3-2. 2019-2020 TS050 HYBRID Powertrain

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TS050 HYBRID in GR Powertrain Development Division

GR Powertrain Development Division develops the powertrain, made up of a combustion engine and the hybrid system, electronically controlled braking (ECB) system, and the aerodynamics, a joint project with engineers at Toyota Motorsport GmbH.

For the 2018-2019 specification powertrain, we improved a lot the performance of the high-power lithium-ion battery, including steps relating to the electrolytes and material of the battery cells. However, for this season we have been working not only to further enhance reliability, but to also reduce battery degradation to ensure that maximum hybrid boost is available without any drop in performance even after 24 hours. There is not much change regarding the engine itself but we have reduced various friction losses. The aerodynamics have evolved, especially the front bodywork as well as the embedded side mirrors and a high-nose, and we expect these modifications to keep us at a strong competitive level.

Competition against non-hybrid LMP1 cars (Equivalence of Technology)

An updated Equivalence of Technology (EoT) was introduced to LMP1 last season to balance the performance potential of hybrid and non-hybrid cars, using fuel flow, fuel capacity and weight. For example, the minimum weight of hybrid LMP1 cars was increased by 26kg from the fourth round at Fuji, reducing to a 10kg increase on the race-one weight for the final round at Le Mans. Non-hybrid cars had no limit to the amount of fuel allowed per lap and originally the engine fuel flow per second was 37.5% more for non-hybrid cars compared to hybrids, increasing to 43.75% more by the end of the season. Via the EoT and performance improvements during the season from the non-hybrid LMP1 cars, the pace of non-hybrids improved and this year we actually saw the closest Le Mans Le Mans qualifying of the WEC era. So we have to be prepared for an ever-increasing challenge.

Our response is to improve the reliability of all parts as well as aiming for performance improvements where possible by refining details and components. While we aim for 100% reliability due to thorough component checking and testing, we know that is never possible, so there is always potential for improvement. All team members in Japan and Germany are working hard every day with the target of making further steps in terms of reliability; if we can make 99.9% into 99.99% then we are moving in the right direction!

For the 2019-2020 season, the ACO and FIA have introduced a success

handicap system, with up to 50kg added to a winning car, following some discussions. This will apply for all races except Le Mans and it means it will be almost impossible to win every race. We not only accept this move; we actively encouraged it because we respect the fans and we know they want to see a closer competition.

TS050 HYBRID targets

The TOYOTA Prius road car is, by its nature, more robust and reliable compared to a race car such as the TS050 HYBRID. Road cars are operated well within their tolerance limits and are designed to operate reliably for many years without major maintenance. A race car must perform, so reliability is to a certain extent compromised in favour of lap time, compared to a road car. Even if something would go wrong on a road car, there are many back-ups and failsafe systems. In motorsport, that is not the case and hybrid development in motorsport relies on a human factor.

The TS050 HYBRID may be a mature race car by now, with many achievements since its debut in 2016, but that doesn't change the fact that its hybrid technology is very complex. We aim to simplify that technology step by step and, by doing that, we can contribute to make ever-better cars for TOYOTA customers. Our aim is for TOYOTA's motorsport-derived hybrid technology to be the most powerful in the world. We strive to enhance this technology and bring high-performance hybrids into the next decade. By doing that we hope customers can feel the benefit of hybrid technology and enjoy the experience of driving even more.

Dreaming of a Le Mans hat-trick

When we won the final round of the 2018-2019 WEC season, we became back-to-back Le Mans 24 Hours winners. In addition to the strong race performance courtesy of the TS050 HYBRID's high-efficiency hybrid powertrain, optimized chassis and refined aerodynamics, the car also showed great durability and the team worked with spirit and precision. We will again call on those factors as we challenge to win Le Mans for a third time. That is our most important goal for the 2019-2020 season.

Despite our recent success, we remain very humble and we know that we have won Le Mans twice from 21 entries. To establish a legacy at Le Mans, we need to make a habit of winning over the long term, both at Le Mans and in WEC races.