



Improvements to an Inlet Ports Flow Coefficient by manipulation of Port Shape, Seat Configuration and Combustion Chamber Design

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Introduction

In a world where engine emissions and efficiency's are becoming more important that out right performance, a new focus is turning towards being able to improve these figures. The design of valves, valve seats, inlet ports and combustion chambers has a large effect on the combustion performance of an internal combustion engine. This study investigates how these individual parameters are able to aid or reduce the flow of air into the combustion chamber.

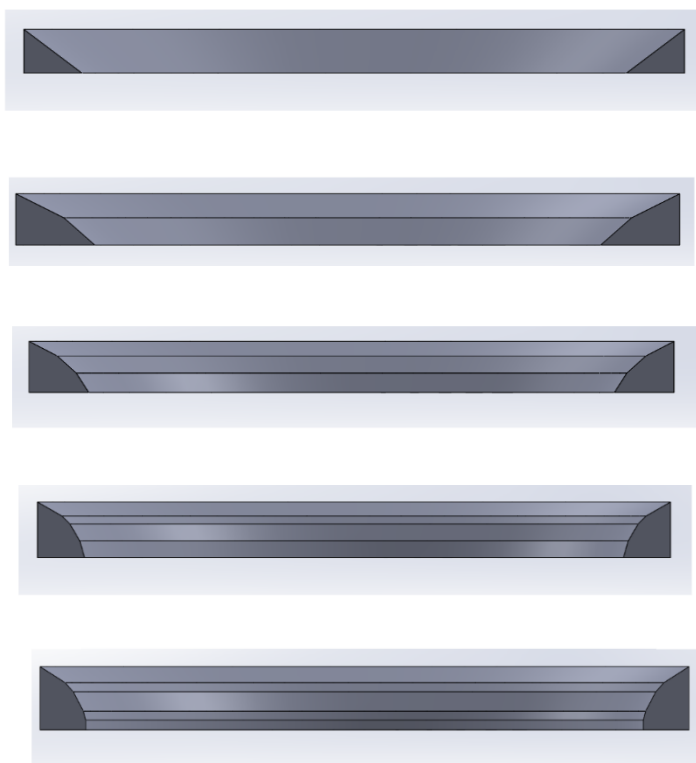
Project Background

With the end of university in sight, it is time to turn towards projects at home. This mini has been sat on the driveway for 4 years and is in need for some attention. The plan is to restore it and to increase the power and efficiency of the engine.



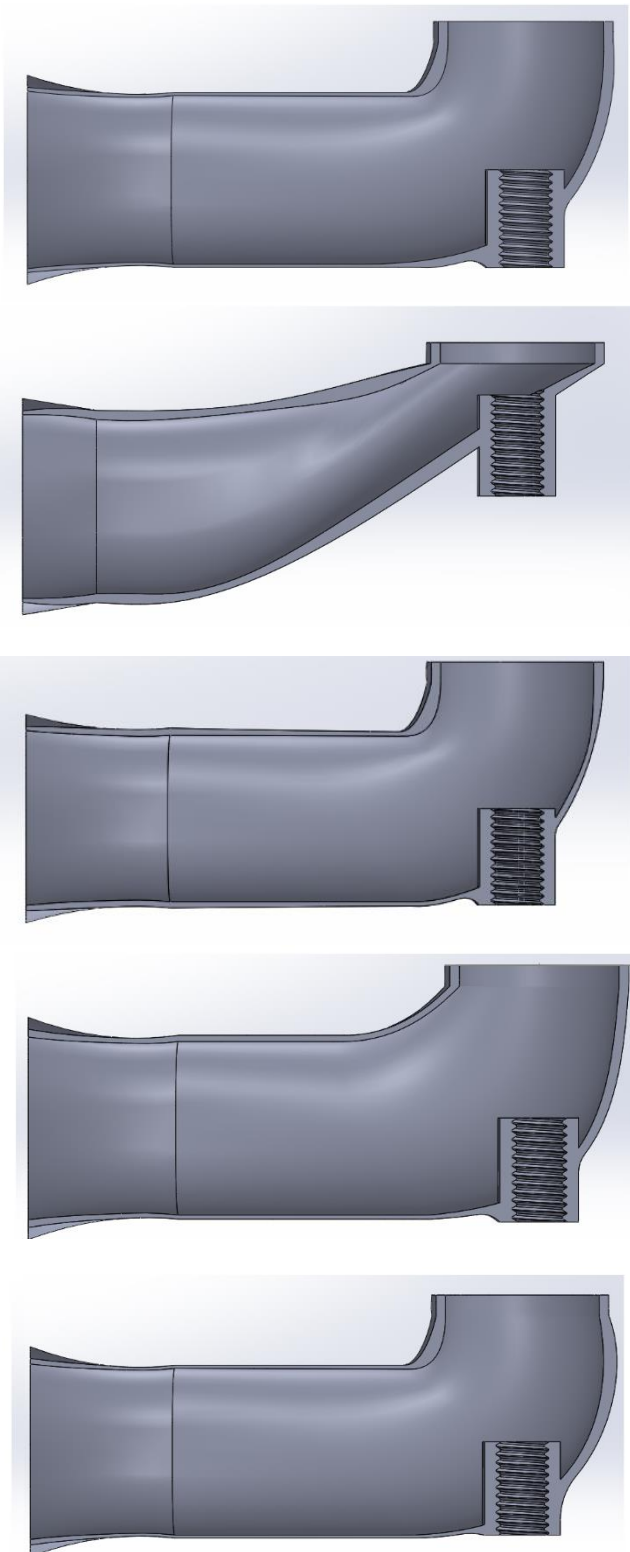
Methodology

- Flow test standard cylinder head
- Model 12G202 Inlet port in CAD
- Model 12g202 seat geometry in CAD
- Model 12g202 Combustion chamber by CAD
- 3D Print modelled parts
- Flow 3Dprinted parts and compare to original
- Flow test printed parts through use of CFD
- Make changes to modelled port deign by manipulating port floor and roof, long turn radius and short turn radius
- Gradually removing valve shrouding
- Add multiple cuts to to the seat
- Decide on best dimensions and component configurations to most increase flow
- Flow test all improved designs with each other
- Flow test all improved designs with each other with the use of CFD
- Validate real world flow testing with CFD test
- Conclude on best and worst design improvements to inlet port flow



Different seat configuartions will be used with the following angles

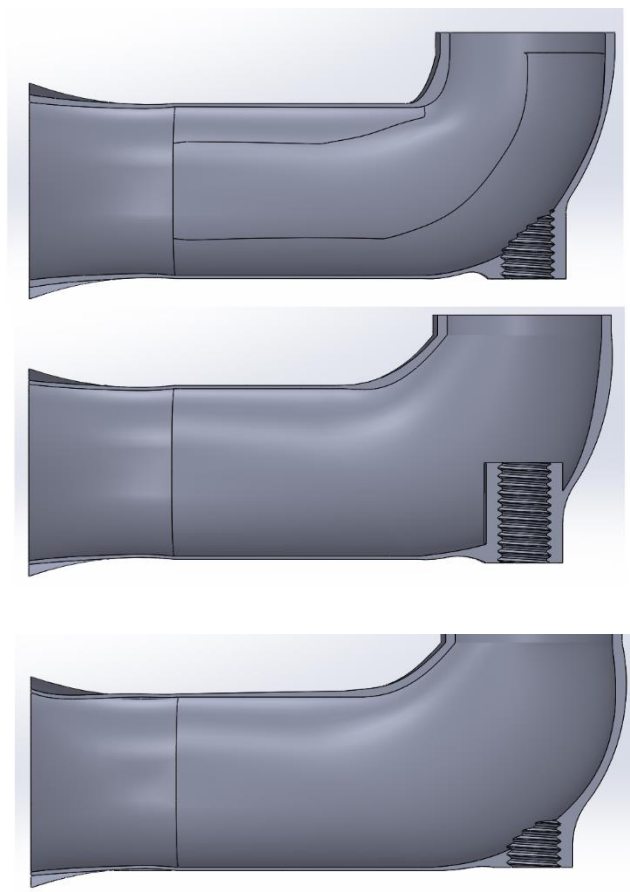
- 1 cut at 45 DEG
- 2 cut at 30, 45 Deg
- 3 cut at 30 , 45, 60 Deg
- 4 Cut at 30, 45, 60, 75
- 5 Cut at 30, 45 ,60 ,75, 80 Deg



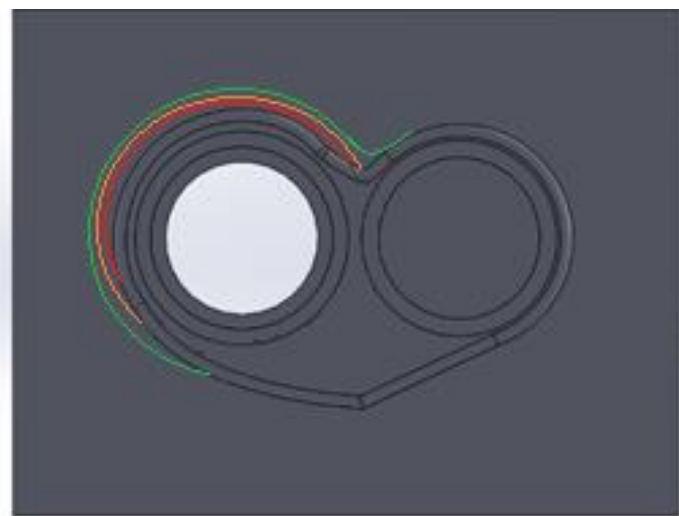
Different port geometry's were tested throughout the project, they are:

- Standard mini port

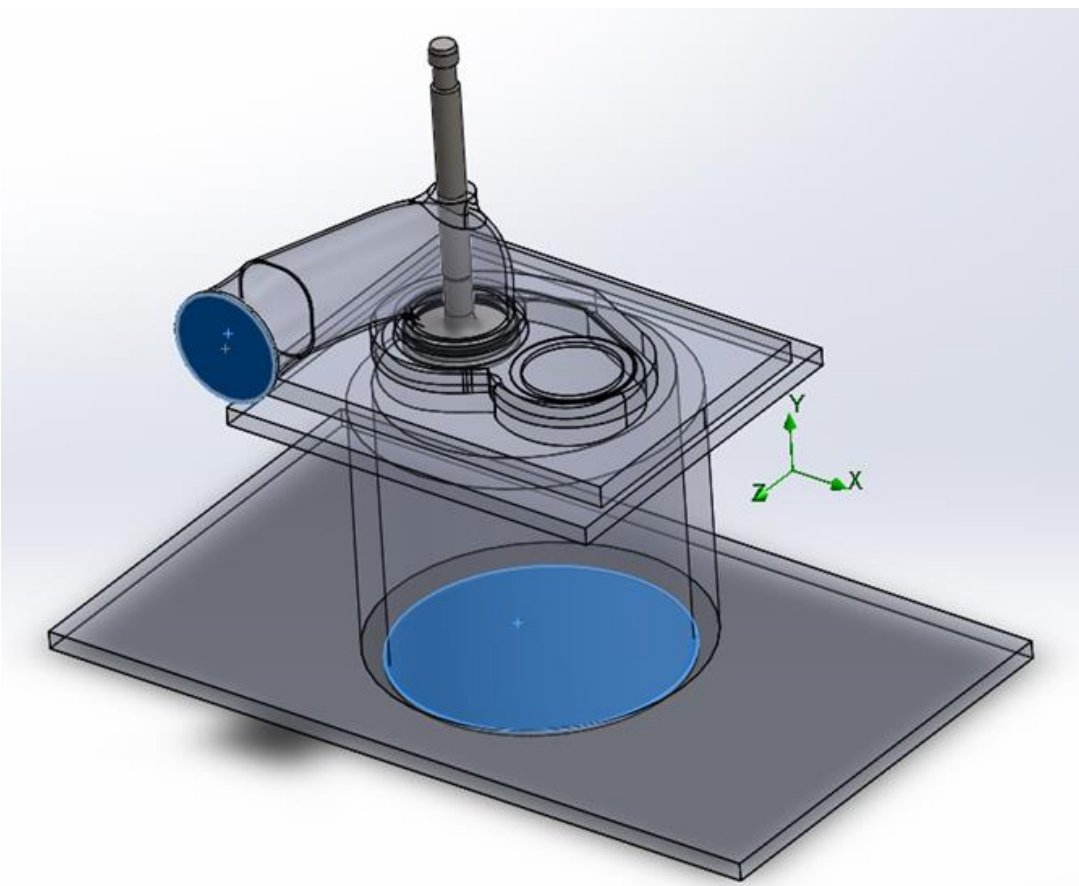
- REDUCED CROSS SECTIONAL AREA
- REDUCED LONG TURN RADIUS
- REDUCED SHORT TURN RADIUS
- Smoothed valve guide



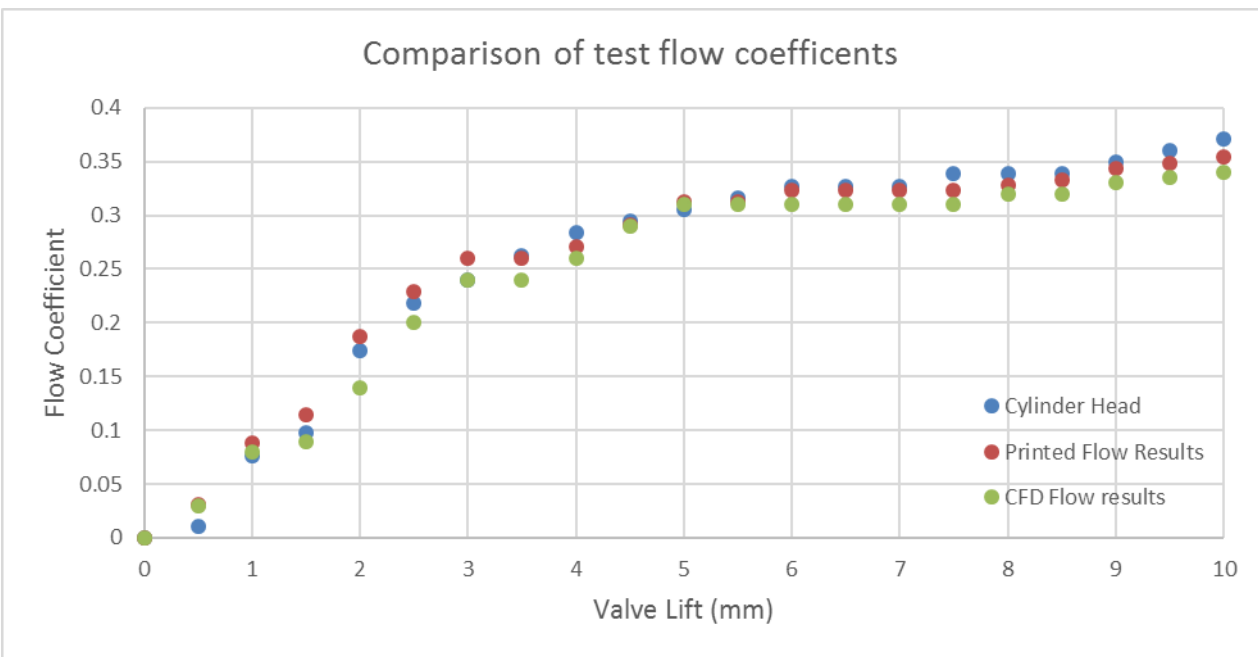
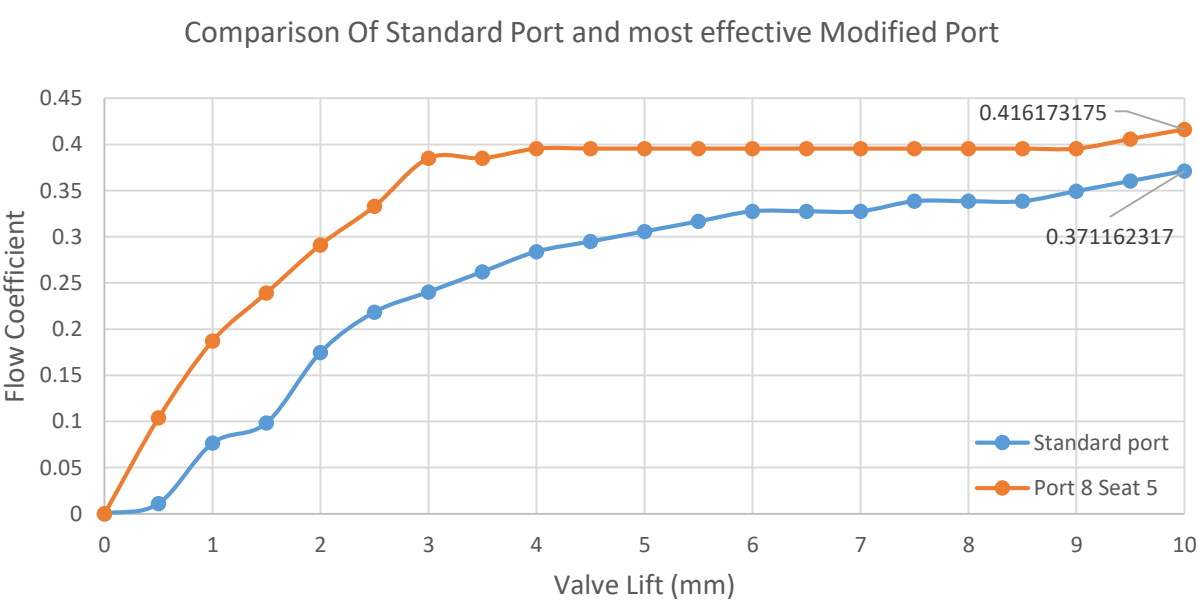
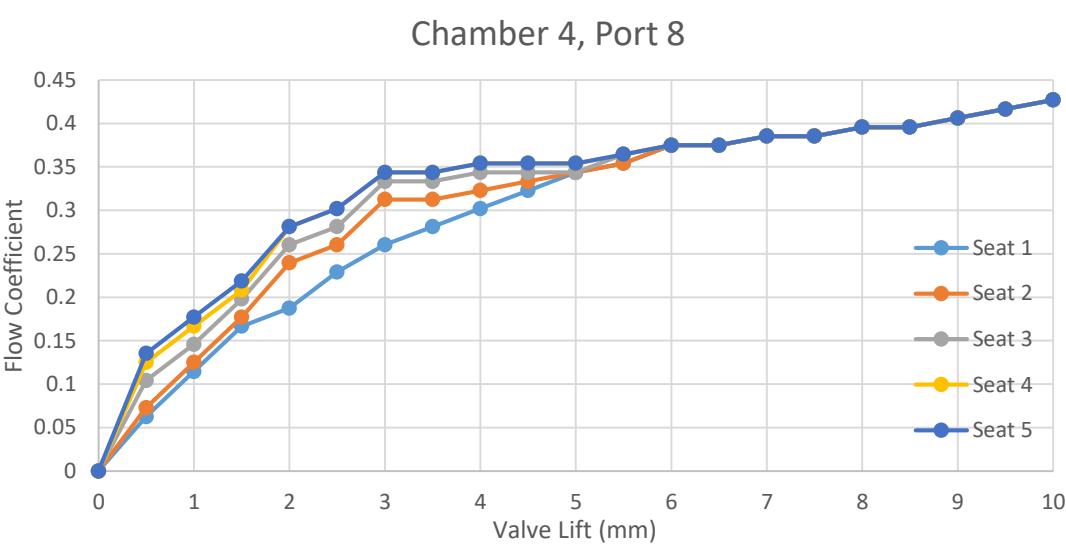
- Increased short radius
- Increased short radius, increased long turn radius
- an Increased short radius, increased long turn radius and smoothed guide



4 different combustion chamber shapes will be tested. These will each have 0.5mm of valve shrouding removed from each design.



Results



Acknowledgements

I would to thank my family for their support and assistance not only through the final year at university, but the last three years as well. Without their moral, physical and financial support the course would have been much more challenging and would have been hard to complete throughout its entirety

References

D, Vizard (2012). How to port & Flow test cylinder heads . Minneapolis: Car Tech Inc . A

Heywood John B 1988 *Internal Combustion Engine Fundamentals* (St. Louis, MO: McGraw-Hill Book Company) 230-245