

Performance assessment of a fixed-bed gasification pilot plant for combined power generation and hydrogen production

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Abstract

Large-scale hydrogen production through near zero emissions gasification plants represents a reliable technology which is being seriously considered for its potential economical implications. However, the application of these technologies is currently subject to high capital and operating costs. This needs great scientific and technical effort to optimize the processes and the equipment, to reduce the hydrogen production cost.

In this context, a flexible and fully equipped pilot platform has been built up in the Sotacarbo Research Centre, in order to study several integrated gasification and syngas treatment process configurations for a CO₂-free combined production of hydrogen and electrical energy, to be used in medium and small-scale commercial plants. The platform includes pilot scale fixed-bed up-draft gasifiers, equipped with a flexible and complete syngas treatment line.

This paper reports the main results obtained in the pilot plant during the last experimental campaign which has been carried out to improve the plant performance. In particular, a series of experimental tests has been performed in order to optimize the coal gasification process in different operating conditions. Moreover, a mention of the overall plant performance, based on the experimental results, has been presented, with particular reference to hydrogen, carbon and pollutant emissions.

Keywords: Coal gasification; Pilot Plant; Coal-to-hydrogen; Syngas treatment

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