Senior Design Project Description

Company Name	EPRI	Date Submitted	4/13/2020
Project Title	Design of ROV for Containment Liner Plates Inspection **(EPRI_ROV)**	**Planned Starting Semester**	Fall 2020

Personnel

Typical teams will have 4-6 students, with engineering disciplines assigned based on the anticipated Scope of the Project. 250 hours are expected per person. Complete the following table if this information is known, otherwise the Senior Design Committee will develop based on the project scope:

Discipline	Number	Discipline	Number
Mechanical/Robotics	3	Electrical	1
Computer	1	Systems	1
Other ( )			

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.

The components in nuclear power plants are designed to maintain the integrity for their entire life-cycle, and those components are examined to identify abnormalities and degradations periodically. However, nondestructive testing (NDT) in the low accessibility area such as containment building liner plates are challenging in terms of time and inspector's safety.

The goal of this project is to develop a conceptual design of remotely operated vehicle (ROV) for containment liner plate inspection. The ROV should be able to payload the NDT sensor, camera and lighting in order to access and navigate the vertical liner and the dome liner. This project will not fabricate any ROV's but build 3D models and assess the feasibility and applicability to achieve the desired goal.

Project Requirements:

This project would design a ROV using 3D models that can be operated on vertical and upper dome liner plates. The requirements of this project are:

- The ROV shall be capable of operating on vertical liner plate and dome liner plates without

slipping and dropping.

- The height of ROV model shall not exceed 6 inch (152.4 cm) to navigate between the gaps of a component in the containment build and liner plate.
- The ROV model shall have sufficient movement with free moving axis to navigate, forward (x), backward (-x), right shifting(y), left shifting (-y) directions and turning in order to get the NDT sensor, camera and lighting to the desired test location. Therefore, the ROV should be able to payload the NDT sensor, camera, light and cable loads and be able to climb vertical walls/upper dome liner plate while providing ease of navigation features. The purpose of the camera and light is to show the location of the ROV and sensor.
- The NDT sensor needs to come in contact with the test surface to commence scanning of the liner plate.
- In order to prevent the ROV dropping to reactor hall area, proper measures shall be considered (for example, a connection hook can be considered on the ROV body. A rope/wire will tie the ROV and connected to the dome wall. This way the ROV will hang on the upper dome with a rope/wire)
- The ROV shall be designed in such a way that no parts become loose and drop-off during its operation. All parts must be accounted for before the go into the liner plate and upon withdrawal.
- The ROV shall not be drop off from the liner plate surface when the power is lost.
- Build 3D CAD modeling and generate movie clips showing the operability.
- Suggest estimated manufacturing cost and bill of materials (BOM)

Expected Deliverables/Results:

- The deliverable will be a 3D CAD modeling files and animated movie clips
- Final Report

Disposition of Deliverables at the End of the Project:

- Hand over all deliverables to the EPRI project manager

List here any specific skills, requirements, knowledge needed or suggested (If none please state none):
- 3D CAD (Solidworks)