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MASTER'S THESIS/ BACHELOR'S THESIS

Conceptual Design and Techno-Economic Analysis of a High Temperature Regeneration Preheater for Efficient CO_2 Capture from Lime and Cement Plants

TECHNISCHE UNIVERSITÄT DARMSTADT

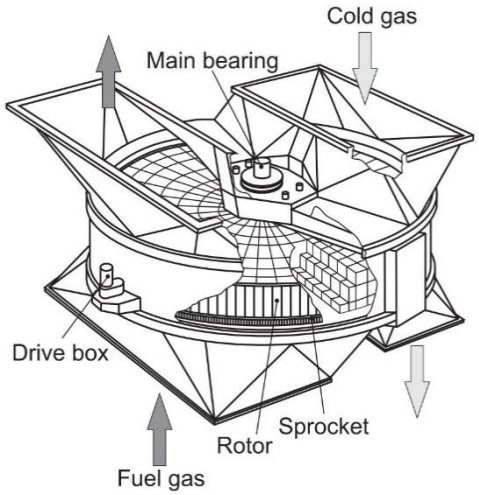
Institut für Energiesysteme und Energietechnik

Prof. Dr.-Ing. Bernd Epple

Otto-Berndt-Str. 2
64206 Darmstadt
www.est.tu-darmstadt.de

Background

Process and combustion CO_2 from lime-based industries accounts for around 8% of the global fossil CO_2 emissions. The process emissions associated with the calcination cannot be avoided without carbon capture, utilization, and storage (CCUS). At the Institute for Energy Systems and Technology (EST), a promising CO_2 capture process, the Indirectly Heated Carbonate Looping (IHCaL), is being developed for integration into lime and cement plants, to reduce the associated CO_2 emissions. In order to deploy this technology, the efficient heat recovery of the high temperature flue gases by combustion air preheating is required.



Sketch of a Ljungström regenerator (rotary heat exchanger) to preheat combustion air with combustion flue gases. Source: Walter and Epple, Numerical simulation of power plants and firing systems (2017)

Aim and Method

The aim of the thesis is to develop an efficient gas/gas heat exchanger to recover heat from the high temperature (1000 °C) flue gases of an Indirectly Heated Carbonate Looping process for CO_2 capture from lime and cement plants. For this, an exhaustive literature review (e.g. scientific journals, patents) will be carried out. This will be followed by the conceptual development of possible design solutions to achieve the component's specifications. Finally, a techno-economic analysis will be carried out to select the best design for industrial deployment.

Proposed Work Structure

The following tasks are proposed for the development of the thesis:

- Initial review of relevant literature
- Identification of the component's technical specifications
- Conceptual design and basic engineering of a high temperature gas/gas heat exchanger
- Calculation of technologic and economic key performance indicators
- Discussion of results, and reporting

Information for the Application

The thesis can be submitted in English or in German.
For applications and further information, please contact:

M. Sc. Martin Greco-Coppi
Wissenschaftlicher Mitarbeiter
EST // L1|01 Room 343 // Tel: 06151 16-22679
email: martin.greco@est.tu-darmstadt.de