ON THE MOVE

The Newsletter of PBR International Limited August 2006

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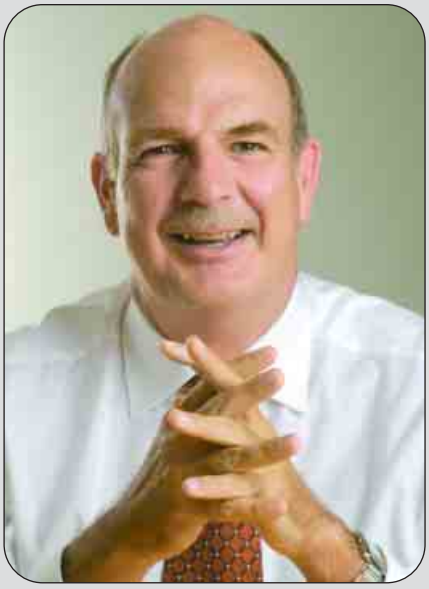
Introduction



John MacKenzie
Managing Director

Welcome to the latest edition of *On The Move*. One of the most rewarding moments for PBR is when we have the opportunity to showcase our latest technologies to the broader industry.

It is with great pride that we acknowledge the recent silver SAE-A award for Engineering Excellence. We are constantly challenging our talented engineers to develop products which will enhance the driving experience and once again they have delivered.

Equally, we look forward to a positive response regarding our ePark technologies which are currently touring North America in a purpose-built vehicle. This will be the first opportunity for many OEM brake designers to feel the ePark experience first hand.

Inside this edition we provide an update on the latest brake system developments PBR has delivered for a number of new model releases in the Australian market along with some exciting news of new contracts stemming from Asia.

Our effort to reduce NVH (noise, vibration and harshness) continues as we upgrade our research and development facilities to include the very latest in noise dynamometer technology.

PBR's future firmly rests with our ability to continue developing innovative products and processes around our core automotive technologies of advanced, lightweight brake products.

We hope you enjoy reading this latest issue.

John MacKenzie

Bigger brakes tame turbo Territory

The release of Ford Australia's turbocharged Territory earlier this year has certainly given SUV enthusiasts something to think about. Sales performance of the Ford Territory SUV have been strong since it was introduced in 2004 but the recent focus by Ford on lifting the performance bar has potentially opened the door to a whole new audience.

The Turbo Territory's strong emphasis on performance was a perfect fit with PBR's expertise in developing high performing brake systems for production vehicles.

The Turbo Territory range uses a 245kW six cylinder engine and incorporates a new 6 speed automatic transmission. As a result of the increased power, PBR has reconfigured the brake package to deliver more stopping power over the front wheels.

The new PBR brake package features massive 340mm front rotors and twin-piston calipers which are neatly packaged into sporty 18in alloy wheels. The balance of the brake package incorporates PBR rear calipers and rotors as well as the actuation system. The upgraded package delivers a 10% increased thermal capacity over the standard Territory giving the Turbo model range stable and reliable braking under the most extreme conditions.

Further improvements have been made to the pedal feel of the Turbo Territory, through an upgraded front caliper and tuning of the brake booster, giving the driver even more confidence in the new Territory's stopping power.

An extensive testing program including vehicle and noise dyno work has resulted in an exceptionally quiet brake package – difficult to achieve with high performance brakes. Early reviews of the vehicle noted the braking performance as remarkable, even more so when considering the vehicle's size.

M-Series caliper shines in Engineering Excellence Awards

The importance of safety and the need to streamline production processes to remain globally competitive were highlighted at the Society of Automotive Engineering – Australasia (SAE-A) ninth annual Automotive Engineering Excellence Awards presented in Melbourne on 11 August.

This is a perfect example of the high standards PBR's Research and Development team can achieve in the pursuit of innovative braking solutions for our customers.

PBR emerged from a strong field and a record number of entries to receive a Silver Automotive Excellence Award for their high performance opposed-piston brake calipers, known as M-Series.

The award was received by PBR's Graham Scull, General Manager Product Design and Development. "This is a perfect example of the high standards PBR's Research and Development team can achieve in the pursuit of innovative braking solutions for our customers," said Graham. "We needed to come up with a brake package that would blitz the opposition, and we did that."

PBR's M-Series brake calipers have been developed in four and six piston variants after extensive research and benchmarking of alternative products. Key design shortfalls in the competing brake calipers were identified and improved upon in the final M-Series design.

One of the key features to emerge from this approach was the development of separate disc pads per piston, which eliminates tapered pad wear that can cause piston jamming and brake failure. The ultimate proof of the M-Series' success was testing it at the Nurburgring circuit in Germany on the latest Z06 Corvette – the 7.43 minute lap time comfortably beat the 8.00 minutes required for "super car" status.

The M-Series caliper features one disc pad per piston.

SAE-A president, Max Gillard, noted that the awards recognised excellence in automotive engineering, manufacturing, product design and quality to encourage higher industry standards. "The conferring of an SAE-A award signifies that the recipient organisation is a leader in its field," he said.

This is not the first time PBR has received an SAE-A award for Engineering Excellence. In 2000 they received a gold award for their development of the Banksia park brake and in 2004 another gold award for the ePark family of electric park brakes.

Graham Scull receiving award.

NVH research enhanced

One of the cornerstones of today's better performing brake systems is the management of NVH (Noise, Vibration and Harshness). As vehicle designers change the ride and handling dynamics of a vehicle it often has a flow-on effect to the brake system which must then be tuned to minimise potential noises such as squeal, graunch and groan.

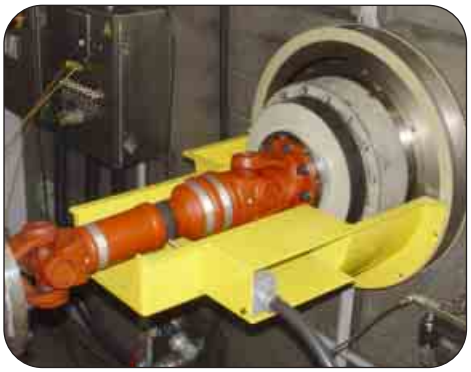
The optimum position for brake system designers is to have full control of the brake corner module, consisting of knuckle, disc rotor and brake caliper. This allows each element of the system to be tuned as part of the whole which ultimately delivers much better overall performance.

As part of PBR's commitment to deliver the latest in NVH research a new Link model 3900 NVH brake dynamometer has been installed at their research and development headquarters in Melbourne, Australia.

Noise dynamometers play a key role in the measurement of brake related noise under a range of operating conditions. Highly sensitive microphones detect specific types of noise under controlled conditions which can then be analysed to determine potential countermeasures.

PBR's latest noise dynamometer incorporates full environmental control (–30°C to 50°C and 20–90% relative humidity), semi-anechoic chamber that minimises background noise (<60dBA) and state-of-the-art data recording and analysis software.

PBR is acknowledged as one of the industry leaders in the field of NVH research and has been recognised by industry bodies such as the SAE (Society of Automotive Engineers) for their outstanding research papers and contribution to the overall improvement of NVH in brake systems.



Noise dyno on test

Latest Camry heralds new era for PBR

It's an exciting prospect in any business when you take a step forward which leads you closer to controlling your own destiny. And that's exactly what PBR has done with their product offering for the fresh new Toyota Camry which is just hitting the dealer showrooms in Australia.

PBR accepted the challenge by taking full development responsibility for NVH.

Toyota Australia set themselves a significant goal – to break the mould on consumer perceptions of what the Camry vehicle is all about – and as the first vehicles roll off the production line they are certainly raising some eyebrows.

Early in the Camry's development Toyota's vision and high expectations were cascaded down to their supplier base and the challenge issued to go that extra step in making the new generation Camry a success.

PBR accepted the challenge by taking full development responsibility for NVH (noise, vibration and harshness) in relation to brake system development. As part of that commitment, PBR also accepted manufacturing responsibility for the knuckles and carriers in an effort to improve the level of control over the brake corner harmonics.

Whilst PBR has been supplying brake corner modules to vehicle manufacturers for some time now, the new Camry has provided the initial step into developing state-of-the-art manufacturing facilities for the production of knuckles and carriers.

Incorporating the very latest in manufacturing technology, PBR's new knuckle and carrier production facility in Melbourne, Australia, is a highly automated example of the company's ability to develop unique production facilities from the ground up in response to customer challenges.

Based on a casting-to-customer philosophy, where there is no human interaction during the machining process, 120 metres of conveyer link eleven intuitive robots and a series of machining centres as up to 2,200 parts per day are processed.

Handed castings are paired on intelligent pallets which are fitted with radio frequency ID tags so that the system knows where each component is at all times.

The new Camry brake system delivers a significant improvement in brake performance through a shift to larger disc rotors and modified brake calipers resulting in improved stopping distances and better pedal feel.

PBR's commitment to fine tuning the new Camry brake system was evident in the 1,700 hours of rigorous vehicle testing undertaken at the Anglesea proving ground and the 8,000 hours of noise dyno testing along with an extensive rig and performance dyno test program at PBR's development facility in Melbourne.

The complete PBR brake package for the new Camry consists of front and rear brake calipers, front and rear disc rotors, Banksia park brake, front knuckle and rear carrier.

The new Camry also acknowledges the confidence that Toyota globally has in PBR's brake system expertise through the expansion of the contract to include Camrys built for the significant Middle East export market.

Banksia finds new U.S. Ford via Japan

In October this year, Ford will commence production of two exciting new crossover vehicles – the Ford Edge and the Lincoln MKX – both of which will feature PBR's unique Banksia park brake.

Whilst the Banksia park brake has experienced a great deal of success in North America, largely through GM light truck platforms, the circumstances through which the Banksia has found its new home with Ford demonstrates the true global nature of PBR's business.

Ford's decision to include Banksia on the Edge and MKX programs stems from a link to the Japanese produced Mazda MPV platform – the basis for the new Ford vehicles – where a locally produced Banksia park brake has been running for some time.

The production of Banksia park brakes in Japan is facilitated through a PBR Technology licensing agreement with Japanese brake manufacturer, JBI. Under this arrangement, JBI assumes design responsibility for developing the final product incorporating the patented Banksia technology.

The licensing of PBR technology to key partners around the globe is an important part of PBR's overall commitment to improving brake system performance and enables a wider spread of vehicle manufacturers access to leading-edge technologies such as Banksia.

The Banksia park brake is unique because of its single-shoe design which improves overall park brake performance whilst reducing weight and product complexity.

Lincoln MKX

Ford Edge

ePark™ on show for U.S. OEMs

There's only one way to really appreciate the outstanding performance of PBR's award winning ePark™ electric park brake system – take it for a drive.

ePark™ delivers a significantly improved driving experience

With that in mind, PBR has fitted the latest ePark™ brake-by-wire technology to a Dodge Ram as part of a North American road show for leading vehicle manufacturers including Ford, DaimlerChrysler and GM.

The installed system is known as an ePBHC (electric Park Brake Hydraulic Caliper) where the electronic park brake mechanism is integrated with a PBR slimline aluminium brake caliper.

Rising fuel prices are driving vehicle manufacturers back to the design studio "in search of solutions which will reduce vehicle weight whilst still providing the level of enhancement and technological advancement that consumers have come to enjoy over recent years.

PBR's ePark™ system typically reduces vehicle weight by around nine kilograms and can operate with a lighter suspension, significantly enhancing fuel efficiency.

In addition to significant mass reduction the ePark™ system eliminates the complexity and inefficiency of park brake apply cables and replaces them with a virtually instantaneous apply mechanism with response times of less than one second.

With the consumer in mind, ePark™ delivers a significantly improved driving experience through features such as *auto-apply, drive-away-assist* and tailored *anti-theft* systems.

During a recent showcase in Europe, ePark™ was acknowledged by brake-by-wire engineers as the smallest, lightest, quietest and fastest by-wire park brake solution to have emerged in recent times.

Dodge Ram

ePBHC – incorporating ePark technology

Around the globe

DOOR OPENS TO LOCAL CHINA MARKET

PBR's expansion into the Asian region through a local presence in China is starting to bear fruit with the first contract to supply the domestic Chinese market now awarded.

PBR's cast iron foundry in Dalian is focussed on producing high quality safety critical items such as brake components, knuckles, disc rotors and transmission components. The new contract, which commences towards the end of 2006, will see the foundry produce approximately 250,000 transmission yokes annually for local company Shunguang Axle.

There has been an increasing level of interest from local and global manufacturers in the foundry's capabilities and further casting component business is expected in due course.

The award of this latest business demonstrates PBR's ability to compete in the Asian market with high quality product at competitive pricing.

The cast iron foundry has a designed capacity of 45,000 tonnes of cast iron per annum and will shortly be complimented

by an aluminium casting foundry to support PBR and the global automotive industry's drive for lightweight components.

Oz industry update

New vehicle models and pressure on fuel prices are the two key factors currently shaping vehicle sales for the Australian automotive industry.

So far this year motor vehicle sales are down 3.1 per cent from record 2005 levels.

With two of Australia's leading locally made models – Holden Commodore and Toyota Camry – in the midst of significant new model releases there has been a lot of activity surrounding old model runouts.

Sales figures for June and July have been relatively strong according to FCAI chief executive Peter Sturrock. With that in mind the FCAI are still predicting that the end of year sales will finish around 980,000 units.

The market is still leaning towards smaller vehicles as fuel prices remain high however market competition on the back of new model releases is likely to stimulate further activity in the larger vehicle sector.

Toyota remains the top selling vehicle brand following another strong sales month leading Holden and then Ford.

New VE Commodore improves ride and handling

The recent release of Holden's new VE Commodore has certainly given motoring writers something to get excited about. Holden's latest offering is bigger, heavier and more powerful than the outgoing Commodore but reportedly offers better fuel economy and a more comfortable ride.

Vehicle dynamics were improved through the introduction of *Linear Control Suspension* and the development of a new brake package.

PBR was set the target to improve fade resistance and pedal feel when developing the new brake system in an effort to deliver a more satisfying driving experience.

Stiffer aluminium brake calipers and larger vented disc rotors form the basis of a system which reportedly delivers a five per cent reduction in stopping distance. Coupled with an increase in disc pad area, the new brake system is more fade resistant and provides a stiffer brake pedal feel.

The VE Commodore also represents a milestone for PBR, making it the first Commodore with a complete PBR foundation brake system. Following the success of PBR's disc rotor business on Toyota Camry, Ford Territory and Mitsubishi 380, PBR has commenced production of the Commodore disc rotors in their Lonsdale facility in South Australia.

VE Commodore

By assuming full control of disc rotors as an integral part of the brake system development PBR is in a better position to fine-tune the intricate dynamics of the system's performance.

Rotor production at Lonsdale