SIEMENS
Ingenuity for life

ZOOMLION

Using Teamcenter and NX helps construction machinery manufacturer operate at optimal efficiency across 12 business divisions

Products
Teamcenter, NX

Business challenges
Provide an effective technical data platform

Promote global data access

Reduce design cycle times

Enhance team collaboration

Ensure smooth flow of process data among systems

Keys to success
Prudently implement Teamcenter

Promote 3D CAD design, analysis and manufacturing

Deepen integration between Teamcenter and ERP

Realize remote design collaboration and build a digital factory

Results
Built an enterprise-wide PLM platform

Reduced data preparation times for new products/new processes from 15 to about 5 days

Built a collaborative work platform for sharing process data

Enhanced interconnection between designs and processes

Built a technical publications management platform

ZOOMLION employs Siemens PLM Software solutions to reduce data preparation times by 66 percent for new product processes

Unique technical advantages
In 1992, Zhan Chunxin, then vice president of the Changsha Construction Machinery Research Institute, which is under the Chinese Ministry of Construction, and seven employees, with backgrounds in national science and technological system reform, established the ZOOMLION Construction Machinery Industry Company, an application-oriented research institute. This was the predecessor of ZOOMLION Heavy Industry Science & Technology Co., Ltd., and was located in the Changsha High-Tech Industrial Development Zone. It was focused on research, development and manufacturing of high tech equipment that was needed for constructing infrastructure projects, including construction machinery, environmental sanitation machinery and agricultural machinery.

The company's unique technical advantages have driven the rapid development of ZOOMLION. Through over 20 years of innovation and development, ZOOMLION has become a global enterprise with products covering 10 categories, 73 series and over 1,000 varieties. It is the largest provider of construction machinery and environmental sanitation engineering in China, and is one of the top three providers of agricultural machinery.

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ZOOMLION was the first company in the industry to get publicly listed on both the Shenzhen Stock Exchange and Hong Kong Exchange. It has a registered capital of Ren Min Bi (RMB) 7.706 billion yuan. Now ZOOMLION is actively undertaking a strategic transformation by building itself into a high-end equipment manufacturer, integrating construction machinery, environmental sanitation machinery, agricultural machinery and financial services.

From CAD to PLM: data-driven application requirements

ZOOMLION was an industry pioneer in using computer-aided design (CAD) systems in product research and development (R&D) for manufacturing activities. Like numerous manufacturers in China, ZOOMLION used CAD to achieve significant increases in product development efficiency and product data. However, the company began to realize that product development activities were getting out of control.

Due to the lack of product development process management tools at the design stage, engineering technicians were only able to store product-related data on personal standalone machines. So the enterprise could not control data, making it difficult to respond to global and remote queries for data in a timely manner.

Likewise, due to the lack of poor integration between the data management and CAD systems, engineering technicians were only able to manually share product data in the form of files, making it difficult

to guarantee the traceability and validity of different versions of drawings. This meant they had to conduct the entire R&D process in the standalone design and management mode, and were unable to collaborate effectively. This also resulted in inconsistent codes, disorderly data, no uniform platform for purchased parts and general parts and other product development problems.

Due to the absence of an overall product structure, it was difficult to produce consistent bills-of-material (BOM) at different stages of the process. It was also difficult to maintain borrowing relations and effectively analyze the impact of changes. In addition, codes were disorderly and several sets of codes coexisted, so users had to maintain multiple comparison tables. The company also often had several codes for one object.

The increased efficiency brought about by using CAD tools made it imperative to optimize product development processes.

In August 2004, ZOOMLION purchased licenses of Teamcenter® software through Siemens PLM Software partner Tongli.

In October 2007, ZOOMLION Group selected Teamcenter as its product data management (PDM) platform and started its pilot application at ZOOMLION Cranes.

In May 2008, ZOOMLION Concrete began implementing Teamcenter and Phase II of PDM (for manufacturing data management). At the same time, the ZOOMLION Group signed a strategic cooperation agreement with Tongli and Siemens PLM Software and decided to use Teamcenter for complete product lifecycle management (PLM) purposes.

"Since 2008, 12 divisions of ZOOMLION have fully implemented Teamcenter PLM solutions," says Zhang Feiqing, manager of the computerization department at ZOOMLION.

ZOOMLION had a comprehensive plan to use Teamcenter, including for product development and design, design collaboration and design/manufacturing collaboration, process tooling design, production and manufacturing, assembly trial runs, maintenance, offsite services and overhauling. This covered applications for managing areas such as product drawings and files, codes, authority, product structures, workflows, design changes, process and design integration, projects, configurations and engineering changes.

ZOOMLION chose Teamcenter because it not only provides comprehensive functionality, but also satisfies ZOOMLION subsidiaries' requirements. In addition, it easily integrates with CAD systems and provides a highly flexible service-oriented architecture (SOA). The discrete manufacturing applications of Teamcenter and good local service providers also played an important role.

"Implementation of Teamcenter as the group's common PLM platform began at a pilot division before further expanding it within the group," says Zhang.

ZOOMLION implemented the PLM project with a step-by-step methodology: First, the company implemented a pilot project in a division with good infrastructure for computerization, and the pilot division chose one or several types of products as the scope of the pilot application.

The goal for the first stage was to realize product drawings and files management, the integration of AutoCAD® software, code management, authority management, product structure management, workflow management, design change management, preliminary integration with enterprise resource planning (ERP) and the initial introduction of project management.

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Only after the pilot division had successfully implemented applications would other divisions initiate the application plan.

The goal for the second stage was to build an integrated management platform for processes and designs, expand project management and configuration management applications, deepen project management and engineering change management, realize PLM integration with 3D CAD and deepen PLM integration with ERP. At the third stage, the goal was to comprehensively promote 3D CAD design and analysis and manufacturing applications, and deepen process management utilizing 3D data.

Finally, at the fourth stage, the goal was to achieve design collaboration with remote parks by building a virtual factory.

Process data management: moving PLM to the next level

From the second stage on, ZOOMLION broadened the scope of the project, extending it from design to industrial management and linking with analysis, manufacturing, enterprise resource management, etc., thus building a complete enterprise-wide computerization capability and beginning to have some application features of the Digital Factory.

For the second stage of the PLM project, ZOOMLION Concrete implemented the process data computerization collaboration work platform that covered almost all product operation units, including pumps, mixer trucks, station types, machine-made sand and dry-blended products.

Prior to implementing the second stage of the PDM project in 2009, process engineers from ZOOMLION Concrete had been using Jinye computer-aided processing planning (CAPP) as their process card fabrication tool. However, with the implementation of the PDM and ERP systems, the card-based work mode of Jinye CAPP card was unable to provide the structured data required by the information system. In order to enable a smooth flow of process data between upstream and downstream systems, reduce the difficulty of data transfer among designs and processes and make preparations for subsequent manufacturing execution system (MES) implementations, ZOOMLION adopted the Teamcenter manufacturing module to realize a seamless connection between the design and process platforms.

"At the beginning, because ZOOMLION had already chosen NX as its design system, we considered what would make the perfect integration between design and process software and reduce data transfer cost

when selecting the process technology to meet our needs, and very quickly chose Teamcenter manufacturing," says Zhang.

"However, at the beginning of project going live we still underestimated the data volume level and our work on modular processes was defective, resulting in huge amounts of process work, especially after changes, producing an almost destructive impact on process data. For a relatively long period of time, process engineers were very much resistant to it. However, we organized business experts to study modular processes and finally made Teamcenter manufacturing the main data system for our processes."

According to Zhang, the final objective of the project was to use Teamcenter manufacturing to build a computerization platform at ZOOMLION Concrete so the company could efficiently control and share process data.

At the application stage, ZOOMLION Concrete's process base data was managed with Teamcenter manufacturing, enabling data standardization. Furthermore, the company could reorganize process data using structured process data models, process objects and process trees, so process data and design BOMs could be more clearly combined. This process data computerization collaboration platform could also be used to configure and manage outsourcing data. Now ZOOMLION Concrete has realized the rapid output of process data summaries and process cards using Teamcenter manufacturing, thus connecting design and process changes.

"We achieved an enterprise-wide product design and process design collaboration capability with Teamcenter, thus enhancing information sharing between design and process departments and bringing computerization collaboration work to a higher level," says Zhang. "Meanwhile, with Teamcenter, we can fully manage process-related technical data and documents, realizing centralized management of process drawings and files, knowledge sharing and process management, and change management from design to process."

After expanding the deployment of the modular process, the number of process data platform compilers was reduced from 11 to three, and the new product process data preparation cycle was reduced from 15 days to five days.

Solving core problems
The construction machinery sector features high-mix low-volume production, so product-related parameters, configurations and performance indicators guide the development of maintenance and user manuals and other publications. In the real-world design process, such technical publications, such as for product design data, often need to be modified and adjusted repeatedly. After completing the design, such technical publications need to go through a series of processes, including collation, translation into other languages, typesetting, etc., before finally reaching users. It often happens that production is completed before technical documents are finished.

With the rapid growth of ZOOMLION's crane business, some urgent problems appeared, including how to rapidly respond to customers during the service process, analyze positioning and solve product problems as well as quickly and accurately identify, quote and deliver spare parts to customers. In order to solve these problems and improve service quality, it is imperative to utilize an electronic lifecycle management asset for product service and support to improve service capabilities and create more value through service.

The annual average compound growth product support management project was initiated in July 2012, and went live in January, 2013, for the first time building product support data using service BOM for automotive cranes. In order to support

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the development of overseas operations, the multi-language version function upgrade of the product support BOM (PSBOM) system was initiated in March 2013, facilitating the rapid production and release of the Chinese, English, Russian and Portuguese versions of illustrated manuals.

Using a 3D design model created using NX and leveraging other software as well, the project uses the data to produce 3D/2D interactive illustrated spare parts service manuals and electronic records for products straight from the product support BOM, thus creating a single management and maintenance system for illustrated manuals.

The 3D/2D-based electronic illustrated manuals, parts lists and model hot point links improve the interactivity of illustrated manuals and make it easier to identify spare parts, avoiding unnecessary costs. Meanwhile, this approach enabled establishing the standards for producing BOM and illustrated manuals, thus improving the production efficiency and quality of illustrated manuals. Integrating the product support (PSBOM) and distributor management system (DMS) enables remote organizations to readily view information in illustrated manuals using vehicle identification numbers (VINs) and spare parts codes, thus significantly facilitating after-sales service work and spare parts sales. Establishing illustrated manuals for product service that supports BOMs further improves ZOOMLION Crane's after-sales service image and capability as well as the profitability of spare parts sales.

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