THE WILLIAM STATES LEE COLLEGE OF ENGINEERING

Company Information

Company Name	*Siemens Energy*	**Date Submitted**	*11/03/2021*
Project Title	*Design of Cleaning System for Large Generator Components* **(SIEM_CLEAN)**	**Planned Starting Semester**	*Spring 2022*

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	
Computer		Systems	
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.

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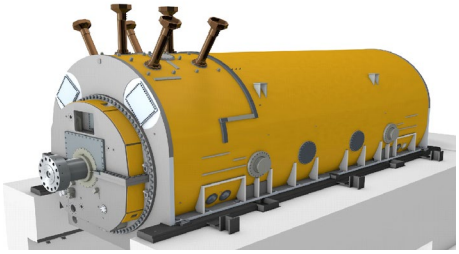

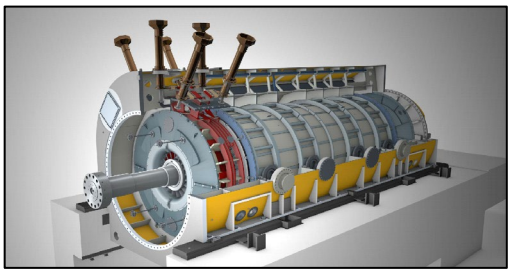

Problem Statement:

Power plant Generators have a multi-decade life cycle. In order to ensure the longevity of the Generator routine maintenance is performed on the Generator rotor and associated components. The components are also required to undergo non-destructive evaluation (NDE) to ensure component integrity. Components are received back into the factory from the power plant because of this service requirement and are received covered in foreign material. This foreign material must be removed to perform a proper evaluation of the component for continued use. In the event of a major unplanned power plant outage, this evaluation is required to be performed as quickly as possible to source replacement components.

Project Requirements:

Currently the components are sent to a machining center for cleaning utilizing hand tools and sandpaper to remove the material. This is time consuming and requires a lot of manual hand labor to complete. In addition, the process imparts a significant amount of wear and tear onto the machining centers involved that are utilized for high precision and accuracy machining. This additional wear and tear incurred, results in a significant repair cost to the machines.

Siemens Energy is investigating a potential alternative process for removing the foreign material on component parts that is faster, less manual labor intensive, and does not impart wear and tear onto high precision machines.

The component dimensions vary in size and shape. Typical dimensions are 50” outside diameter by 42” height by 38” diameter. The process used must not remove any base material in the cleaning process and only remove the foreign material.

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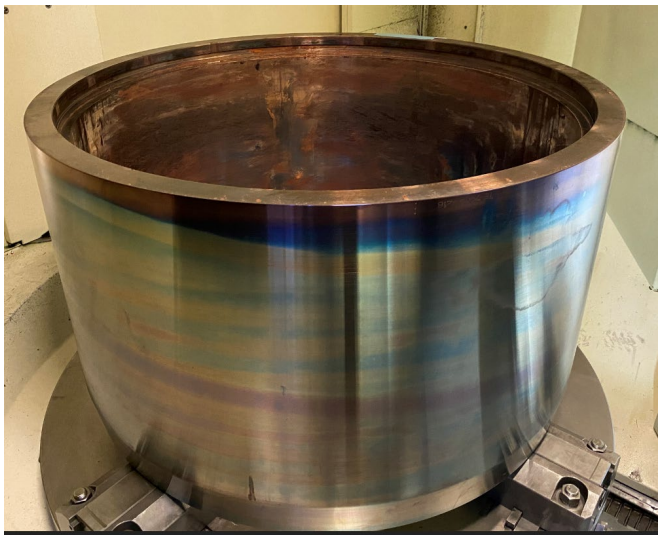

Expected Deliverables/Results:

- Design of a system for cleaning large components.
- Sourcing and obtaining components for the new system.
- Building the new system.
- Ensuring all environmental and safety regulations are met.
- Instructions for performing the process using the designed system.
- Recommended maintenance procedures.

- Complete drawing package:
    - CAD drawings for every part, where applicable
    - Bill of materials
    - Assembly instructions
    - Recommended maintenance procedures
    - Cost Estimates
- Process instructions:
    - Manufacturing Instructions
    - Safety Requirements
    - Lifting instructions
-

Disposition of Deliverables at the End of the Project:

Students are graded based on their display and presentation of their team's work product. It is

mandatory that they exhibit at the Expo, so if the work product was tested at the supporter's location, it must be returned to campus for the Expo. After the expo, the team and supporter should arrange the handover of the work product to the industry supporter. This handover must be concluded within 7 days of the Expo.

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

- Mechanical design
- Capability to design for mechanical specifications including, weight, lifting, deflection, etc.
- Fluid Mechanics
- CAD/CAM