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Design, Prototyping and Evaluation of an Elastically-Based Mechanical Starter for Automotive Engines

Design, Prototyping, and Evaluation of an Elastically-Based Mechanical Starter for Automotive Engines

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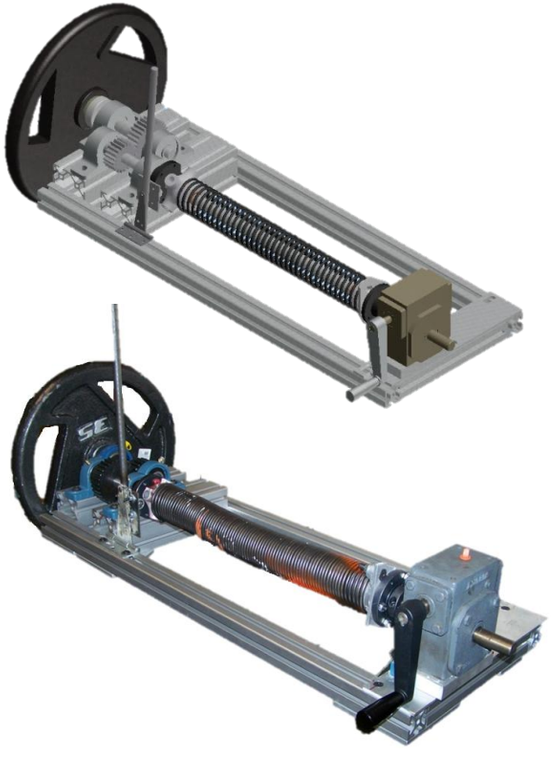
Research Objective: Provide proof of concept and determine feasibility of a spring-powered engine starter.

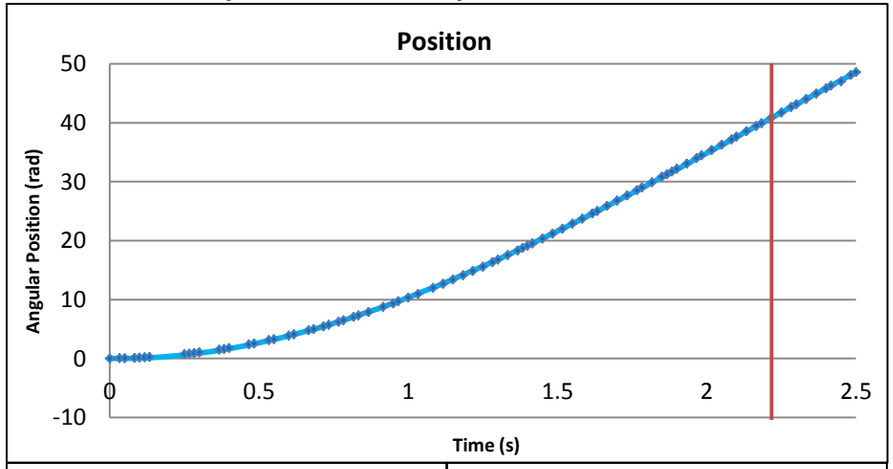
Design and Prototyping

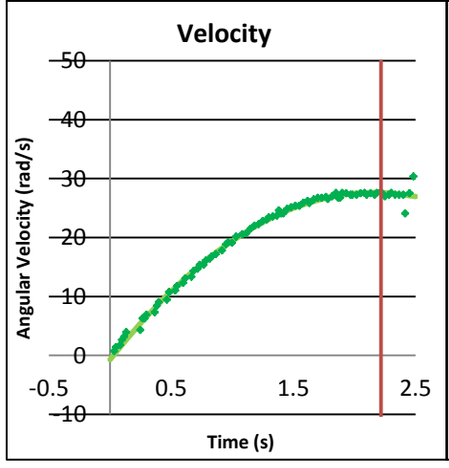
- Concept was interpreted into commonly available items
- Key components acquired first
- 3-D modeled in Autodesk Inventor around key components for sizing
- Remaining components purchased and assembled

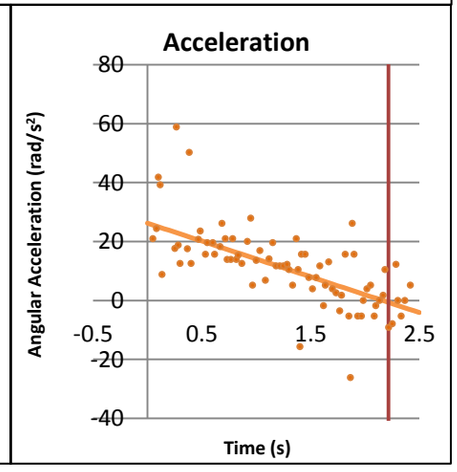


Experimentation

- Video camera and strobe light used to collect data
- Data points fit to curve and differentiated both numerically and theoretically







Evaluation

- Energy and power determined
- Calculated mass of spring capable of providing torque to start engine
- Various steels explored

Material	Tensile Strength MPa (ksi)	Mass of Spring kg (lbs)
Hard Drawn ASTM – A227	1309 (190)	16.0 (35.2)
Oil Tempered ASTM – A229	1344 (195)	15.2 (33.4)
Alloy Steel ASTM – A232	1516 (220)	11.9 (26.2)
Music Wire ASTM – A228	1654 (240)	10.0 (22.0)

Conclusions

- Spring starter with equal or less weight than conventional electric starter found to be feasible
- Environmental risk decrease realized with reduction in size of battery

Recommendations

- Continue development of this concept
- Next step: incorporate spring starter on real engine