ABERLINK
Innovative Metrology

Case Study

Automotive Case Study 03/2016

Company: **GKN Plc**

Zenith too

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As with many of the advanced automotive technologies that have become commonplace within automotive transport, hybrid flywheel technology, known as Kers in the F1 world, was developed in the world of motorsport. Through development in this fiercely competitive arena, Hybrid Power has developed a system that can deliver high, continuously cycling power output over an extended operating life, which far exceeds that of current, battery based hybrid applications.

Acquired by GKN Plc in April 2014 from Williams Grand Prix Engineering, GKN Hybrid Power is at the forefront of hybrid flywheel technology. GKN Hybrid Power now makes the advanced technology available to applications such as hybrid buses and other passenger and commercial vehicles to improve fuel economy and reduce emissions. The Hybrid Power team, based in Oxfordshire, UK has already introduced the advanced technology into applications as diverse as London buses and the Le Mans winning Audi R18 e-tron Quattro.

The GKN system has a number of unique features. The core of the hybrid system is the Magnetically Loaded Composite rota, which provides a highly efficient electrical energy storage capability which is both cheaper and lighter than batteries. Compared to a battery, the electric flywheel has a much higher specific power density. This means that for applications that require relatively short bursts of energy at a higher power, the flywheel system is a fraction of the weight, volume and cost (by as much as a third) of a battery. The benefits of the low carbon certified system include minimal re-engineering requirements and up to 25% fuel improvement.

In addition to the ingenious design of the GKN Hybrid Power hybrid flywheel technology, the systems efficiency is dependent on the high precision of its manufactured components.

Chris Tye, Operations Manager at GKN Hybrid Power, explained “GKN Hybrid Power’s Gyrodrive electric flywheel technology is a Kinetic Energy Recovery System (KERS). When a vehicle brakes, it harvests the energy normally lost as heat. The flywheel stores the energy and returns it to the wheels on demand, boosting power, saving fuel and reducing emissions. When the driver brakes, a traction motor within the drivetrain slows the vehicle and by doing so generating electricity. This electricity is used to charge the flywheel, spinning it at up to 36,000rpm. When the driver accelerates, the system works in reverse. The stored energy is drawn from the flywheel and converted back into electricity to power the traction motor. This action reduces the work done by the internal combustion engine and, depending on the application, improves fuel economy by up to 25%.

“Our system can continuously deep cycle at high power without the longevity concerns for batteries when operated similarly, it can also operate through a broader range of operating temperature when compared to battery alternatives, in addition, full cycle life costs are lower.

“Given the loads placed on hybrid flywheel technology and the punishing environments it is designed to work in, all of GKN Hybrid Power’s components are manufactured to the highest quality standards, also, many of them have challenging dimensional tolerances.

“The commercial success and increasing demand for our hybrid flywheel technology recently began to place a burden on our existing manual Coordinate Measuring Machine. So before we started to encounter inspection bottle necks we began a search for a second, larger, CMM that was more capable had the benefit of CNC operation.

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"Having considered machines from several companies, including the manufacturer of our existing CMM, we decided that Aberlink's Zenith too, fitted with a Renishaw PH10M motorised indexing heads and SP25 scanning probe system, was the ideal CMM for our growing needs. In addition to accommodating all of our existing parts, the machine's large capacity - x1000 mm x y1000 mm, z 600 mm, will enable it to accept all anticipated future large components.

"As the Zenith too is so easy to operate and Aberlink's software is so intuitive, following a brief training session, our operators quickly became proficient in the machine's operation. As our new Aberlink CMM is fully CNC, within 3 weeks of its installation, our CMM operator had written over 100 part programs related to our most common components. Now, we are able to load a single large part or multiple smaller components onto the bed of the machine, recall the relevant program, and with the press of a button instigate a fully automatic CNC measuring routine."

Manufactured by Aberlink Innovative Metrology, the largest UK owned Coordinate Measuring Machine manufacturer, the Zenith too Coordinate Measuring Machine range consists of 10 machines with XYZ capacities from 1000x1000x600mm –1000x3000x800mm.

The Zenith too's cutting edge, all aluminium construction, advanced drive design and raised guide-ways ensures that despite its choice of generous measuring envelopes, the machines' extremely low inertia characteristics guarantees excellent speed of operation. Impressive accuracy and repeatability figures are further aided by the range's measuring structure being completely independent of the machine's granite surface table. Although the large capacity series is perfectly suited to use within environmentally controlled inspection environments, it is on the shop floor where the Zenith too range's low thermal mass and extremely robust characteristics come to the fore, enabling the accurate measurement of large parts, or multiple smaller components to take place nearer to their point of manufacture.

The impressive hardware of the new Zenith too is complemented by the range's intuitive Windows based software. A welcome bi-product of any Zenith too CMM inspection routine is that a simultaneous picture of the measured component is created in real-time on the operator's computer screen. Dimensions between the measured features, mirroring those that appear on the component drawing, are then picked off as required. In essence Aberlink's 'smart' software represents an intelligent measuring system that is able to automatically recognise and define the various features being measured. Aberlink 3D is claimed to be the easiest to use CMM software currently available, so much so, that a complete novice is usually able to perform relatively involved measurement routines after just 5 minutes training.

Aberlink supply a complete Zenith too 'turn-key' package, including a comprehensive training programme, a wide choice of motorised or manual probes, Aberlink's celebrated 3D software and not least the latest generation of high speed custom controllers, that are capable of generating true, three dimensional contours.

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