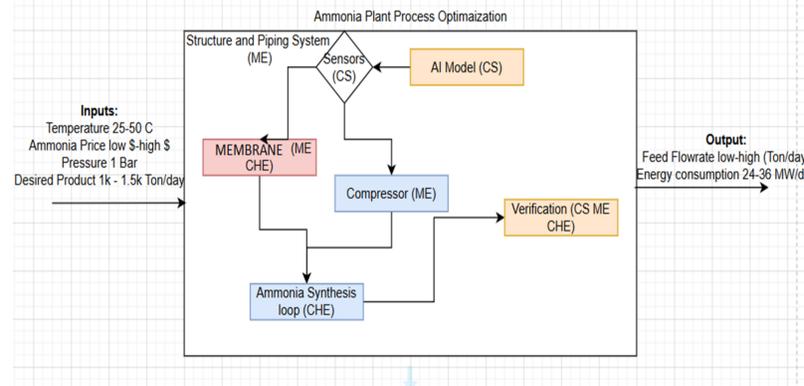


Process Overview



Constraints

- Compressor operation condition
Maximum Pressure : 160 psi which is 11 bar approximately
- Membrane operation condition
Pressure range : 116 – 348 psi
Working Temperature : 5 – 65 c
- Ammonia purity above 99%
- Update time for data every 10 min

All Specifications

- Purity of ammonia >99%
- Predict ammonia prices monthly
- Fresh Feed Flow Rate < 350 Ton / hr
- Minimize Energy consumption < 1 GW
- Response Time < 1 sec.
- Capture efficiency of membrane > 25%

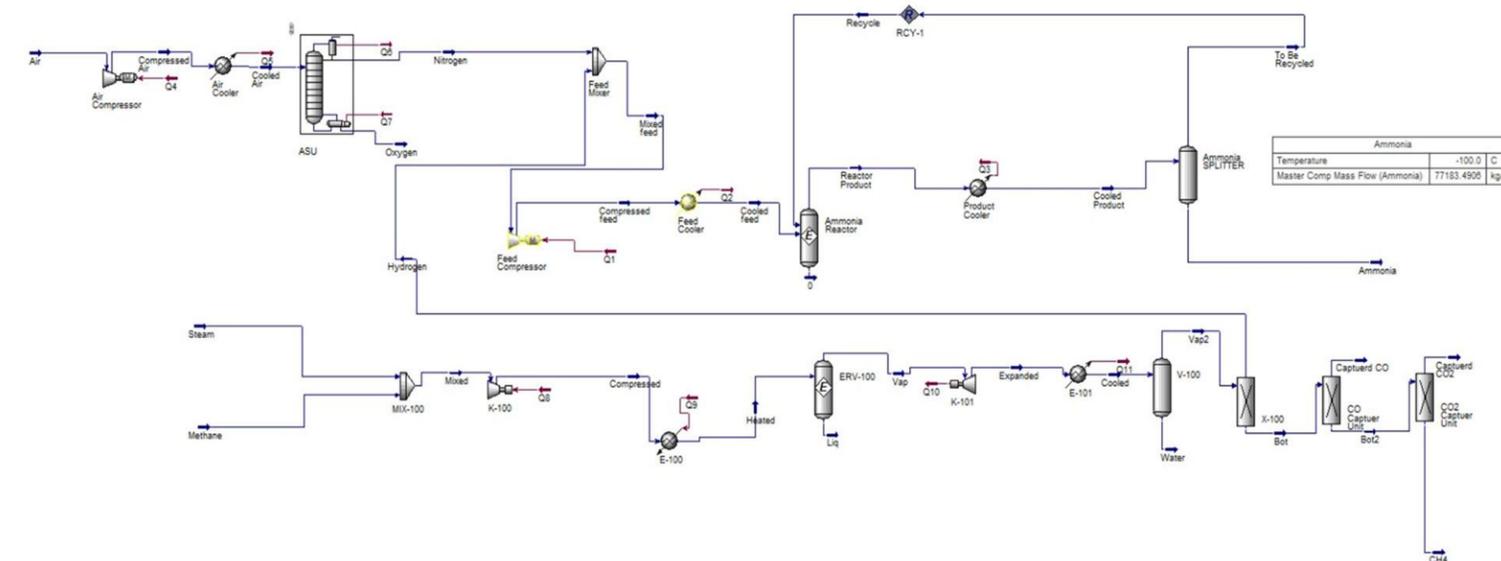
Testing / Validation

Specification	Results
Capture efficiency of membrane >25%	Met (28.57%)
Purity of ammonia >99%	Met (99.80%)
Minimize Energy consumption < 1 GW	Met (0.7 GW)
Response Time < 60 sec.	Met (45 sec)

Problem Statement

There is a need to optimize ammonia production by combining simulation, AI prediction, and physical validation. This project addresses that by developing a prototype system with an integrated mechanical air separation unit to optimize a stage in the production .

Aspyn Hysys Simulation



Prototype Design

The prototype consists of a 12V air compressor connected to a gas separation membrane using brass fittings and a manual needle valve for pressure control. A pressure gauge monitors inlet conditions, sensors for pressure and temperature, website to calculate the best amount of ammonia in what condition using AI, and a gas analyzer measures oxygen levels at both nitrogen and oxygen outlets to confirm separation performance.

Conclusions

After finishing the project we found that using AI model to optimize is the best approach but it need to have some connection to the simulation instead if entering the data manually to enhance the process, also we can see that when the sensor shutdown the system if the temperature is high need to be monitored to insure there is no disturbance in the system, the project in our scope fulfil the requirement but it can be expand on to cover the entire ammonia production process when there is enough resources and time