SOLENT UNIVERSITY

Design and Development of a Jenbacher 4 series Engine Cradle

BEng (Hons) Mechanical Engineering 2020 Brandon Carter

Aims and Objectives:

Aim

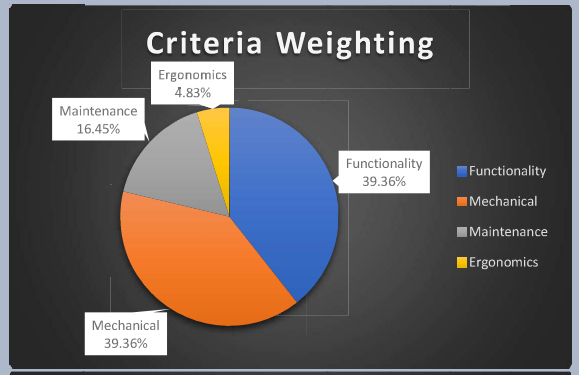
- The aim was to design and develop a rotating engine cradle. The cradle will need to be capable of not only withstanding the weight of the engine block, but also withstand the extra forces applied when the block is being worked on I.E. when the main engine bolts are being tightened

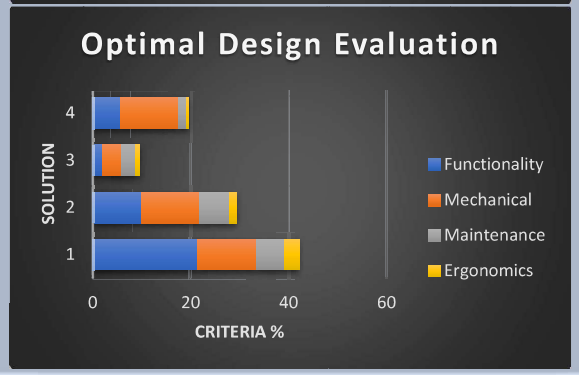
Objectives

- Carry out market research of existing products:
- Evaluate conceptual design ideas:
- Detail design and material selection:
- Prototype, test and evaluate new design:
- Document the project and thesis:

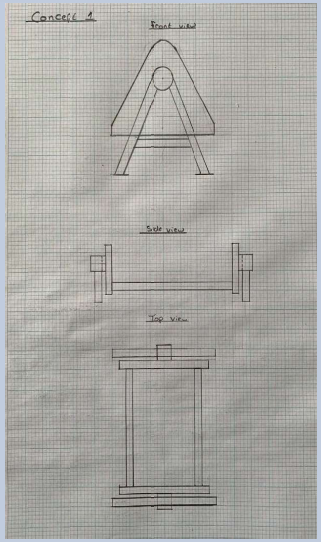
AHP (analytic hierarchy process):

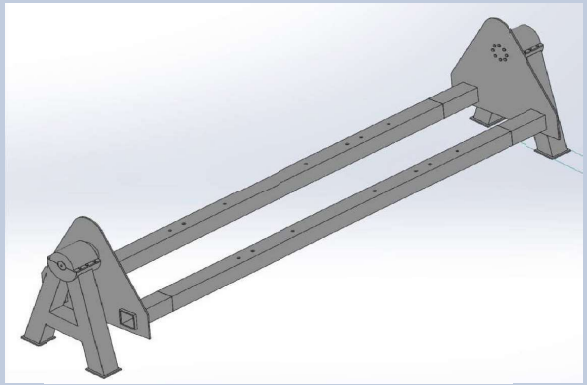
AHP was used to evaluate and choose an optimal design for the engine cradle. AHP is a criterion-based selection method, which employs pairwise comparisons and relevant scale to produce a thoroughly extensive methodology for selection of an idea/concept.





Prototype

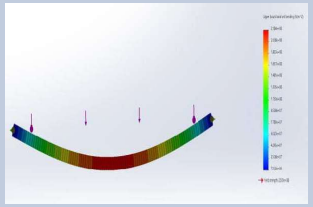


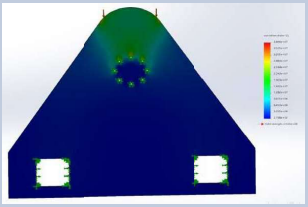


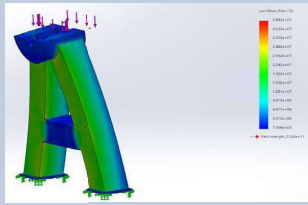
Item number	Part number	Description	Quantity	Item number
1	Stand		1	1
2	Stand cover		2	2
3	BS,6267 RCR-265-16,SI,NC,16	Cylindrical Roller Bearings	4	3
4	Turning shaft		2	4
5	Box Section		2	5
6	M10 X 40mm	BS-EN-24017	12	6

Testing

Due to this project being a pure design based project, FEA analysis was carried out on the main components of the engine cradle. This use of FEA allowed for the components to be simulated and analysed, to ensure they were able to withstand the forces applied.







Recommendations

- Six Tools – The use of six sigma tools, especially Failure mode and effect analysis (FMEA). This tool allows for a structed approach to prioritising risks, it would be beneficial to score the risks identified, allowing for precautions to be implemented for the high scored risks.
- Optimisation of components- The optimisation of the cradle's components would allow for the material used to potentially be reduced. Therefor reducing the overall cost and weight of the cradle.
- Fatigue analysis- Would be a beneficial tool to use as it will allow for the failure due to repeated cycle loading to be calculated. This will then aid in the evaluation of the cradle components and contribute towards the maintenance aspects of the cradle, as the number of cycles for each component can be calculated.
- Fabrication Cost- The overall Fabrication cost for the cradle needs to be calculated, with the cost being split into labour cost, material cost, consumables and motor cost. This will allow for cost of each segment of the build to be evaluated and analysed.

Conclusion

In conclusion the project can be considered a success, as it accomplishes the aims and objectives specified at the beginning of the project. The project is laid out in a structured manor, with supporting evidence linking all aspects of the project together. A range of engineering topics were utilised throughout the project, showing theory from these areas can be taken and applied to an engineering project.