

## Modelling of Combined Heat, Hydrogen and Power Production via Hydrothermal Liquefaction of *Saccharina japonica*

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Our study provides a techno-economic feasibility study for the industrial scale process design for H<sub>2</sub> production via HTL using Aspen Plus process simulation. The goal of simulation study was to evaluate various industrial scale design cases in quest of minimum hydrogen selling price (MHSP). Various design alternatives were taken in consideration to analyze the economics. Design cases were built to minimize the natural gas utilization and to enhance maximum heat integration. Base case design with external utilities, Case 1: Combined heat, power and hydrogen production (CHHP), Case 2: modified by using fraction of HTL product for combustion were introduced. Hot oil system was introduced in the Case 1 and Case 2 as an effective element for reducing the natural gas consumption. Combined heat, hydrogen and power production (CHHP) was simulated using 480,000 kg/yr., of dry *Saccharina japonica*. Economical study revealed that the Case 1 showed the lowest H<sub>2</sub> price of 2.97 \$/kg with an hourly production of 6659 kg/hr of H<sub>2</sub>.