



FORMULA **MANIPAL**

Engineered with Passion



FORMULA **MONTHLY**

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KEEPING UP WITH FM

Lewis Hamilton once said, "In racing, there are always things you can learn, every single day. There is always space for improvement, and I think that applies to everything in life." Keeping this in mind, this month has been exhilarating and challenging for everyone here at Formula Manipal after our performance at Formula Bharat 2023. Our team has begun working for the upcoming international competitions FS Austria and FS East (Hungary) to be held in July and August respectively. Every subsystem has been working around the clock in the workshop, researching and improving on current designs. We've reached new landmarks in our EV testing and that is just the start of our progress this month. We could not have had a better start to the month than welcoming a new title sponsor onboard.

We are proud to welcome SCHAEFFLER as our newest Title Sponsor for the year 2023-24. We cannot thank them enough for their support, interest in our team, and hard work to make this happen. We truly believe that with the support from sponsors such as Schaeffler, our team will reach heights like never before.

MECHANICAL

- To better accommodate our drivers, our vehicle dynamics subsystem has designed a new steering column to better suit our drivers.
- Our transmission subsystem is designing the custom open differential and the bevel gears to be placed inside it, have been designed. Furthermore, they have designed two new differential case designs that will now go through numerous simulations to determine which has the best performance and durability.
- Additionally, we are manufacturing our all-new aero package. The nylon moulds for the same have started to be machined.
- Our engine subsystem has been working rigorously to design a new intake manifold that will help maximize performance.
- Finally, the structures subsystem is creating a new steering wheel with paddle shifters and an integrated display. They have also been getting ready to make a new carbon fiber seat with custom seat inserts made of two-part liquid foam.

DRIVERLESS

- The brake-by-wire, steer-by-wire and emergency braking systems' actuation strategies have been tested by our driverless subsystem.



ELECTRONICS

- The electronics subsystem has primarily been working on debugging issues present in the current electrical wiring harness.
- The electronics team has also been working on features that improve the performance of the driver in the car. The shifting lights, which help the driver change gears at the ideal RPM range, were one of the primary upgrades. The installation of a 3.5-inch dashboard display provides the driver with a live feed of important engine sensors as well as other important information like the battery voltage, RPM, etc.
- The torque mode test of the EMRAX 208 electric motor by our controls subsystem was successful! Due to limitations of the lab testing arrangement, the testing was restricted to an absolute minimum. The test setup includes the 270V battery setup, the testing wiring harness, and the HV assembly. The team is working on assembling the FMe20 rear assembly so that we can test the motor and gain a better understanding of its control and feedback levels. On the FMe23 accumulator design, the team has decided to move to Molicel (cylindrical cell) and thus the BMS design of the same is in progress. Due to the constraint of not meeting 30% of all cells' temperature monitoring, standalone temperature monitoring systems will be used. Furthermore, the Arduino-based BMS master has been tested and will be used to replace the Linduino master in the upcoming design.



Formula One in the Electric Age

Ladies and gentlemen welcome to the exciting world of Formula One racing, here from the Formula Manipal workshop. This is the pinnacle of motorsports where you will witness the best drivers in the world compete with the most brilliantly engineered cars for glory and honor. It is not just a race, it is a battle - a battle for supremacy, a battle for the podium. As the race progresses, you will witness the drama unfold. There will be moments of triumph and moments of heartbreak. There will be nail-biting overtakes and daring maneuvers. The competition is fierce, and the stakes are high. As one of the most visually striking and exciting sports in the world, Formula One draws in viewers with explosive races, shocking victories, and dramatic mistakes.

What happens when the world led by Tesla slowly shifts to electric cars? We will have sleek, silent, and sustainable cars that offer unparalleled performance on the road. The age of electric cars has arrived and is slowly taking over the road and race track. Will Formula One survive the age of electric cars? Ross Brawn, a former Formula One manager and the technical director knows companies won't rush to drop a quarter-billion dollars to fund a team in a sport without fans. "You create the race because you've got substantial investment from technological partners who create this magic of Formula One," Brawn says. Toto Wolff, the team principal of the Mercedes-AMG Petronas F1 team says, "Formula One is an audio-visual spectacle. We need to be shocked by the sheer speed of the cars and the sound of the engines." Everybody jumps on the hype of electric cars because Tesla is doing it, but no manufacturer who is going pure electric has ever earned one dollar of profit". Formula One is among the most cash-infused sports in the world. Team budgets stretch into millions of dollars, and much of that money goes towards developing parts for their thoroughbred machines. Some of those innovations even end up in our driveways.

As the consumer world trends toward electric vehicles, Formula One shows no sign of stopping the brakes on its combustion engines. To avoid losing fans and their wallets, F1 heavies look to the petrol-fueled sensory assault to maintain interest. In parallel, in order to maintain the interest of eco-conscious race fans, the Federation Internationale de l'Automobile (FIA) recently bankrolled a new electric racing series called Formula E. Currently, the battery packs used instead of engines in Formula E can't last a 50-minute race. It is impractical to swap one out, mid-competition. That's why, about halfway through an ePrix, this happens: The car dips into the pit. The driver unbuckles his five-point harness, removes his steering wheel, climbs out of his car, hops over to a fully charged car, climbs in, lets the team buckle his safety harness and attach his steering wheel, and zooms off, with the motor whirring like an angry vacuum cleaner. Due to its technology, Formula - E is safe, environment-friendly, and sustainable but it simply cannot replace the original Formula One. A solution to this is that Formula One could go electric. Generations of history make it unthinkable for manufacturers like Ferrari to step away. Also, legions of fans will buy tickets and TV packages that support the billions of dollars required to create the spectacular cars, just like those same fans who gave up their DVDs for Netflix and landlines for cell phones. They'll come to appreciate aspects of racing other than the noise. But, we don't know for sure. In the future, some countries will be very heavy on electrification. In others, it won't be much different from what you have now. So the technology on an F1 track might have applications in areas that won't be suited to electrification until decades after cities and infrastructure-heavy markets adopt it.

Therefore, there is no clear vision of what Formula One will look like in 2031. It could continue to be petrol run or battery run or run by "e-fuel". E-fuel uses renewable electricity to separate hydrogen from water, the hydrogen combines with carbon taken from the air to form a hydrocarbon, which is the basis for a form of synthetic petrol. Hence, for now, let us cheer on our favorite drivers as they compete for glory in the world's most prestigious motorsport championship. With fuel or batteries or "e-fuel" there will never be a dearth of action, heart-stopping moments, and memories that last a lifetime.

WELCOMING SCHAEFFLER : THE FIRST TITLE SPONSOR OF THE 2023-2024 SEASON

Precision, sustainability, and innovation are just a few words that come to mind when thinking of Schaeffler – a company that has been shaping the future of mobility for over 75 years. Schaeffler isn't just a company – it is a pioneer in the development of cutting-edge technology that helps make our world more efficient and connected. Meet the company at the heart of motorsports, a company that has been a fixture on the international motorsports scene for several decades and continues to be a high-performance global player in the field of mobility worldwide. It is one of the most significant industrial giants that is responsible for the success of multiple industries such as automotive, aviation, and aerospace.

75 years ago, two brothers Wilhelm and George Schaeffler founded the Herzogenaurach-based business Industrie GmbH (in German). Despite not having a background in engineering, George Schaeffler's ideas helped create a major player in the field of motion. The company was managed for fifty years by George Schaeffler. He was meticulous and always questioned conventional ways of thinking. His motto was "Always New Tasks", which is "Immer Neue Aufgaben" in German, a smart play on "INA" that is still used today.

He kickstarted the creation of a top global supplier of ball and rolling bearing manufacturers, servicing the automotive and multiple core industries. Who knew three independently prosperous businesses - INA, LuK, and FAG would eventually combine to become a force to reckon with in the world of mobility.

Constantly in motion, a long business history comes with new names, new ideas, and new prospects. Ball bearing mills, cage-guided needles, roller bearings, and the diaphragm spring clutches are some of the many ground-breaking inventions that have shaped the future of motion and mobility, all created by Schaeffler.

The concept of "intelligent simplicity – creating simple, smart products to increase efficiency", has been expressed by all their products since 1950. Each of their products i.e., bearings have several features such as being dependable, portable, and light. All their inventions have helped several industries such as automotive, aviation, and aerospace up their game.

Each of their products stand as a testament to how well-rounded a company, Schaeffler is. Despite being involved in aviation, and aerospace, Schaeffler has been at the heart of motorsport disciplines for several decades. Motorsports runs in the blood of the company. In addition to Formula Student and the Schaeffler Motorsports Academy, Schaeffler has a distinguished history as a pioneer in FIA Formula. Schaeffler has partnered with several teams in the past, helping them achieve new titles, victories, and record times. 5 minutes, 19.55 seconds: this is the record-breaking Nürburgring Nordschleife lap time achieved in 2018 by the Porsche 919 Hybrid Evo, a joint prototype by Porsche and Schaeffler. More than victories and triumphs, Schaeffler motorsports, is the ultimate testing ground for technology. If it makes a convincing case on the race track, it can do the same on road.

Through their dedication to quality and precision, Schaeffler has shattered records in recent years. There are several amazing cases of Schaeffler coming through with incredible inventions. One of their best creations is the world's smallest drawn cup needle roller bearing. It was designed for a motor application. In addition, the spherical plain bearing heavy weight became the largest series-produced spherical plain bearing in the company's history. This product single-handedly improves the performance of machines, systems, vehicles, and devices.

This all-time weight record of FAG, owes its existence to an unusual project during the Cold War years. The USA wanted to recover a sunken Soviet submarine in the Pacific. In order to assist them, FAG designed and built the bearing to support the articulated joint of the salvage vessel's recovery claw, in 1974. Another shining example is the London Eye which has an overall weight of 2,100 metric tons. With this weight, it still manages to turn smoothly, thanks to two FAG spherical roller bearings weighing several tons each.

In the field of motorsports, Formula Manipl is more than just a team of engineering students and automobile enthusiasts. The team through grit and passion constantly works towards building the best Formula-style race car. Every season, the team members spend countless hours in the workshop aiming to achieve greater heights than the year before. Each team member approaches every challenge with a good work ethic, never settling for anything less than their best.



Two FAG spherical roller bearings made by Schaeffler are used to turn the London Eye



Porsche Hybrid Evo, a prototype by Porsche and Schaeffler - achieved the record breaking Nürburgring Nordschleife lap time of 5 minutes, 19.55 seconds, in 2018.

It is truly an honor to see that one of the most significant industrial giants that are responsible for the success of multiple industries is supporting our hard work and passion. The team would like to take this moment to express our deepest gratitude to Schaeffler for becoming our exclusive bearings partner for the season 2023-2024. We are also thrilled to have Schaeffler as our first Title Sponsor for the season, helping us move one step closer to all the goals we set for this competition season.

We want to thank the entire team at Schaeffler for their commitment and support that helped fuel the fire in us to build the car. Your partnership means more to us than words can express. We are proud to carry your name and logo into the race track and will do everything possible to make you proud. Our team cannot wait to see what this competition season holds for us and looks forward to several more seasons together with Schaeffler.

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