The WILLIAM STATES LEE COLLEGE of ENGINEERING

UNC CHARLOTTE

Senior Design Project Description for SPRING 2014
Project Title: Vibration Monitoring System

Supporter: Duke Energy – McGuire Nuclear Station

Supporter Technical Representative: ASSIGNED

Faculty Mentor: _____ ASSIGNED   __X__ TBD (check one)

Single Team __X__ Dual Team _____ (check one)

Personnel (EN/ET): _____ E, __2__ Cp, _____ Cv, __2__ M, _____ SE

(Complete if the number of students required is known)

Expected person-hours: (250 per student)

Description of Project:

The VL (Lower Containment Ventilation Air Handling) vibration monitoring system at MNS is obsolete with no replacement parts available. The vibration monitoring system is located in 8 locations (i.e. 4 locations on Unit 1 and 4 locations on Unit 2) inside containment. Over the past 2 to 3 decades the vibration monitoring systems have had its share of failures.

The monitoring system uses accelerometers to monitor vibration on the VL fans, and it uses other components to display and announce any alarms or trouble at the reflash cabinets and HVAC panels in the control room.

The VL vibration monitoring components are located in Lower Containment and have been experiencing malfunctions due to the high area temperatures and humidity. The area high temperature (at least 140 ^{0}F) is due to incorrect air flow of VR (Control Rod Drive Mechanism Ventilation) to VL. The heat is causing the electronics to fail on the monitoring system.

There was an engineering change in place to replace the monitoring system but the mod was abandoned. Due to obsolescence and reliability issues the VL vibration monitoring system has been defeated. Data is collected weekly or bi-weekly by Maintenance technicians.

Initial Project Requirements (e.g. weight, size, etc.):

This project will evaluate the vibration monitoring system to identify parts that cannot withstand the environment and design a new system which will be able to withstand the environment. To accomplish this, the following must be accomplished:

- Purchase the current system from the PLC center (Duke Energy will assist with this.)
- Identify all of the components in the system and create a Bill of Materials
- Identify components that are obsolete (i.e. no longer manufactured)
- Identify which components cannot withstand the environment in which the system is installed through research, testing and analysis

- Redesign the system and develop a prototype
- Develop a test rig and Test the prototype to verify that it correctly monitors the required vibration frequencies and can withstand the environment in which it will be installed

Expected Deliverables/Results:

The deliverables will include a prototype with a user manual complete with operating and maintenance instructions and all design drawings. A complete report of the analysis, findings and results will provided.

Personnel: (Check each skill that is needed – Put an X next to all that apply)

E = Electrical Engineering or Electrical Engineering Technology

   ___ Circuit design
   ___ Communication and wireless
   ___ Device fabrication and utilization of clean room facilities
   ___ VLSI design
   ___ Power systems and power management
   ___ Robot control and systems

CpE = Computer Engineering

   ___ Advanced Logic design and computer architecture
   ___ Advanced FPGA development in VHDL and/or Verilog
   ___ Communications
   ___ Embedded systems and software development
   ___ Robot control and systems

Cv = Civil Engineering

   ___ Geotechnical engineering
   ___ Environmental engineering
   ___ Structural analysis
   ___ Structural materials

M = Mechanical Engineering or Mechanical Engineering Technology

   ___ CFD / Fluid dynamics design or analysis
   ___ Computer Aided Modeling or Machining
   ___ DFM / DFA
   ___ Energy use analysis
   ___ Finite Element Thermal Analysis
   ___ Finite Element Structural Analysis
   ___ Internal combustion engines
   ___ Machine dynamics or design
   ___ Metrology

___ Structural design
___ Thermodynamics
___ Vibration analysis and remediation

SE = Systems Engineering

___ Integration
___ Project Management
___ Quality issues
___ Simulation
___ Systems Design
___ System Operations

List here any specific skills needed that are not included above: