EuroSciCon

International Conference & Expo on

Recycling

August 20-21, 2018
Amsterdam, Netherlands

Expert Opin Environ Biol 2018 Volume: 6
DOI: 10.4172/2325-9655-C2-021

INTEGRATED AIR SEPARATION UNIT AND SOLID OXIDE FUEL CELL POWER PLANTS AND WITH LNG COLD ENERGY UTILIZATION

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An integrated air separation unit (ASU) and solid oxide fuel cell (SOFC) power plant is introduced and analyzed. The required power in the ASU is supplied by SOFC system. Liquefied natural gas (LNG) is used as fuel to the process. LNG cold energy is recovered in the AUS system and re-gasified natural gas, enters the SOFC stack. A portion of the oxygen produced in the air separation system is used in the power plant system so an oxy fuel combustion chamber is utilized after the SOFC stack. The process configuration is disclosed and analyzed in detail. Composite curves of the multi stream heat exchangers show that thermal design of the process has been done suitably. Minimum temperature approach and logarithmic mean temperature difference (LMTD) are in the rage of [2, 4] and [6, 13] respectively. Energy consumption for the proposed air separation process with LNG cold recovery is about 34% lower compared for a convectional cryogenic air separation process. Specification of the process equipment and material streams are presented. Effect of operating parameters like LNG flow rate and pressure, column operating pressure, turbine inlet temperature on the process performance are analyzed. The cold energy of LNG improves the liquefaction of the nitrogen and power generation output. This result confirms that the hot and cold utility sources are not required in the process. Also the processes are investigated by exergy method analysis. Exergy efficiency and destruction of the process component are calculated.

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