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THERMAL SCIENCE

International Scientific Journal

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NOVEL CONCEPTS FOR NEAR-ZERO EMISSIONS IGCC POWER PLANTS

ABSTRACT

The paper aims in examining and evaluating the state of the art in technological concepts towards zero-emission coal-fired power plants. The discussion is based on the evaluation of a novel concept dealing with the carbonation-calcination process of lime for CO₂ capture from coal-fired power plants, compared to the integration of CO₂ capture in an Integrated Gasification Combined Cycle power plant. Results from thermodynamic simulations dealing with the most important features for CO₂ reduction are presented. Preliminary economic considerations are made, taking into account investment and operating costs, in order to assess the electricity cost related to the two different technological approaches. The cycle calculations were performed with the thermodynamic cycle calculation software ENBIPRO (ENergie-BIllanz-PROgram), a powerful tool for heat and mass balance solving of complex thermodynamic circuits, calculation of efficiency, exergetic and exergoeconomic analysis of power plants. The software code models all pieces of equipment that usually appear in power plant installations and can accurately calculate all thermodynamic properties at each node of the thermodynamic circuit, power consumption of each component, flue gas composition etc. The code has proven its validity by accurately simulating a large number of power plants and through comparison of the results with other commercial software.

KEYWORDS

[IGCC power plants](#), [CO₂ capture](#)

PAPER SUBMITTED: 2005-07-12

PAPER REVISED: 2006-11-14

PAPER ACCEPTED: 2006-01-09

CITATION EXPORT: [view in browser](#) or [download as text file](#)

THERMAL SCIENCE YEAR 2006, VOLUME 10, ISSUE 3, PAGES [81 - 92]

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