AMZ News

EVENTS AND WORLD RECORD

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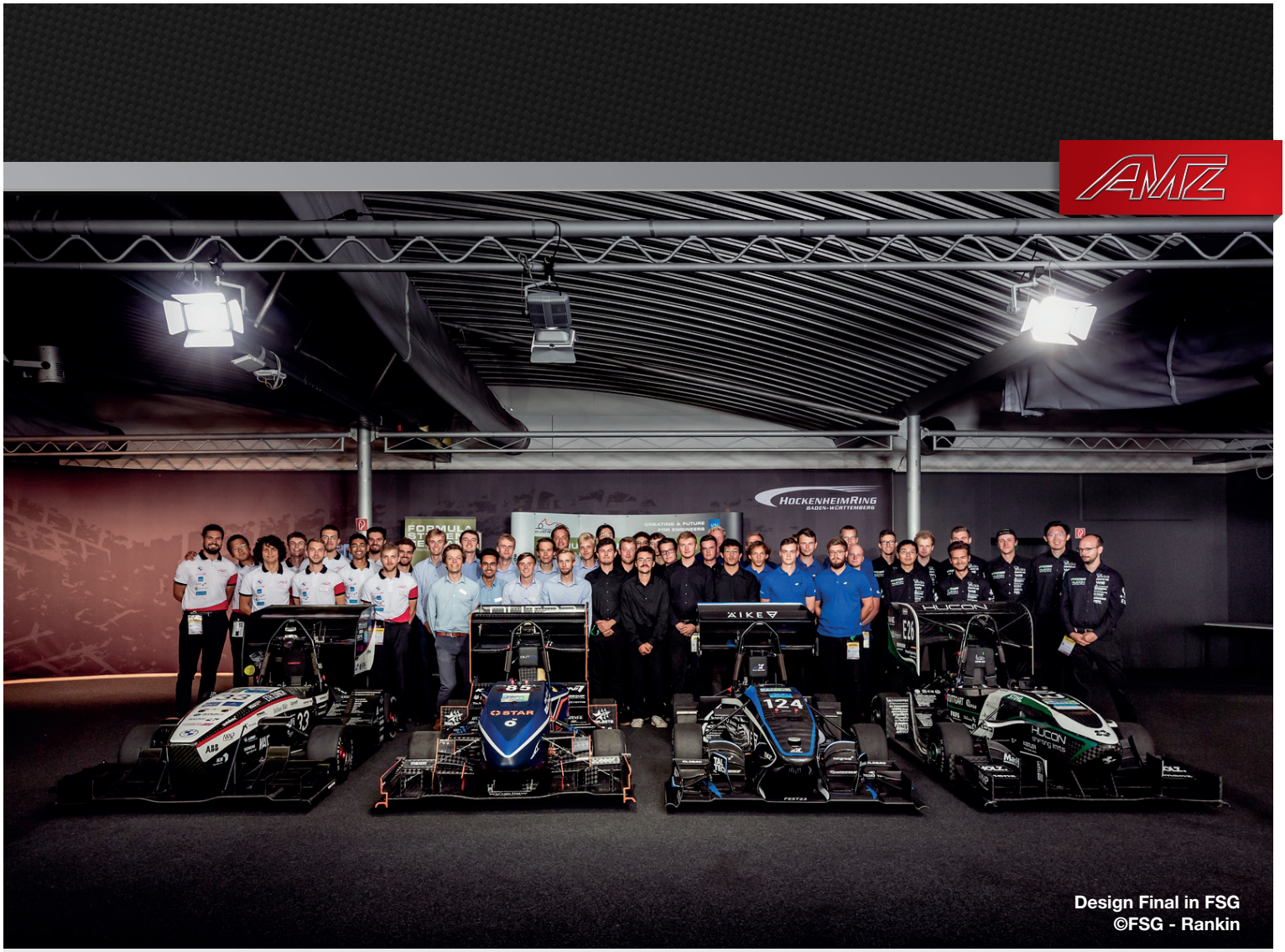
Formula Student Austria

After the rather local Formula Student Switzerland (FSCH), the first international trials were on the agenda with the competitions in Austria and Hungary in direct succession. Inspired by the victory in FSCH, we were able to further optimise various performance-generating control systems in a final testing sprint and tailor them to different driver needs. Arriving at the Red Bull Ring in Spielberg, we again had to deal with electrical problems, which is why the technical scrutineering of the electronics as well as the accumulator lasted until the third day of the event. In the meantime, the static events were on the agenda - on the so-called "Bullengrill" with a view of the F1 racetrack. Both in "Engineering Design" and in "Cost & Manufacturing" we impressed the judges with our engineering as well as manufacturing and cost understanding and reached the finals in both disciplines.

Having passed the static scrutineerings, we caught up on the remaining tilt, brake and rain tests late in the evening and early in the morning, respectively, and so on the morning of the fourth day of the event we went into the first dynamic disciplines - skidpad and acceleration. While Skidpad involves riding an 8-shaped figure to experience the maximum lateral acceleration, Acceleration is about mastering the 75 meter straight as fast as possible to test the cars maximum longitudinal acceleration. With 12th and 13th places, the two disciplines were only little above average for the time being, but after long nights to get the car ready to drive, they provided further important points. Unfortunately, we couldn't get lucky also in the remainder of the competition - in the Autocross run an important sensor failed, which made the car difficult to control, while on the endurance course the on-board electronics broke down and meant a bitter 0 points in the most important discipline. Nevertheless, we were able to set a consoling final point at the closing ceremony - while we finished just outside the podium in 4th place in the Cost & Manufacturing event, we won the Engineering Design event and proved our broad knowledge of CFRP (carbon fibre reinforced plastics) processing with the "Carbotech best use of composites" award.

Formula Student East

Located at the Hungaroring in Budapest, Formula Student East directly followed FSA. We competed here for the first time this season with our autonomous system in the Driverless Vehicle (DV) category. This presented the team with an additional challenge and an even tighter schedule. Nevertheless, we mastered the mechanical, electrical and accumulator scrutineerings very quickly, only the autonomous system had to be changed a few times due to the first-time event participation. On the test track, however, we again encountered several problems - on the one hand, the motor control did not



Design Final in FSG
©FSG - Rankin

work as desired and led to incorrect torques being applied. On the other hand, the velocity estimation in the controller was faulty, which affected our driving support systems. With greatly reduced power, we were nevertheless able to participate in all driverless as well as manned disciplines.

In the meantime, the static disciplines took place, where we had the upper hand in the driverless category - with a victory in Design and a 3rd place in Cost, we achieved a lot of points for the DV category.

The awards ceremony was as mixed as the whole event so far. The excellent DV results were followed by a bitter disappointment and only 7th place in the manual design event, and 4th place in the driverless Autocross was followed by an unfinished run in the longer Trackdrive discipline, where we suffered a loss of communication to the autonomous system. In the end, however, the victory in the efficiency class was a consolation that at least partially compensated us for all our efforts. We finished the event in 5th place (driverless) and 6th place (manned) out of 31 teams.

Formula Student Germany

The highlight of the season would come at the very end. With over 3000 participants, 100 teams from 25 countries and over 400 volunteers, FSG is the biggest competition for young engineers in the world. It's where the fastest teams and fastest drivers gather, the most prestigious event is also the last of our season. With 1 week of preparation time after FSEast, we were able to regroup, sort out the last details on the car and put the finishing touches to organizational procedures. This paid off immediately - after just one day we had all the major scrutineerings behind us, and the following morning's tilt, rain and brake tests were a formality. On the test track, for the first time this season, we were able to deliver our usual performance we knew from home also at an event and on an unknown track. We finished DV Skidpad and DV Acceleration among the top 5 on track, but unfortunately the Acceleration time was disqualified again due to an irregularity of the measured voltage. Meanwhile, the static disciplines took off - with 150/150 points in Design, 94/100 points in Cost and 55/75 in the Business Plan, we were convincingly the best team in the statics and took home another FSG trophy with the Design win.

Another one was soon to follow - with merely 3.27s for the 75m distance of the Acceleration discipline, we not only beat the competition, this was also the second fastest time ever set in FSG.

The next day dampened our spirits somewhat, with two DNFs in the DV autocross and DV trackdrive disciplines, we unfortunately no longer played a role in the fight for the Driverless Cup trophy. On the bright side, however, we kept our chances of winning the electric category for the first time since 2018 - thanks to valiant performances from our drivers, we were able to cheer on the second fastest time in the autocross and take a razor-thin lead into the final day of competition - it was time for the Endurance.

In the last 22 kilometers, the fastest 5 teams would decide the winner of FSG 2023 among themselves, separated by only 30 points, with a maximum of 325 still up for grabs. In a final that could hardly be surpassed in terms of suspense, it was unfortunately not quite enough, and we had to admit defeat to the faster car from Aachen. With a strong 2nd place we could leave Hockenheim with our heads held high, this result is the best AMZ result for 5 years and at the same time cements our position as one of the fastest Formula Student teams in the world.

Conclusion & Successes

Even though there were some frustrating moments during the season, the team can look back on probably the most successful season in the last five years. With twelve first places, a good foundation was laid for the next team.

First Places

- Acceleration (FSG)
- AutoCross (FSCH)
- Efficiency (FSCH, FSEast)
- Endurance (FSCH)
- SkidPad (FSCH)
- Cost & Manufacturing (FSCH)
- Engineering Design (FSCH, FSA, FSEAST (DV), FSG)
- Overall (FSCH)

Outlook

Soon the new team will start its work, and with fresh energy and tireless passion will try to surpass *castor's* successes. They too will design, tinker and develop, and will be dependent on experienced manufacturing partners, sponsors and industrial partners. We would like to take this opportunity to thank you for this year, for your loyalty, your support and the trust you have placed in us, without which this project would not be possible. We hope to have you on board again next year.

0.956 seconds - World record

In 2014, AMZ managed to beat the world record for the fastest acceleration from 0-100 km/h with a time of 1.785 seconds. This record was beaten by the Greenteam Uni Stuttgart - another Formula Student Team - by six thousandths of a second one year later. AMZ quiickly had an answer and broke the record again by more than two tenths of a second with a time of 1.513 seconds.

As some of you may have noticed last fall, the "Greenteam" was able to beat our acceleration world record from 2016 with a time of 1.461 seconds. Immediately, it was clear to us that we couldn't just leave it at that and that the record should be brought back to Switzerland.

We decided to retool the 2019 car, *mythen*, and optimize it for maximum longitudinal acceleration. With a completely new powertrain, a maximum wheel torque of almost 2000 Nm and a maximum power of 240kW can be achieved. In addition, the complete aerodynamic concept was changed to a pure power ground system, so that a downforce of 300kg can already be achieved at standstill for maximum traction. Weight savings were of course also a big issue, so that the weight of *mythen* could be reduced to approx. 140kg.

On 01.09.2023 the time had come. With final optimizations to the suspension setup, traction control, as well as further minimal weight savings, we managed to set a breathtaking time of 0.956 seconds. A new world record for electric vehicles. In just 12.2 meters *mythen* accelerated from 0 to 100 km/h, with a maximum acceleration of 3.81 g. All these developments were carried out in parallel with the Formula Student project *castor*. A team consisting of alumni from previous years combined all the strengths of the AMZ and made this project possible. Of course, this would never have been possible without our sponsors and partners, who made an essential contribution to this fantastic time. We thank you very much for your cooperation and hope that you also enjoy having the record back in Switzerland!