Leading transmission manufacturer integrates product and process data using Teamcenter and Tecnomatix

In recent years, significant changes resulting from rising prices of raw materials, fluctuating exchange rates, governmental policy regulations and other factors have seriously challenged the auto parts industry. Despite these difficulties, Shanghai Automobile Gear Works Co., Ltd. (SAGW), is still the leading transmission manufacturer in China. The company's leadership is closely related to the significant role of digital management in its operation and development.

A wholly owned subsidiary of SAIC Motor Corporation Limited, SAGW is the most influential transmission developer and manufacturer in China. In 2014, SAGW sold more than 3.6 million transmissions of various types and achieved an annual sales revenue of RMB 8 billion yuan, accounting for 15 percent or more of the domestic market. Founded in 1925, SAGW is headquartered in Jiading, Shanghai. The headquarters covers a land area of more than 800,000 square meters with a floor area of more than 290,000 square meters. The present value of its fixed assets exceeds RMB 2 billion yuan. SAGW operates national-level technical and test centers.

Leading the industry through digital management

SAGW supplies transmissions for automobile models of 30 leading domestic and overseas automakers. Its transmissions are used on passenger cars, light buses, pickups, SUVs, minicars and heavy-duty trucks from SAIC, Volkswagen, SAIC GM, Brilliance Jinbei, Changfeng Leopard, SGM Dongyue, SGMW and others. In addition, SAGW has built manufacturing bases for various types of transmissions and specialized manufacturing plants for gear shafts, forgings, flywheels and synchronizers on the basis of holding companies in Shenyang, Shandong and Liuzhou. Currently, SAGW is capable of producing various longitudinally and horizontally mounted manual and automatic transmissions, some of which are sold in international markets.

Business challenges
Rising prices of raw materials
Fluctuating currency exchange rates
Increasing regulatory requirements
Ineffective interrelation and sharing of product and process data

Keys to success
Link people, processes and knowledge using Teamcenter
Link all manufacturing disciplines using Tecnomatix
Streamline product and process design
Improve change management

Results
Significantly reduced process engineering workload
Improved accuracy, standardization and efficiency of process resource scheduling
Faster conversion of EBOMs to MBOMs
Improved management of process data and resources
Significantly reduced design and process cycle times
Reduced manufacturing and purchase costs
“SAGW implemented the system in a phased approach. As an overall implementation strategy, SAGW streamlined its operations while concurrently selecting experienced consultants and teams to implement the project.”

SAGW has a powerful technical research and development team and various advanced test and validation benches for product performance and functionality testing. The company has strong transmission assembly development and test capabilities and a complete set of advanced new product development management systems. The SAGW Technical Center is one of the state-recognized corporate technical centers and is also the transmission research and development sub-center of SAIC Motor’s national-level technical center. SAGW has established a long-term and extensive cooperation relationship with GIF, the world’s most famous professional transmission design and development company based in Germany, which has significantly improved SAGW’s autonomous innovation and development capabilities. SAGW has become a complex high-tech enterprise by shifting its focus of development and manufacturing from manual transmissions to automatic transmissions. It cooperates with internationally renowned companies in developing brand-new automatic transmissions for which SAGW owns intellectual property rights. The company continues to keep its innovations aligned with global automobile developments.

Following the path of digital management

SAGW began applying Siemens Digital Industries Software solutions in 1998 and implemented product data management (PDM) in the design and process functions, enabling the company to explore ways to better integrate design and manufacturing. At that time, product and process data was managed in the PDM system, but there was no intrinsic interrelation, sharing or effective collaboration between process and product data. A series of product development and manufacturing management problems persisted, including inefficient design and manufacturing, inconsistent coding, disorganized data, and the lack of a uniform maintenance platform.

To address these problems, SAGW undertook two projects aimed at expanding the application of the PDM system by introducing Teamcenter® Manufacturing solutions and gradually moving from PDM to product lifecycle management (PLM). In 2008, after combining the design and process functions, SAGW consolidated the PDM system with its corporate technical management code and Global Powertrain Development Process (GPDP), and continued expanding the
application of the PDM system, implementing electronic sign-off.

At the directive of top management, SAGW decided to further extend the functionality and scope of the PLM system and gradually achieved central management of company-wide product lifecycle data, building on an in-depth understanding of the functionalities of Teamcenter software for product lifecycle management and the Tecnomatix® portfolio of digital manufacturing solutions.

In 2014 SAGW began implementing a manufacturing data management (MDM) system for structured management of process data in the PLM system. After more than a year’s deployment and application, SAGW has preliminarily built a unified and comprehensive computerized development and manufacturing process, thus promoting innovative product development and manufacturing practices and making phased achievements toward full lifecycle collaboration in design and manufacturing.

Building a complete MDM system
In the fiercely competitive automotive industry, an enterprise’s new product development capability is its core competency. As a developer and manufacturer of automobile transmissions, SAGW assigns prime importance to product development. In that process, the cycle time from product design to mass production of qualified product is very long, and it is often difficult to meet urgent customer requirements. Development cycle time is prolonged by many factors, including the lack of good collaboration between product and process design.

SAGW managed its process data in the PDM system for many years, but not in a highly structured manner. In addition, the PDM system was not closely integrated with process data, and process routes were mainly manually collated and transferred to the SAP® enterprise resource planning system (ERP).

In 2014, SAGW launched a manufacturing data management system to achieve seamless and bi-directional integration with product data, timely and accurate use of product design data, effective collection of manufacturing process data and analysis of manufacturing process parameters. The system was also designed to accumulate intellectual assets like experience and lessons learned from processes and manufacturing practices, to establish a unified digital manufacturing platform covering process development and resource management, and to continuously improve the company’s digital manufacturing.

The MDM system enables SAGW to validate and simulate assembly and machining processes as well as production line capacities, integrate with the SAP ERP system through the bill of materials (BOM), collect and analyze manufacturing process data, collate production field data, improve process management, and build a uniform digital manufacturing platform covering process development, virtual manufacturing, resource management, process experience and manufacturing knowledge.

“This is SAGW’s process director, the system improves process design efficiency and quality and reduces low-level errors.”
The core task in implementing the MDM system was to build an efficient process design platform that links the PDM with ERP and manufacturing execution systems (MES), forming a complete structured process data management system based on product design data, and providing a collaborative environment for product and process design.

**Phased implementation**

SAGW implemented the system in a phased approach. As an overall implementation strategy, SAGW streamlined its operations while concurrently selecting experienced consultants and teams to implement the project. User training was conducted before the system launch, and the company continued optimizing the system based on user experiences after the launch.

In the first phase (from June 2014 to April 2015), the company applied Teamcenter Manufacturing solutions, including capabilities for planning part and assembly manufacturing processes, creating and distributing files and manuals, accessing views of manufacturing data structures, and managing the manufacturing resource library. The team also created the process-specific resource library, templates, process flows and documents, and change management procedures.

For Phase I, SAGW built a manufacturing data and processes management platform, covering the resources library, templates, process flows, process documents, problems and change management. The company implemented process-specific operation applications, bill of process (BOP) construction and management and structured process designs types; dual-clutch transmission engineering applications and workshop field process management.

For Phase II (2015), SAGW extended the applications to its manufacturing plants and subsidiaries and created an interface between the MDM and publishing systems. Phase III plans include virtual simulation, validation and optimization of processes, guidelines for production lines and production capacities; further integration with ERP; and other refinements of the integrated design and manufacturing platform.

**Positive results**

The results are beginning to show. The process data collaboration platform built using Teamcenter Manufacturing has improved SAGW’s process data management. The unified process terminology has improved the standardization of process data. The automatic output of process

“SAGW selected Siemens solutions because of the company’s expertise and proven implementations in the automotive industry and its outstanding after-sales service.”
Customer’s primary business
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Customer location
Shanghai
China

Implementation of the MDM system has significantly reduced process engineers’ work and improved the accuracy, standardization and efficiency of process resource scheduling. The system enables process engineers to focus on key issues in the process design process, by providing a streamlined channel for converting engineering BOMs to manufacturing BOMs and tools for automatic data capture. According to SAGW’s process director, the system has improved process design efficiency and quality and reduced low-level errors.

Siemens Digital Industries Software solutions helped SAGW integrate product and process design and realize a business process that connects designs to processes, thus providing reliable technical assurance for connecting upstream and downstream development. With digital management, SAGW has powerful capabilities for decision-making and innovation that support future and success and industry leadership.

Reliance on solutions from Siemens
For SAGW, Teamcenter provides an integrated environment for building and managing information on products, processes, workshops and resources. Tecnomatix’s simulation and virtual trial run applications enable enterprises to identify and eliminate potential problems in a digital environment before they materialize.

Teamcenter and Tecnomatix’s powerful solutions and comprehensive functionalities meet the requirements of all functions. SAGW selected Siemens solutions because of the company’s expertise and proven implementations in the automotive industry and its outstanding after-sales service. As the solution and support provider, Siemens provided efficient guidance and support in technical issues, operations, knowledge training and team management, and laid a solid foundation for long-term cooperation.

Reports has improved efficiency in preparation of process reports. The process resources library, manufacturing resources library and process knowledge repository have improved and structured management of the data for various process development resources.

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