



Company Information

Company Name	EPRI	Date Submitted	5/27/2022
Project Title	Use of Motor Current Signature Analysis (MCSA) for detecting journal bearing faults (EPRI_MCSA)	Planned Starting Semester	Fall 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	3	Electrical	1
Computer		Systems	

Company and Project Overview:

The Electric Power Research Institute (EPRI) conducts research, development, and demonstration projects for the benefit of the public in the United States and internationally. As an independent, nonprofit organization for public interest energy and environmental research, we focus on electricity generation, delivery, and use in collaboration with the electricity sector, its stakeholders and others to enhance the quality of life by making electric power safe, reliable, affordable, and environmentally responsible.

Project Requirements:

MCSA is a non-intrusive monitoring technology that can detect many faults in the induction motor and the driven load. As indicated in the recently published EPRI report "Exploring MCSA/ESA and EMSA as Complementary Monitoring Technologies for Electromechanical Equipment: An Overview – 3002017730," there is a gap in the use of MCSA for detecting sleeve bearing failures. Many of the critical induction machines in the power plant use sleeve bearings. Developing this capability of MCSA would help reduce the number of sensors required while keeping the machine's reliability at the same level.

This project aims to either detect oil whirl or excessive clearance fault of a sleeve bearing in a laboratory environment.



Approach:

1. The student team will review past research regarding MCSA technology and emulation of oil whirl or excessive clearance techniques.
2. The student team will develop a reasonable project plan to review with the UNCC appointed advisor and the EPRI team. At a minimum, the project plan should include:
 - a. Test-bed setup with an induction motor and driven load
 - b. Selection of motor type, driven load, sensors, and data acquisition systems
 - c. Data acquisition for healthy conditions at different load levels; for example – 70%, 90%, and 100% load. The data acquisition period should be at least 30 minutes to include mechanical, thermal, and electrical transient and steady-state conditions.
 - d. Multiple (at least five) data sets for unhealthy conditions at different load levels; for example – 70%, 90%, and 100% load. The data acquisition period should be at least 30 minutes to include mechanical, thermal, and electrical transient and steady-state conditions.
3. Analysis of data and fault detection modeling based on acquired data.

Expected Deliverables/Results:

1. The student team will provide a detailed report, including but not limited to the
 - a. Summary of the reviewed literature
 - b. Test-bed setup description
 - c. Data acquisition conditions
 - d. Each data-set description
 - e. Data analysis approaches
 - f. Model development description
 - g. Data and model analysis results
 - h. List of hurdles and how it was resolved
 - i. Conclusion
2. Raw data-set and processed data sets
3. Model and data processing algorithms/code in Matlab or Python

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):

- Interest in controls, data acquisition and sensors.