

Customer Success Story

KOLLMORGEN PARTS PUT BRD IN POLE POSITION

Formula One racing teams demand the highest performance from every single component, which is why motion system specialist, Ball Racing Developments Ltd, uses high quality parts supplied by Kollmorgen. Together with BRD's expertise, the company's components help the systems accurately simulate the motion required to help train budding Formula One drivers.

After many years of evaluation and working with a range of motion systems for various clients, Surrey, UK-based Ball Racing Developments Ltd (BRD) came to the conclusion that there was nothing on the market that could provide the accurate simulation of a car's motion.

For this reason, the company commenced the development of a new type of system dedicated to the motions experienced in a car, particularly the high velocity forces of a Formula One racing car. Such a project would have a wide range of potential markets, including racing driver training, high end entertainment applications, and private owners with high levels of disposable income.

The first of this new generation of dedicated driving motion systems was released in November 2007 and sent to a casino in Macau that wanted accurate motorsport simulators as part of its entertainment offering to clientele.

"We were unhappy with the delivery of timescales and the performance of the equipment offered by our existing supplier of motion control products," explains company director Nick Ball. "We therefore invited new tenders for the subsequent build round from which we hoped to source a more compact and higher performing motor solution."

This specification was ultimately fulfilled by AKM-7 and AKM-6 brushless AC servomotors from Danaher Motion company Kollmorgen.

"AKM motors offer 0.16 to 53Nm torque and speeds up to 8,000 rpm in a compact housing that gives customers impressive power density capabilities," states Danaher Motion's UK sales manager

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FAST FACTS

Application:

Racing Simulators

Produkt-Lösung:

S600/S700 Servodrives
AKM™ Servomotors

Client Since:

2007

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About Kollmorgen

Kollmorgen is a leading provider of motion systems and components for machine builders around the globe, with over 70 years of motion control design and application expertise. Through world-class knowledge in motion, industry-leading quality and deep expertise in linking and integrating standard and custom products, Kollmorgen delivers breakthrough solutions un-matched in performance, reliability and ease-of-use, giving machine builders an irrefutable marketplace advantage.

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Brad Storey. "This is an important factor to BRD, where any weight savings can provide significant benefits to performance and reaction times. The AKM motors were approximately half the size of the competitor products they replaced."

With one motor required for each degree of freedom on the new BRD V1-500 motion platform, one AKM-7 motor was supplied to provide movement in the surge direction (forward and backwards acceleration and deceleration), while AKM-6 variants were supplied to provide motion in the side slip (side-to-side lateral thrust) and yaw (angular motion in the horizontal plane) directions. Yaw is an integral and unique function of the BRD system that is achieved by changing the centre of rotation between the front and rear wheel positions.

Each motor is served by Kollmorgen's latest S700 AC servo drive, a fully digital servo amplifier that is ideal for complex drive tasks. Fast feedback evaluation and best-in-class control circuits support high performance applications.

In light of the fact that a growing number of engineers are moving towards Ethernet-based communications such as EtherCAT and SynqNet, Kollmorgen has geared the S700 to the future by integrating an Ethernet connection into the new drive. The S700's onboard interface means that customers such as BRD no longer have to rely on additional expansion cards for this kind of compatibility.

With the next two motion platforms bound for Singapore, where they would be used to promote the first Formula One Grand Prix held in the country (also Formula One's first night race) during September 2008, time was of the essence. Now convinced by the performance credentials of Kollmorgen's motor and drive technology, it made sense to include ballscrew and bearing systems in the same package, a decision that would minimise lead-time and simplify the build process.

"There are a bewildering number of motion control products on the market, but the concise and easy-to-understand Danaher Motion family of products helped to ease any confusion," says Mr Ball. "This proved essential to the success of the project and we managed to complete two V1-500 BRD motion platforms in just 10 weeks from signing the order, including design, build and installation."

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The actual movement of the Formula One car mounted on the motion platform is provided by three 40mm x 40mm ballscrews of Danaher Motion company Thomson. All are the same length for commonality purposes and each offers 1.2m of travel.

Thomson ballscrew assemblies consist of a screw with a precision ground or rolled helical groove, a nut (the outer race) with an internal groove, and a circuit of precision steel balls that re-circulate in the grooves between the screw and nut. This anti-friction design converts torque to thrust as either the screw or nut turns and the other component moves in a linear direction. All of Thomson ballscrews were supplied to BRD with a high lead, which is necessary to generate the 1m/sec acceleration required.

Complementing the ballscrews is a Thomson Profile Rail 500 series ball/roller linear guide system. These highly configurable ball and roller guidance systems are designed in accordance with DIN standard 645-1 to support a load and allow low friction linear translation of that load.

The linear guide bearing systems were supplied to BRD with an option to plate with thin-dense chrome (TDC) in order to withstand the exceptionally humid atmosphere in Singapore. The original units operating in Macau (featuring non-Danaher Motion products) already have signs of corrosion due to humidity.

All of the Kollmorgen and Thomson products supplied for use on the motion platforms were assembled by BRD's team of engineers at its Surrey headquarters, although parent company Danaher Motion provided the services of an on-site applications engineer for a few days to help set up the first system and ensure any trouble-shooting issues were quickly and efficiently resolved.

The products were supplied within a 4-6 week lead-time with full support from Danaher Motion before delivery in terms of providing product dimensions so that BRD's own products could be designed accordingly.

When mechanically complete, the two motion control platforms were linked with visual and sound technology created by BRD by mapping and modelling the Singapore street circuit. Based on BRD's netKar Pro software platform, anyone can download a free copy of the Singapore night race circuit from www.singtelrace.com and practice driving the difficult track that twists and turns it way around many of Singapore's famous landmarks. You can even post

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your lap times to the on-line leader board to see how you compare with others.

Delivered in April 2008, the two full size, full motion BRD racing simulators exclusively for Singapore Telecommunications (SingTel – race sponsor), are designed to give the most realistic racing experience short of being in an actual race car. Apparently crashing into the barriers originally produced such a sudden jolt that the effect was toned-down by BRD in the interests of health and safety. Approximately 1.5 to 2.0 G-force is generated in each axis of motion by the platform. As an added safety measure all drivers have to wear a four-point racing harness.

The two BRD simulators have been available to the general public to test drive at various venues around Singapore in the build up to September's Formula One Grand Prix.

Although high end entertainment has provided the original applications for this exciting technology, there has also been plenty of interest from racing teams, and with very encouraging feedback. A leading Formula One driver has already tested the V1-500 (the same model as those supplied to Singapore) and managed to reduce his lap time by up to 0.7 seconds with the motion system activated. This provided the driver with greater 'feel' for effects present in a real racing environment such as under-steer, over-steer, weight transfer and braking, and helped improve his reactions. It is even possible to wheel-spin through rapid oscillation of the Thomson ballscrews, an effect not achievable on the original units supplied to Macau. Since then, several other Formula One teams have also tested BRD's V1-500 simulator.

"The potential for V1-500 in the racing world is huge," concludes Mr Ball. "We already have plans to build a driving school that could feature as many as 20 networked simulators so that budding racing drivers can be taught to improve their driving skills and race against each other."

Ultimately, BRD's new motion platform is helping to fulfil the company's aim of making motorsport, often a prohibitively expensive sport, accessible to its millions of fans around the world.

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Picture 01



Picture 02



Picture 03



Picture 04



Picture 05

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