



Project Title in Regular Font Size 48

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Introduction

In Europe Ford is one of the largest motoring companies and is revered for there powertrains. For many years the ford Duratec engine series have propelled racing series such as MCR2000 and the ford Zetec and pinto are still being used to armature racing to this day, but as times change and government regulations change with it, demand for smaller more efficient engines that produce fewer CO2 and NOx emissions greatly increase. Procedures such as the world harmonized light vehicle test procedure which as of 1st of January 2019 enforces a limit of no more than 130g CO2/Km. Furthermore as of 2020 this limit will reduce to 95g CO2/Km [1]. Due to these restrictions companies such as ford have developed small turbo charged engines such as the ecoboost series.

ECOBOOST

The 1.6 ecoboost one of the larger capacity engines in the ecoboost range available in Europe. It is redily available as it come in a variety of cars such as the ever popular focus, fiesta and Mondeo models. Therefore it is a reasonable assumption that people will start using them for race/competition use.

The power an engine can create relies on two thing the engine capacity which dictates the torque and the operating speed. As the ecoboost range is a rather low engine capacity range increasing the power can be achieved by increasing the rpm limit.

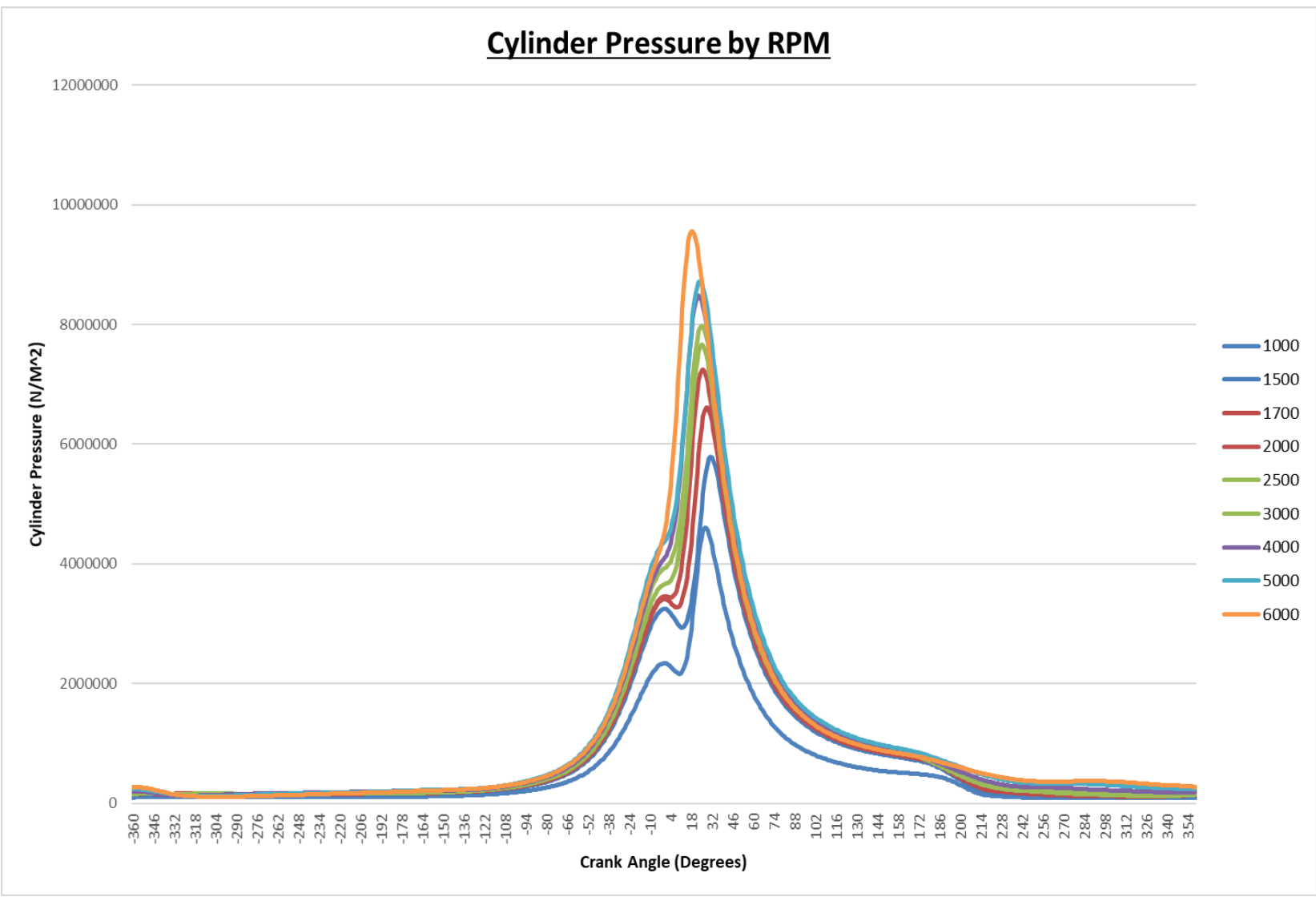
Power = (Torque*RPM)/radians per sec

A simple solution then is increasing the rpm but there in lies the problem. The higher the engine speed the greater the stress on the engine, this is where engines start to break.

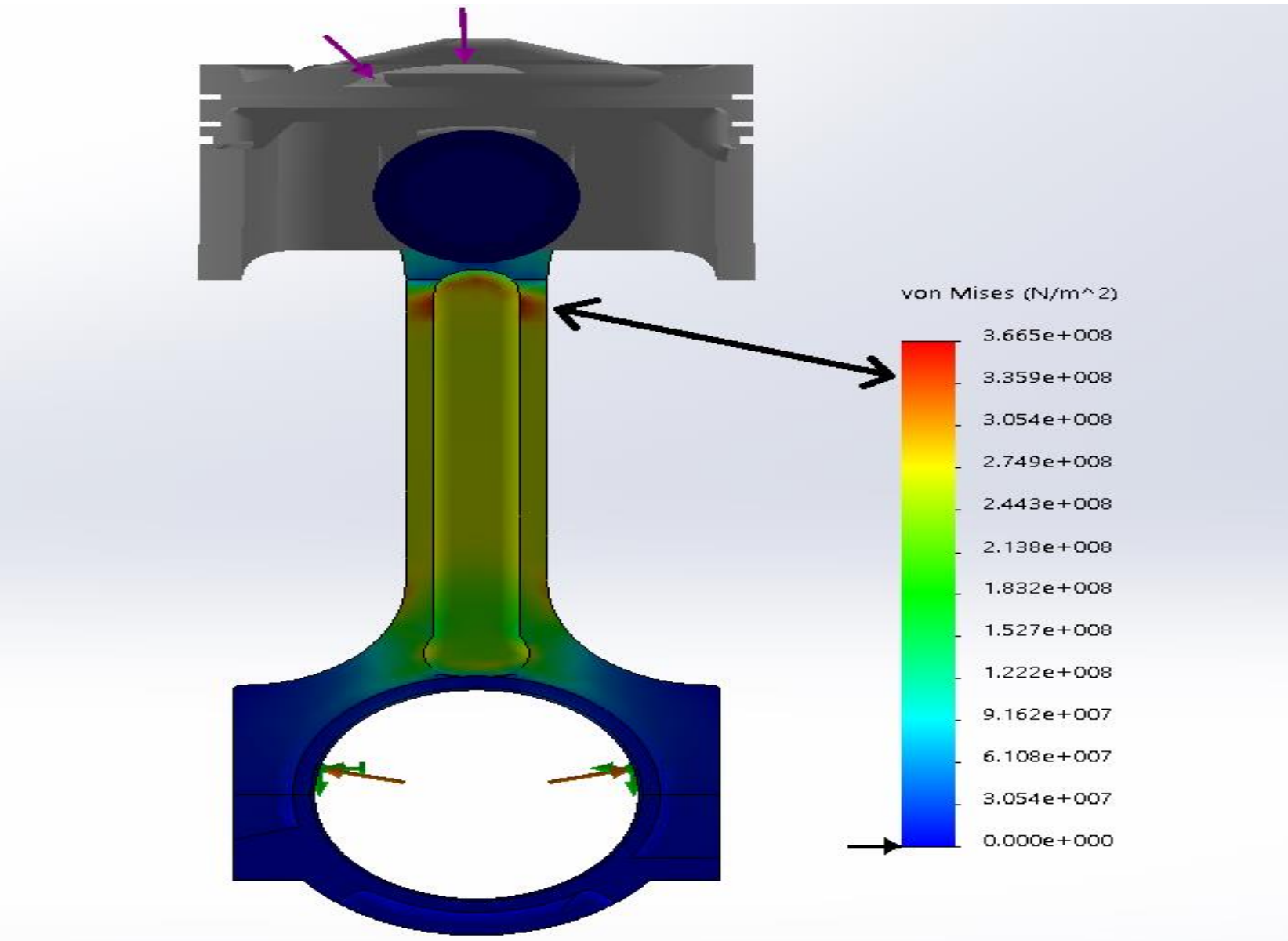


A picture of a 1.6 ecoboost engine for reference.[2]

The first stage of developing high revving engines is to understanding its current capabilities. To do this simulations have to be made and calculations formulated. bellow is a table of the gas forces in a ecoboost cylinder.

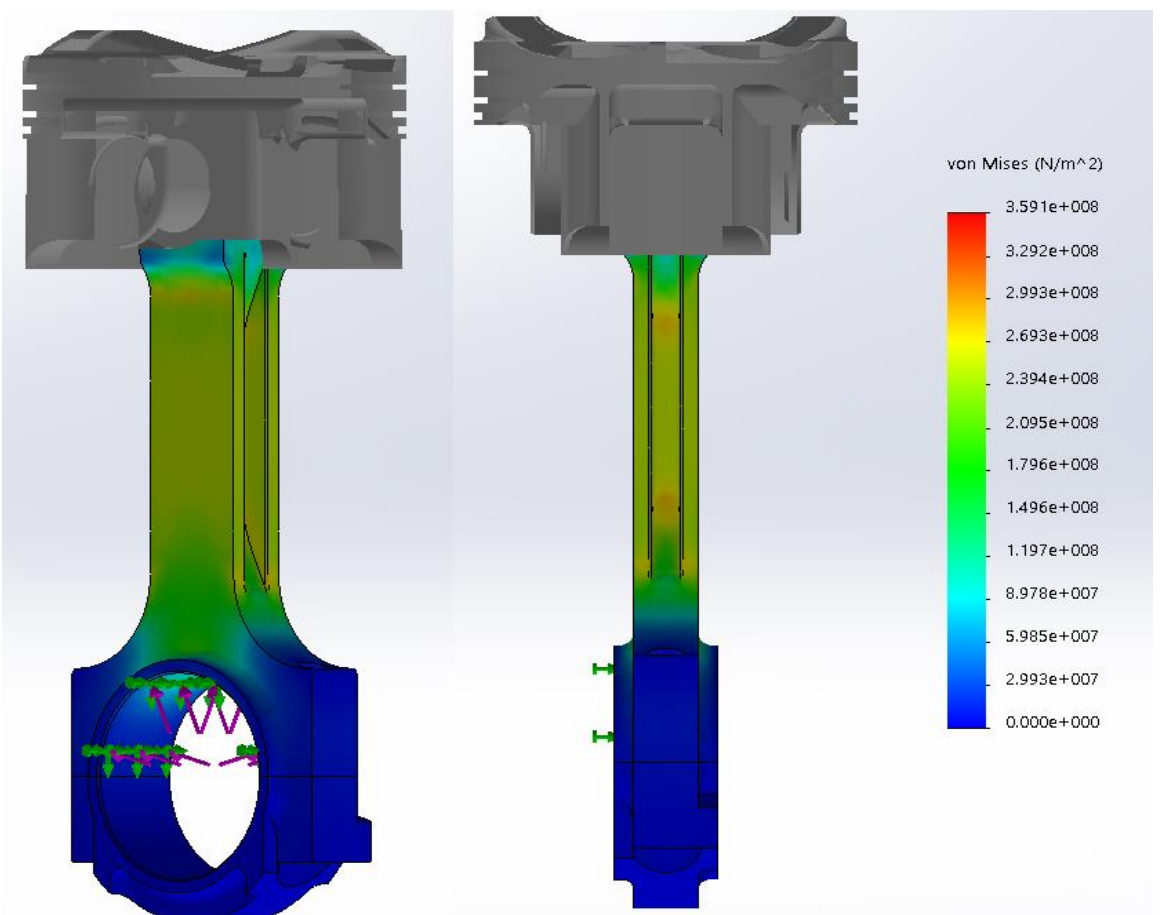


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1.6 ecoboost conrod static tested at 6000 rpm pressures
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Once a model has been made of the engine and verified by calculations and simulations new component designs can be made.



New design of a large H beam 4340 forged steel connecting rod J.Lewis 2019

The final stage of production is to analyse the new components against the old ones to find strengths and weaknesses in a bid to continually improve performance and efficiency.

Conclusions

Changing connecting rod via size shape and material can lead to greater performance benefits. From my studies the best and easiest way to increase a conrods strength is to increase the area of the shank however it can be a catch twenty two situation as it increases the weight which effects the capability.

Acknowledgements

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References

- [1] WLTP facts, [Online]. Available: <http://wltpfacts.eu/from-nedc-to-wltp-change/>. [Accessed 01 04 2019].
- [2] Ford Sales, [PDF]. AVAILBLE: <https://www.ford.co.uk/content/dam/guxeu/uk/documents/home/experience-ford/about-ford/ford-component-sales/specification-details-data-sheets/16-ecoboost-np.pdf>