Team Thunderdome: Emergency Lawnmower-Powered Generator

Objective
Create a cheaper and more readily available source of emergency power during blackouts with a device that lets a lawnmower create electricity.

Market Size
• About 300,000 in the Washington D.C. Area

Customer Requirements
• Easy to setup and run
• Safety and reliability
• Compatible with many lawnmower types.
• Inexpensive
• Powers vital appliances

Engineering Characteristics
• Cost
• Size
• Weight
• Power output

Constraints
• Must generate 120 volts A/C
• Portability and size

Physics of Device

Concept Generation

Meshed Gear
Pros: Accurate alignment
Cons: Difficult setup and interference

Ashtrey Design
Pros: Very easy setup, one part
Cons: Complex part, alignment problems, unsecure attachment

Decision Characteristics

Power Output | Weighting
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2.69 | 
1.81 | 
1.27 | 
0.84 | 

Final Decision
The rotating pin design was picked due to being simple, inexpensive, reliable, and universal. It allows for some axial misalignment, easy attachment, and vertical offset.

Design

Operation of Product
• Mount lawnmower on top of device with correct orientation, and lock in place with wheel clamps
• Start lawnmower and lock safety handle in place
• Lawnmower automatically engages blade coupling, powering the generator

Key Innovation
• Universal coupling allows for most lawnmowers to be quickly and easily used even with some misalignment.

Prototype and Testing
FEA performed to demonstrate necessary material properties of coupling and important support structures.
Simplified prototype built to test feasibility of concept, test coupling ease, and ballpark power output of generator system
• Static pins instead of rotating pins
• Wooden frame instead of metal frame
• 12V alternator instead of 120V generator head

Test Results and Future Work

Test Results
• Generated ~1100 watts of power
• Testing rig overloaded and failed
• Blade coupling functioned as intended but lawnmower mounting was more difficult than desired

Future Work
• Runtime under various load scenarios
• Different lawnmower models and blade types
• Prototype and test lawnmower mount and safety system

Reflection
• Demonstrated functionality of coupling system
• Successfully generated power with lawnmower