Rothweiler

HCL

CAMWorks helps build a custom bike

From Zero to Sixty in 2.7 Seconds

CAMWorks

Right on target:
CAMWorks helps build a custom bike

User report - Rothweiler Feinwerkmechanik in Pfinztal near Karlsruhe (Germany)

Rothweiler Feinwerkmechanik's ability to design and build a complete custom motorcycle was made possible not least by the functionality, precision, and ease-of-use of the CAMWorks CAD/CAM system. But it is not just with this showpiece and technology carrier that the Baden-based company relies on CAMWorks. Rather, it also depends on it in its everyday operations as a parts producer.

Life is not easy for parts manufacturers. They face stiff competition. Manufacturing even simple parts using drawings is no longer anywhere near good enough to compete in the marketplace. But those who have something special to offer, such as being able to manufacture particularly large parts, deliver high quality, or the ability to extend their process chain into the customer's designing, will find their own market niche. Rothweiler Feinwerkmechanik, located in Pfinztal bei Karlsruhe, has developed a few of these types of special capabilities to enable it to provide its customers with rapid and flexible assistance.

Rothweiler Feinwerkmechanik was founded in 2003 by Dirk Rothweiler. Wanting to shed his regular job and begin to build some independence, he sold "all my worldly goods," as he puts it, in particular his car and his motorcycle, and invested the money in machinery. His first machine tool was a used lathe. "That's what I used to generate my first sales. And whenever I was able to pull enough money together, I bought the next-better machine, until at some point I was able to purchase the newest CNC machines," Rothweiler remembers.

Today, with five permanent employees and additional "loan workers" from partner firms, his company offers a wide range of machining options. These include turning, milling, and polishing, along with a number of kinds of precision machining, plus welding, surface and heat treatments, materials testing, and material analysis.

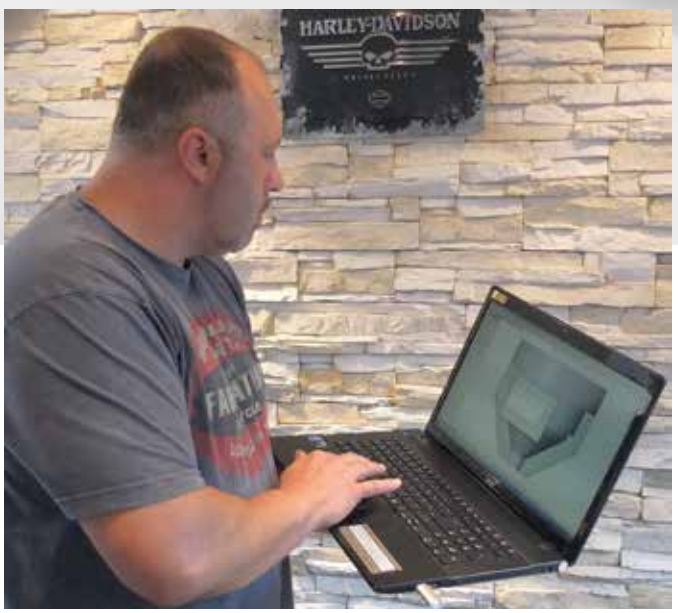
When it comes to working materials, Rothweiler Feinwerkmechanik knows no bounds: steel, stainless steel, titanium, inconel, and alloy materials are handled as easily as aluminum, non-ferrous metals, or plastics, and even fiber-reinforced composite materials. Dirk Rothweiler goes one step beyond the machining. "I often assist my customers in the design process by contributing my know-how regarding the manufacturability of the parts. We get to the finish line together and faster than if the designer were doing it alone."

Then Rothweiler manufactures the prototypes. After they have been tested and released, serial production can begin. Here as well, the manufacturing specialist can help by negotiating with compatible serial manufacturers, including international firms. These Baden-based manufacturers are currently on the threshold of a major development in the company's history: They are about to bring the machine tools and equipment, until now scattered across multiple sites, together in a manufacturing building about 1000 m^2 in size.

Without CAD/CAM, (almost) nothing goes

“I spent at least five years looking for the right CAM software,” says Rothweiler. During his search, he purchased a number of packages and tried them out, but was never completely satisfied.

The ‘Dragstyle Custom’ by Dirk Rothweiler in all its glory: dream motorcycle and technological showpiece, all in one.



At Rothweiler, CAMWorks runs on a laptop.

He found out about CAMWorks by chance and “soon after I got the note from the distributor, I went to their office and had them show me the system. Then I did a short three-day training session and made up my mind then that it was the right one,” says the company owner. He particularly liked the fact that he now had a CAM system “that I could use to create my NC programs with a straight line to the programming target instead of using a zig-zag approach. That allowed me to save a lot of time, and still does now.”

CAMWorks

was the first CAM software integrated completely into SOLIDWORKS.

For the user, this deep integration means:

You can get to the menus and machining trees inside SOLIDWORKS with just one click.

You don’t have to leave SOLIDWORKS to carry out the CAM machining.

The CAM system uses the same geometry as the CAD system. This ensures that the part being machined matches the modeled part.

There are no time-consuming format conversions. The standard interfaces include STL, STEP, IGES, Parasolid, ACIS, VDA etc.

Along with CAMWorks, SOLIDWORKS came into the company as the CAD system and has also come to be highly prized. Before we take a closer look at the process chain, let's first take a look at the system itself.

The integrated CAD/CAM system for all types of machining

CAMWorks is an integrated modular CAD/CAM system. Its automatic feature recognition and the use of a technology database make it possible to do the programming in large part automatically. Nevertheless, users can intervene manually at any point in the process and make any changes they want.

The system's automatic feature recognition analyzes the geometry of the 3D model and extracts the features (shaping elements) from it that can be employed directly as milling features, turning features, or wire EDM features.

The Technology Database is the "brain" behind the automated machining performed by CAMWorks. The database links tools, operation strategies, and machining parameters with the features. When generating operations, CAMWorks automatically links these settings. The operation parameters can be changed before and after the toolpath is created.

The CAM system is of course also equipped with sophisticated simulation options, from simple machine tool simulation (workpiece, fixtures, tools), to complete virtual machine simulation. For roughly the past year, the system has also included options for running simulations after the post-processor run.

From data import to shop

Around 95% of parts at Rothweiler are currently created using the CAD/CAM process chain. "The first advantage with this system is that no errors occur in my system during the data transfer from the customer."

If the part is in its own system, then it is analyzed precisely, particularly in regard to manufacturability. If this is the case, the NC program is created, with which the automatic feature recognition, among other things, is a great help.

Dirk Rothweiler uses the integrated Technology Database to store technology values (feed rates, turning speeds) that he has collected from practical experience for certain materials and tools.

"Every machine works a little differently because of rigidities, thermal behavior, axis arrangement, etc. That means that the NC program has to be optimized to account for it. I perform this optimization directly on the machine, but I enter the values obtained from experience into the CAMWorks database. So the database learns every day and delivers the exact values the next time at the push of a button," Rothweiler stresses.

The VoluMill feature included in CAMWorks is used for almost every roughing operation. This is a special kind of down-cut milling which, according to Rothweiler, "saves at least 50 percent of the machining time and minimizes machine tool wear, or at least ensures they wear very evenly."

Dirk Rothweiler at one of his Haas CNC machines.

The NC programs that are created are then simulated. This is done to show not only feasibility, but also to determine machine run time. “And that allows me to be able to produce a realistic quote very quickly, which is a clear competitive advantage,” says Rothweiler from experience.

He had the post-processors built by CAMWorks reseller and is very satisfied with them - “no problems at all there.”

The parts specialist also uses the after-postprocessing simulation option newly incorporated into CAMWorks. Simulations are run here using a G-Code simulator and the information in the postprocessor is taken into consideration along with it. Rothweiler’s experience with this has been positive. “After a few tries, I have become certain that the software functions precisely, that is, any program that comes out here will also definitely run on the machine.”

Motorcycle dream to dream motorcycle

Dirk Rothweiler has been a two-wheeler enthusiast from his earliest youth. The idea of making changes and conversions in order to turn an everyday vehicle into something special was always particularly exciting to him. Since he has maintained this enthusiasm over the years, it was not exactly improbable that he would come to supply the custom bike market with parts as soon as his company was equipped to do so. As this area of business was beginning to boom throughout Europe, he and a colleague settled upon the idea of building their own complete motorcycle.

“If I can produce these parts for others, then I can do the rest as well.” That was the starting point in 2006/2007.

Of course, it wouldn’t be just any motorcycle, but rather something quite special, or what is called a ‘Dragstyle Custom’ (see photo).

Some three years passed from idea to concept to implementation. In 2010, the machine was finally finished. A small selection of the parts that were produced at Rothweiler Feinwerkmechanik.

They manufactured almost all the parts themselves. The CAD/CAM process chain described here played an important role in the effort. The parts that were procured included the engine, a 2-cylinder V engine with 2 liter displacement and 160 HP to give the bike the propulsion it needs.

Many of the parts were manufactured from titanium, but the tank halves and fenders were constructed of polymer fiber aramid composites.

“This material has a deformation behavior that is similar to metal, making it better suited than a CFK composite, which splinters easily,” says Rothweiler, explaining his choice.

They collaborated very intensively from the very beginning with TÜV Süd-West, which performed a series of calculations and made sure through their consultation that the motorcycle would be able to receive a permit for roadway use.

Today, the project is complete. Dirk Rothweiler uses his ‘Number 1’ as a showpiece at a lot of technology fairs. It shows quite forcefully what Rothweiler Feinwerkmechanik can do and has already opened the door countless times for new business. And that’s how it should be.

For more information, go to: www.camworks.com

One of the things that mark dragstyle motorcycles are their powerful rear wheels. The majority of the bike parts were manufactured by Dirk Rothweiler himself.

Die Funktionen von CAMWorks auf einen Blick

2D	3D	5-Achs	VoluMill
Fräsen	Drehfräsen	Drehen	Drahten
Schnitt-stellen	Automatische Feature Erkennung		Simulation
Tech DB			

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