SIEMENS
Ingenuity for life

Heavy equipment

MX

Farm equipment manufacturer cuts one to two weeks off the design cycle

Product

Solid Edge

Business challenges

Design equipment that meets the varied needs of farmers worldwide

Decrease product costs

Improve the efficiency of the manufacturing process

Keys to success

Fast and easy implementation of Solid Edge with synchronous technology

Ease of using scanned tractor data

Comprehensive digital check of assemblies

Data created using Solid Edge imported into FEA system as foundation for finite element models

Agile processes that facilitate product innovation

Results

Only four to five weeks between scanning a track to completion of drawings

Designs are done in one week, compared to two to three weeks previously

Solid Edge is the heart of a process that includes digitizing tractor models and using FEA to advance durable products for the global market

Serving farmers around the world

When Louis Mailleux took over the family forge in 1951, he could not have imagined that the business would become one of the main players in its market: fitting farm tractors with lifting and handling equipment. "We began by making ploughs," recalls Emmanuel Renoux, R&D (research and development) director at MX. "Very quickly, Louis Mailleux turned to making loaders for farm tractors. Activity developed progressively in Brittany, then in all of France, and now the loaders are worldwide." Today, MX products can be found in 60 countries.

A loader is handling equipment placed at the front of the tractor. It consists of moveable arms held by a frame that is permanently attached to the tractor. The arms themselves hold tools such as buckets with or without forks, feeding buckets, manure forks, bale handlers, pallet forks, front linkages (for mounting tools in front of the tractor) and power takeoffs for turning tools such as mowers.

Results *(continued)*

Designs are more accurate

Two engineering models needed now versus six previously

Parts are optimized for strength

MX develops and mass-produces its MX brand agricultural loaders for approximately 7,000 tractor models. "In all, the company makes 8,500 loaders per year with about 550 employees," says Renoux. Manufacturing a loader involves transforming sheet metal or steel bars by cutting and bending them, then assembling them using manual, automatic or robotic welding.

Each designer is autonomous

In MX's R&D department, engineers are in charge of the loader designs, while designers handle administrative tasks such as defining parts lists, drafting, dimensioning, and implementing changes. Designs cover two product families: commercial tractor equipment, such as loaders and tools, and standalone products.

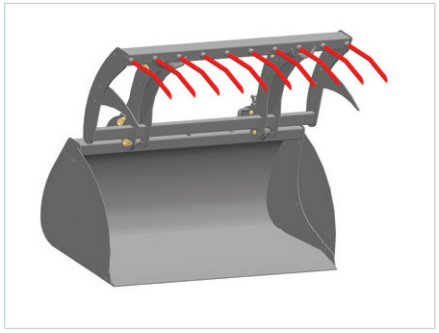
In designing commercial tractor equipment, MX supports tractors of all brands. The first step involves scanning a tractor with a laser system that performs touchless 3D digitizing. The scan is converted using dedicated software in a format that can be imported into Solid Edge® software from product lifecycle management (PLM) specialist Siemens Digital Industries Software.

"We are then able to design the equipment that will fit on this tractor using Solid Edge," Renoux explains. The engineer must design the equipment in a way that doesn't interfere with the tractor's normal operation and preserve access to things, such as the oil tank, drain pan, diesel filter, oil filter, air filter, cooling radiator, and so on. "The space all around the tractor is very full, even more now that anti-pollution standards must be considered," observes Renoux.

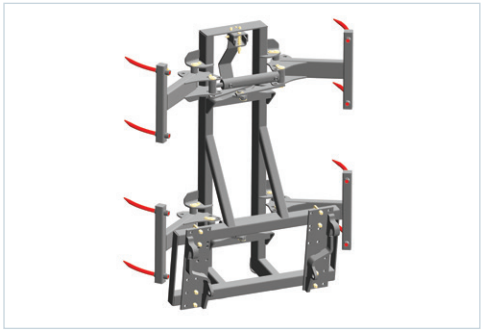
The engineers design the equipment in 3D. The components created using Solid Edge are then digitally assembled on the tractor model, where all of the design

TECHNIC T410 loader.

Bale grab for wrapped round bales (with plastic wrap) MANUBAL C40.



Multipurpose Bucket BMS 200.



Bale grab for straw and hay bales MANUBAL W500.

Set frame and front linkage and front power takeoff.

constraints are checked: correct turning of the wheels, absence of collisions, access to the entire tractor's maintenance elements and so on. After this, parts lists and drawings are created. Then it is time to start production. "There are four to five weeks between the time a tractor comes in to be scanned and the drawings are ready," says Renoux.

For standalone products, the scanner is not used. The process is more conventional, starting with designing the cast and welded parts using Solid Edge, and then using finite element analysis (FEA) on the structures. The FEA application uses the computer-aided design (CAD) data in its native format. It is used to create the finite element mesh, perform the calculations and indicate the areas to be changed and optimized using Solid Edge.

"Rather than having a group of FEA specialists, I wanted each designer to be autonomous for designing the product families, doing the analysis, and optimizing the part designs to requirements," Renoux says. "It's up to the designer to do the static studies, to know the resistance and the strains on the structures he designed and dimensioned, to take into account the forces (measured during the tests), to analyze the right areas, to optimize the design, and then to come back to the beginning of the loop to ensure the quality of this optimization using a final resistance calculation."

Approximately 10 mechanical engineers are able to use FEA to perform this optimization cycle. MX's CAD and FEA provider was responsible for training the engineers on finite element analysis technology.

Why Solid Edge?

Although today's designs are more complex and involve more parameters, usually only two engineering models are needed to arrive at a finished part. Before the arrival of Solid Edge, a half-dozen models were needed.

Why Solid Edge? "We used 2D CAD software in the past but it limited our possibilities," replies Renoux, who was responsible

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Emmanuel Renoux
R&D Director
MX

Solutions/Services

Solid Edge
solidedge.siemens.com

Customer's primary business

MX develops and mass-produces MX brand agricultural loaders for approximately 6,500 tractor models.
www.m-x.eu

Customer location

Acigné
France

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for the selection of Solid Edge, in collaboration with his information technology (IT) department. "We wanted a better solution that covered every aspect of the design process, and would let us accurately design complex parts made by plastic injection molding and casting. We needed to change!

"We chose Solid Edge in 1998 after having done a complete analysis of the market," he continues. "This mid-range solution seemed to be a good compromise between the desired software performance and the amount of investment needed to implement it in the company. We placed emphasis on software suited for both design and manufacturing engineering's needs because Solid Edge is also used for designing the production methods."

Renoux found the installation of the software to be very fast, and training took only one week. In summary, implementing Solid Edge was very easy. "Getting to know the software was very simple and quick, even for people who had never used Solid Edge before," notes Renoux. About 35 people, mainly in the design department but also in the manufacturing engineering department, use the software.

Since then, MX has benefited from the enhancements to Solid Edge, in particular the introduction of synchronous technology. Renoux sums up the advantages of using Solid Edge this way: "In addition to reducing by a factor of three the number of engineering models needed to ensure adequate part strength, Solid Edge has enabled us to increase the accuracy of part definitions. The 3D design capabilities of Solid Edge allow us to have a design in a week instead of fifteen days to three weeks before."

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