

Getting to Know:

Matthew Tongue, Norbar Torque Tools Ltd

Introducing maxon's new series of customer interviews.

By Karen Whittaker

- **Tell us little about your background. How did you come to the industry?**

I started out with a degree in Industrial-Product-Design from Coventry University in 2002. In 2009 I came to Norbar and have been working ever since in the Product-Realisation-Team (PRT). The purpose of this specialist team is to focus purely on the design and development of Norbar's new products, unburdened by the day to day engineering tasks, which now means that time-to-market has been improved significantly. PRT is a great place to work – we generate design concepts based on the latest technologies and materials, and then develop the product right through into production, including tooling and calibration rigs.

Some of the calibration rigs can be more complicated than the tools themselves. Our latest project required one such rig, fortunately maxon were able to offer the products and support needed to help the rig meet the high technical specification required of it.

- **Tell me a bit more about your company.**

Norbar is the world's leading torque specialist, devoted exclusively to the design, development and production of torque tightening and measuring equipment. We have two factories in Banbury employing over 200 people. In addition to this Norbar has

companies in Australia, North America, China, Singapore, New Zealand and we have just opened Norbar India.

- **What was the application for maxon products within Norbar?**

The latest addition to our product range is an electronic torque wrench named NorTronic®. When we talk about an electronic torque wrench we mean a battery powered wrench containing sophisticated electronics coupled to an integrated torque measuring device, in this case a strain-gauged beam. The electronic interface allows the operator to set a predefined 'target' torque, then when the wrench is in use it can communicate in a number of ways to alert the operator when the desired target torque has been reached.

In addition to this, thousands of results can be stored in the wrench and then downloaded to a PC via USB or the Wireless transmitter. Once downloaded to the PC our software developed specifically for NorTronic® users will allow the results to be analysed and recorded.

An important feature of the NorTronic® is its ability to measure the angle through which the wrench has been turned (via a gyro chip). This is essential for applications where bolt tension is critical as many engineers prefer the more reliable 'Torque and Angle' method over torque only.

It was this aspect of the NorTronic® which threw up the interesting challenge of providing a calibration rig which could be used in production to set and check the angle measuring capabilities of every wrench, and it was this rig which required the use of Maxon products and support.

- **Why do some people use 'Torque and Angle' when tightening a bolt rather than torque alone?**

When you tighten any bolt what you're really aiming to do is create a tension in the bolt, essentially to stretch it slightly like a spring to create a clamping force. Measuring

the torque used to tighten a bolt is a very common and relatively simple way to establish how much tension has been created in the bolt, but it can be affected by a number of factors, mainly friction. Many people don't realise just how much torque goes into overcoming the basic friction in the thread and under the bolt head. By lubricating a bolt you can drastically reduce the amount of torque required to induce the same load.

Engineers now eliminate much of this uncertainty on critical joints by only relying on torque for the initial part of the tightening sequence (known as the snug torque). The second part of the sequence is a rotation through a pre-defined angle. If the pitch of the thread, angle of rotation, and mechanical properties of the bolt are known then the induced tension in the bolt can be calculated. Hence the need for many operators to be able to set a torque and angle tightening sequence on their NorTronic®.

- **Why did you choose to work with maxon motor?**

We chose maxon products because we had used them on previous test rigs, some of which are used continuously in production, so we know they are reliable. In this application, it was maxon's ability to offer us a complete solution (DC motor, plating gearhead, EPOS motor controller and software) and excellent support that saved us time.

The calibration rig itself is essentially a rotating arm, onto which the wrench is placed. The key aspect of the rig is accuracy. The calibration process sees the wrench put through a number of tests. During these tests the angle of rotation and angular speed must be tightly controlled. The arm is driven by a maxon DC motor, gearhead and the EPOS controller has enough inputs/outputs to be able to control the whole rig.

Throughout the Angle calibration rig design and build process Mark Gibbons, Technical Engineer at maxon motor uk, was a huge help. We came up against a number of problems, mostly created by our attempts to achieve a very high degree of

angular accuracy in the rig. At one stage we had to fit an auxiliary encoder into our system and Mark was able to help us integrate it with the controller and EPOS software. Mark was also able to help later on in the project when we were writing our own in-house software with operator interface to control the Angle-rig.

What were the issues for you Mark?

Norbar required a high degree of accuracy and a high torque from a compact envelope. To produce the torque required in such a small space the planetary gearhead and brushless permanent magnet servo motor seemed a logical choice. The DC motors were fitted with maxon encoders, but Norbar's very high position accuracy requirements meant that the inherent gear backlash in the 706:1 drive chain would not deliver the positional accuracy required. The EPOS2 50/5 controller supports a dual control loop to overcome backlash and lost motion in the drive chain, facilitated by the use of a second encoder from Scancon on the output drive. Norbar wanted the motion to be very slow and gentle. The EPOS facilitates sub 1 rpm speeds to the 3rd decimal, this combined with a high line count encoder made the slow motion possible. Ian Broome, the software engineer, used their own master controller via USB, facilitated by windows DLLs he wrote the C++ code for the control sequence quickly with a little guidance.

- **What have been the highlights and lowlights of the current project?**

The highlight of the NorTronic[®] project has been bringing technologies new to Norbar (wireless transmission, gyroscope angle measurement) together with our tried and tested strain-gauging expertise to create a product that we are proud of.

The lowlight of the NorTronic[®] project would have to be the complexities of international wireless frequencies; it's taken a lot of work to understand the regulations of various countries.

- **How do you see the industry evolving over the next 5 years?**

Traditionally Norbar have had a range of electronic products alongside an array of mechanical products. With the newly launched NorTronic® and EvoTorque® we are seeing a trend towards electro-mechanical tools, and I think the future of our products lies here. We've learnt a lot about wireless transmission of data and I can see other tools in our range benefiting from this technology in the future.

- **Additional material**

YouTube video - launch of NorTronic®:

<http://www.youtube.com/watch?v=orMffbIY3Yc>

NorTronic® on our website:

<http://www.norbar.com/NorTronic-TorqueWrenches-54-1-369-range.aspx>

If you are a maxon motor uk customer and are interested in participating in maxon's Getting to Know series, please contact me on Karen.whittaker@maxonmotor.com or 01189 733 337.