stage, analysis and optimization are performed using the preliminary solid models of assemblies and systems created using NX. At the prototype design documentation stage, solid models with product and manufacturing information (PMI) are used, helping to enable the fully digital circulation of documents. Teamcenter enables Crosscity Engineering to efficiently employ “end-to-end” design and quickly obtain a structure that is optimal in all respects.

“From a concept to the beginning of production, NX helps us develop products within 15 months,” says Suleimanov. “Based on the stages we have executed so far, the work is being carried out ahead of schedule.”

### Upon certification

Once the first bus is certified for production, the non-production team of Crosscity Engineering will be enlarged to 35 employees, who will fully bring the product to market. The main tasks of the team will be preparing and issuing engineering documentation, supplier relations management, dealer network support, parts and commodity logistics, advertising and product promotion.

In the near future, Crosscity Engineering also plans to use such Siemens PLM Software solutions as Teamcenter manu-

“Our strategic goal is to create high-value, exceptionally compelling public service vehicles. Siemens PLM Software’s tools enable us to make bold and innovative ideas come true quickly with the highest possible quality.”

Rodion Suleimanov  
Chief Designer  
Crosscity Engineering

## Solutions/Services

NX  
NX CAE  
[www.siemens.com/nx](http://www.siemens.com/nx)  
Teamcenter  
[www.siemens.com/teamcenter](http://www.siemens.com/teamcenter)

## Customer's primary business

Crosscity Engineering, a Russian bus manufacturer, creates automotive parts and composites, as well as new products.

## Customer location

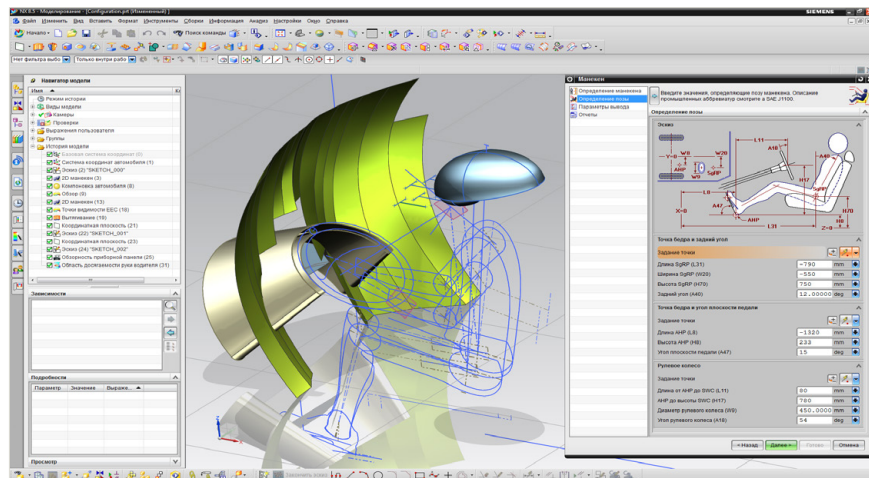
Chelyabinski, Oblast  
Russia

“What our engineers liked about the CAE module and the NX package as a whole was the ergonomics – the simple and easy-to-use functions, menus and settings. All this speeds up the creation of both the design and finite element models.”

Nikolay Pridvorov  
Design Engineer  
Crosscity Engineering

“...the simple and easy-to-use functions, menus and settings. All this speeds up the creation of both the design and finite element models.”

Nikolay Pridvorov  
Design Engineer  
Crosscity Engineering



facturing software, the Process Simulate and Plant Simulation solutions in the Tecnomatix® portfolio, and the Fibersim™ portfolio of software for composites engineering. The company is planning to make a number of modifications after bus production begins. Work is also possible on other types and classes of new-generation public service vehicles using the appropriate advanced technology.

“Our strategic goal is to create high-value, exceptionally compelling public service vehicles,” says Suleimanov. “Siemens PLM Software’s tools enable us to make bold and innovative ideas come true quickly with the highest possible quality.”

## Siemens Industry Software

Americas +1 314 264 8499  
Europe +44 (0) 1276 413200  
Asia-Pacific +852 2230 3308

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

© 2014 Siemens Product Lifecycle Management Software Inc. Siemens and the Siemens logo are registered trademarks of Siemens AG. D-Cubed, Femap, Fibersim, Geolus, GO PLM, I-deas, Insight, JT, NX, Parasolid, Solid Edge, Teamcenter, Tecnomatix and Velocity Series are trademarks or registered trademarks of Siemens Product Lifecycle Management Software Inc. or its subsidiaries in the United States and in other countries. Nastran is a registered trademark of the National Aeronautics and Space Administration. All other logos, trademarks, registered trademarks or service marks used herein are the property of their respective holders.  
Z9 37333 1/14 A