UNC CHARLOTTE
The WILLIAM STATES LEE COLLEGE *of* ENGINEERING

Senior Design Project Description

Company Name	*Stabilus*	**Date Submitted**	7/30/2020
Project Title	*Universal Powerise Testing and Demonstration Platform* **(STAB_DEMO)**	**Planned Starting Semester**	Fall 2020

Personnel

Typical teams will have 4-6 students, with engineering disciplines assigned based on the anticipated Scope of the Project.

Please provide your estimate of staffing in the below table. The Senior Design Committee will adjust as appropriate based on scope and discipline skills:

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

Company and Project Overview:

Organization Background

As one of the world's leading providers of gas springs, damping solutions and electromechanical POWERISE drives, Stabilus has demonstrated its motion control expertise for eight decades in the automotive, aerospace, medical, and a host of other sectors. Gas springs, dampers and electromechanical drives from Stabilus optimize opening, closing, lifting, lowering as well as adjusting actions and protect against vibration. Employing more than 6,200 people worldwide, the company has its operational headquarters in Koblenz, Germany and global annual revenue of over $1 billion. Stabilus operates production plants in nine countries and distributes its products in over 50 countries in Europe, North, Central and South America as well as Asia Pacific via its regional offices and sales partners. Stabilus produces products for the automotive industry from its plant in Gastonia NC.

Project Overview

The project plan is to have the team produce a universal product demonstration and testing platform to drive forward the development of a Standard Catalog for Stabilus-made electromechanical actuators — brand name POWERISE — and associated products.

Project Requirements:

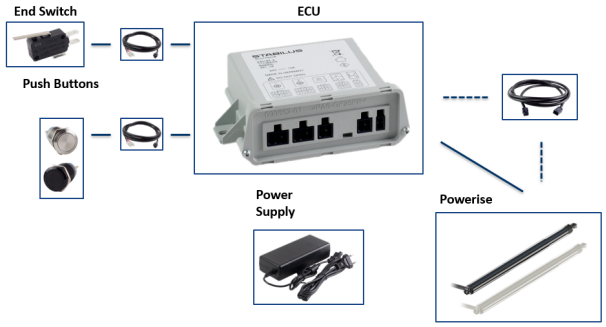
Certain developments are necessary to make existing electromechanical actuator product portfolio fully competitive in non-Automotive market segments. Examples of key developments include:

- Automatic latch interface and control with existing Electronic Control Unit (ECU)
- Wireless control inputs/sensors (Bluetooth, RFID, Wireless, etc.)
- User influence over control parameters
- Control of system via mobile app

Additionally, more information needs to be gathered on the performance of the entire suite of Stabilus actuators — including DA90 and SD90 devices — in non-Automotive contexts, such as swing doors and vertical/horizontal slides.

Design Problem

Currently, Stabilus produces an ECU with assorted peripherals to provide control of its POWERISE actuators in non-Automotive contexts:



The only control inputs the system currently accepts are signals from the associated push buttons — there is no ability of the system to interface with automatic latches, operate with touchless control inputs, or interface with any sort of mobile app. Additionally, the parameters of the system — such as motor speed, PWM, obstacle detection sensitivity, and others — must be manually determined through testing in a practical mockup of the application in question.

From a mechanical perspective, the POWERISE product is well understood in an Automotive application context, both in terms of kinematic performance, and in terms of durability and performance validation. However, automotive contexts are typically rigorously defined beforehand

by the customer and have projects whose timescales are on the order of several years. Conversely, non-automotive projects frequently demand information and results on a much faster basis, with much less clearly-defined expectations from the customer. It is in Stabilus' interest to be able to rapidly respond to requests for information regarding actuator performance and durability with empirically-determined, highly-accurate data.

Project Objectives and Desired Output

The primary objective of this project is to assist in the development of a practical, commercially-viable solution to the existing electronic and mechanical shortcomings of the POWERISE product line. This is to be achieved by producing a physical and electrical system capable of carrying out function and durability tests for entire range of Stabilus electromechanical actuators**.** The system must make use of existing range of Stabilus electromechanical devices, and system control must be based off of existing Stabilus technology (Industrial ECU, Smart Powerise, etc.)

Expected Deliverables/Results:

- **Electrical/software deliverables**
  - System must be able to interface with and operate automatic latches
  - System must incorporate non-physical (i.e. touchless — RFID, Bluetooth, etc.) sensors for control inputs
    - The sensors used for this functionality should be industrial standard and cost-effective from a series production standpoint
  - System must be accompanied by a corresponding mobile app for user interface, operation, and data acquisition in cases of validation testing
  - System should include an app or program to accept inputs from Stabilus kinematic simulation software, and output recommended ECU parameters based on desired user function

- **Application categories to be demonstrated**
  - Swing door — public restrooms, office/home doors, etc.
  - Horizontal slide — kitchen drawers, sliding doors, etc.
  - Vertical slide — windows, TV lifts, etc.
  - Single-hinge flap — engine covers, boat/RV hatches, etc.

- **Geometry and physical design**
  - System must be free-standing and fully self-stable
  - System must be robust and transportable
    - System should ideally be self-encasing
  - Ideal footprint of approximately 3'x5'

    - Height negotiable — ideally in the 6' range

- System must be sufficiently aesthetically appealing to be used in trade shows and other public contexts

Disposition of Deliverables at the End of the Project:

Hardware and software developed are the property of Stabilus. Work product is to be displayed at the last Expo then immediately handed over to Stabilus.

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

- Kinematics
- CAD/CAE/Rapid Prototyping
- Mobile App Development
- Engineering Economic Analysis