THREE MILE ISLAND ALPHA NATURAL DRAFT COOLING TOWER ICING

Overview
TMI’s Alpha Natural Draft cooling tower experiences significant ice formation on the fill support structures during periods of below freezing temperatures. When ice forms, the efficiency of the plant decreases because the ice blocks the air flow into the tower thus raising the temperature in the tower. The spray nozzles were installed too close to the wall and the seal next to the wall was not sealed properly. This causes water to drip down the wall of the tower and squirt out at the top of the exposed fill support structures and then freezes on the fill support beams blocking air flow and increasing the load on the beams.

Objectives
To determine how to eliminate the ice accumulation on the fill support structures which currently reduces air flow and decreases plant efficiency. This semester, the TMI team evaluated where the freezing water was coming from and also designed how to eliminate the ice on the fill support structures.

Approach
- Identify what the problem is at TMI
- Identify where the freezing water is coming from
- Brainstorm variety of ideas how to melt the ice on the fill support structures
- Analyse and eliminate the ideas on how to melt the ice
- Meet with TMI to discuss our ideas and to get an insight to specifically where the water is coming from and to learn about their current possible solutions
- During the meeting with TMI more exact requirements were discovered
- Concluded that melting the ice on the fill supports is not a feasible solution
- Brainstorm variety of ideas on how to divert the water away from the inner wall of the cooling tower
- The idea of changing the spray pattern at the nozzle was conceived
- The new spray pattern was reverse engineered to get a possible idea of the new nozzle design which was created in SolidWorks
- The new spray pattern would be approximately 120°
- The existing spray nozzles are made out of PVC and the new ones would also be made out of PVC

Outcomes
- The sponsor will save about $350,000 per year as a result of this project
- The TMI station will improve their efficiency by about with our new spray pattern
- Since this problem is common in the northeast this solution could be implemented in other cooling towers