Wine and Water

California accounts for almost 90 percent of the wine produced in the United States. Among the top wine manufacturers in the world is Martini Winery. The winery has a crush facility in Delhi, California and a bottling facility in Madera, California. When the wine is ready to be bottled, it is transported by a tanker truck from Delhi to Madera. Before the wine is input into the tank, the truck must be washed out and inspected for the necessary level of cleanliness. The truck needs to be regularly washed and inspected for cleanliness levels, which uses 12,448,800 gallon of water per year. The availability and constant supply of water has increasingly become a problem for Martini Winery. The high water consumption during this process results in wastage of water as well as high annual water cost of $335,208 for Martini Winery. The company is find ways to reduce their water consumption by 30% while maintaining their cleanliness standards.

The current process requires an operator to lower three nozzles through the open hatches on the top of the tanker (see figure above). Then, the operator turns on the water for a two cycle wash. First, there is an approximately two-minute water rinse cycle. Then, this is followed by an approximately five-minute sanitation cleanse cycle using chlorine dioxide. The water sprays out of the three standard nozzles, hits the tanker walls and drains out through ports on the bottom of the tanker (see figure to the right). There is a visual cleanliness check after the wash process, and additional wash time is added if any debris is observed. There are also randomly scheduled quantitative cleanliness checks of the tankers that involve taking samples and measuring contaminants.

Propose an improved design that would reduce the water consumption, which would also help bring down the costs to wash the tanker.

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You should consider a few constraints while developing a new design. Your solution should be able to wash a 6,500-gallon tanker with a water pressure within the range of 130-160 psi. The design must adhere to cleanliness standards for food and food-grade components.

Your goal is to learn about the issues that are important to the winery (*empathize*). Based on the information provided in this case (and some extrapolating), provide what the issues/problems are (*define)*. Consider issues like what might be causing water wastage? How could you limit the use of water while maintaining the cleanliness standards? Within your group, you need to think about probable solutions to address the problem (*ideate*). As the engineer team involved in developing a solution to reduce the water consumption what steps will you take? Propose a prototype model as a part of your solution that stops or reduces the factors that lead to less water being wasted. Finally, *test* your solution by presenting it to your peers which will help you look at the limitations in your solution.