

Aerospace and defense • Energy and utilities • Marine

## Manthorpe Engineering

Machining company uses NX to transform performance-critical designs into organic and irregularly shaped components

### Product

NX

### Business challenges

Transform complex designs into physical products

Ensure precision

Estimate and plan with accuracy

### Keys to success

Leverage accuracy of NX data

Use simulation to eliminate cutting issues

Facilitate collaboration between design team and shop floor

### Results

Achieved accurate time and cost estimations

Predicted tool path and outcome with accuracy

Achieved tolerances of less than five microns

Facilitated higher-quality finish

Optimized machine time per component

Minimized potentially expensive scrap



**Siemens PLM Software solution enables Manthorpe Engineering to deliver complexity with precision and speed over a complete range of aerospace alloys**

### Providing submicron accuracy

From small prismatic to rings and casings up to 3.4 meters in diameter, Manthorpe Engineering specializes in the machining of difficult-to-manufacture, performance-critical components. It fabricates, machines, tests and assembles high-integrity components from a range of materials, including exotic alloys.

Founded in 1978, Manthorpe Engineering is a Tier 1 supplier to the aerospace, industrial, marine and power generation industries. The company has an extensive site near Derby in the United Kingdom (UK) with over 9,000 square meters (100,000 square feet) of manufacturing area. The machining division is equipped with the latest high-speed cutting tools on a range of computer numerical control (CNC) machines, providing 5-axis multitasking capability among a range of other machining services. These machines are used to turn forgings, castings and a range of other materials into precision-finished components. Temperature-controlled rooms ensure that the tolerance margin of

## Results continued

Enhanced quality processes with NX data

Provided short turnaround for customers

**"We need a CAD/CAM technology that's both powerful and flexible."**

Tom Pochciol  
Business Director  
Manthorpe Engineering

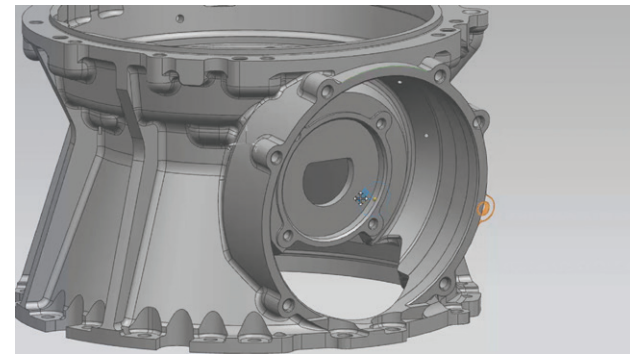
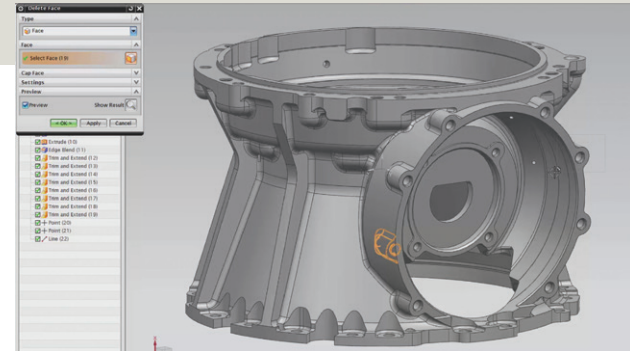
sensitive materials is not lost through atmospheric fluctuations. The company also provides nondestructive testing services.

"What differentiates us as a company is the complexity of the components that we machine," says Tom Pochciol, the business director of Manthorpe Engineering. "They can be large and awkward in shape. We might, for example, be working on the engine casing for a jet or the particularly tight tolerances of a bearing system. A human hair is approximately 60 microns in diameter and we regularly have to achieve measurement accuracy to five microns. Achieving tight positional tolerances is even more challenging. We need a CAD/CAM technology that's both powerful and flexible."

## Translating customer intent

Manthorpe Engineering uses NX™ software from product lifecycle management (PLM) specialist Siemens PLM Software. NX is delivered via TTL, CAD/CAM (computer-aided design/computer-aided manufacturing) supplier and Siemens PLM Software partner. TTL customized postprocessors, configured software and delivered user training for the company.

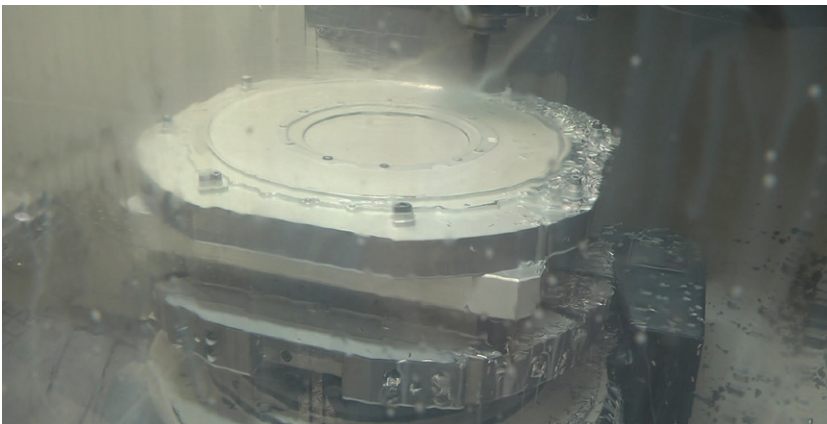
"It is very important to get the right postprocessors for each machine and then fine-tune them," says Pochciol. "Our contacts at TTL have been very helpful and continue to provide us with support whenever we need it."



Customers usually design components and send both 3D and 2D information to Manthorpe Engineering. This kickstarts a collaborative process. "A 3D model is a representation of a perfect idea of what a product should be; yet in the physical world there is variability, so we need to draw on our expertise and knowledge of the customer's requirements to understand what tolerances are allowed," comments Pochciol.

## Delivering better value to the customer

The design evolves as Manthorpe Engineering adds specialist expertise to improve manufacturability and shorten timescales. "One of the first things we do using NX is to make sure that we can optimize the design for manufacture," adds Steve Lee, a manufacturing engineer at Manthorpe Engineering. "Time on the machine is money and if we can find any areas of the design that can be improved, we have a conversation with the customer, interrogate the model in NX and manipulate certain features if necessary. We can iterate with the customer very quickly to ensure that the production process is the most cost effective and time efficient."

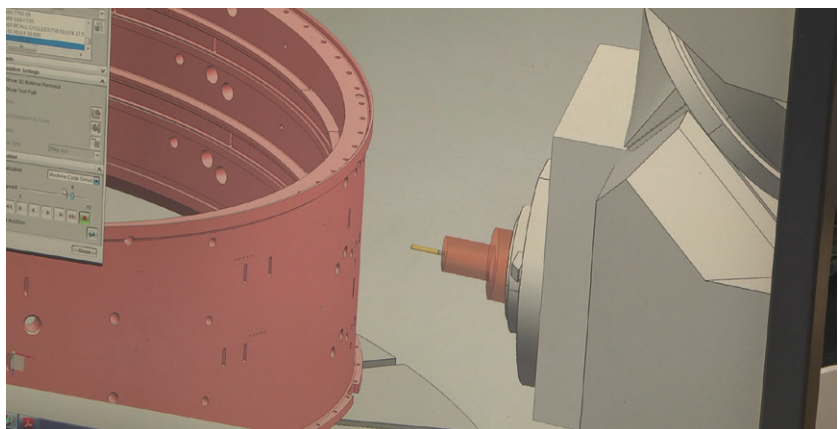
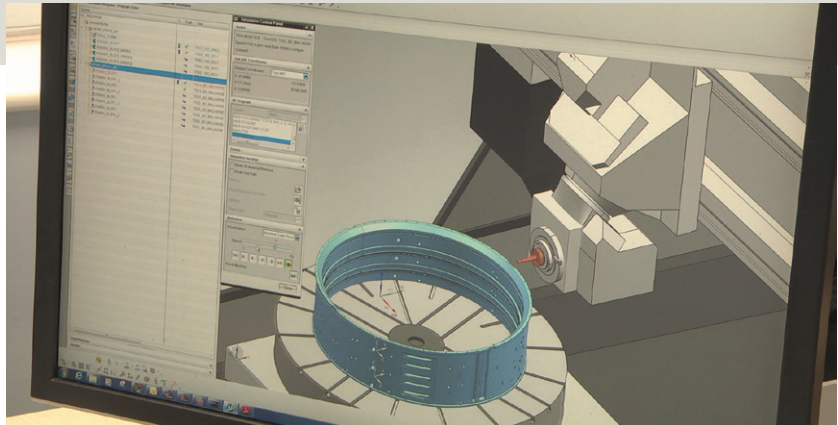


Lee collaborates with colleagues to plan the manufacturing schedule and programming of machines, which run day and night. "We use information gained from NX to apply times to each tool path operation. Even at a very early stage, before we have won a contract, we can gain a clear idea of how long a job will take to complete and can let our estimators in the sales department know. Once we have actually won a job, we use the information from NX to define the manufacturing method and set up the machining program to select the right tools."

#### Placing curves and flows in the right place

"The components that we receive frequently incorporate smooth, flowing lines involving very complex geometry," says Lee. "It would, for example, be impossible to accurately reproduce certain irregular shapes without 3D capability and the manufacturing control that it gives us."

"The CAM software I used previously would not have been able to handle the complexity of the parts we tackle. A key benefit of NX is the ability to keep track of, and graphically represent in 3D, the in-process state of a workpiece relative to the raw material stock. This is critical for effective mill-turning strategies. NX CAM automatically generates an in-process workpiece to provide seamless transfer of workpiece configurations between milling and turning operations."



"The strength of NX is that it is very easy to compare the model of the raw material prior to machining with the finished product. After the programming of any tool path, NX gives a visual representation of the material that has been removed and any that is left. This means that we are constantly up to date with the amount of metal the program will remove and also the amount remaining."

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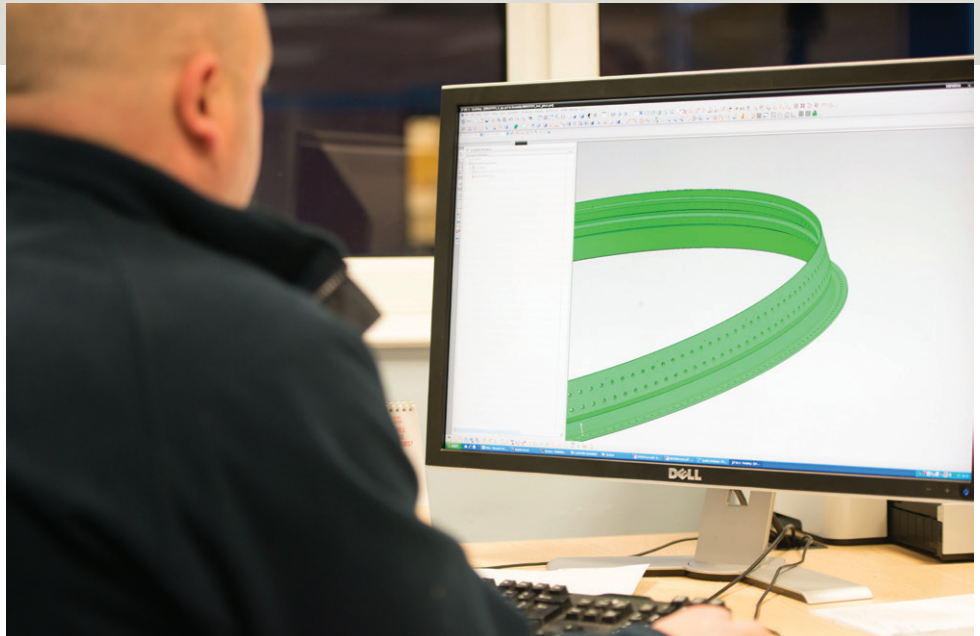
Steve Lee  
Manufacturing Engineer  
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“An exact fit is very important, particularly when we have valuable parts on a machine. NX is the best tool we can have; it gives us complete confidence in the outcome and saves time and money.”

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Serving many customers in the aerospace industry, Manthorpe Engineering has a strong quality assurance ethos. Quality processes are thoroughly embedded because the company has to show that it has achieved a target and that it can repeat a methodology. NX is fundamental to this process. Lee notes: “We provide the NX model to our CMM so that we verify a product against that model. The CMM will define the key characteristics of the model and check these in the physical product.”

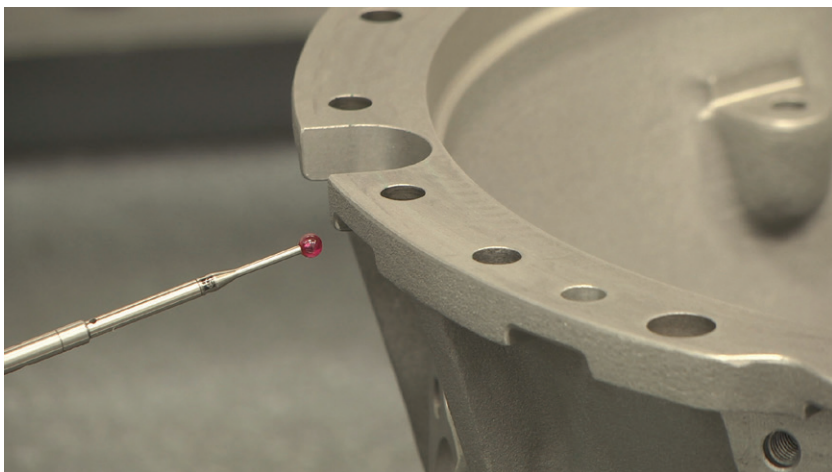
Training is also very important at Manthorpe Engineering, which is encouraging machinists to learn NX. Lee was a machinist before he began learning CAM

and, over the years, has used various software applications: “NX enables complexity yet it is really easy to pick up and a machinist can learn programming very quickly.”

#### **Using simulation to test accuracy before cutting**

NX is the tool that brings planning and production together at Manthorpe Engineering. This is particularly important when the team is handling delicate or expensive materials. “When we are working with a tricky material like titanium at a diameter of 3.4 meters, we cannot afford any mistakes during machining so we run a simulation of the tool path first,” says Pochciol.

The integrated machine tool simulation is driven by output from the NX postprocessor rather than just tool path data, so NX facilitates a higher level of program validation. In a virtual environment, NX shows the complete machine, fixtures and tool as it runs through all the movements on the component. That allows both planners and machinists to confirm that there are no clashes, no cuts in the wrong place and minimal waste material. Lee adds, “An exact fit is very important, particularly when we have valuable parts on a machine. NX is the best tool we can have; it gives us complete confidence in the outcome and saves time and money.”



### Solutions/Services

NX CAD  
NX CAM  
[www.siemens.com/nx](http://www.siemens.com/nx)

### Customer's primary business

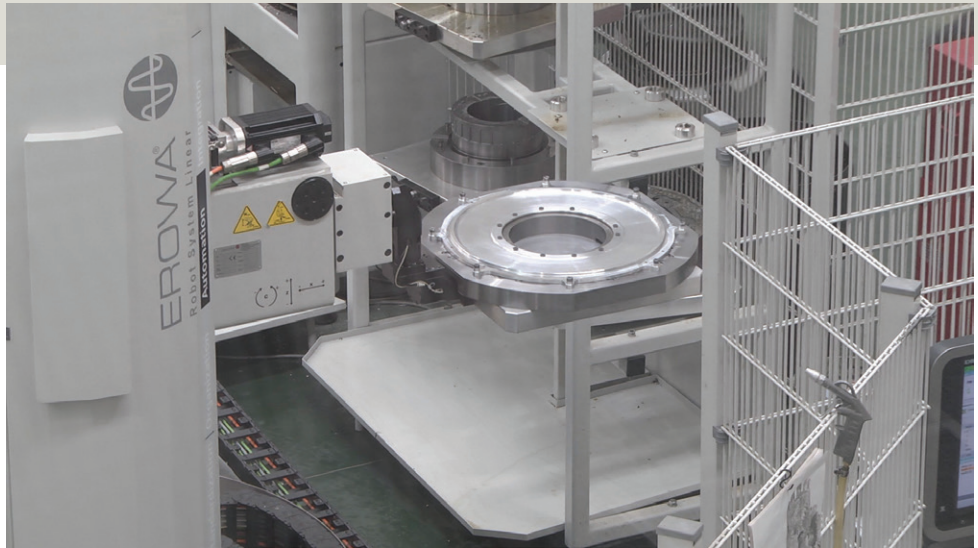
Manthorpe Engineering specializes in the machining of difficult-to-manufacture, performance-critical components from a complete range of aerospace alloys, both ferrous and nonferrous, including exotic alloys such as Nimonic, Inconel, Waspaloy and titanium. Machined components range from small prismatics to rings and casings up to three meters in diameter.  
[www.manthorpe.co.uk/engineering.html](http://www.manthorpe.co.uk/engineering.html)

### Customer location

Derby  
United Kingdom

### Partner

TTL  
[www.ttl-solutions.com](http://www.ttl-solutions.com)



Whether the product measures six inches or over three meters, the outcome is attainable because NX handles any differences in size and scale. In addition, it enables effective management of schedules. During a simulation, if the team discovers that a job runs smoothly but not within the anticipated time, there is flexibility to make adjustments. "NX gives us a full picture of what to expect before a product goes onto the shop floor. It also provides the reassurance that we are using our machines optimally," concludes Lee.

### A smarter way of working

"We differentiate ourselves by specializing in the technically challenging side of manufacturing and stay ahead by investing in our machinery and our people," says Pochciol. "There is no way we could create the shapes we now do without NX. It is an enabling technology for modeling and developing complex methods of manufacture, and it allows us to work in very close partnership with our customers. We have strong ambitions for the future and, along with the skill of our engineers, NX is central to our business."

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Business Director  
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