

Senior Design Project Description

Company Name	Husqvarna	Date Submitted	11/30/2017
Project Title	Battery Powered ZTR – (HUSQ_BATT)	Planned Starting Semester	Spring 2018

Personnel

Typical teams will have 4-6 students, with engineering disciplines assigned based on the anticipated Scope of the Project. 250 hours are expected per person.

Complete the following table if this information is known, otherwise the Senior Design Committee will develop based on the project scope:

Discipline	Number	Discipline	Number
Mechanical	3	Electrical	2
Computer	1	Systems	
Other ()			

Project Overview:

Husqvarna Group

The Husqvarna Group is a global leading producer of outdoor power products for forest, park, and garden care. Products include chainsaws, trimmers, robotic lawn mowers, and ride-on lawn mowers.

The Group is also the European leader in garden watering products and a global leader in cutting equipment and diamond tools for the construction and stone industries. The Group's products and solutions are sold under brands including Husqvarna, Gardena, McCulloch, Poulan Pro, Weed Eater, Flymo, Zenoah and Diamant Boart via dealers and retailers to consumers and professionals in more than 100 countries. Net sales in 2016 amounted to SEK 36 billion and the Group has around 13,000 employees in 40 countries.

The Consumer Brands Division of the Husqvarna Group has its headquarters located in Charlotte, NC. The Consumer Brands division aims to be the leading forest and garden supplier for the broad mass consumer segments.

Products are sold mainly through retailers such as Lowe's and Walmart in the US and Castorama and B&Q in Europe. The retail landscape is highly consolidated in North America and competition in the mass consumer segment is fierce with a strong emphasis on price. The estimated

addressable market amounts to SEK 70bn, of which more than 60 percent is in North America and slightly less than 30 percent is in Europe.

Currently, all ride-on lawnmowers and zero turn mowers (ZTR) in the Consumer Brand Division's portfolio are powered by a petrol engine. The project proposal for the UNC Charlotte Senior Design Team would be to convert an existing petrol ZTR into a battery powered ZTR and develop the algorithm for the steering and feedback to perform like the petrol version.

Project Requirements:

Husqvarna will provide the UNC Charlotte Senior Design Team with a commercially available petrol ZTR, 2 electric wheel motors, 2 motor controllers, a master controller, and a 48v lithium battery pack. The design team will be responsible for the following:

- Removing the unnecessary petrol components.
 - Engine
 - Hydraulics
 - Drive Belts
 - Controls
 - Etc.
- Mounting and assembling the electrical components while maintaining proper weight distribution and stability.
 - Wheel motors
 - Battery Pack
 - Controllers
 - Etc.
- Electrical Wiring and Sensors
- Developing how the user controls provide feedback to the motors.
- Developing the software algorithms so that the unit drives and performs like a petrol ZTR.



Expected Deliverables/Results:

- Fully functioning electric ZTR (minus the cutting deck)
- Operates like a traditional petrol ZTR (user input, steering, ground speed, acceleration)
- Code for controls
- 3D CAD models of any newly designed components
- 2D tolerance drawings of any newly designed components
- Technical specifications and documentation for any new sourced components

Disposition of Deliverables at the End of the Project:

- Any hardware or software developed by the UNC Charlotte senior design team is the property of Husqvarna. The hardware and software will be handed over to Husqvarna at the conclusion of the final Design Expo on December 7, 2018 unless otherwise noted.

List here any specific skills, requirements, knowledge needed or suggested (If none please state none):

- 3D CAD modeling
- FEA
- Basic knowledge of metal fabrication
- Feedback algorithms
- C/C++
- MatLab or Java/Python for simulation