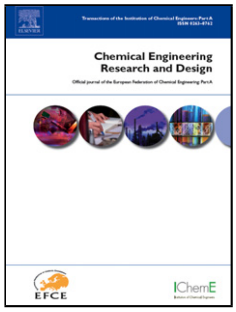

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A Multi-objective Optimization for the Design and Operation of a Hydrogen Network for Transportation Fuel

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Abstract

In this work we present a multi-objective, multi-period, mixed integer, linear optimization formulation to analyze a hydrogen supply chain network. The objectives of the optimization problem are:(i) the maximization of the Net Present Value (NPV) and (ii)the minimization of the Greenhouse Gas (GHG) emissions, while determining: (i) the locations of the hydrogen facilities, (ii) the production technology, (iii) the size of each facility (iv) transportation unit and (v) the distribution route. The model was deployed for the state of Texas and two scenarios were investigated: (i) oxygen co-produced with hydrogen from electrolysis is discarded and (ii) oxygen co-produced form the electrolysis is further processed and sold to generate revenue. A Pareto curve of twenty efficient points is developed and the extreme points on the curve are used to test the aforementioned scenarios. We found that further processing of produced oxygen for sell instead of discarding it made electrolysis an economically viable technology option for the production of hydrogen.

Keywords: Hydrogen infrastructure, Strategic supply chain planning, Mixed integer linear programming, Multi-objective optimization, Greenhouse gas emissions

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