UNC CHARLOTTE
The WILLIAM STATES LEE COLLEGE *of* ENGINEERING

UNC Charlotte – Lee College of Engineering Senior Design Program

Senior Design Project Description

Company Name	*Stabilus*	**Date Submitted**	*06/14/2019*
Project Title	*Portable Gas Spring extension velocity testing device* **STAB_GAS**	**Planned Starting Semester**	*Fall 2019*

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		Systems	
Other ( )			

Company and Project Overview:

As one of the world's leading providers of gas springs, damping solutions and electromechanical POWERISE drives, Stabilus has demonstrated its expertise for eight decades in the automotive industry and a variety 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.

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A critical characteristic of the Gas Spring is the extension speed of the piston rod from a fully compressed position measured in meters per second. We have lab test equipment to perform this testing, but there is a need to be able to bring a portable test unit to a customer site for part testing and validation. Development of that unit is the objective of the project.

Project Requirements:

Develop a portable test device to enable rod extension speed in the field. Requirements:

- Functional display with an easy to use operator interface to conduct test and display and store results
- Power source: Electric (120Vac) and pneumatic using shop air (100psi)
- Specifications:
  - Minimum Gas spring length 170mm
  - Maximum Gas spring length 800mm
  - Tube OD Diameter: 15mm, 18mm, 19mm, 22mm 28mm
  - Rod OD Diameter: 6mm, 8mm, 10mm
  - Minimum test stroke: 45mm
  - Maximum test stroke: 400mm

Test Description:

Each Gas spring has a unique length, functional stroke and extension speed characteristic. This criteria is shown on the gas spring drawing, which shows the type of test needed, the location in the stroke where the test should be measured, and the velocity upper and lower tolerance in meters per second.

Control:

The test fixture must be adjustable to set variable lengths and strokes for the gas springs being measured depending on part dimensions.

Four test types are necessary:

VS1: This is a 25mm test in the stroke of the gas spring with the piston rod oriented downwards. The 25mm window should be selectable inside the stoke so that the measurement is taken while the piston package is traveling through the column of oil inside the gas spring
VS2: This is a 25mm test in the stroke of the gas spring with the piston rod oriented downwards. The 25mm window should be selectable inside the stroke so that the measurement is taken while the piston package is traveling outside the column of oil inside the gas spring
VS5: This is a 25mm test in the stroke of the gas spring with the piston rod oriented upwards or downwards. The 25mm window should be 10mm before full extension of the piston rod.
Full Stroke test: This test will measure the velocity over the entire stroke of the gas spring with the piston rod oriented upwards or downwards

The test selected will determine what type of input is needed from the operator to determine if the part meets specification. The functional display needs to show the test results, and if the part meets the specification.

Safety:

Gas springs are pressured, and have most have hundreds of newtons of extension force, provisions need to be made so the parts does not come out of the testing fixture during compression or extension of the piston rod.

Expected Deliverables/Results:

- Prototype of a portable testing device that has been tested and verified to the project requirements.
- Drawing package and costed bill of material that would allow Stabilus to build more units in the future
- Dimensions: Be able to break down and fit in a Pelican 1690 case for transport.
- Operation and Maintenance manual for the testing device
- Completely functional tester shall be provided. If cost of the tester exceeds the available project budget, then discussions with the Supporter will need to determine additional funding or provision of parts from supporter to allow completion of tester within budget or reduction in the build scope to fit the budget.

Disposition of Deliverables at the End of the Project:

Provide to Stabilus at the conclusion of the Expo

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

- None