

Thermal Balance Study on bulk NH₃ Storage – AirProducts – 1 student

Two additional ideas that are really valuable to Air Products, linked to our Green H₂/NH₃ developing business, require fundamental Chemical Engineering calculations, but I fear may not appear super exciting on the surface are both regarding the large ammonia tanks that we (and others in the industry) are starting to build, own, and operate:

- Although there is API guidance for sizing relief valves for these NH₃ tanks, the guidance is surprisingly vague for what we call the barometric pressure case (basically what happens to the NH₃ tank pressure when a hurricane approaches and passes over the NH₃ tank, for example in Texas or Louisiana). This case ends up being the sizing case in many projects. We have therefore come up with a dynamic model solution for determining the relief flows required, but it is complex and it takes time to solve. We would like a student/team to dig into the details, see if they agree with our methodology, and see if a steady state solution is possible for different tank sizes.
- In addition, there is something called a thermal overload case where warm NH₃ gets added to a tank full of cold NH₃. Again, the industrial guidance is surprisingly vague and we need to know when there is a relief case in this situation and what would the relief flows be.