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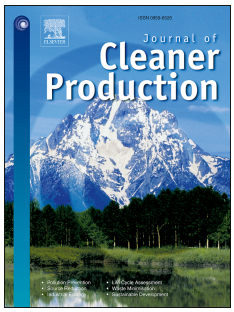

Introducing a novel air separation process based on cold energy recovery of LNG integrated with coal gasification, transcritical carbon dioxide power cycle and cryogenic CO_2 capture

Mehdi Mehrpooya, Reza Esfilar, S.M. Ali Moosavian

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Introducing a novel air separation process based on cold energy recovery of LNG integrated with coal gasification, transcritical carbon dioxide power cycle and cryogenic CO_2 capture

Mehdi Mehrpooya*[a, b], Reza Esfilar [c] and S.M Ali Moosavian[c]

[a] **Renewable Energies and Environment Department, Faculty of New Sciences and Technologies, University of Tehran, Tehran, Iran**
[b] **Hydrogen and fuel cell laboratory, Faculty of New Sciences and Technologies, University of Tehran, Tehran, Iran**
[c] **School of Chemical Engineering, University College of Engineering, University of Tehran, P.O. Box 11365-4563, Tehran, Iran**

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An integrated coal gasification process with a novel double-column cryogenic air separation unit (ASU) based on the LNG (liquefied natural gas) cold energy recovery is proposed and analyzed. The process consists of a trans-critical carbon dioxide power generation cycle, a shift converter unit and cryogenic CO_2 capturing system. ASU is used to produce high purity oxygen (99.99%) and nitrogen (99.99%). The specific power demand per flow rate of pure oxygen is 0.11 kWh/kg. Due to effective integration between two distillation columns in the ASU, the latent heat of the condenser in high pressure column is exchanged with reboiler of the low pressure column. The outlet LNG stream from ASU is utilized as cold source of the condenser in the trans-critical CO_2 power cycle. The results show energy saving in the ASU and trans-critical power generation are 2301.6 kW and 14217.6 kW respectively. The produced high purity gaseous oxygen is sent to the coal gasification unit to participate in the gasifier reactions. In this process, 99.83% of carbon dioxide with 99.80% purity, is captured and the required power is about 0.10 kWh/kg CO_2.

*Corresponding Author: Tel: +98 21 86093166, Fax: +98 21 88497324
Email address: mehrpoya@ut.ac.ir

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