



Project Title in Regular Font Size 48

Jack Hazlewood

Malcom McDonald

School of Engineering

BEng (Hons) Motorsport Engineering



Introduction

The project is based on engine tuning and mapping. There will be the aim of increasing the horsepower of the car while using a knock sensor to ensure the power delivery is safe. All parts of mapping will be adjusted, things such as fuel, timing and boost pressure.

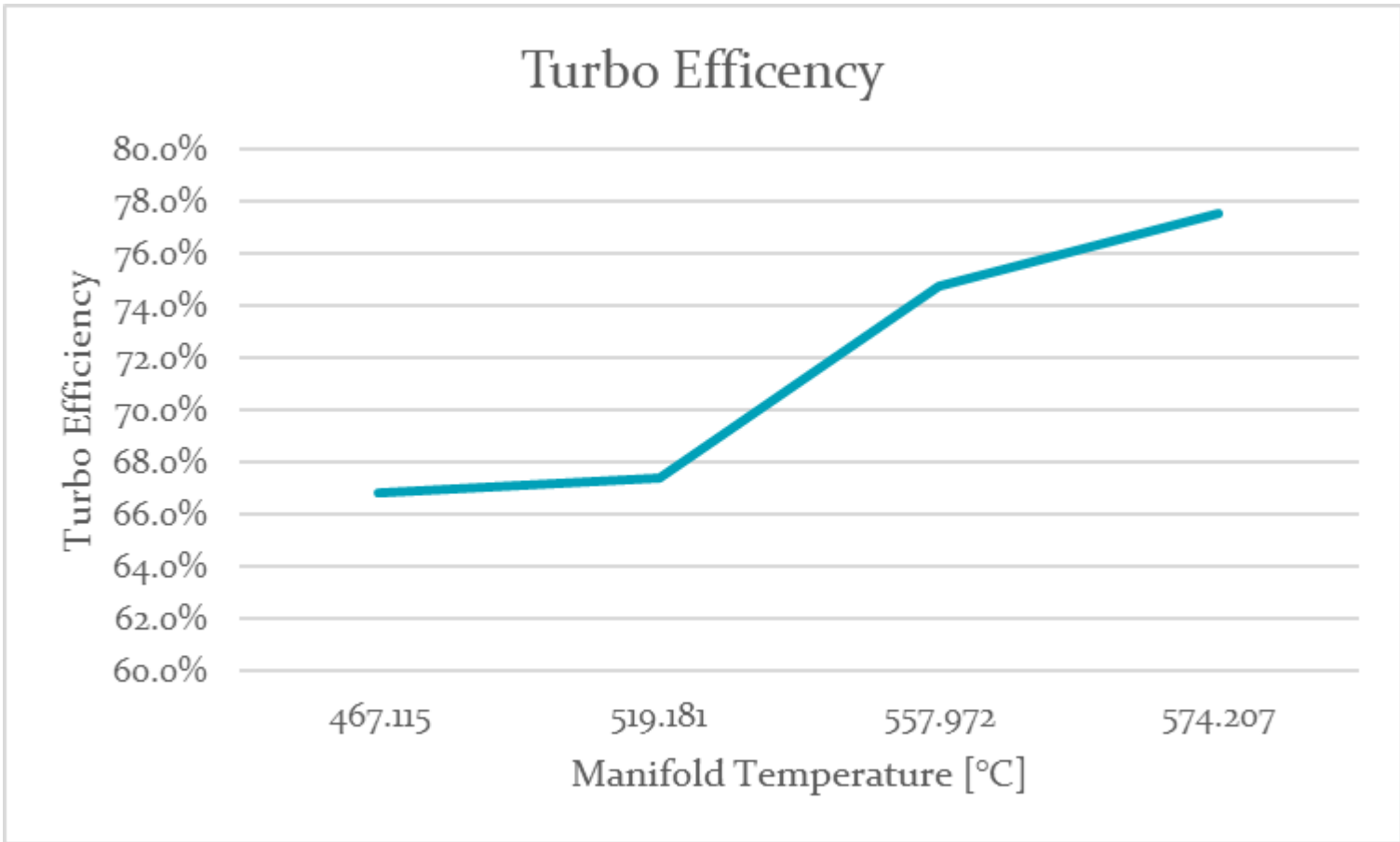
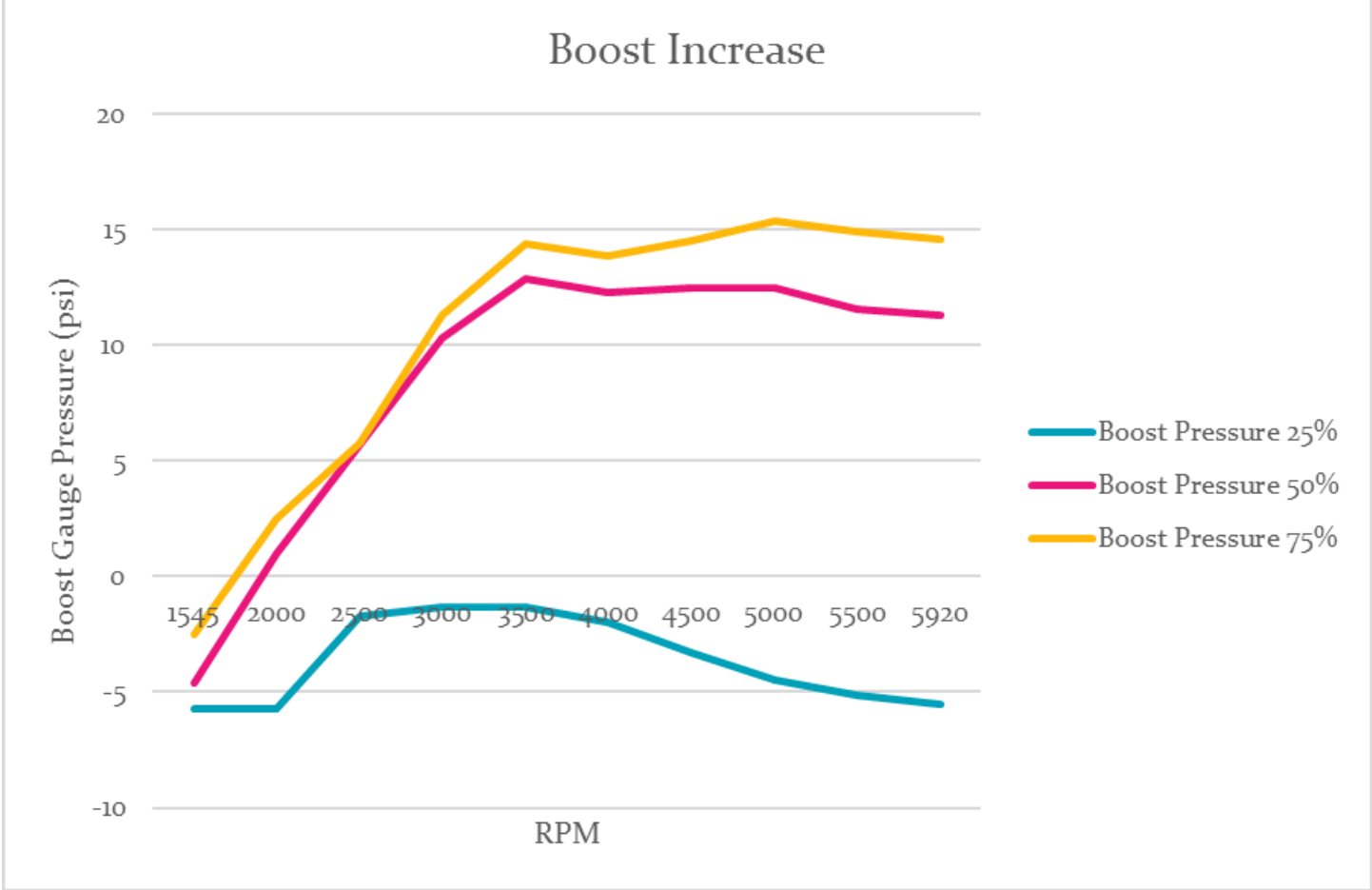
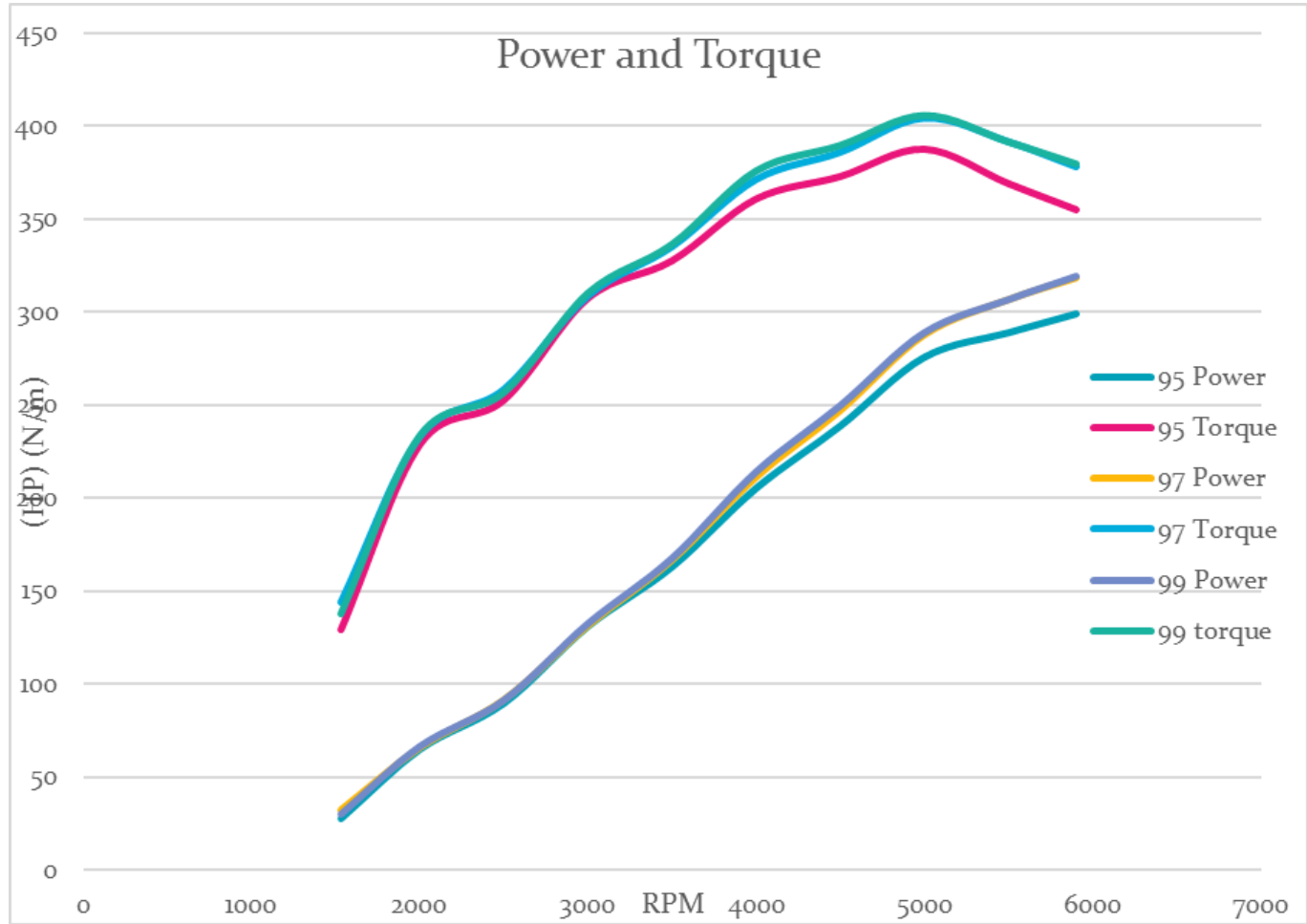
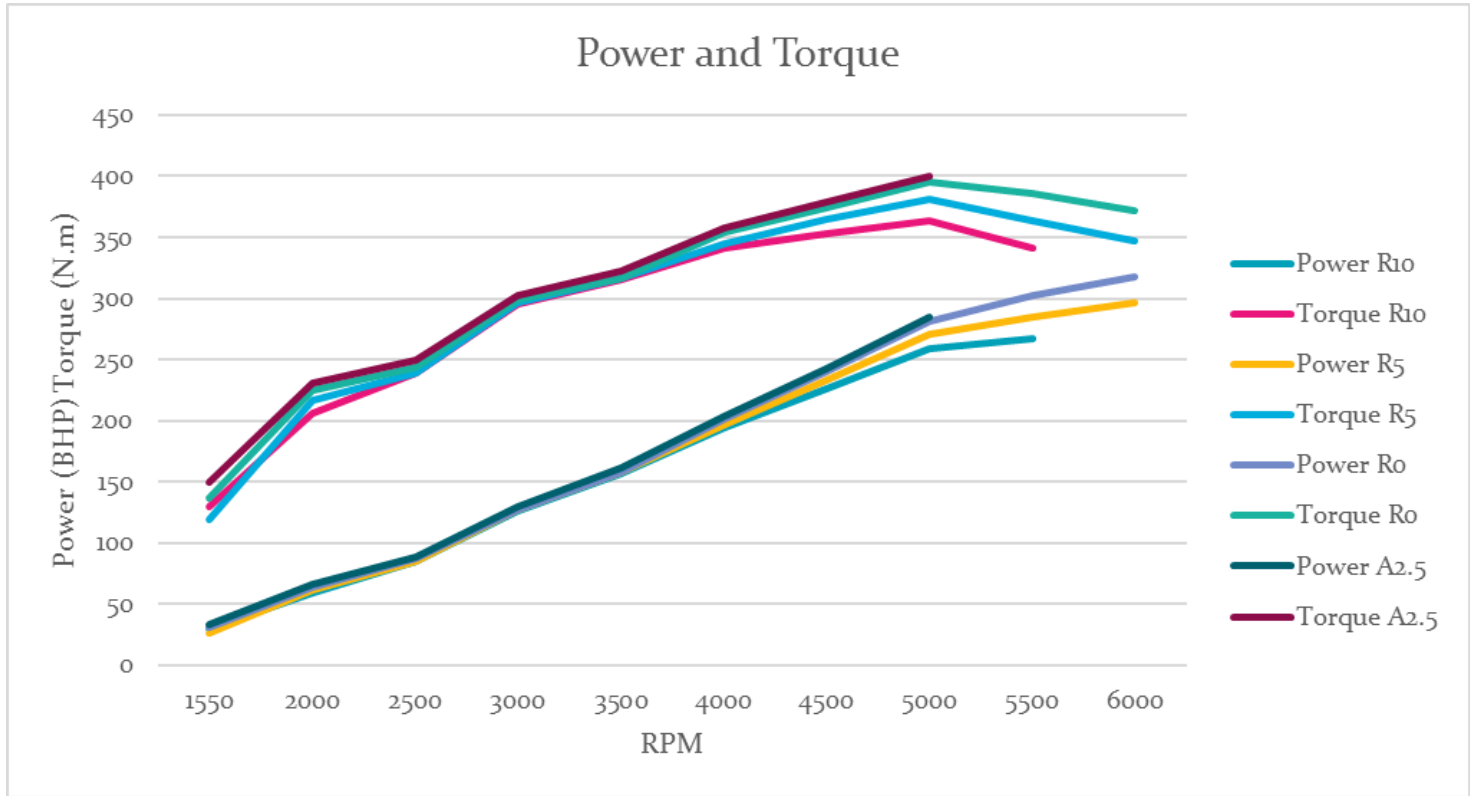
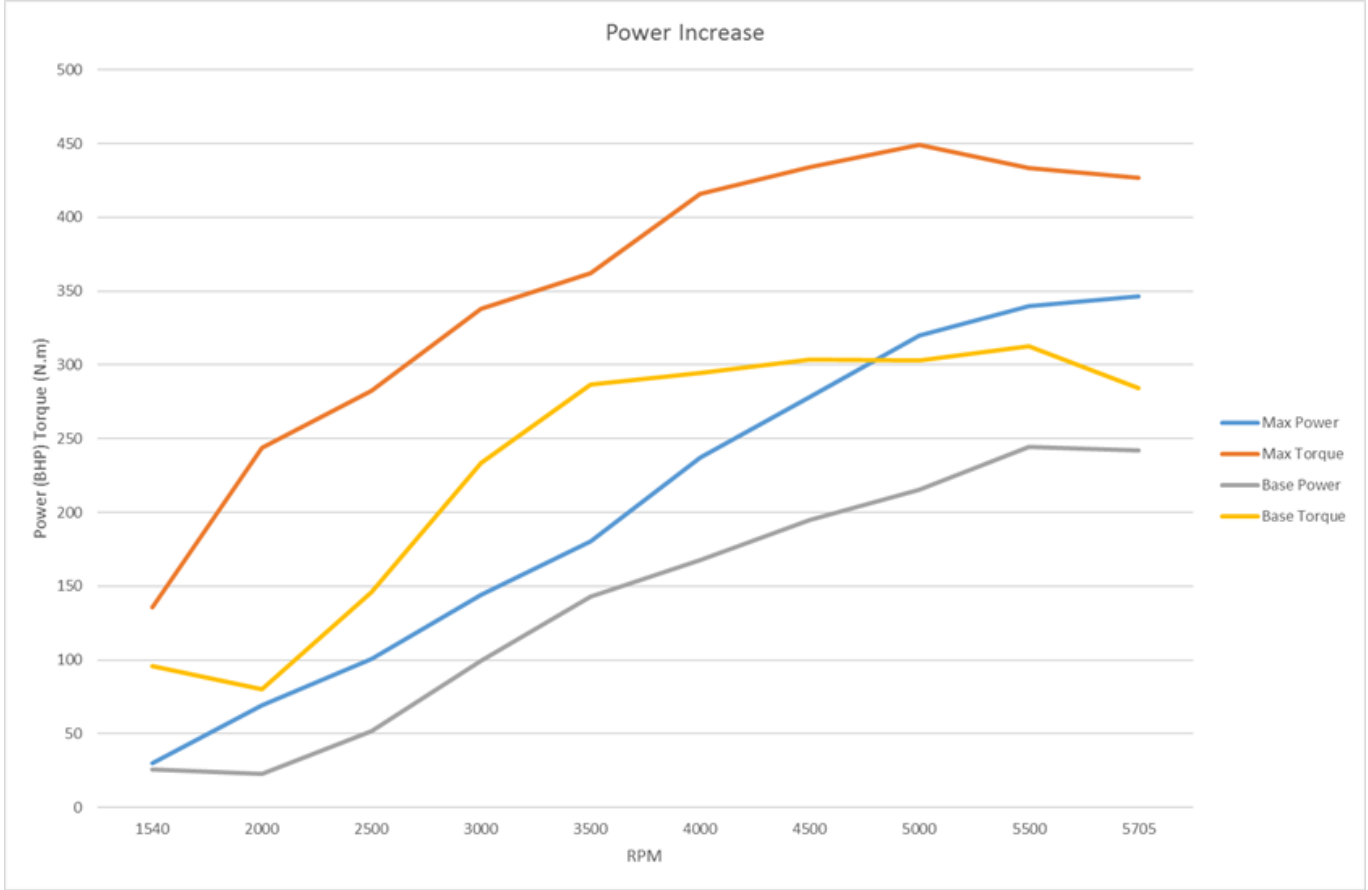
The car being used is the Nissan 200sx with a quoted power output of 197 BHP. This is a 2.0 litre turbocharged engine. The turbo used is a T28 turbo. The car will be fitted with an aftermarket ECU to make tuning all aspects of the engine more efficient. The ECU being used is the Link G4+. This Plugs straight into the standard chassis harness.

Project Aims

- Adjust the fuel table to get optimum power from the fuel
- Adjust the timing table to produce max power with the consideration of detonation.
- Adjust the wastegate duty to allow changes in boost pressure.
- Look at throttle part loadings to see the effects.

Methodology

To start the car needs to be strapped down on the dynamometer and the program turned on. The cars RPM needs to be set due to lack of OBD port and therefore a RPM driving trial needs to be completed. With the correct settings inputted into the program, the car can be started and the run started. Take the car to the RPM limit to get maximum power figures. Save the run on the program to the built in database. Make any relevant changes to the map and then complete a new run.



Results

The results of the project show that there was an increase of 75% power from the quoted power output. This was due to a variety of changes to the mapping of the car. From start to finish the car runs a lot smoother and keeps a consistent AFR. It showed that reducing the duty cycle of the fuel improved the engine performance, however with the engine going too close to stoichiometric meant the engine got too hot and therefore an AFR of around 12.5 showed best results. The ignition timing was altered using a knock sensor to pickup frequencies within the engine. More power was made with an advanced timing but the engine was knock limit. Finally the turbo showed an efficiency of around 75%, this was done with the wastegate fully shut to a RPM of 3500.

Conclusion

To conclude the project, more horsepower was extracted from the engine using boost, fuel and timing. The engine was monitored using AFR, boost sensor, knock sensor and thermocouples in the exhaust. The octane rating of fuel allows for a more advanced timing and therefore improves the performance of the engine. The project was a success, with knowledge being gained and the drivability of the car being improved.

Acknowledgements

I would like to acknowledge Mark Fall for all the dynamometer help and support. As well as Malcom McDonald for the inspiration and support throughout the project. Finally I would like to thank Morgan Kirkham-Jones for the support in completing Dynamometer runs.