SIEMENS

Education

# Perm National Research Polytechnic University

## University uses NX and Teamcenter to enable students and trainees to use advanced technologies to solve real-world problems

**Products**

NX, Teamcenter

**Challenges**

Update the conventional approach to teaching

Introduce a comprehensive PLM training program

Establish the university's common database with online access

Deploy NX and Teamcenter at PAO Motovilikhinsky Works

**Keys to Success**

Integrate Teamcenter and NX into the academic process

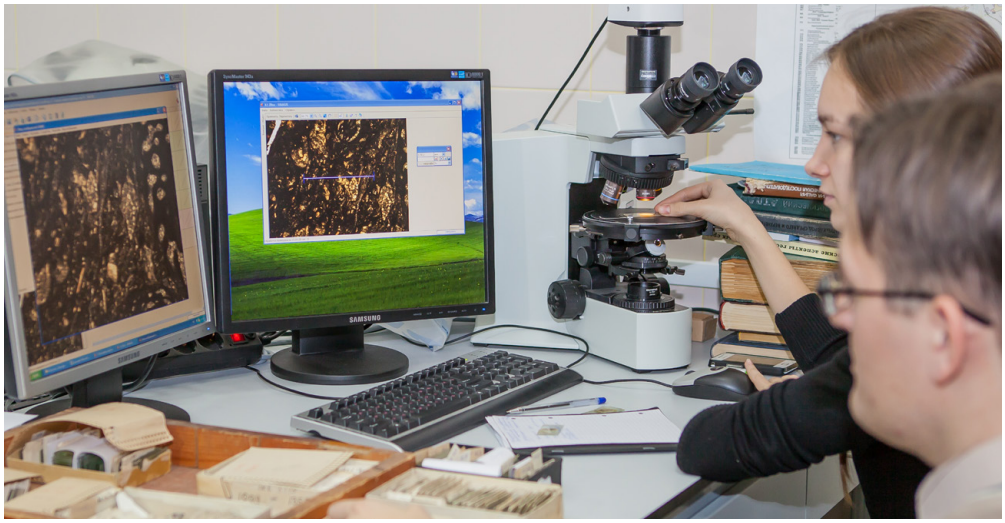
Partner with leading metallurgical company PAO Motovilikhinsky Works

Train faculty members in Siemens PLM Software technologies

Utilize support from Siemens PLM Software

**Results**

Allowed graduates and trainees to use advanced technologies to solve real-world problems



### Perm National Research Polytechnic University graduates easily find jobs with the help of Siemens PLM Software

**Taking a new approach to teaching**

Today, any young engineer has to be able to work with computer-aided design (CAD)/ computer-aided manufacturing (CAM)/ computer-aided engineering (CAE) systems. It is critical for skilled professionals to be introduced to advanced technologies in order to improve a firm's product development and manufacturing processes.

Following modern manufacturing trends, many companies in Perm have deployed product lifecycle management (PLM) solutions, so the Department of Innovative Manufacturing Technologies in the aerospace school at Perm National Research Polytechnic University (PNRPU) considered introducing advanced CAD and PLM tools into its curriculum for the retraining programs intended for industry experts. Such a move was needed to avoid costly on-the-job retraining of the university's graduates, and improve their positions in the labor market.

The first step was choosing a vendor. The actual needs of major employers for the school's graduates were considered. These employers included Aviadvigatel (gas turbine engine production) and OAO Rusturbomash (centrifugal compressors production).

**Results** *continued*

Enabled graduates to easily find jobs

Developed a comprehensive program to teach Siemens PLM Software technologies to students and industry experts

Enabled PAO Motovilikhinsky Works' move to digitalization


**"The primary project winners are the manufacturing companies of Perm since now they can employ skilled engineers, and the university's graduates who feel confident when they enter the job market. We have already received positive feedback concerning the skills of our graduates."**

Professor Vadim Karmanov
Head, Department of Innovative Manufacturing Technologies
Perm National Research Polytechnic University

"We had to learn the capabilities of several leading PLM solutions available on the Russian market," says Professor Vadim Karmanov, head of the department of innovative manufacturing technologies. "We thoroughly analyzed these tools and opted for Siemens PLM Software as a single vendor. The Siemens PLM Software portfolio covered all the technologies we needed to establish an advanced product design, manufacturing and maintenance solution based on the digital mockup concept."

He also notes another important factor that has certainly contributed to making the final decision. Most of the school's graduates work at the United Aircraft Corporation, United Engine Corporation, Russian Helicopters and the Khrunichev Space Center, all of which use technology from PLM specialist Siemens PLM Software and consider it the industry standard.

### Leveraging NX and Teamcenter

At the same time, PAO Motovilikhinsky Works began to transition to advanced manufacturing technologies by deploying the solutions from Siemens PLM Software. The company needed skilled professionals to operate the modern software tools. Most of the company's engineering staff had graduated from PNRPU. For this reason,

## "The Siemens PLM Software portfolio covered all the technologies we needed to establish an advanced product design, manufacturing and maintenance solution based on the digital mockup concept."

Professor Vadim Karmanov
Head, Department of Innovative Manufacturing Technologies
Perm National Research Polytechnic University

Motovilikhinsky Works joined the project. Siemens PLM Software proposed a comprehensive approach and developed a continuous university-to-company engineering education concept that introduced Siemens PLM Software solutions into the academic process. The parties agreed to join their resources, and a trilateral project was launched in 2014.

Siemens PLM Software has delivered 20 NX™ software and 110 Teamcenter® software seats to the department, including technical support and updates. The company's experts developed and held dedicated seminars for the faculty members. The seminars covered PLM fundamentals and applications, and PLM procedures using Teamcenter and NX. Concurrently, the faculty members and Siemens PLM Software's experts deployed the software.

**Getting rid of paper**

It is impossible to learn how to use a PLM system with just one course. At least two important domains are essential to a student's knowledge base: design and manufacturing. Once skill sets have been acquired in the first domain, 3D modeling, the students move to the second domain, learning how to use production planning tools. However, "unlearning," so to speak, is sometimes necessary as students had already acquired some training that is no longer useful to their advancement. Their new environment is completely digital. A solution to this challenge is learning PLM from the very beginning of their education.

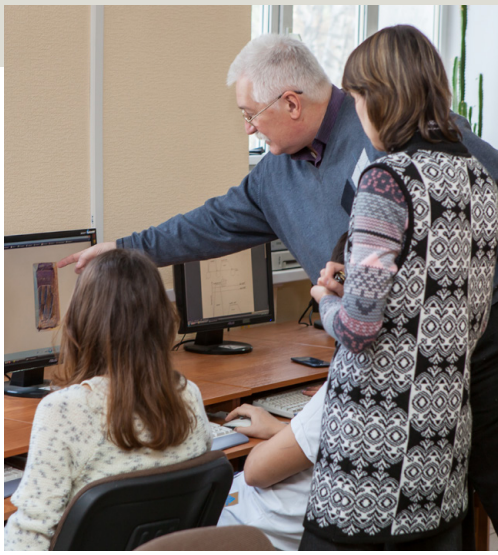
"The students have no problem with learning the basic NX CAD functionality as a part of the course," says Karmanov. "Subsequently, they expand their skills by using NX CAD for developing other course projects."

Until recently, they used NX CAD to develop projects but submitted paper drawings and notes. As PNPRU launched the joint project with Siemens PLM Software, it abandoned paper documents. The students learn 3D modeling in the PLM environment, and only work with digital models. Now they evaluate and grade digital projects. All the course project materials (drawings, analysis results, the professor's notes and reviews) are submitted digitally, and are stored in a unified database with online access from any device. It enables collaborative project development, and simulates a real-world industry environment. Several such collaborative final projects have already been presented.

The undergraduate students learn NX CAM in their third or fourth year, and continue to work on it during their master's degree program. The students majoring in engineering learn numerical control (NC) programming, process planning and other skills. The NC course includes actual part manufacturing in an NC milling and turning

**"The factors that have contributed to our success are the dedication of the faculty members, and the support from Siemens PLM Software's experts in software deployment, setup and training."**

Professor Vadim Karmanov
Head, Department of Innovative Manufacturing Technologies
Perm National Research Polytechnic University



machining center. After the third year, the students have an internship at a manufacturing company, where they apply their skills.

The students who enter the master's program in academic year 2015-2016 will learn CAE with NX Nastran® software. The system's extensive functionality enables the teaching of various analysis domains such as dynamics and finite element (FE) modeling. The students will be able to solve computational fluid dynamics (CFD) and strength analysis problems to verify their designs.

**Initial results**

NX CAD, NX CAM and NX Nastran have been included in the academic process. With support from Siemens PLM Software, the university has opened a retraining program intended for the manufacturing companies of Perm. Here students learn how to use PLM technology: designing with NX CAD, evaluating designs with NX Nastran and developing NC programs with NX CAM.

A group of design and manufacturing engineers and NC programmers from PAO Motovilikhinsky Works has completed the retraining program. The group included more than 100 experts. After completing the program and presenting their final paper, each student receives a retraining certificate in innovative manufacturing technologies.

The project is a win-win for both parties: the university established an advanced continuing education program extending from the first year to master's studies; Motovilikhinsky Works started a product development digitalization process and is training its experts.

"The primary project winners are the manufacturing companies of Perm since now they can employ skilled engineers, and the university's graduates who feel confident when they enter the job market," emphasizes Karmanov. "We have already received positive feedback concerning the skills of our graduates."

**Closing the gap**

PLM represents a comprehensive and dynamic software domain that is continuously being improved. Mastering the many facets of PLM takes a new approach to education. That approach requires a new teaching philosophy.

"It is imperative to close the gap between the academic process and actual manufacturing," says Karmanov. "A graduate should be as competent as an expert with several years of experience under the belt."

To make this happen, the department has introduced collaborative projects and teamwork for students who solve real problems for the manufacturing companies. Soon the department will open a student design office dedicated to exploring innovation.

**Solutions/Services**

NX CAD
NX CAM
NX Nastran
www.siemens.com/nx

Teamcenter
www.siemens.com/teamcenter

**Customer's primary business**

Perm National Research Polytechnic University (PNRPU) offers graduate and retraining programs in engineering, manufacturing, natural sciences, economics, management and the humanities. The primary employers of the university's graduates are instrument makers and manufacturing companies. In 2009 the university was one of the 12 schools awarded national research university status.
www.pstu.ru

**Customer location**

Perm
Russia

The department is also going to deploy a comprehensive set of design, production planning, manufacturing execution and maintenance technologies for developing innovative products and creating an academic knowledge base. The goal is to extend the use of Siemens PLM Software solutions in the academic process to improve the quality of education. For this reason, the department will obtain additional NX and Teamcenter seats.

"The implementation of Siemens PLM Software's vision has drastically changed the academic process and the conventional approach to a university education," notes Karmanov. "The factors that have contributed to our success are the dedication of the faculty members and the support from Siemens PLM Software's experts in software deployment, setup and training."

> "The implementation of Siemens PLM Software's vision has drastically changed the academic process and the conventional approach to a university education."
>
> Professor Vadim Karmanov
> Head, Department of Innovative Manufacturing Technologies
> Perm National Research Polytechnic University

**Siemens PLM Software**

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

**www.siemens.com/plm**


53040-Z6 12/15 A