Exelon Generation - Three Mile Island
ECCS BWST Vortex Prevention

Overview
The problem is during the chance of a Loss of Coolant Accident (LOCA), the Borated Water Storage Tank (BWST) can start vortexing at a certain height, causing cavitation of the pumps and millions of dollars in damage, as well as no way to recirculate coolant. The operator has a 38 second time window to open two sump suction valves at 9.5 feet of water level, and a 15 second time window to close two BWST suction valves at 6.33 feet. If these time windows are not met, vortexing can occur, allowing air into the pumps.

Objectives
The original problem statement was to lengthen the time window for reactor operators or eliminate it altogether. The problem statement was then refined to lower the critical height of vortex formation or prevent vortexing altogether through the use of a vortex breaker to lengthen time windows for reactor operators.

Approach
- Received list of proposed solutions
- Weighted solutions on cost and safety
- Vortex breaking was the most highly rated solution
- Vortices and vortex breakers were researched extensively
- Several vortex breaker designs were developed as the best solutions
- Began analysis of experimentation and simulation
- Experimentation was determined not optimal for the scope of the course
- Fluent ANSYS was chosen as the CFD program
- A simplified model of the storage tank was created
- Vortex formation was shown in the simplified model
- Attempts to model vortex breakers in the simulation were inconclusive
- Proposed vortex breaker designs work based on theory and literature

Outcomes
Finally, list the outcomes for this project making sure to clearly convey their implications for the sponsoring company:
- Vortex breakers are by far the cheapest solution to lengthen the time critical action
- Plenty of literature has been found promoting the effectiveness of the proposed vortex breaker designs
- The best two breaker designs are the extended outlet pipe and baffles
- Experimentation to prove the effectiveness of the vortex breaker designs is encouraged for future works.