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Introduction



Vince Joy
Vice President Sales and Marketing
PBR International

Welcome to the latest edition of *On The Move*. PBR is currently involved in a great deal of activity as we prepare for new contracts commencing in 2006.

New manufacturing facilities located in Thailand and China have commenced production and new contracts for the China plant have been secured.

In Europe, AP Italia's growth continues with the commencement of new drum brake production for the popular Fiat Punto. A number of new programs will commence production at AP through the balance of this year and into 2006.

In this edition we provide an update on our efforts to further develop brake-by-wire technologies. In April a paper discussing PBR's ePark technologies was presented at the SAE International World Congress

in Detroit. We are also actively testing the next generation of eMB (electro-mechanical brakes).

One of the key drivers for PBR's success has been the adoption and ongoing refinement of high-level engineering disciplines. By taking a holistic approach to the development of braking systems we are able to deliver significantly improved levels of brake performance for our customers. In this edition of *On The Move* we provide an insight into our approach for reducing NVH.

We hope you enjoy reading this latest issue.

Vince Joy

Electro-mechanical brakes hit the test track

PBR's pursuit of an electro-mechanical brake system (eMB) has taken a further step forward with in-vehicle assessment now underway. The eMB system has been developed in conjunction with PBR through their brake-by-wire research and development arm, Pacifica Group Technologies (PGT).

After successful software, electronic and mechanical development and extensive testing on the bench, the eMB has now been fitted to a development 'mule'. The light truck is currently being put through its paces at the Anglesea test track.

PBR believes that the eMB system has a bright future

Three other eMB mules, two of which were built at PBR's facility in Detroit, have been released to a development partner for further tuning, software enhancement and performance testing. Along with PBR's Detroit engineers, PGT is working closely with the development partner in building a concept car. These futuristic vehicles showcase the latest in automotive technology such as hydrogen



A development 'mule', fitted with eMB, on the Anglesea test track.

fuel cell powertrains. In using the PGT eMB system, the electrical architecture of the vehicle then allows other by-wire technologies to be integrated such as steering by-wire and chassis by-wire.

To date, all testing has been very successful and PBR believes that the eMB system has a bright future although commercialisation is still some years away.

The system comprises four intelligent brake calipers, each capable of having control over their corner of the vehicle. The calipers can individually vary the amount of clamp force

(braking torque) at each corner thereby ensuring that the vehicle has maximum stability under brakes. The 42 volt powered system is centrally controlled via an electronic control unit (ECU) which contains, amongst other items, the application software.

PBR's objective is to initially develop the eMB to the equivalent of a hydraulic brake system and then make improvements taking it beyond any current system. Advanced braking functions such as dynamic brake force distribution, traction control and driver tuneable brake feel will follow.

Designing for silence - conquering NVH

In today's world, where technology evolves at lightning speed, vehicle owners are being treated to a driving experience like never before.

Today's cars are faster, lighter, safer and quieter. For passengers the ride is smoother and more comfortable. Vehicle manufacturers have taken huge steps to eliminate such annoyances as wind noise. But the resultant hush has raised the expectations of vehicle owners and so the challenge has been laid to eliminate every last groan, moan, squeak and squeal that may exist.

PBR's approach to eliminating N&V comes from a systematic design and development philosophy

The term NVH (Noise Vibration and Harshness) is not new to the automotive industry but the critical nature of measuring and eliminating NVH issues has received increased focus over recent years.

As one of the leading brake system technology suppliers to the industry, PBR is committed to the ongoing reduction of issues relating to brake N&V (Noise and Vibration) in today's vehicles.

There are many factors that influence the propensity of a brake system to exhibit N&V. Each component; pads, caliper, rotor and knuckle, has the ability to impact the system's performance in this area. So the greatest potential for improvement comes through the ability to control the design and manufacture of these components as a single sub-system – the brake module.

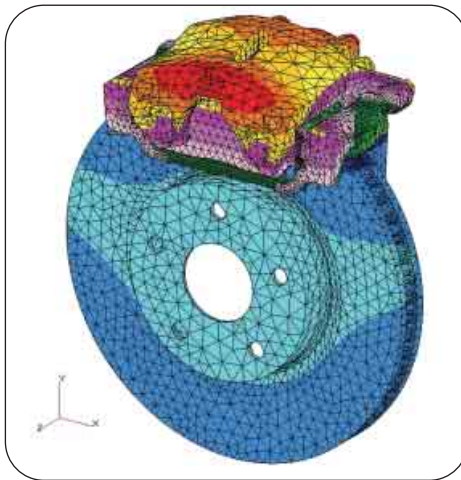
Wherever possible, PBR seeks to provide vehicle manufacturers with the optimum N&V solution by developing the entire brake module. PBR brake modules have been integrated into vehicles such as the Chevrolet Corvette and Pontiac Grand Prix GXP in North America and will appear on Mitsubishi Australia's Magna replacement vehicle, the 380, when it is released in October.

PBR's approach to eliminating N&V comes from a systematic design and development philosophy.

During the early design phase, the vibration characteristics of each individual component



A PBR noise dynamometer conducts noise testing.



Computer models are used extensively to predict noise.



are studied to minimise the potential for modal coupling between components. A full brake assembly model is then studied for squeal propensity using comprehensive Finite Element Analysis (FEA) software such as Abaqus. The analysis results then feed into component modifications so that the potential for squeal is minimised before any components are produced.

The selection of friction material is the most important phase. Here it is critical for material candidates to undergo N&V tests prior to final selection. PBR's goal is to eliminate low frequency N&V issues such as shudder, creep groan and graunch during this phase.

When friction material selection is finalised, prototype components are produced and noise testing is conducted on the brake noise dynamometer. This testing is critical as it simulates a range of environmental conditions and facilitates high level N&V evaluation early in the development program.

Final system analysis for N&V is then carried out in representative vehicles at PBR's proving ground facility at Anglesea, Victoria.

In response to the growing focus on N&V issues and PBR's increased brake module business, PBR will be significantly increasing their capacity for noise evaluation at their research and development centre in East Bentleigh, Victoria, during October 2005.

Shanghai GM awards first China contracts



SHANGHAI GM

With the first of two manufacturing facilities in Dalian, China, now producing PBR calipers and Banksia components for North American customers, the initial contracts to supply PBR brakes for locally produced vehicles have been awarded by Shanghai GM.

The first contract was awarded for the supply of front and rear brake calipers and rotors for the Buick Royaum program which will commence production in November 2006. The Royaum is a derivative of the VE Holden Statesman which is currently produced in Adelaide, South Australia.

A second contract has been awarded for the supply of rear calipers to the Cadillac STS program which also commences production in November 2006.

These contracts will help form the base for the company's growth in the Asian automotive market where local production in China will play a significant role. Work has now commenced on the construction of a foundry to complement the existing machining and assembly facility in Dalian and is expected to be operational by mid 2006.



Cadillac



BUICK



Going Green

TREES FOR CARS

PBR is pleased to announce the continuation of its association with Greenfleet Australia in the battle to control greenhouse gas emissions.



Greenfleet is a non-profit organisation which seeks to offset the impact of greenhouse emissions in Australia by planting trees to absorb the offending gases. In a world-first program,

Greenfleet invites fleet owners and individual motorists to register their vehicles at a cost of \$40 each.

In return, Greenfleet plants 17 native trees per vehicle on behalf of the owners. The 17 trees, as they grow, absorb the greenhouse gases that an average car produces in one year.

PBR has been a supporter of Greenfleet since 2002 and in that time has managed to offset an estimated 559 tonnes of greenhouse gases each year. This means that PBR's fleet is rendered "greenhouse-neutral" with more than 2,210 trees being planted annually to absorb the equivalent emissions.

To date PBR's trees have been planted in north and east Victoria as part of Greenfleet's Murray Darling Rescue project. The Murray Darling is Australia's most important river system and is suffering from salinity, erosion and other degradation. In 2005 PBR's trees will be planted near Bendigo and at the Dutton Downs in the Gippsland Lakes region.

Since 1997, Greenfleet has planted more than two million native trees in Victoria, New South Wales, South Australia, Western Australia and the Australian Capital Territory on behalf of individual motorists and fleets.

AP communicates growth at Autopromotec

Bologna, Italy, sprang to life for the European Automotive Aftermarket in May this year as the Autopromotec 2005 trade exhibition surpassed all previous attendance records with over 93,000 trade visitors attending over the five days.

AP Italia, Pacifica's European manufacturing operation, was one of 1,107 exhibitors in an industry display of the best and most technologically advanced products and services for vehicle assistance.

AP is well known in the industry as a supplier of drum and park brakes to Fiat.

AP is well known in the industry as a supplier of drum and park brakes to Fiat. However, many of the exhibition attendees, the mechanics that make decisions about replacement parts, were

unaware of AP's recent growth with new business through Ford, Nissan, Renault etc.

Autopromotec also provided an excellent opportunity to clarify the brand relationship between AP and PBR – a brand known to distributors but not as well known to mechanics.



This year's Autopromotec increased its international standing by including 352 foreign exhibitors covering 43 countries.

AP's exhibition was attended by Paolo Buriasso, Gianfranco Cugno and Gaetano Marras, the Aftermarket team; Rosaria Rigamonti, Giancarlo Obertino and agents

Tino Paggiaro, Giuseppe Fronticelli and Alfonso Poggio all of whom were very pleased with the high level of interest shown by attendees.

Detroit engineers exposed to ePark™

As car company interest continues to build for PBR's ePark™ family of electric park brakes, the broader automotive engineering community have been exposed to this unique approach to brake-by-wire at the April 2005 SAE International World Congress in Detroit.

The four-day SAE World Congress held at Cobo Centre in Detroit gathered together almost 36,000 attendees from 47 nations.

At the heart of these products is a trouble-free, robust, small and exceptionally quiet actuator.

PBR was honoured to take part in the Society's 100th anniversary by presenting a paper by Nui Wang and Dennis Plunkett on the ePark™ electric park brake family.

This comprehensive paper details the challenges posed by hidden system interactions and the solutions that PBR created while developing its future product range of by-wire electric park brake systems otherwise known as ePark™.

PBR has designed two types of ePark solutions – a cable puller (ePB) and an integrated caliper (ePBHC). At the heart of these products is a trouble-free, robust, small and exceptionally quiet actuator which demonstrates flexibility of mounting arrangements coupled with flexible software and vehicle interfaces.

PBR's solution approach enables a vehicle manufacturer to integrate an electric park brake into a vehicle platform while providing the OEM with design flexibility, improved performance and increased features including numerous automated functions and improved passive safety.

Other advantages demonstrated included simplification of corner or axle manufacture, reduction in component count, improved passive safety, flexibility in cabin layout and improved integration with existing vehicle infrastructure.

A more comprehensive summary of the paper was published in the June 2005 edition of Auto Engineer Australasia.

During 2004, the ePark™ by-wire park brake featured on the Toyota Sportivo concept vehicle and was declared the winner of the SAE-A Automotive Engineering Excellence Awards.



PBR's unique ePB actuator

Product spotlight

EXPANDED BRAKE FLUID RANGE

For almost 80 years, the PBR brand has been a symbol of quality and reliability in the replacement parts industry. Brake specialists and general mechanics alike know that when they use PBR products they have been researched, designed and manufactured with a specific purpose in mind.

PBR brake fluid is no exception. For many years PBR has been servicing the aftermarket with two grades of specially formulated brake fluid. PBR Red Dot is a high quality DOT 4 grade fluid suitable for earlier model vehicles whereas PBR Gold Dot is a Super DOT 4 grade formulated to meet the demands of more recent models.

As industry requirements change PBR is committed to delivering products that provide the best fit for today's vehicles. That's where PBR Yellow Dot brake fluid

comes in. Toyota vehicles, for example, must be serviced using a DOT 3 grade of fluid. PBR Yellow Dot is a heavy duty DOT 3 fluid that provides the best ongoing protection for brake systems in these vehicles.

PBR is committed to delivering products that provide the best fit for today's vehicles

At the other end of the brake system performance spectrum is the increased growth in 'Performance Brakes'. PBR now has a number of performance brake upgrade kits available and recognises that the market for club racing and general performance enhancement is still growing.



For this market PBR has introduced a racing grade brake fluid under the popular PBR Performance brand. The new racing fluid is known as BF-600 and is positioned at the high end of this specialist market having a typical dry boiling point of 312°C.

PBR racing brake fluid is now available to the aftermarket and already proving popular with enthusiasts. The new PBR Yellow Dot fluid will be released in September.

New Fiat features AP brakes



In Europe, Fiat will continue its longstanding relationship with AP Italia when the new Fiat Punto (project 199) goes into production in Melfi, South Italy, fitted with AP rear drum brakes.

The new Punto forms part of a vehicle platform that also includes the Opel Corsa which will commence production in mid 2006 and also be fitted with AP drum brakes.

AP Italia will commence production of the new drum brakes at their facility in Savona,

Italy during July where annual volumes are expected to reach almost 400,000.

The Punto is indisputably the most popular Fiat vehicle and has been a significant part of AP Italia's relationship with Fiat since they first commenced manufacturing Punto brakes in 1992.

In all, AP Italia produces brakes for approximately 800,000 Fiat vehicles annually making them the leading brake supplier to Fiat in Europe.

Oz industry update

For the first time in Australian automotive industry history monthly new-vehicle sales have pushed into the six-figure zone by topping the 100,000 mark.

June sales closed at 101,907 vehicles – 4.8 per cent ahead of the previous record month set in June 2004. At the half-year mark industry sales had reached 498,967 vehicles – 5.4 per cent ahead of the same period last year.

The Federal Chamber of Automotive Industries is holding firm with their forecast for 2005 of 980,000 which

would easily surpass last year's record of 955,229 vehicles.

RECORD SALES

Whilst competitive end-of-financial-year incentives may have played a large part in achieving the new record, the current boom in small car sales is more likely driven by a renewed focus on fuel economy.

The SUV market remains the fastest growing sector of the industry with sales up 9.8 per cent led by the ongoing success of the locally-built Ford Territory.

Toyota continues to lead the overall market as the top-selling brand with 21.1 per cent share of the market ahead of Holden (16.8 per cent), Ford (12.7 per cent) and Mitsubishi (8.0 per cent).

Imported brands which continue to perform well include Honda whose sales are up 31.4 per cent for year-to-date, Mazda (up 17.7 per cent) and Hyundai (up 15.6 per cent).