FST LISBOA

TÉCNICO LISBOA | U LISBOA | UNIVERSIDADE DE LISBOA

MOTOR TESTBENCH

www.fstlisboa.com

THE TEAM

Team of top students in Instituto Superior Técnico **started in 2001 by 10 students.**

OUR GOAL

To develop a formula type prototype every year, **competing to represent Portugal throughout Europe in the Formula Student Competitions.**

50+ MEMBERS

13 PROTOTYPES BUILT

OUR HISTORY

FST01

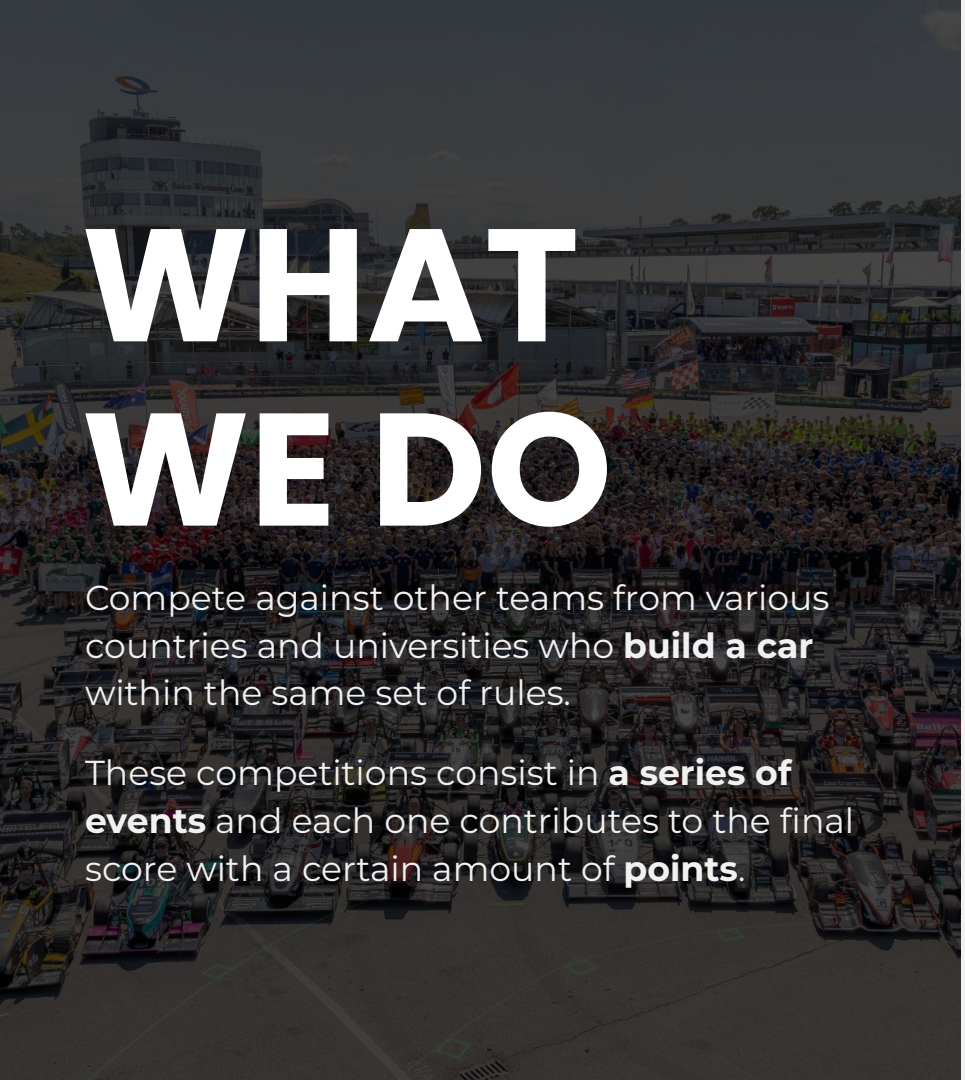
Our **first** prototype

FST09e

Our **most iconic** prototype

FST13

Our **latest** prototype



WHAT WE DO

Compete against other teams from various countries and universities who **build a car** within the same set of rules.

These competitions consist in **a series of events** and each one contributes to the final score with a certain amount of **points**.

STATIC EVENTS

- Business Plan Presentation
- Cost & Manufacturing
- Engineering Design

DYNAMIC EVENTS

- Acceleration
- Autocross
- Efficiency
- Endurance
- Skid Pad
- Trackdrive

ELECTRICAL SWITCH

FST Lisboa started on **combustion** vehicles but changed to **EV** in 2009.

EV Powertrain is composed of:

Battery

Inverters

Motors

PROPULSION SYSTEM

Currently:

- Self-developed Battery
- AMK Inverters
- AMK Motors
- 4 Electric Motors

with 21Nm and 20000 RPM's each

- Total Power of 140 kW

the competition limits us to 80kW

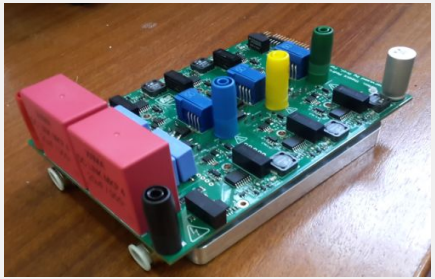
ELECTRICAL CHALLENGES

- **Car performance** is closely related to **Powertrain Performance**;
- AMK commercial powertrain solutions are **far from the best possible**;
- **56% Overall** efficiency;

- From the **80kW**, only **44.8kW** end up being usefull;
- Current technology allows us to improve efficiency a lot in **motors** and **inverters**.

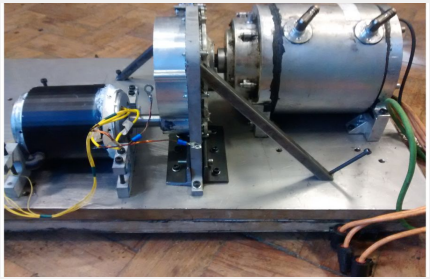
98,2%	86,7%	82,1%	80,0%
Accumulator	Inverters	Motors	Transmission

TEAM IMPROVEMENTS



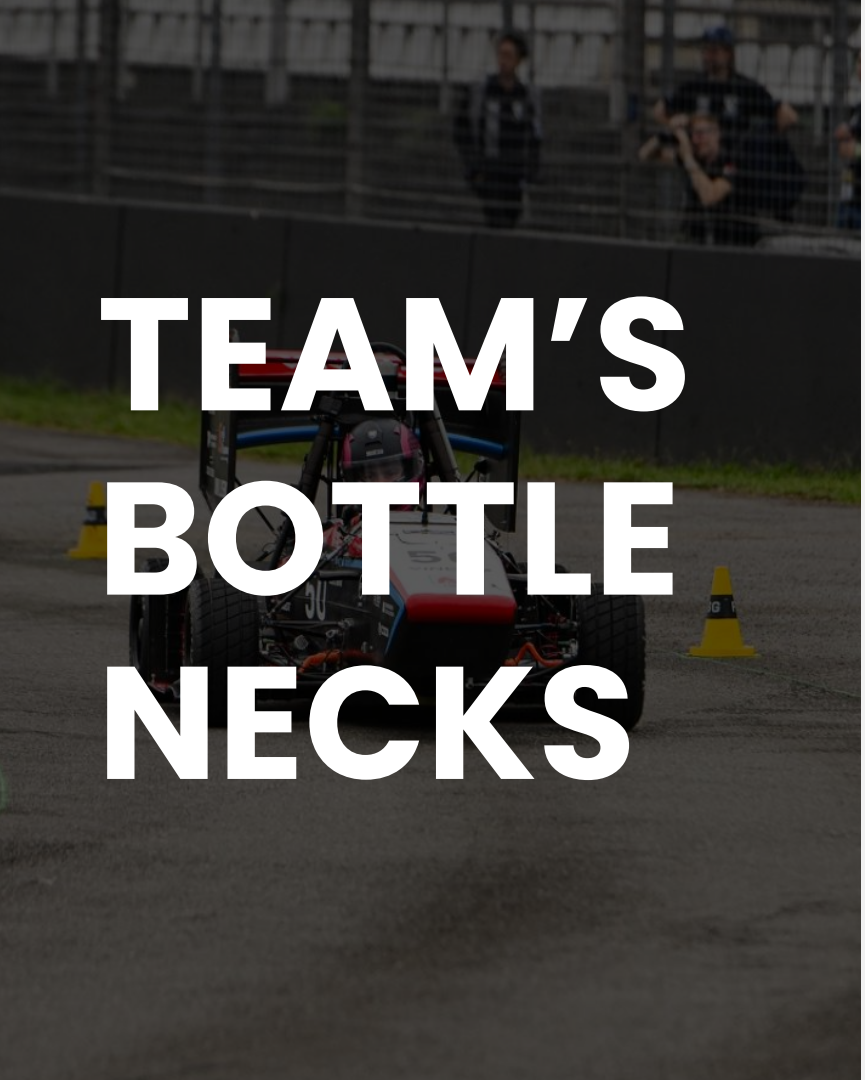
Self Made **Inverters**

2 Master Thesis resulting in 2 prototypes.



Self Made **PMSM motors**

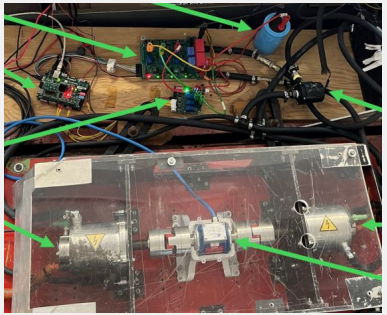
2 Master Thesis resulting in 2 prototypes

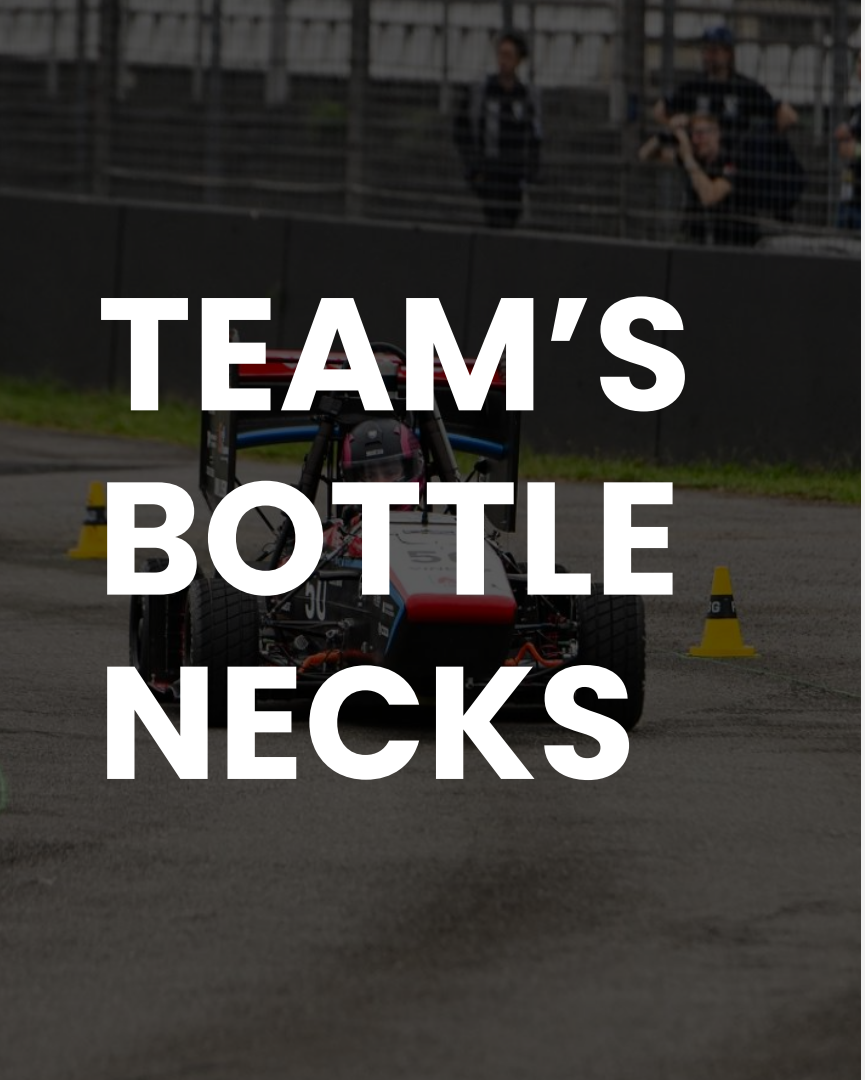


TEAM'S BOTTLE NECKS

Lack of a GOOD motor testbench to do proper testing and validations;

We have built one it had limitations that we quickly found out;





TEAM'S BOTTLE NECKS

Difficulties:

The tests started to be more demanding and the test bench broke at **8000 RPM's.** This damaged the shaft of **2 motors** and the **torque transducer.**

Main causes: Bad design, Vibrations and Misalignments.

Overall, the test bench **wasn't** designed to meet the team current needs

OUR FINAL GOAL

We want to build a proper test bench!

HOW YOU CAN BECOME PART OF OUR JOURNEY

We are looking for **students** that are interested in and motivated to take over this problem and develop a **master thesis** with the team capable of **reaching speeds** up to **21000 RPM's**.

TOPICS:

Vibration Analysis, **Structural Analysis**, **Mounting Analysis** and **Experimental testing and validation**

THANK YOU

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www.**fstlisboa**.com