

NX • Teamcenter

Frisa

Forging specialist cuts cycle time from concept to commissioning by 55 percent using integrated design, simulation and manufacturing

Industry

Industrial machinery and equipment

Business challenges

Physical testing costly and impractical

Machine customization too time-consuming

Lack of press engineering knowledge due to outsourcing

Keys to success

In-house machine customization through integrated NX design/simulation/manufacturing environment

Synchronous technology for rapid geometry editing

Teamcenter to significantly improve collaboration

Exceptional technical support

Results

Reduced rotary die project cost by 50 percent

Engineered solutions in-house in weeks compared to months

Successfully modified hydraulic press to exceed original design capabilities

Frisa uses NX CAD/CAM/CAE and Teamcenter to rapidly customize hydraulic presses used in their forging processes

Forging evolution

Frisa Forjados S.A. de C.V. (Frisa) is a world-leading manufacturer of seamless rolled rings and open die forgings supplied across a number of industries, including aerospace, construction, industrial machinery, oil and gas, power generation, and wind power. Frisa was founded in 1971 in Monterrey, México, as a small forging shop that supplied rings and blanks to local machine shops. Since then, Frisa has continued to expand its capabilities, diversify its product lineup, and grow from a local machine shop to an international operation with three facilities in Mexico and one in the United States. Frisa's success can be attributed to the unique and innovative ways it has evolved the forging process to improve speed and quality. Although the basic processes used for forging have not changed for decades, Frisa finds ways to incrementally tweak and modify their manufacturing processes. This results in better products for their customers.

For example, Frisa makes tooling modifications to the giant presses used early in the ring forging process to press the material into the initial shape. However, due to the sheer size and magnitude of forces within a press, as well as the customized nature of those tooling modifications, it is impractical for Frisa's engineers to use physical testing to ensure new tooling designs will last and perform as expected. Just the manufacture of a single tooling modification can take two months, which is time



Results (continued)

Cut cycle time from concept to commissioning by 55 percent

Substantially enhanced collaboration across 3 plants and 30 engineers

Established best practices/ technology to continuously develop and implement strategic projects internally, and win new business



"Our job is to work on equipment modification and retrofits to increase our manufacturing capabilities for new products. With NX CAE, we increase our engineering expertise, allowing us to offer solutions to more complex challenges."

Simon Yanez Chief Engineer Frisa Frisa cannot spare if the tooling doesn't perform as intended.

Predicting performance with simulation

Frisa recognized the benefits of using simulation as a way to predict if a tooling modification will perform as expected and be durable enough to last for its intended service life.

To review performance, the company outsourced its engineering and simulation work to a service provider. However, outsourcing created an issue in that the company's process and machine parts are very unique in the forging industry, and it would take an extensive period of time for the engineering service provider to get sufficiently up-to-speed to actually do the engineering. The company quickly realized it would be more advantageous to do the engineering work in-house, where the knowledge of the process resides.

Finding the right tool

With knowledge of the manufacturing process and an understanding of what changes would be required to bring about the maximum benefits, Frisa just needed to find the right tool to take action and start developing its own solutions. A critical requirement was a tool that would enable engineering analysts to collaborate quickly with product designers. It was essential that data flow rapidly and painlessly between the two.

Frisa was already using NX[™] software from product lifecycle management (PLM) specialist Siemens PLM Software. That made NX CAE a logical choice for Frisa, not just because the company was using NX CAD for design but, moreover, because NX CAE had the engineering capabilities to address Frisa's unique manufacturing challenges. Since its tooling solutions often encompass complex geometry, the engineering team could use the powerful geometry handling capabilities of NX CAE to rapidly simplify the geometry for analysis purposes and reduce design/analysis cycle time.



The other challenge for Frisa's engineers was to get up-to-speed with whichever CAE tool was chosen, since the engineering work had previously been outsourced. Frisa's engineers felt the technical support they received from Siemens PLM Software was exceptional. "For starters, Siemens PLM Software's technicians provided exceptional customer service for software trials," says Edgar Benavente, project engineer at Frisa. "They listened to our needs on simulation and offered us a solution that included what we wanted and more. Siemens PLM Software listened to us before we were even customers, which helped us greatly reduce the learning curve and utilize the simulation capabilities of NX CAE in a matter of weeks."

By bringing simulation in-house with NX CAE, Frisa is able to engineer new solutions in just a matter of weeks compared to months when using an external service provider. Benavente calls attention to the importance of simulation in the company's process, "Understanding the mechanical properties of our tooling solutions is a key to their performance and service life. With



NX CAE, we can predict the stresses in our assemblies, giving us confidence when selecting a heat treatment."

Simon Yanez, chief engineer at Frisa, adds, "Our job is to work on equipment modification and retrofits to increase our manufacturing capabilities for new products. With NX CAE, we increase our engineering expertise, allowing us to offer solutions to more complex challenges."

Modifying the Lake Erie 3000T press

One of the first major projects following implementation of the new in-house engineering process was the development of new rotary tooling for Frisa's Lake Erie 3000T press. Technical requirements for this tooling include a working force of 1500 tons, so Frisa's engineers needed to minimize the driving torque required for driving rotation of the new tooling.

The new tooling was designed using NX CAD. Then, using NX CAE with NX Nastran[®] software, Frisa's engineering team planned to perform a static structural analysis of the cold tooling. To start the process, the engineers opened the geometry in their engineering environment. They were able to do so without having to import the data and fix any transfer issues, because geometry from NX CAD passes seamlessly to NX CAE. Next, the engineers directly edited and eliminated various geometry features using synchronous technology, an extremely fast way to idealize and simplify geometry prior to meshing the analysis model.

Once the analysis model was complete, the engineering team performed a linear structural analysis with contacts. The results showed how the stresses were transmitted through the assembly and how the different components interacted with each other. One of the most important parts of the design is the central part of the rotary tooling. Here, Frisa was able to graph stress values on the center line of the assembly.

Edgar explains, "After a few iterations, we realized we needed to optimize the geometry, and geometry modifications are very easy to make using NX... just a few clicks and done. Synchronous technology means editing geometry is no longer a timeconsuming task, and the associativity of our analysis model to the design means we can rapidly evaluate the performance of design changes." "For starters, Siemens PLM Software's technicians provided exceptional customer service for software trials. They listened to our needs on simulation and offered us a solution that included what we wanted and more. Siemens PLM Software listened to us before we were even customers, which helped us greatly reduce the learning curve and utilize the simulation capabilities of NX CAE in a matter of weeks."

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Edgar Benavente Project Engineer Frisa

"Synchronous technology means editing geometry is no longer a time consuming task..."

Edgar Benavente Project Engineer Frisa

Solutions/Services

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

Teamcenter www.siemens.com/teamcenter

Customer's primary business

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Customer location

Santa Catarina, Nuevo Leon Mexico

"With Teamcenter, collaboration throughout the different engineering departments has become easy and efficient. There are no more delays transferring files, and the data is always available and safe using Teamcenter."

Edgar Benavente Project Engineer Frisa After optimizing the components where stresses were high, the validation was complete, illustrating that the new design for the tooling of the Lake Erie 3000T press would meet the job requirements and also have the durability needed to meet the intended service life.

Integration across product development

Development doesn't stop after a successful validation of a new design, because Frisa also manufactures the tooling modifications in-house. Complete integration of CAD, CAE and CAM helps Frisa streamline its development processes. Using NX CAM, Frisa's manufacturing engineers can seamlessly take the latest design data into their environment for manufacturing planning and execution. Frisa also uses Siemens PLM Software's Teamcenter® software to manage all of the design, simulation and manufacturing data generated by its engineering departments, so that all departments are in-sync with the right information across three different plants in Mexico.

Benavente points out that all new engineering designs are updated using Teamcenter, making them accessible to other engineering departments such as product development and tooling, so they can use the data to revise the manufacturing process based on the modifications made to the press. He explains, "With Teamcenter, collaboration throughout the different engineering departments has become easy and efficient. There are no more delays transferring files, and the data is always available and safe using Teamcenter."



Forging success

Benavente says that PLM is a critical success factor at Frisa: "Our internal costumers come to us looking for answers to their needs. With Siemens PLM Software technology, we are able to offer a wide range of solutions that meet or exceed their initial expectations in a very short period of time."

The Lake Eire 3000T press demonstrated the strength of the solution set. From concept to commissioning, the press took only five months, a new record for such a project. Additionally, Frisa realized a cost reduction of 50 percent compared to what a similar project would have cost using the company's previous development processes. Once fully functional, the new forging capabilities for the Lake Erie Press will exceed their original design capacity.

Edgar notes that with NX, Frisa now can now design, analyze and manufacture products that it couldn't develop using its previous approach, pointing out that this provides the company a definite step-up in competitive advantage.

Siemens Industry Software

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