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ebm-papst supporting technical revolution in Formula1 – Partnership with MERCEDES AMG PETRONAS

This season, Formula 1 racing has experienced its biggest technical revolution regarding efficiency since the sport began in 1950. For this very reason, ebm-papst, the leading manufacturer in fans and motors has decided to enter into a partnership with the MERCEDES AMG PETRONAS Formula 1 racing team.

ebm-papst has developed off-board cooling solutions for the MERCEDES AMG PETRONAS F1 W05 racing cars, in addition to working closely with the team to improve the garage working environment at Grand Prix venues through innovative, custom-built heat extraction and cooling solutions which will be introduced later in the 2014 season. This will be of particular value at venues such as Singapore with challenging climatic conditions.

Furthermore, MERCEDES AMG PETRONAS and ebm-papst will work hand-in-hand on future projects to improve the energy efficiency of the team's operational facilities at Brackley, in addition to holding technical working groups to share expertise and best practice in areas such as Computational Fluid Dynamics (CFD), turbine technology and energy efficiency.

By signing with MERCEDES AMG PETRONAS, ebm-papst becomes the first major partner to enter Formula One as a direct consequence of the new efficiency based rules introduced for the 2014 season and beyond.

Winner of the 2013 German Sustainability Award (GSA) in the category "Germany's most sustainable companies" – one of the most prestigious prizes of its kind in Europe – ebm-papst has been recognised for its outstanding achievements in sustainability.

It is from these very principles that the new era of Formula One finds its roots. As the automotive industry increasingly demands more from less, efficiency and hybrid technologies become all the more relevant. As the pinnacle of automotive technology and performance, the sport has a significant role to play in driving these technologies forward. For MERCEDES AMG PETRONAS, this fresh philosophy and its relevance to the road holds particular importance.

Head of Mercedes-Benz Motorsport, Toto Wolff, commented: "Formula One is the pinnacle of automotive innovation. As such, it has a duty to push the boundaries of technology. The new regulations not only encourage this innovation but also make the sport more relevant to the direction in which the motoring industry is heading.

"Our partnership with ebm-papst not only provides the team with the best solutions available to operate our racing cars but it also demonstrates the significance of new and innovative technologies within the sport. To welcome a new partner as a direct

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consequence of the new 2014 rules is proof that we are heading in the right direction. Our research and development for the race track is now increasingly relevant not only to our road car activities but also wider fields of technology."

Rainer Hundsdörfer, CEO of ebm-papst, commented: "We are delighted that MERCEDES AMG PETRONAS has chosen our sustainable technology and that we are able to join Formula One at this important strategic realignment for the sport. For us, this commitment represents an investment in the future. MERCEDES AMG PETRONAS is world class when it comes to the domain of aerodynamic efficiency. I am confident that we will derive mutual benefit from this partnership.

Notes to Editors: MERCEDES AMG PETRONAS and ebm-papst

Off-board cooling

ebm-papst has developed, in conjunction with the MERCEDES AMG PETRONAS Formula One™ team, a highly specialised off-board cooling solution optimised for the sidepod radiators and roll-hoop of the F1 W05 race cars which will be deployed when the car is on the grid and in the garage at all Grands Prix and test sessions.

Ambient temperatures at Formula One races can reach up to 40°C with ambient on-car temperatures up to 75°C and an operating temperature of over 120°C for the sidepod radiators.

In order to achieve the optimal performance for the cars, ebm-papst has used their latest in fan technology. For grid and parc ferme the sidepods and roll-hoop will be cooled with the new 'S Force' axial fans (4114N/2H8P) whose performance curve match the high back-pressure characteristics of the Mercedes system and provide a 518% improvement in delivered airflow. This high performance contained within a small packaging size meets the requirements for a small portable powerful system.

When the car is in the garage, the sidepods and roll-hoop will be cooled via a larger low-noise forward-curved centrifugal solution where the motor and impellor have been integrated into a bespoke designed scroll housing to fit perfectly on to the car for maximum performance and low noise in the garage environment.

Garage Heat extraction and cooling

As the worldwide leader in efficient fans and motors, ebm-papst have developed a bespoke high efficiency heat extraction and cooling solution for the MERCEDES

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AMG PETRONAS team garage that will be implemented during the 2014 Formula One season.

With the garage temperature reaching up to 45°C at tracks such as Singapore, ebm-papst will ensure the best possible environment for the MERCEDES AMG PETRONAS team, its' drivers and guests.

Further Technical Working Groups

During 2015, ebm-papst's highly skilled engineers will also design and implement further cooling solutions for the MERCEDES AMG PETRONAS Operations Centre in Brackley, UK. This will enable the team to reduce electricity usage and CO2 emissions to further support the facility's ISO14001 status.

Notes to Editors: The New Era of F1 in 2014 – Efficiency and Performance

2014 introduces what is widely recognised as the biggest technical revolution in Formula One season since its inaugural season in 1950. However, while probably the most far-reaching, this is far from being the first major upheaval in the history of the sport. For decades, engineers have been pushing the boundaries of performance, extracting the absolute maximum from the technology at their disposal and exploring every avenue of development in the pursuit of automotive perfection, only to have their creations cast into the annals of racing history. Increasingly complex regulations always force fresh innovations to suit constantly evolving sporting and technical requirements.

The revolution of 2014 has subtly different roots, with rules written to encourage rather than restrict new technology. As the automotive industry increasingly demands more from less, efficiency and hybrid technologies become all the more relevant. As the pinnacle of automotive technology and performance, Formula One has a significant role to play in driving these technologies forward.

In years gone by, the term efficiency may have appeared at odds with the ethos of Formula One: a conservative contrast to the 'flat-out' image of the sport. For 2014, however, that perception has changed fundamentally. Put simply, efficiency now equals performance. Where the power of a normally aspirated engine is defined by the amount of air that can be put through it, the performance of the all-new Turbocharged V6 Hybrid Power Unit is now defined by the amount of fuel available to each competitor. The driver who can extract the most performance from the available 100 kg of fuel energy – in other words, achieve the best conversion

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efficiency – will have a competitive advantage. The more efficiently the Power Unit can convert fuel energy into kinetic energy, the more that advantage will grow.

Of course, efficiency has long been a key area of development in Formula One. In years gone by, where fuel usage has not been limited, the advantage lay in weight saving. Put simply, the less fuel you carried, the lighter and faster the car: particularly at the start of the race. For 2014, however, the race fuel allowance has been fixed at a maximum of 100 kg, compared to a typical race fuel load of around 150 kg in 2013. To complete the same race distance at similar speeds, the Power Unit has had to become over 30% more efficient: a challenge which demands significant new technologies.

Part of the efficiency gain comes from the V6 Internal Combustion Engine (ICE): a smaller capacity 'down-sized' engine running at lower speeds than its predecessor. The power output and therefore efficiency is enhanced by turbocharging: allowing additional power to be extracted from the same quantity of fuel energy. The really clever part, though, comes in the form of the ERS Hybrid system. In 2014, there are up to seven possible energy journeys to re-use energy within the vehicle. The target: to achieve the same power output – around 750 hp – using around one third less fuel.

While areas of 'familiar' technology (bore size, crankshaft centre line, etc.) have been specified, technical freedom has been left in the areas likely to generate gains in overall efficiency. It's a formula designed to encourage innovation in the pursuit and development of cutting-edge technologies that are ultimately relevant to the everyday motorist.

As always, weight is a key factor in performance. While the regulations stipulate a new maximum weight limit for the car of 691 kg – up from 642 kg in 2013 – this is now far more difficult to achieve. The Power Unit itself must have a minimum weight of 145 kg, while the additional cooling requirements of both the turbocharger and Hybrid systems only add to the challenge.

From an aerodynamic perspective too, innovation has been stretched to the limit. Fundamentally, there are two key elements to a fast Formula One car: having the most power possible to accelerate down the straight, plus good mechanical and aerodynamic performance to allow for quick cornering. The 2014 regulations bring with them a new set of challenges not only relating to the more visually obvious elements of the car, but more fundamentally in terms of packaging.

Hidden from view, the integration of the Power Unit and related systems into the chassis provides a significant aerodynamic challenge. The Power Unit itself takes a

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completely different shape to its predecessor, while more hybrid systems, a more complex exhaust system, plus an intercooler required for the pressure charging system are all contributing factors to the cooling requirements of the car. Managing heat is not only necessary in terms of car integrity but also performance and efficiency. Two opposing influences thereby exist: one focused on ensuring that each of these components operates within an optimal temperature range, the other on packaging the related cooling systems in such a way as not to detract from the aerodynamic efficiency of the car.

Overall, then, it is clear that Formula One in 2014 presents a fresh set of challenges to designers, engineers, drivers and spectators alike. As has been the case throughout generations of the sport, the introduction of new rules serves to encourage innovation and showcase Formula One as the cutting-edge of new technology: adding a level of intrigue which is relevant not only for the interest of spectators, but the automotive industry as a whole. As the latest phase of an evolutionary process that continues to position Formula One at the heart of contemporary technology, 2014 truly puts the 'motor' back into 'motorsport'.

About ebm-papst

ebm-papst is a worldwide innovation leader in fans and motors with over 15,000 different products, providing the ideal solution for virtually all air technology and drive engineering tasks.

ebm-papst engineering services are available throughout the world, however the source of the company's engineering skills originates in Germany where more than 650 engineers and technicians conduct intensive work in the fields of motor technology, electronics and aerodynamics.

Close cooperation between the company's three central locations in Mulfingen, St. Georgen and Landshut creates a high level of expertise in a variety of sectors. These include ventilation, air-conditioning and refrigeration technology, household appliance and heating engineering, electronic cooling for IT and telecommunications, and finally R&D services provided to many major automotive brands.

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