FROM RACETRACKS TO HIGHWAYS

Why is Formula 1 important?

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For decades, Formula 1 (F1) has not only been the pinnacle of motorsport but is also one of the fastest R&D labs known. With the intention of being the fastest car on track, each participating team has optimized its car through several iterations. The cars started off being small and narrow and quickly evolved into more aerodynamic machines to improve track times. Teams also realized the importance of weight distribution and moved the heaviest component - the engine, to the car’s rear end by the 1960s. An improvement in the wing design in the late 1970s, which featured an upturned airplane wing was the turning point in the sport as it allowed the drivers to make faster corners adding more downforce. With the advent of electronics, pre-programmed active suspensions and traction control became vital aids to the drivers in the 1990s. Over the next two decades, improvements in material technology helped tire design for different track conditions together with lighter and stronger bodywork making the car all the more faster - over 350 km/h. Motorsport sooner or later trickles down to road cars. Since the advent of hybrid technology, F1 cemented itself at the forefront of technology, from consumer electronics to smart cities.

Steering wheels- Through the ages

One of the prime links between the driver and the car - the steering wheel, has gone through tremendous scrutiny making it lighter, more functional and better integrated with the rest of the car. Various options on the wheel help the driver communicate with both the car and his team. For instance, a driver sometimes makes more than 50 gear changes in a minute - all using a single finger through the steering wheel! We can thank F1 for our multi-purpose steering wheels in road cars today.

Evolution of a racing car’s steering wheel

Engine efficiency

A century ago, the efficiency of the thermal engine was about 17% and today thanks to F1, we are looking at engine efficiencies close to 50%. These drastic innovations are possible as the regulations in F1 are aligned with the mission of the road car world very often. One of the earliest F1 cars introduced a double overhead camshaft, which allowed for an increased airflow at higher speeds together with a wider angle between the inlet and exhaust valves. A decade later, this technology found its way to consumer vehicles.
Kinetic energy recovery system - KERS

A race car loses an incredible amount of kinetic energy when it brakes at corners. Engineers with F1 teams work on harnessing any bit of energy they can to improve the car’s performance. Richard Feynman’s technique proposed over five decades ago to capture a car’s kinetic energy finally came to fruition in the first F1 car in 2009. The mechanism transfers energy lost during braking into electrical energy which gives the battery an extra charge. Very soon, this became an important energy conversion and storage mechanism in hybrid road cars.

Materials technology

The introduction of carbon fiber - a material with a superior strength to weight ratio revolutionized F1 in the 1980s. The race car teams soon replaced most of the chassis with carbon fiber, which drastically improved fuel efficiency and performance. It didn’t take too long for this technology to find its way into road cars.

Further, over the years Pirelli (the only tire manufacturer in F1) has developed seven grades of dry tyres (in soft, medium and hard), that are used for varying levels of grip and longevity. The company then launched itself into the road car world to develop state of the art tires with superior performance in dry and wet conditions.
Data management

Wireless data transmission is another crucial component as there are hundreds of sensors on the car providing feedback and the data needs to be visualized and interpreted as fast as possible. This technology is extremely useful in the development of fully automated road cars.

Data collected in an F1 race monitors both the car and the driver

Planning, strategy and team work

No sport is as logistically challenging as motorsports. While equipments matter in most sports, in F1 the driver is only half the athlete. The vehicle is the other half. The team’s performance relies heavily on the right components being present at the right time while the venues shift between five continents with as little as a week between races. Further, a race pit stops involve changing all four tires on a car in about a couple of seconds. Teams need to be precise with these strategies as races are won by the smallest of margins- as little as a hundredth of a second. It isn’t uncommon to see some of these planning and scheduling techniques being used in high-pressure environments like hospitals.

Team work in play at a pit stop and an operation theater