

# Managing Shop Floor Data

## First Gear Utilizes New Tooling and Machining Processes with Assistance from KISSsoft

Matthew Jaster, Senior Editor

**There's no substitute for a good software package in gear manufacturing.** It's a critical shop floor tool that provides practical engineering services that customers appreciate. When you're in the business of specifying and procuring high quality gears, the software needs to meet many objectives including the consideration of all tolerances of center distance, tooth thickness and tip diameters, root diameters, fillets, etc. It's also imperative that the software updates include the latest revisions to the gear standards being used in the industry.

Many companies, including some of the largest aerospace customers that use gears, may not always have extensive exposure to gear design or gear manufacturing processes today, according to Greg Leffler, president, First Gear Engineering & Technology.

"Our customers often need help with their designs and getting the proper information on their prints to guarantee what they order is correct and will function as desired," Leffler said. "This requires us to use *KISSsoft* software every day for verifying robust design principles to determine the proper cutter to produce the desired tooth profiles."

One of First Gear's medical customers is borrowing technology from the gear industry to produce a specific medical device. Some of the device's components are being manufactured on First Gear's CNC gear machinery. Although it is a non-standard design, First Gear employs *KISSsoft* software to provide solid models that can further be evaluated in FEA and other analyses.

"We are able to design new tooling and machining processes that have not been done before (to our knowledge) to produce these components," Leffler added. "KISSsoft has been a huge help in this program."



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### A Quality Start

First Gear serves many industries including medical, aerospace, military, motors and drives, automation, food and general commercial. The company offers services such as hobbing, shaping, finish grinding and finish rolling of gears and splines and provides assistance in the design and development of prototypes to hundreds of thousands of gears annually.

An emphasis on quality began from day one, when the company took delivery of an M&M Analytical Gear Inspection Machine.

"We continually invest in new equipment to advance our capabilities. We have state-of-the-art gear inspection and analysis equipment from Penta Gear (formerly known as PECo and now part of the Kapp-Niles group) and Pratt & Whitney. We have been AS9100C and ISO 9001:2008 certified for many years and this year we received our accreditation for ISO 17025 to re-calibrate master gears, splines and gages, and we are seeing business for this service from many industries. This is another segment of our business where *KISSsoft* software is helpful," Leffler added.

"When we need answers, we can talk to KISSsoft engineers immediately and have been impressed with their product

knowledge and response time. We have found their software to be very intuitive and user friendly, it is updated frequently and it is very simple to manage," Leffler said.

### New Software Solutions Equals New Business

The solution KISSsoft provided for the medical customer is out of the ordinary in gear manufacturing and has allowed First Gear a unique opportunity to broaden the scope of its manufacturing services. For example, the First Gear staff doesn't claim to know everything there is to know about gears, but they are blessed to know a handful of people who have spent their entire lives in this industry and they can go to these people for answers when needed.

"These engineers have had exposure to almost all types of gearing and have provided a wealth of information when needed," Leffler said. "We have used other commercial software packages, but KISSsoft is the first to provide an all-encompassing package that includes solid modeling and other features that have not been available to us before."

In addition to the current standards found in the software, First Gear engineers were able to design non-stan-

dard gearing using the standards as a guideline. The flexibility of the software allowed them to do several “what-if” designs in a very short period of time.

The more comfortable the engineers get with the software solutions, the more opportunity they have to utilize it in other areas. The software is used on a daily basis at First Gear when reviewing the accuracy of data on prints that they are quoting. Most all international standards are available in the software which is very useful today.

“We see prints from all over the world. We want to confirm that all the data is correct and our customer will be able to use their gears as they intended. We also work with customers on new designs, often providing a complete analysis,” Leffler added.

KISSsoft has allowed First Gear engineers to evaluate many design options for its customer’s applications and select the best solution that minimizes the potential for noise, heat generation and tooth wear. “The detailed manufacturing evaluation that follows allows us to either design the proper tool or choose an available tool and calculate the details of the final product. This saves our customer time, money and provides them quality, confidence and assurance,” Leffler said.

### Training

The tutorials present within the software and the help from KISSsoft’s engineering support staff makes it easier to learn the ins and outs of the software package. Another great reference tool is the instructional videos KISSsoft produces online.

“Attending one of KISSsoft’s training programs is another great way to get deeper into utilizing more of KISSsoft’s capabilities through class design exercises,” Leffler said.

### First Impressions

In an ever-competitive gear market, First Gear wants to be the first choice when it comes to specifying and helping buyers and engineers in procuring gears. The right software package, one that keeps up with the faster and more efficient pace in manufacturing today, significantly helps the organization meet its daily objectives.

First Gear expects to more than double the size of its current facility in the next year (the company wants to expand to offer complete design and manufacturing capabilities). They are also looking to acquire or build other gear facilities where opportunities exist.

“We’ve had the luxury of utilizing several CNC machines since day one. We have a database of all our hobs, shaper cutters and their exact geometries, material properties and coatings available,” Leffler said. “This information, coupled

with *KISSsoft* software, confirms that we can produce the geometry the customer prints specify and in turn makes it quick and accurate to quote jobs. This gives us the confidence that we are doing everything possible to make our customer’s job easier.” 

### For more information:

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## Latest KISSsoft 03/2016 Updates

The latest KISSsoft *Release 03/2016* debuted earlier this year at the Industrial Fair in Hannover. This version included enhanced evaluation of planet carrier deformation, bevel gear contact analysis, and the following improvements:

### Plastic Gears

The application area of plastic gears has grown significantly in the last decade. The requirements from the industry to design stronger, lighter, quieter and more efficient gears have also motivated plastic manufacturers to produce custom made materials.

In the last two years, the new VDI 2736 guideline for the design of plastic gears was introduced. Unfortunately, its material data for lifetime calculations is limited. In order to design gears with custom made materials, it seems necessary to measure the fatigue data and temperatures in gear

tests prior to the gear design. As a supplement to the VDI 2736 guideline, the calculation of plastic deformation and wear of plastic crossed helical gears (according to Pech) has been implemented in the KISSsoft *Release 03/2016*.

### 3D Modeling

Modeling in *KISSsys* has been simplified in the latest KISSsoft *Release 03/2016*: Now, for example, when elements are added, the part geometries are prefilled with default values. At the same time, the shafts are positioned intelligently, to suit the gearing types involved, such as cylindrical gear pair, bevel gear or planetary stage. The user can now see the modeling progress immediately in the 3D view. Another new feature is the option of adding assemblies (such as planetary stages) to a model, and also adding shafts, if required.

### Roller Bearings

The new version now contains the very latest data from the "Rolling Bearings" catalog. By cooperation between SKF and KISSsoft, all future releases of KISSsoft will include an updated bearing database from SKF. The previous KISSsoft database contained 4,000 SKF bearings — the new release contains 11,500 bearings as shown in the latest catalog. In case of major changes to the catalog by SKF, KISSsoft can deliver a new database to the customer with patch files. This collaboration ensures that KISSsoft users are able to design gearboxes using up-to-date bearing range and bearing catalog data. ([www.kisssoft.ch](http://www.kisssoft.ch)). 

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