

Optimal sizing and layout of the distributed H₂ production system with safety and cost considerations

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H₂ is an important commodity chemical that can also be used as an alternative fuel. One of the envisioned uses is powering fuel cell vehicles, which can contribute towards reduced CO₂ emission and greater sustainability. The way how H₂ is currently produced and distributed, however, is not compatible with using it as a fuel. This is primarily due to the high costs associated with storing and delivering H₂ from the centralized production facilities to the end-use sites like H₂ stations that will be distributed throughout a region. The on-site production of H₂ at the locations where they are being consumed can contribute to lowering the overall cost of delivering H₂. This study proposes a methodology for modelling and solving the optimization problem of configuring the sizes and layout of H₂ production sites that minimizes the overall cost. The application of the proposed methodology to a hypothetical case involving H₂ supply to three stations is included. The results demonstrate how the optimal solution found by the methodology can reduce the overall cost compared to the traditional centralized production system.