

Formula Student is a well-known international competition that judges not only speed but, more importantly, know-how. With the 2010 season about to begin, dSPACE visited the UPBracing Team at the University of Paderborn in Germany for an inside look at ongoing development work. The team is focusing on extending the electrical and electronic components, even including an electronic clutch.





Behind the Scenes

The UPBracing Team is fine-tuning new components for its racing car to gear up for the 2010 season of Formula Student.





Formula Student Opens Doors

There is hardly a German university without a Formula Student team. The Association of German Engineers (VDI) began holding the Formula Student Germany competition in 2006. Since then, it has grown into a major project, watched with interest and great respect by universities and the automobile industry alike. Participating students find that it opens doors for them, as partner companies in their recruitment processes proactively search for students with Formula Student experience. So it is no surprise that in the last few years, the available starting slots in Formula Student Germany were taken up within minutes of registration opening.

The teams are constantly improving, and the standard of competition in Germany is also getting higher, even though it already enjoys a reputation as the fairest but most demanding competition in comparison with other countries. Every year, the organizers raise the competition's level of difficulty, ensuring a continuous professional development process which the UPBracing team fully embraces. With the help of dSPACE products, the young engineers have again come up with exciting innovations to impress judges and spectators at the Hockenheimring this summer.

Faster and Lighter with Electronics

Creativity and teamwork are key when Paderborn's up-and-coming engineers plan new vehicle components and then test, build and measure them after weeks of research. To hold their own against the 77

harness that provides quick access. Design work on the new cable harness is very complex and extensive, as each individual connection has to be thought out in advance, and every time a component's position is changed, the entire cable harness has to be rebuilt. The result is impres-

The fifth injector ensures that fuel is used more efficiently and adds an extra 5 HP.

other registered teams, this year the UPBracing team is mainly concentrating on three new features that will reduce the weight of their self-designed racing car, the PX210, and also boost its horsepower.

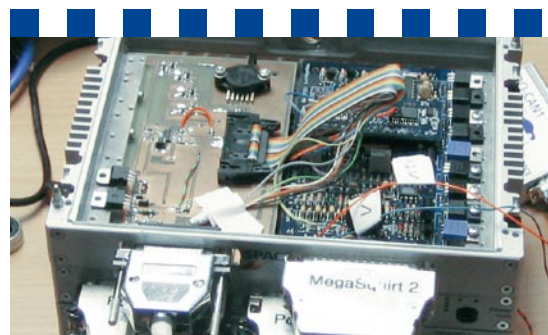
sive: The vehicle's overall weight is slightly reduced, its faults are easier to find, and its reliability has been improved.

The Fifth Injector Adds 5 HP

The installation of a fifth injector has also brought greater power and efficiency. The E85 fuel used by the UPBracing Team has a high heat of vaporization. To use the effect better and to allow the air in the cylinder to start cooling even earlier, the

Structured Cable Harness

In its predecessor, the PX208, each cable is installed and shielded individually, which makes it more difficult to correct any faults that occur. The new vehicle has a structured cable





students installed a fifth injector at the start of the air duct. By injecting fuel into the air duct, the air can be cooled down from 30 °C to 5 °C, improving the supply to the cylinder at high engine speeds. Because the fifth injector needs different injection values, which cannot be adjusted by the engine ECU, the engineering students are using dSPACE's RapidPro system. RapidPro works simultaneously with the same algorithm as the engine ECU and guarantees that all five signals are parallelized and synchronized. The results are more efficient fuel utilization and a power increase of 5 HP.

Hand Clutch

A normal manual transmission car has three foot pedals: the clutch, the brake, and the accelerator. But in the compact PX210, it is difficult for the pilot to reach the middle pedal. So this year, the brake in the PX210 is on the left, the accelerator is on the right, and a hand lever on the steering wheel activates the electronic clutch. When the clutch lever on the steering wheel is moved, the data is passed electronically via a CAN bus to the RapidPro system, which controls the clutch motor. Initially the drivers were very skeptical of this system which is also used in professional Formula One race cars, but soon became enthusiastic. The start-up is smooth, the vehicle handles very well, and there is a good driving feel.

Teamwork and Dedication

Overall, Formula Student is much more than just a design competition for the students. It gives competitors an opportunity to run through the entire process of constructing a product prototype and to get to know important real-world workflows, from the original idea to development work to final manufacture. "We are working just as if we were in a real company," explains UPBracing team member Denis Wachsmann. Teamwork and interdisciplinary communication play a major role. The different workgroups such as mechanical engineering, IT and accounting constantly have to coordinate with each other and develop a feel for the work that others are doing. "The main thing is not personal victory, but success for the entire team," adds his team colleague Felix Langemeier.

In the races too, both the participants and the spectators soon realize that fairness and sportsmanship are important components in the competition. The organizers aim to promote soft skills as well, so Formula Student has its own award for these qualities. Even if every team wants to win, the students are not meant to use their elbows, but to lend a hand if another team needs help. 99.9 % of the work done by the young engineering students is learning by doing, and they show enormous creativity and commit-

The Countdown Has Begun

The UPBracing team still has quite a bit to do before the race begins, and the time left before they get a taste of Formula One racing this summer is shrinking fast. And this year, the students are not only competing at the Hockenheimring from August 4 to 8: They will also be at the starting line at Formula Student Austria.

ment. So a 60-hour week is no exception, as the students are constantly searching for new challenges and are immensely ambitious in their innovative planning. Even so, Formula Student's main aim is the same as ever: fun and enthusiasm for motorsports. ■

