EFFLUENT SEPARATOR

- Flash Drum (vaporizes steam to separate components)
- Baffle Separator*
- Centrifugal (blades/fan)
- Mechanical (mix of baffle/centrifugal)

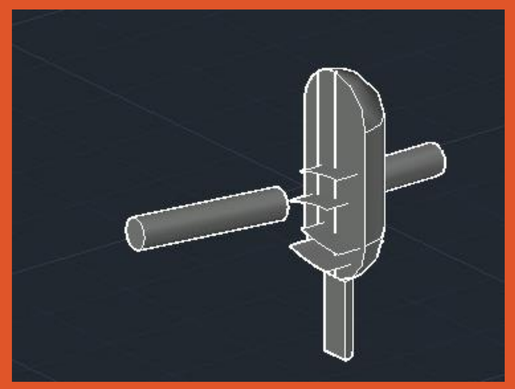

Figure 3. CAD drawing of the baffle separator

HYDROGEN PURIFICATION

- Absorber
  - room temperature
  - Removes water, carbon dioxide, oxygen, and non-methane hydrocarbons
- Getter
  - High temperature
  - Removes water, oxygen, carbon dioxide, and hydrogen carbons
- Cryogenic
  - 38 to -460 degrees Fahrenheit
  - Removes all impurities except helium
- Palladium
  - 350 to 400 degrees celsius
  - Separates everything

Oregon State University

HYDROGEN ELECTROLYSIS AND PURIFICATION

The production of SAE J2601 hydrogen through the electrolysis of water and hydroxide solution for the use of HD vehicles

Ashley Kunihiro, McKinzee Mode, Madisyn Thorne

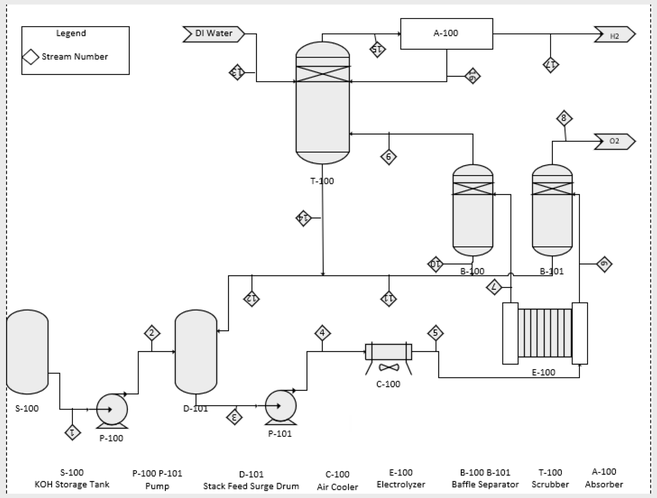

Figure 1. PFD of the hydrogen electrolysis and purification system

Figure 2. NREL's 1.25 MW Electrolysis and Fuel Cell Testing Facility. Photo credit: NREL

DESCRIPTION OF PROCESS

1. KOH combines with H_2O and is circulated through an air cooler
2. Mixture sent to the electrolysis stack and split into hydrogen and oxygen molecules
3. Cathode and Anode effluent sent to baffle separators
4. Oxygen released in the environment.
5. Cathode effluent sent to packed bed scrubber to remove excess KOH
6. Absorber used to dry and purify hydrogen to SAE J2719 standards

OBJECTIVE

- Develop a hydrogen infrastructure for NREL's Advanced Research on Integrated Energy Systems (ARIES) platform.
- Power HD/MD vehicles, as well as marine and rail transportation.
- The facility will be located at the NREL Flatirons Campus in Colorado.
- 12 million USD capital expenditure budget
- Estimated Production: 300.03 kg/hr
- Annual Revenue: 25.3 million USD
- Breakeven Cost: 4.28 USD/kg

ECONOMIC EFFICIENCY

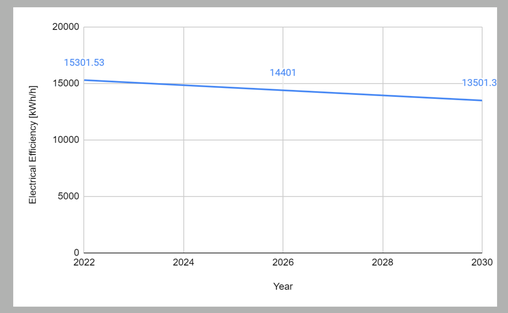

Figure 4. Electrical efficiency of the hydrogen stack over time

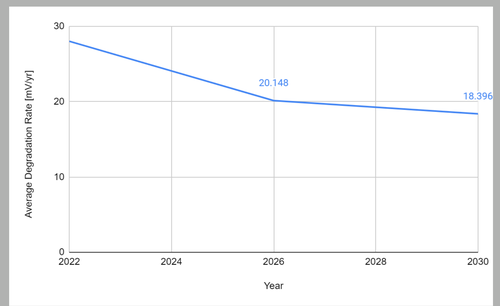

Figure 5. Average Degradation of the hydrogen stack over time

FUTURE WORK

- Increase electrical efficiency
- Explore other renewable sources of energy to power the plant
- Tap into city water lines for easier accessibility

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