



Honda CR500R Study

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Introduction

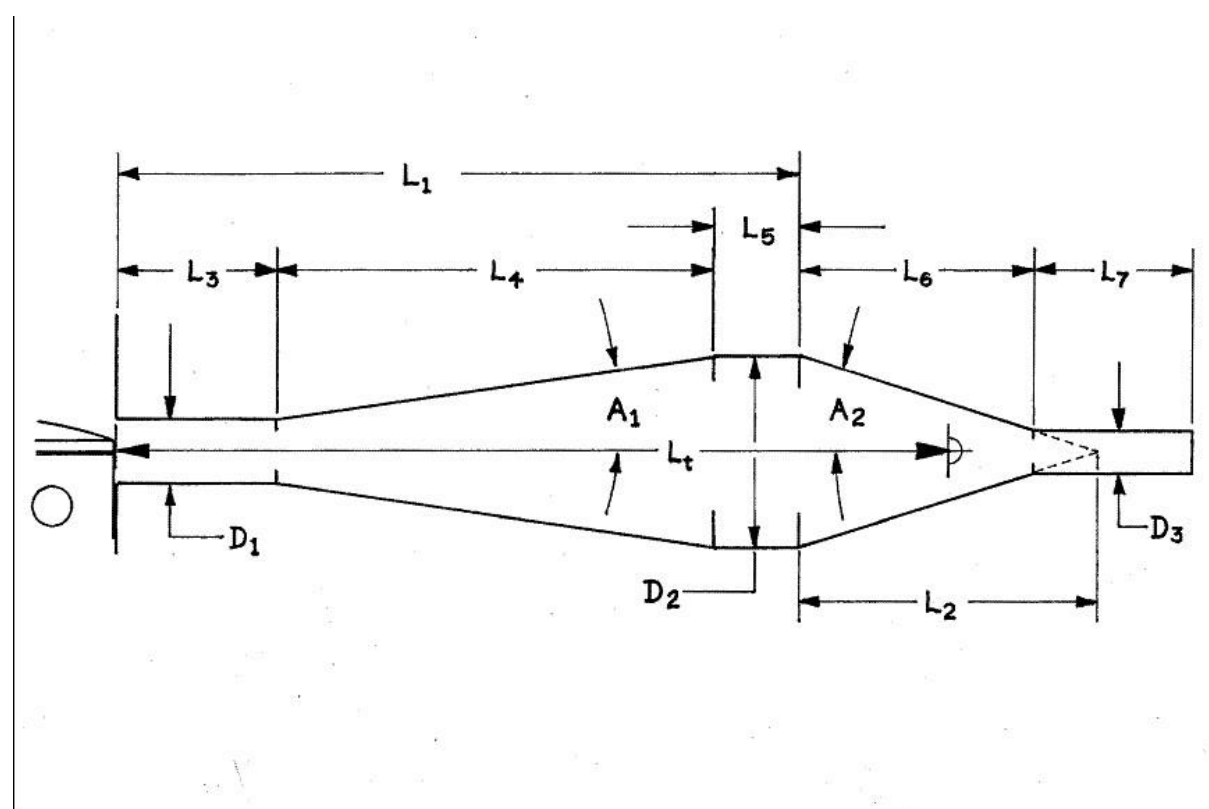
This report will explore two chosen areas in which the Honda CR500R can be modified to improve performance for use in several motorcycle disciplines. The first section will cover the design of a pair of CNC machined billet aluminium crank cases which can be used as a direct replacement for the OEM parts. This section will highlight the changes made to the design to improve performance, longevity and make the part suitable for manufacture. The second section will study the exhaust system and how it can be designed to change the characteristics of the engine. A modified system will be created mathematically, manufactured and then tested to allow the real-world data to be compared to the calculated data.



Figure 1 – CR500R

Methodology

$$L_t = \frac{V_s \times \theta_0}{12 \times RPM}$$



The exhaust created for this motocross bike will tune the engine to produce peak power at 6500 RPM and have a powerband width of 2000 RPM.

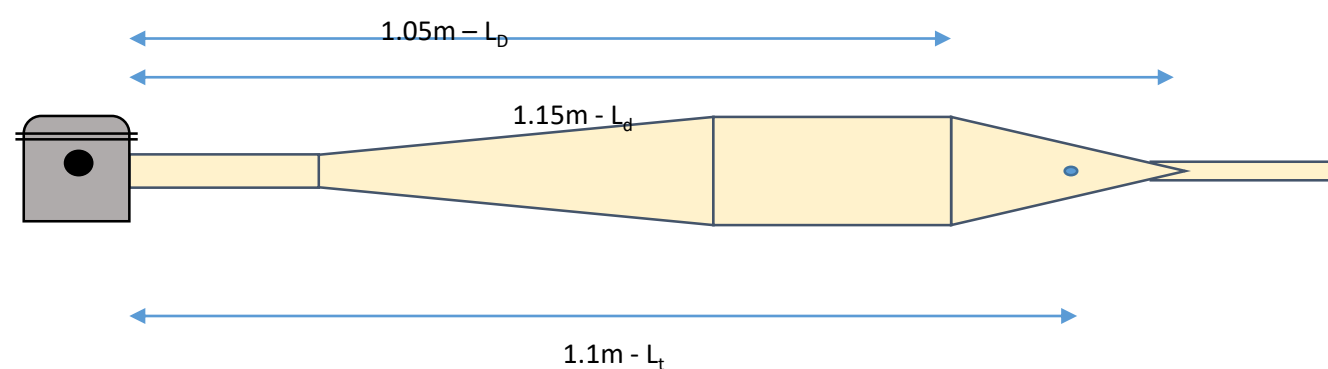


Figure 2 – Design for CR500R

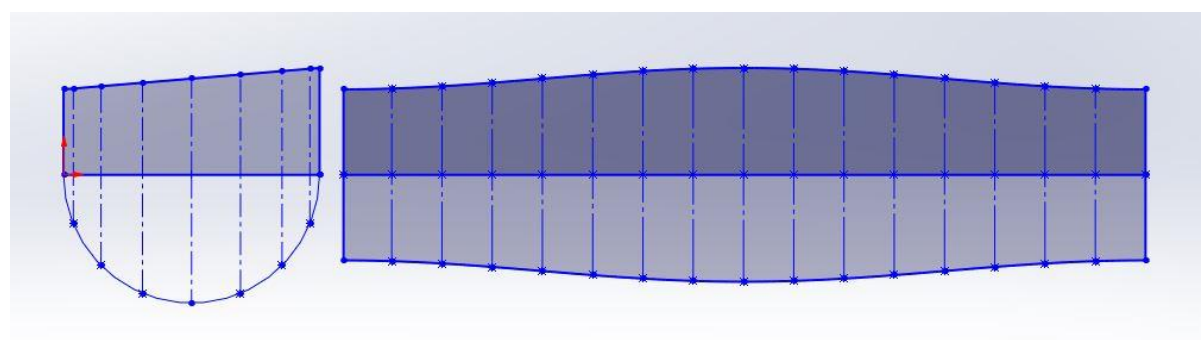


Figure 3 – Mitred pipe section.



Figure 4 – Crankcase with cracked housing..

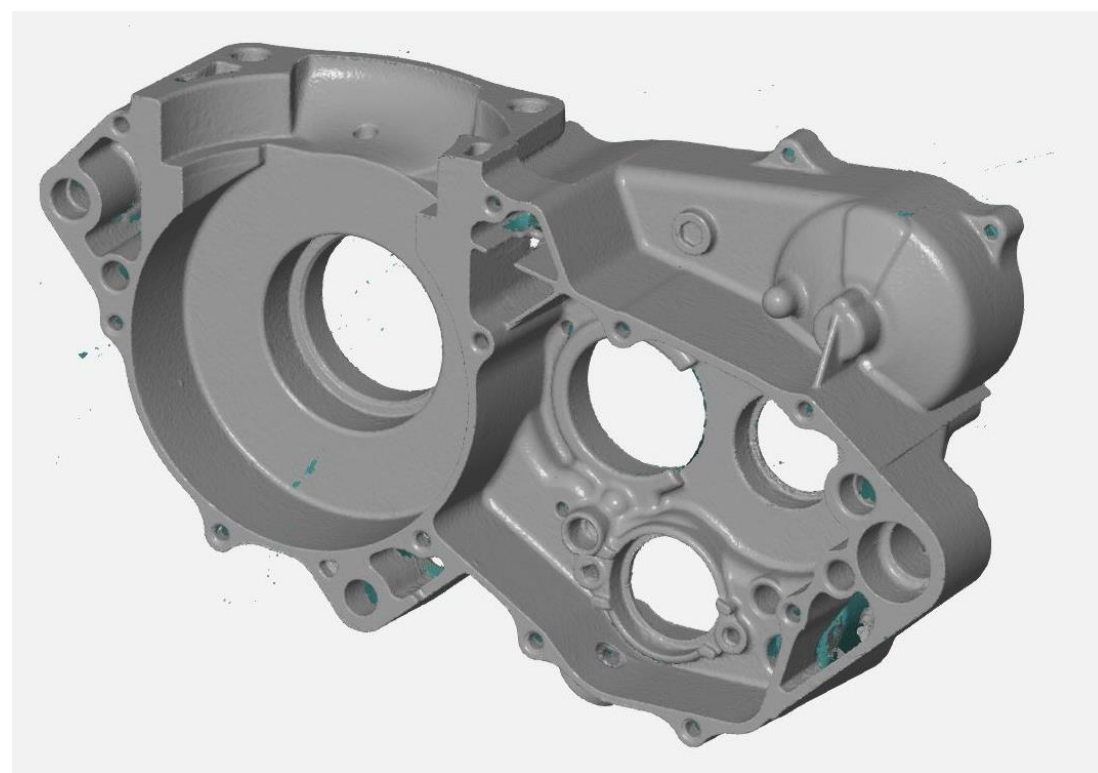


Figure 5 – Scanned Crankcase..

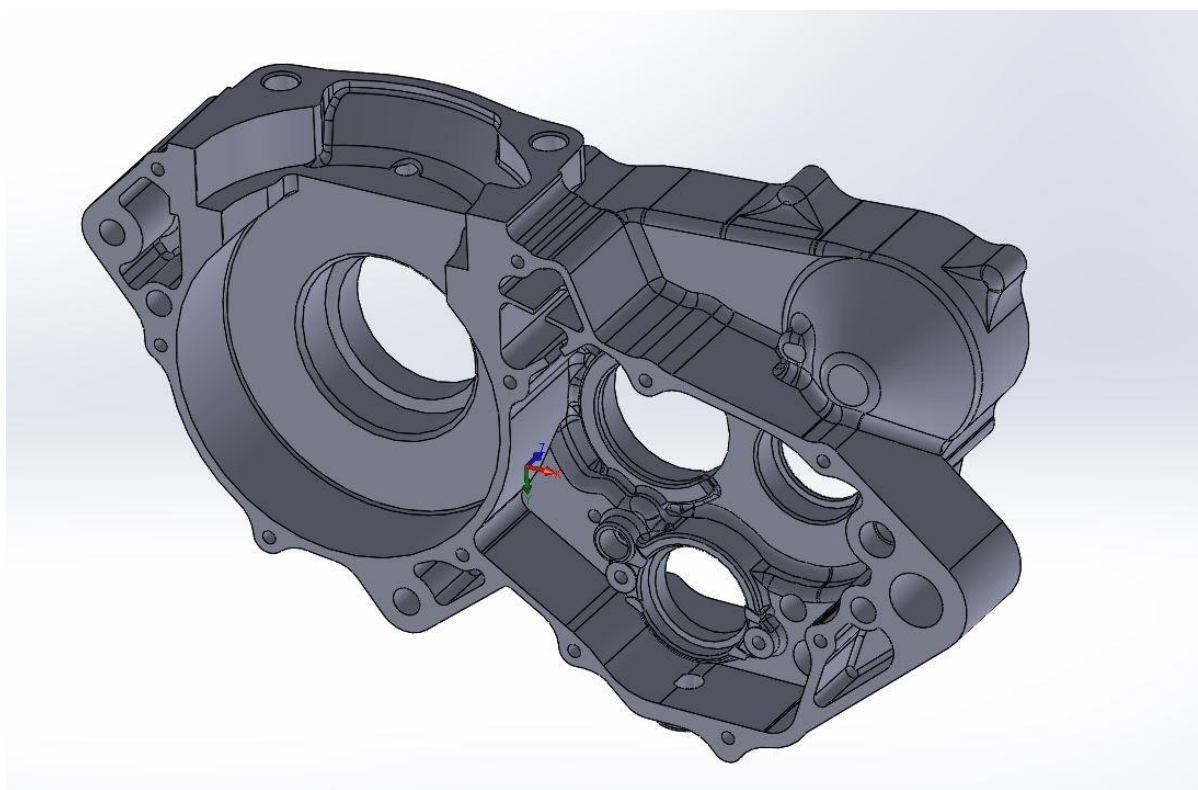
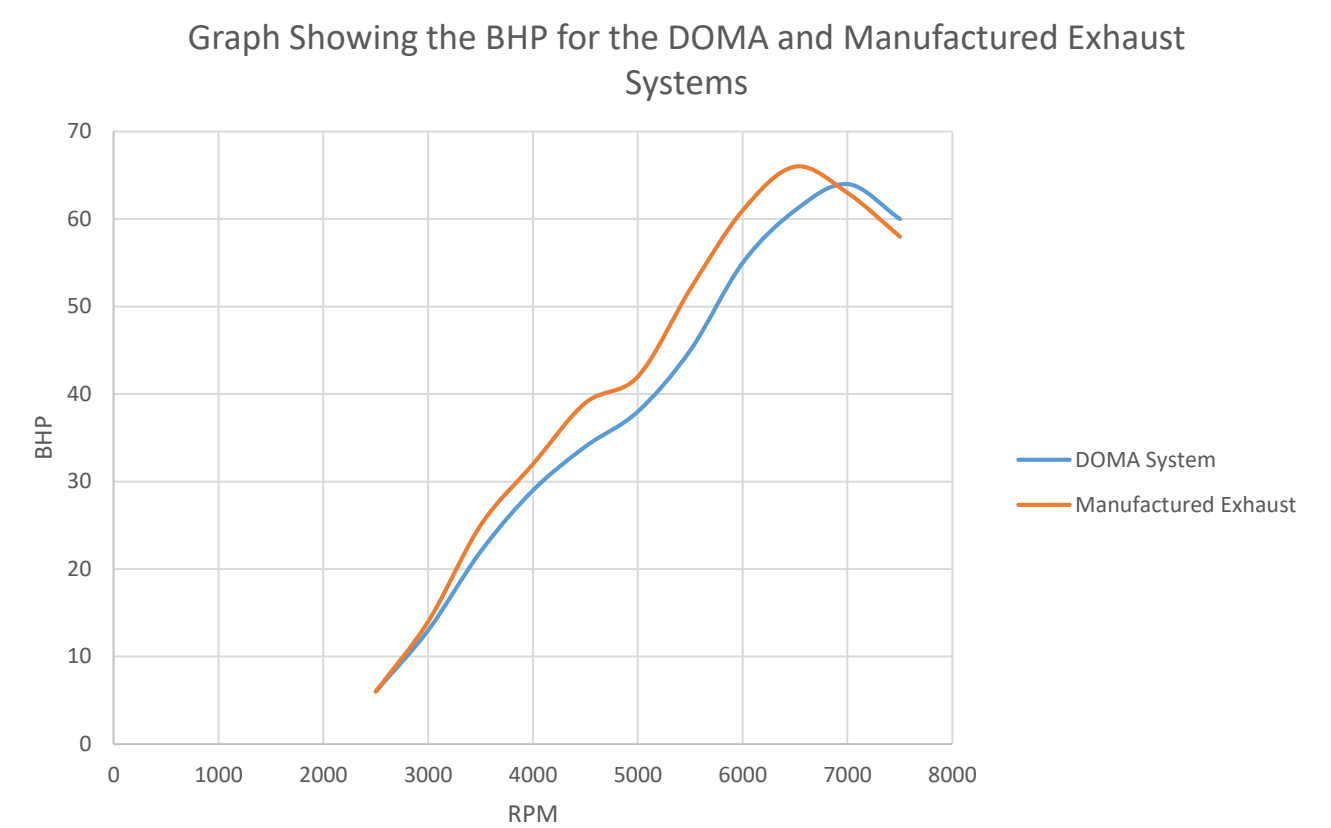


Figure 6 – Scanned Modelled Crankcase..

Results

The CR500R was run on the MAHA motorcycle dynamometer with the DOMA system and the new manufactured system. The test was carried out in fourth gear between 2500 and 7500 RPM. The tests were completed back-to-back on the same day using the same fuel (Shell V-Power) mixed 32:1 with Silkoline Pro-2 oil.



Conclusions

In conclusion it is clear that the designed expansion chamber did as expected. The longer tuned length lowered the peak power RPM by the desired amount; validating the formula provided in the (Jennings, 1973) tuning handbook. The power band width is a value which is difficult to put an exact figure on when looking at the graph or even riding along looking at a rev counter. Looking at the graph the powerband appears to be wider than that of the DOMA system, which was the desired effect however, the exact width is difficult to read from the dyno graphs. Surprisingly, the designed expansion chamber produced 2 more BHP peak than the DOMA system. Although this is at a lower RPM it is due to the increased diameter of the belly section. This, as described by (Blair, 1996), is the most efficient design for the positive pressure pulses returning to the exhaust port.

References

Blair, G. P. (1996). *Design and Simulation of Two-Stroke Engines*.