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Novel Concepts for Spring-Based Mechanical Energy Storage in Motor Vehicles

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Development of Novel Spring-Based Energy Storage Systems for Motor Vehicle Applications

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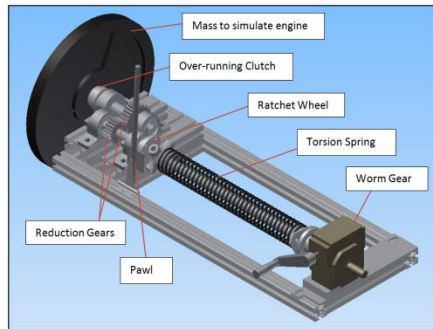
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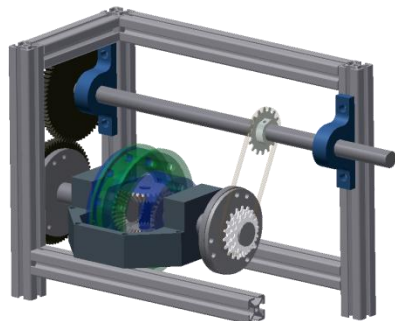
Objective: To improve efficiency and environmental safety of motor vehicles by utilizing springs in mechanical energy storage systems, such as hybrid drivetrains and engine starters.

Introduction/Motivation

- Inherent disadvantages of electrical energy storage systems: hazardous, inefficient
- Gas-electric hybrid systems are costly: limited use in developing countries



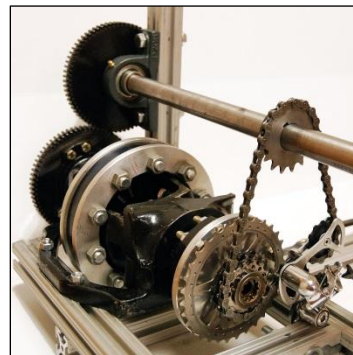
Mechanical starter design



Hybrid drivetrain design



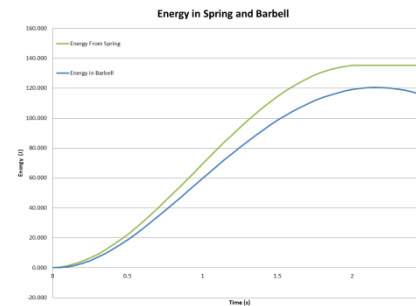
Mechanical starter prototype



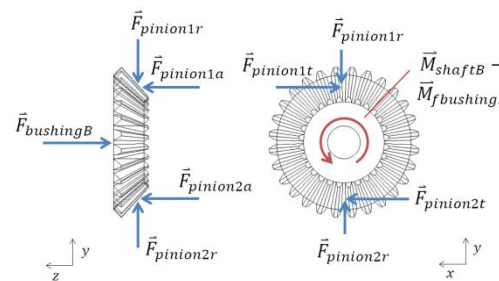
Hybrid drivetrain prototype

Methodology

- Review of available spring materials
- Tensile testing to examine the energy storage potential of material samples
- Mechanical starter and hybrid drivetrain concepts developed
- Proof-of-concept prototypes built and tested



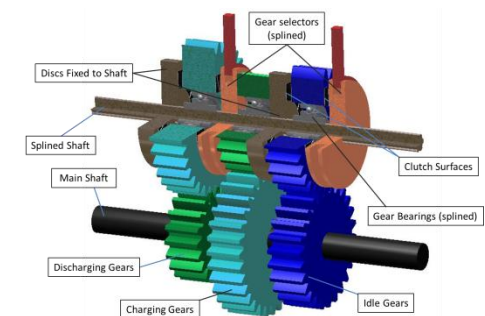
Energy testing of starter prototype



FBD from static analysis of hybrid prototype

Conclusions

- Natural rubber material samples showed the greatest energy storage potential of those tested
- Transmission refinement needed for hybrid system
- Mechanical starter is most promising concept due to ease of potential integration with current vehicles
- Research is ongoing



Hybrid transmission concept

Future Direction

- Refinement of hybrid drivetrain concept including transmission development
- Motorcycle will be purchased
- Starter prototype will be adapted to meet size and power requirements of motorcycle engine