



F1 TECHNOLOGICAL CHALLENGE RESTARTS WITH SEVEN TEAMS

Greater Proportion of Braking Force in Front, Smaller Rear Discs and Brake By Wire System in 2014 Formula One World Championship

STEZZANO, Italy, March 14, 2014 – Participants in Formula One since 1975 resulting in 23 Constructors and 19 Drivers World Championships, Brembo reaffirms its leadership status in 2014 as supplier of braking systems to seven teams involved in F1: Caterham F1 Team, Infiniti Red Bull Racing, Mercedes AMG Petronas F1 Team, Sahara Force India F1 Team, Sauber F1 Team, Scuderia Ferrari and Scuderia Toro Rosso.

Based on new FIA regulations adopted for the 2014 season, several important technical developments (smaller, more fuel-efficient engine, increase in the minimum weight to 691 kg, and the reduction of downforce) will obviously have a significant impact on the F1 braking systems, including the new callipers and carbon friction materials.

For 2014, a greater proportion of braking force will be transferred to the front axle with the maximum brake torque ideally decreasing due to the reduction of downforce and speed of the cars. Stopping distance, on the contrary, will be greater and, consequently, time spent under braking increasing.

For these same reasons, rear brake discs can be smaller in diameter compared to last season, with a resulting advantage in terms of weight and speed of response to pressure. Their thickness may also be thinner (25mm), due to the reduction of the energy to dissipate.

In 2014, the new Energy Recovery System (ERS) creates increased drag on the car under braking and therefore requires electronic control of the rear brake pressure to insure chassis stability. To accomplish this, an innovative system has been incorporated: Brake By Wire (BBW). As the driver brakes, the BBW electronic controller provides the high-pressure hydraulic system with the proper braking force to the rear axle. In case of emergency, the master cylinder remains connected to the brake pedal and the hydraulic connection directly to the calipers for the driver to operate, but this functions only in case of a BBW failure.

Brembo has been active in the design and simulation of BBW braking systems, as well as the individual components of Brake By Wire. For some teams, the Italian company has developed only the actuator, which acts as an interface between the hydraulics of the car and the rear calipers. For other teams, Brembo has developed a more substantial part of the BBW system, involving the valves that influence the BBW switch from normal use to emergency condition.

Greater ventilation for brake discs

In recent years, Brembo engineers have completely changed the brake cooling, which in F1 can reach a maximum temperature of 1.200 °C, by redesigning the cooling system to include up to 1,000 ventilation holes. The ventilation of Brembo carbon brake discs went through a development process resulting in a considerable increase in overall performance of the braking system.



The increase of airflow was also achieved through CFD calculations (*Computational Fluid Dynamics, fluid dynamics study through computer*), a synergic study, developed by each race team, of the airflow between the intake and the brake disc. This resulted in an optimal design of ventilation holes, which increased in number but reduced in diameter, thereby increasing exponentially the carbon surface open to airflow and therefore thermal discharge. This structural evolution required a much more complex mechanical processing, along with a growing effort in terms of in-depth analysis of fluid dynamics. The support of each team has been crucial to the design of air intakes for new cars.

Lower wear of brake system thanks to CER and customization of systems

Material is considerably changed as well. CER represents an evolution of CCR material that considerably reduces wear, guaranteeing more effective thermal conductivity. Compared to previous material, CER offers excellent warm-up time; that is, maximum rapidity in reaching more efficient operating temperatures; a wide application range in terms of both pressure and temperature, and very smooth friction performance. All these features provide the driver with a perfect modulation of the braking system. The incredibly low wear results in more reliable performance from the start to the end of race. Disc material is the same for all teams supplied by Brembo, who continues to research and develop composite materials that are more manageable.

Significant numbers

In a full season, Brembo supplies each team with the following material for its two cars:

- 10 sets of calipers (i.e. 4 x 10 components)
- From 140 to 240 discs
- From 280 to 480 pads

Some ten hours of continuous manufacturing activity are required to produce a caliper, although in reality the process is interrupted by other steps including various surface treatments, hand assembly and subsequent testing. Both the materials and the steps of the entire process are always 100% tested.

Mini web site www.formula1.brembo.com

Within the Brembo web site, there is a special section www.formula1.brembo.com dedicated to the Formula One World Championship. In addition to technical data concerning the key braking points of each circuit, the section provides enthusiasts with countless information about the world of braking systems for Formula One cars.

About Brembo SpA

Brembo SpA is the world leader and acknowledged innovator of disc brake technology for automotive vehicles. Brembo supplies high performance brake systems for the most important manufacturers of cars, commercial vehicles and motorbikes worldwide, as well as clutches, seats, seat belts and other components for racing. Brembo is also a leader in the racing sector and has won more than 200 championships. Today the company operates in 16 countries on 3 continents, with 22 production and business sites, and a pool of about 7.000 employees, about 10% of whom are engineers and product specialists active in the R&D. Brembo is the owner of the Brembo, Breco, Bybre, Marchesini, and Sabelt brands and operates through the AP Racing brand.

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