Senior Design Project Description

Company Name | Areva | Date Submitted | June 15, 2017
---|---|---|---
Project Title | Alternative Impact Limiter Designs for Used Nuclear Fuel Shipping Casks (AREVA_IMP) | Planned Starting Semester | Fall 2017

**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:

<table>
<thead>
<tr>
<th>Discipline</th>
<th>Number</th>
<th>Discipline</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical</td>
<td>4</td>
<td>Electrical</td>
<td></td>
</tr>
<tr>
<td>Computer</td>
<td></td>
<td>Systems</td>
<td></td>
</tr>
<tr>
<td>Other ( )</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Project Overview:**

Nuclear plants were originally designed to provide temporary storage of spent fuel on the reactor site. The rods removed from service are initially put into cooling pool where the temperature and radioactivity is lowered. The spent fuel was intended to be transported off-site where it could be reprocessed into usable fuel or disposed of as waste. However, reprocessing did not occur as planned and storage at site went from temporary to long term. As the pool capacity was exceeded, a dry storage system was developed. The containers for dry storage are called “Casks”. To safely transport casks, impact limiters have been designed to mitigate the effects of accident scenarios that could breach the casks.

**Initial Project Requirements:**

Currently some used nuclear fuel shipping casks are designed to utilize impact limiters that either cannot be built due to a shortage or lack of building materials or are to cost prohibitive to build because of the use of difficult to obtain supplies or difficult to perform manufacturing processes.

This project would involve designing impact limiters for a shipping cask system that are capable of withstanding hypothetical accident conditions (HAC) as specified in 10CFR71. These HACs involve drops, impacts, fires, etc. and would require the students to perform some modeling using software programs capable of modeling mechanical properties to demonstrate their designed impact limiters would be able to protect the used nuclear fuel from these HACs (e.g., ANSYS). In addition, there is a cost element to these impact limiters that should also be considered to ensure an
effective and affordable solution has been obtained. The Project Team would be provided the
design of a cask system and the design of the current set of impact limiters the cask system has
been licensed to as a starting point. The team would then be asked to establish materials for and
develop the design for impact limiters for the ~125 ton, ~8 foot diameter, ~25 foot in length cask
system and the impact limiters would have to have a diameter less than ~11 feet to ensure the cask
can be shipped by rail.

**Expected Deliverables/Results:**

- Design for impact limiters that meet the specifications
- All back-up analysis that demonstrates compliance with the specification

**Disposition of Deliverables at the End of the Project:**

*No hardware to be produced*

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

- Skills and access to software products to perform the static and dynamic modeling.