

Company Information

Company Name	<i>Siemens Energy</i>	Date Submitted	<i>05/27/2021</i>
Project Title	<i>HD-9 Adjustable Fixture Stand Design (SIEM_HD9)</i>	Planned Starting Semester	<i>Fall 2021</i>

Senior Design Project Description

Personnel

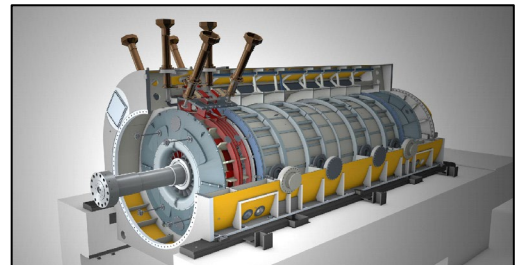
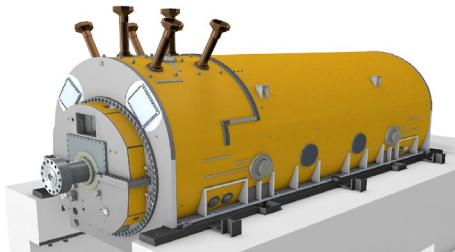
Typical teams will have 4-6 students, with engineering disciplines assigned based on the anticipated Scope of the Project.

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	5	Electrical	0
Computer	0	Systems	0
Other ()			

Company and Project Overview:

The Siemens Charlotte Energy Hub is the company’s worldwide hub for 60 Hz power generating equipment. Opened in 1969, the facility has manufactured and serviced generators and steam turbines for the power generation market for decades. In November 2011, the facility celebrated the opening of a new expansion, adding gas turbine production and service capabilities. The new Gas Turbine facility was designed based on LEAN manufacturing principles and certified for U.S. LEED Gold green building standards, making it the most advanced gas turbine production plant in operation. The expansion represents a \$350 million total investment in Charlotte, adding 1,000 jobs. With its current workforce of 1,500 and more than one million square feet of space under roof, Siemens Energy in Charlotte has become the largest manufacturer in the city and the second largest among the 250+ Energy companies based in Charlotte.



The project is sponsored by the Siemens Generator Manufacturing department in Charlotte NC. The project is to design and build an adjustable fixture stand to hold different size exciter and small

rotor parts. The fixture must be hydraulically adjusted in four different directions for setting up parts precisely. This will allow more flexibility in setting up the parts. The new fixtures will cut set-up time which will allow Siemens to machine parts in shorter amount of time. In the current process, the fixture is manually adjusted using “V” blocks which takes more than four hours to set up.

Project Requirements:

I. Current Fixtures in Use:



Figure 1: Current Set-Up



Figure 2: Current V-Blocks

- a. With the current fixtures on HD-9, the set-up time takes up to four hours.
- b. The fixtures are difficult to set-up because it requires a lot of manual moving.
- c. Each exciter and rotor need to be set within 0.001”, therefore with the current fixture it is difficult to hit the 0.001” precision.

II. Example of an adjustable fixture

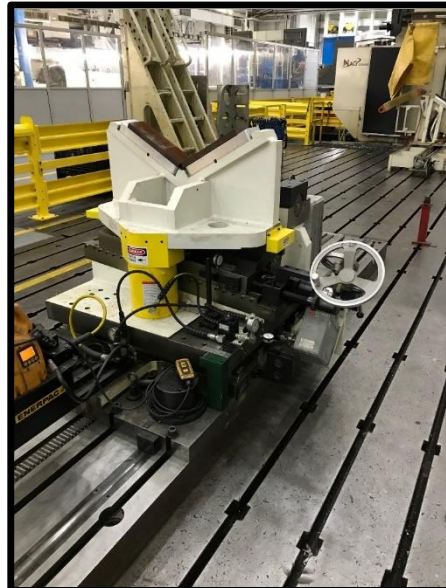


Figure 3: Example of an Adjustable Fixture

The pictured fixture is not the right size or capability for what is needed for this operation. This fixture is used in another operation and it included to show the concept of an adjustable V holding fixture. For this project the objectives are:

- Design a hydraulically operated fixture stand for easily loading and adjusting different size exciters and small rotors.
- The fixture must be adjusted up, down, left, and right using a mechanical system. Similar to the image above.
- Two different fixtures must be designed. First fixture will be on the South end of the machine. The fixture must hold different diameter rotors and must not move in any direction.
- The second fixture (North end) must hold different diameter rotors and be able to hydraulically adjusted up, down, left, and right.

Expected Deliverables/Results:

- Complete drawing package that can be given to a machine shop for fabrication and assembly:
 - CAD drawings for each part (2-D Prints and 3-D Models)
 - Bill of materials
 - Assembly instructions
 - Maintenance procedure
 - Cost estimate for the complete fixture
 - Complete build of the fixture at the end of the SD II (depending on the budget, this may be a scale version or a portion of the design to demonstrate the functionality)
- Analysis of the Fixture
 - Complete FEA for ensuring that the fixture is capable of holding various size rotors
 - Analysis of the hydraulics to ensure safety for the operators and damage to the parts

Disposition of Deliverables at the End of the Project:



Models, documentation, and hardware must be given to the supporter after conclusion of the expo.

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

- Machine Design
- Fluid Mechanics
- Strength of Material
- Statics
- CAD
- Blueprint Reading
- Fabrication
- Design for mechanical specifications:
 - Weight, lifting, deflection, etc
- Travel required to Siemens Charlotte facility