Development of Simulation Models for a Metal Hydride Compressor and Thermal Storage

Description

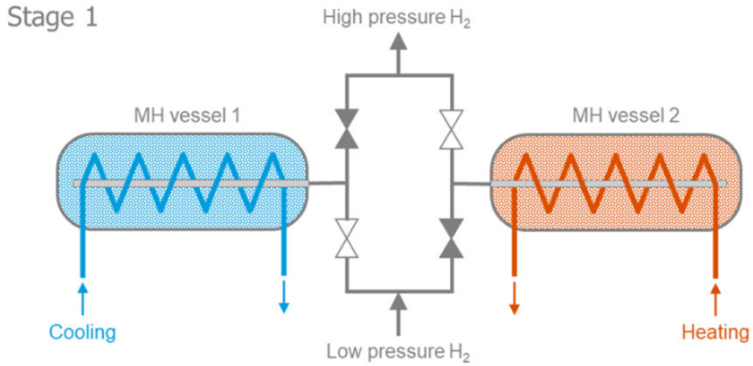
Metal hydrides (MH) are known as a material-based hydrogen storage technology, where hydrogen is absorbed and chemically bound into the metal lattice. In addition to its storage function, by utilizing the pressure-temperature correlation of its reaction equilibrium, metal hydrides can also be used as a thermally driven hydrogen compressor. By supplying heat to a hydride saturated with hydrogen, the equilibrium pressure rises, allowing for hydrogen to be released at high pressures. Alternatively, by absorbing hydrogen, reaction heat is released, thus the hydride can also function as a de facto thermal storage. Both MH applications are gaining increased attention due to possible synergies with different technologies in hydrogen energy systems.

This thesis consist of three main parts:

(1) Literature research on suitable metal hydride materials and applications for compression and thermal storage.

(2) Integration of existing MH models in Matlab/Simulink with hydrogen production and utilization within hydrogen applications and infrastructures.

(3) Systemic simulations to evaluate operating ranges, efficiency and costs for the selected application use cases.



Source: Hystorsys AS (https://www.hystorsys.no/)

Work Packages

- Literature research on materials and applications (1 month)
- Integration of compressor and thermal storage models (2 months)
- System simulation of energy systems and efficiency evaluation (2 months)
- Written thesis (1 months)

- **Start**: immediately
- **Duration**: approx. 6 months
- **Paid Master Thesis**
- **Contact**: Dr. techn. Nejc Klopcic, klopcic@hycenta.at
  Christian Höß, hoess@hycenta.at