

A Theoretical Investigation: The Effect of Applying KERS to a Sports 2000 Race Car

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Introduction

This project investigates how much a kinetic energy recovery system, KERS, could effect the performance of the MCR car.

Throughout the report, different components, locations and regulations were investigated and analysed.

UWTSD's MCR Sports 2000 race car was used on the Silverstone International Track.

Aims:

Background Research

Calculate & Simulate

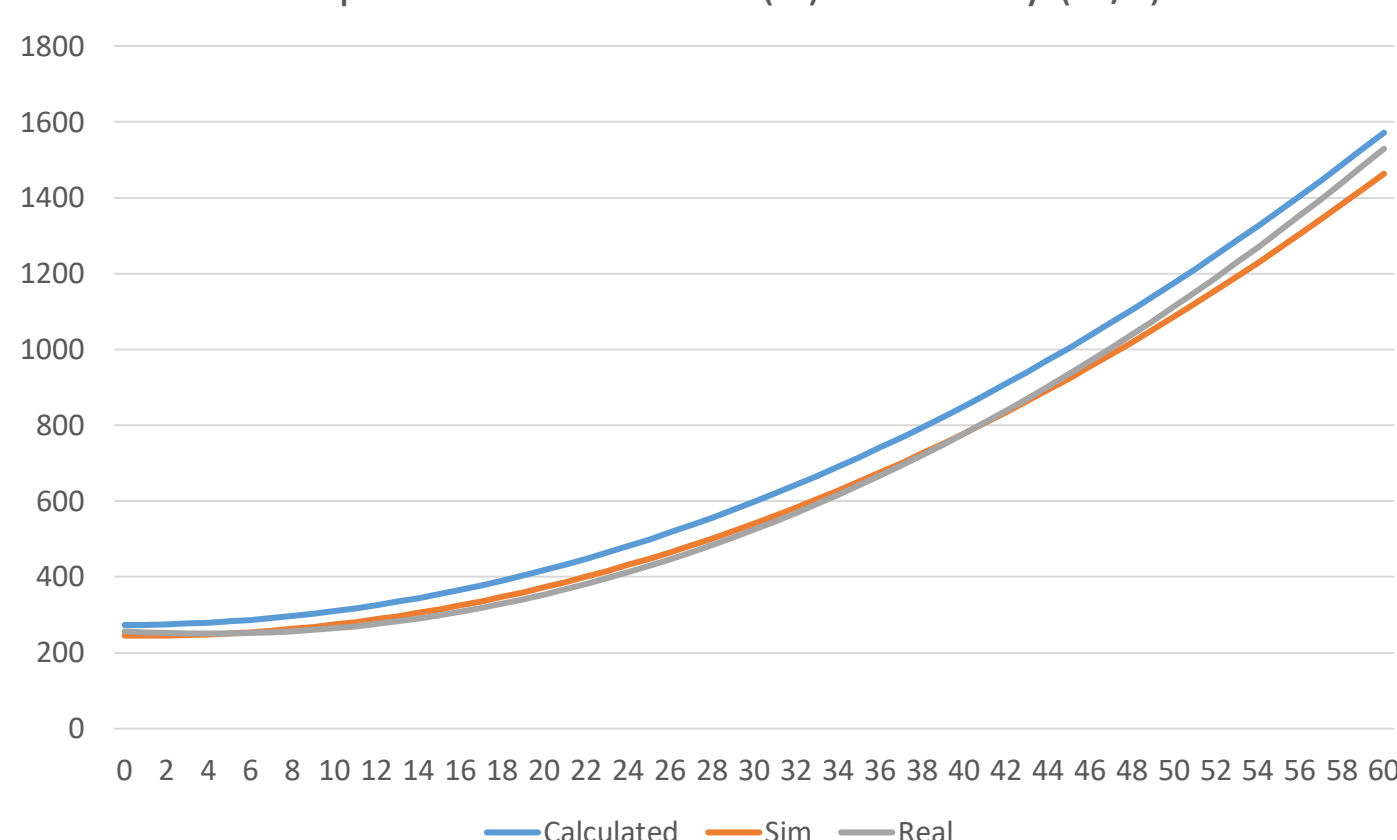
Analise Results

Methodology

Coast Down Tests

- Conducted in the Simulator (Primary Data) and Physically (Secondary data)
- Resistive forces were calculated and plotted against the velocity
- Trend line equations were produced and displayed with the calculated equation, see Graph 1 below.

Graph 1: Resistive Force (N) vs Velocity (m/s)



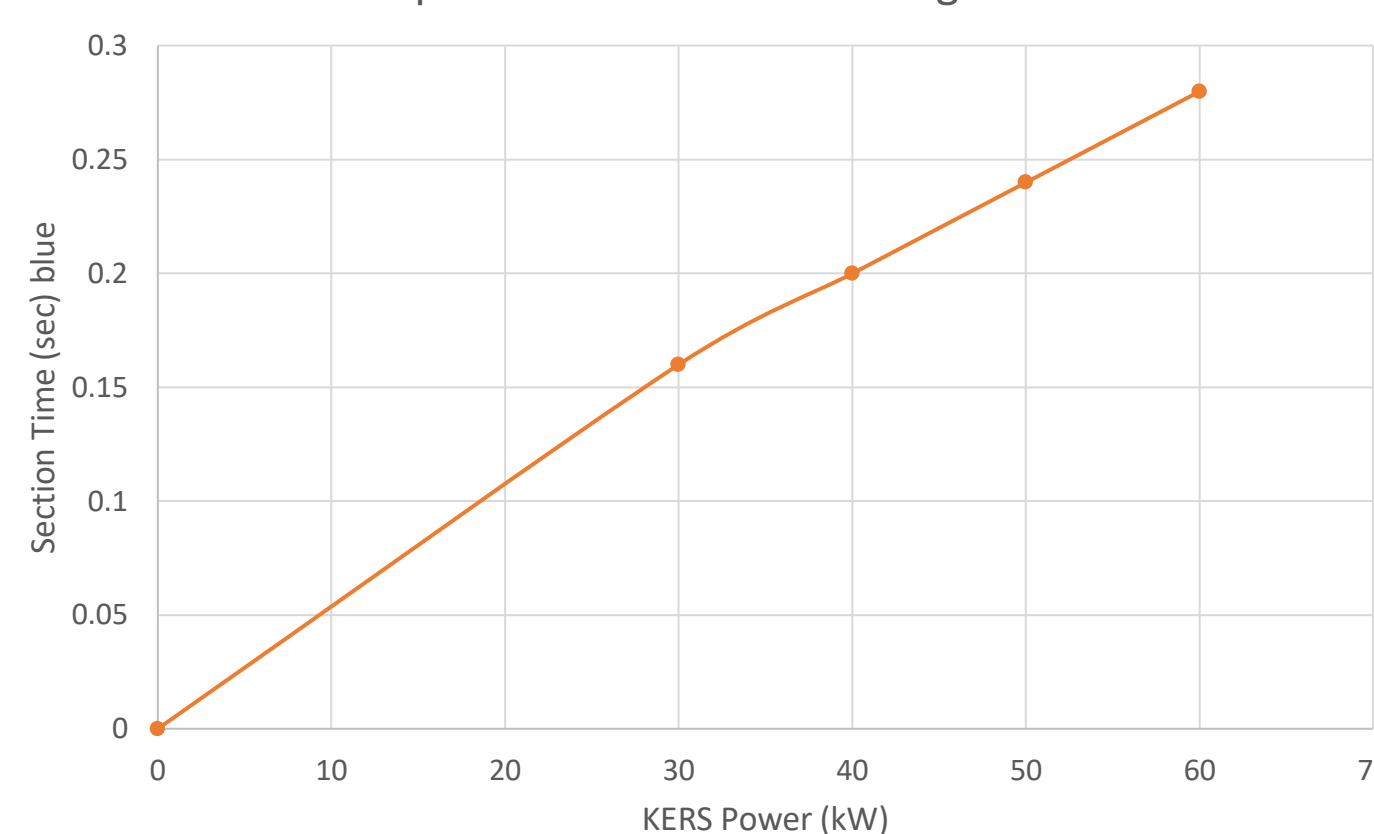
Wheel Lock Limit

- Gives the maximum harvesting power at the minimum velocity
- The result was 38kW, in wet conditions.
- This influences the MGU power and usage

Motor Power Investigation

- Between 30kW and 60kW
- Tested in a 226m straight section of the track using a 2.4 second deployment time
- How much the section time decreased by with each power is seen in Graph 2 below.

Graph 2: Motor Power Investigation



Packaging and Final Components

- Considers measurements of the car and limitations of regulations [3]

Final locations:

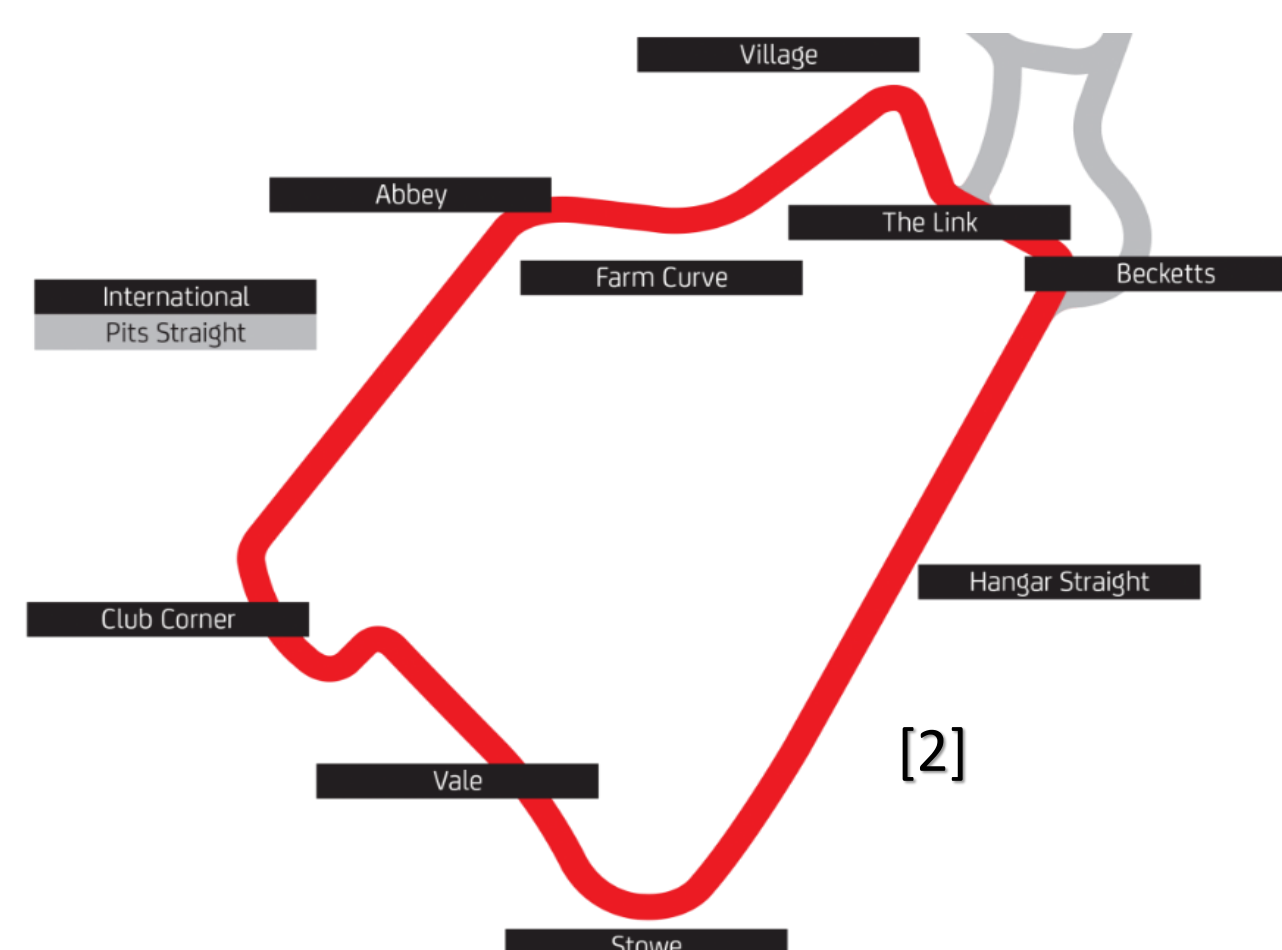
Motor: Crank Shaft

Battery: Passenger Compartment

Controller: Passenger Compartment

Calculated KERS Lap

- 26.83kW (30kW before losses) motor chosen with a system of 28kg
- 4 areas for harvesting identified, cumulating 9.76 seconds
- 3 areas for deployment identified

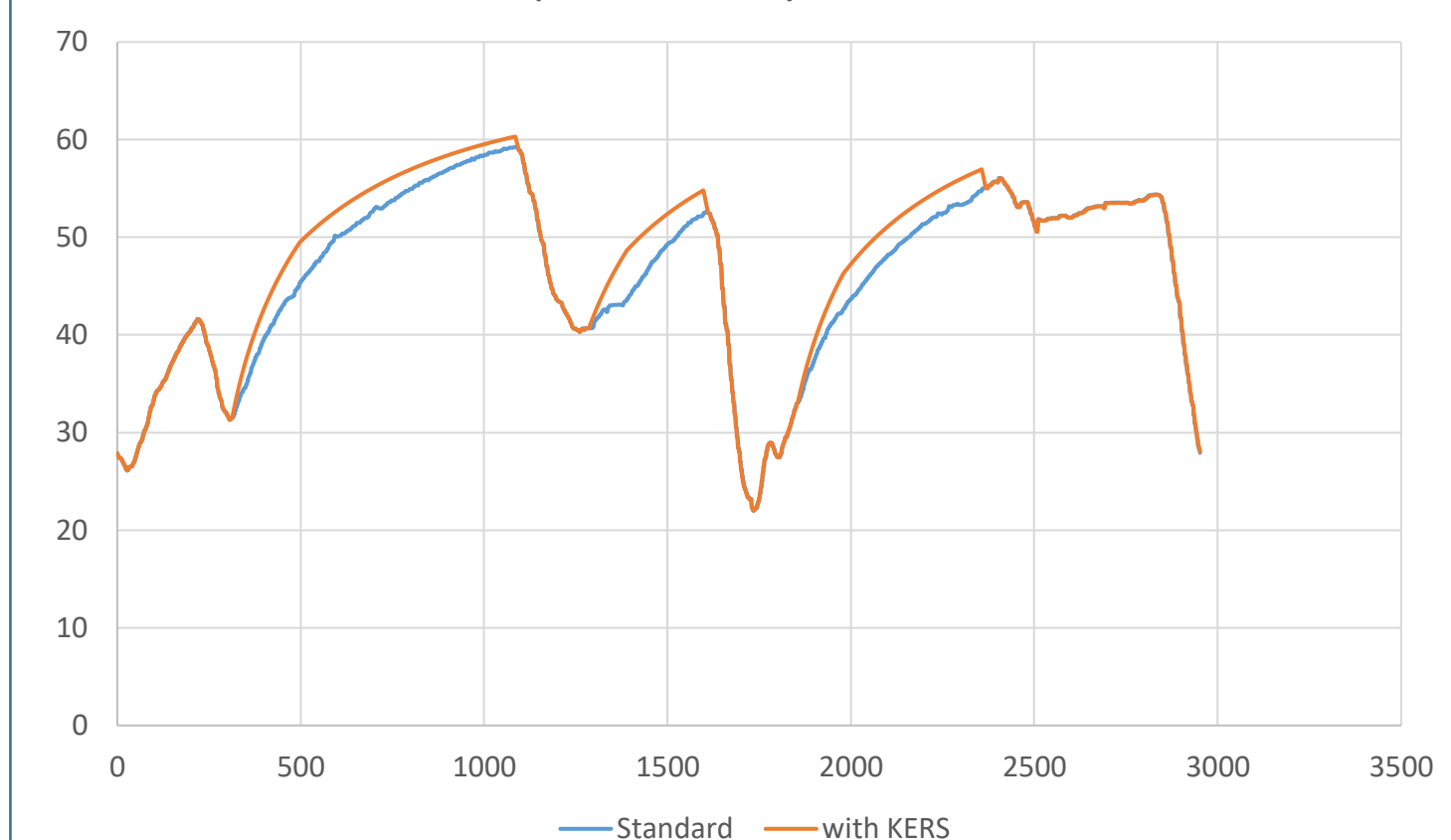


Results

The lap time decreased by 1.82 seconds with KERS from the standard 67.06 seconds. This is a 2.7% reduction.

Graph 3 validates the results and shows how much faster the car performs at each point on the track

Graph 3: Velocity vs Distance



Conclusion

Applying KERS, has a positive effect on the performance of the car and the efficiency by using otherwise wasted energy.

But this is only relevant if championship and governing body regulations allow for it. Currently, it is unlikely SRCC will implement it.

Physically implementing a system like this is also costly and so doesn't meet the needs of this small, sometimes self funded, championship

Acknowledgements

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References

- [1] M Sport Eng, 2016. Our Car: M Sport Eng. [Online] Available at: http://www.msport-eng.com/?page_id=1665
- [2] Silverstone, 2016. International Circuit: Track Hire: Silverstone. [Online] Available at: <https://www.silverstone.co.uk/track-hire/>
- [3] Ratley, R., 2020. Overview of the proposed Technical Regulations governing the use of Electric Vehicles in UK Motorsport. Colnbrook: Motorsport UK.