Overview
The problem that was presented to us was developing a gas scrubber and recycle system for Wave Liquefaction™. This process is to take place after the liquid scrubber system, which other H Quest teams have developed. Our team’s final proposal was a combination of a horizontal impingement-plate scrubber that also utilized gas sieves and membranes.

Objectives
Our objective was to develop a system that extracted and recycled desired components. This process needed to be completed in the most economically feasible way possible for our sponsor.

Approach
- Met with our sponsor at least once a week via video chats
- Gathered customer needs from the company information that our sponsor sent us
- Three initial scrubber systems were proposed: spray, double venturi, and impingement-plate
- Solvent, material, and previous patent research was conducted
- Cost assessment of each piece of research was performed
- Industrial research was performed
- Impingement-plate system was selected
- Thermodynamic analysis was conducted
- Concept diagrams were developed to show gas flows, reactions, and thermodynamic properties
- AutoCAD and SolidWorks drawings were developed

Outcomes
A conceptual gas scrubber device has been proposed for an engineering scale coal to liquids process. Removal of contaminants is theoretically achieved to a desired extent and is subject to experimental validation. Our system theoretically possesses an efficiency of approximately 90% due to vigilant industrial research on gas scrubber systems. We have developed a scrubber system that meets the sponsor’s major requirement that the system does not have a large pressure drop. Our design is economically and space efficient as well due to the smaller facility.