R&D of Racing EVs for FSAE

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Introduction

- Formula SAE is a student design competition organized by SAE International (formerly Society of Automotive Engineers).
- Tohoku University Formula Team (TUFT) has joined in electric class of Student Formula Japan (SFJ) since 11th competition at 2013, but our first machine “TF-13” and 2nd machine “TF-14” had technical problems and were not passed a specific car inspection before dynamic events.
- To revenge at 13th SFJ, we decided to make the completely new machine “TF-15”.

Objectives

- Pass the inspection and run on the corse.
- Win the first position at electric class.

Design of TF-15

“Simple & Light”

We could not make an electric system of TF-14, so we drew focus to design system perfectly. A reliability of electric system is very important, because TF-14 had many troubles and we could not get accurate time to gather data. So we design electric system simply and improve reliability of our machine.

A power of drivetrain system of TF-15 is powerless compared with other teams, so we designed most parts lightly.

TF-15 has been more advanced car than TF-14 and TF-13, and is the best car of our machines.

Well considered performance

In the development of this year’s competition vehicle, we placed great emphasis on the car’s kinematical performance. Also Improving rigidity, saving unspring mass and improving reliability are specific features of the TF-15. These struggles made it possible to achieve 1.5G lateral grip, so TF-15 showed good performance at cornering.

Doubled spring mass natural frequency and strengthened chassis increased vehicle roll stiffness. Because of these changes, vehicle stability and also steering response had improved.

Fig 1. The 3-view drawing of TF-15

Fig2. The exterior of TF-15

Table 2. The result of 13th SFJ

Results are listed below.

- Report
We eventually passed the inspection, and our machine run the Endurance Run Event for the first time, but our first run did not succeed. When our machine run about 8km, a gearbox of TF-15 got trouble. A bolt which fixed a gear worked loose, so the gear scraped an inside wall of the gearbox. Because of this trouble, TF-15 slowed down. With sincere regret, we retired Endurance Run Event.

On the other hand, we get an award of most light weight EV. It is the first podium for TUFT.

- For Improvement
TF-15 is limited accelerating force and top speed, so we must have a more powerful motor or reduce vehicle weight.

Fig1. The 3-view drawing of TF-15

Table 1. The specification of TF-15

Table2. The result of 13th SFJ

Performance

Acknowledgement

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