

Bachelorarbeit

Titel der Arbeit // Title of Thesis

Theoretical and experimental investigation of an additive manufactured recuperator burner regarding heat transport processes as well as combustion and pollutant behaviour

Akademischer Abschlussgrad: Grad, Fachrichtung (Abkürzung) // Degree

Bachelor of Engineering (B.Eng.)

Autorenname, Geburtsort // Name, Place of Birth

Akshay Vengayil, Kozhikode, India

Studiengang // Course of Study

Mechanical Engineering

Fachbereich // Department

Maschinenbau, Umwelt- und Gebäudetechnik

Erstprüferin/Erstprüfer // First Examiner

Prof. Dr.-Ing. Andreas Wichtmann

Zweitprüferin/Zweitprüfer // Second Examiner

Dipl.-Ing. Marcel Fiehl

Abgabedatum // Date of Submission

07.10.2020

1 Introduction

The steady depletion of energy resources around the world due to various major factors has contributed to severe problems of exhausting all available non-renewable energy sources such as oil, natural gas and coal. Predictions indicate that global non-renewable resources will be exhausted in the next 50 years if the present rate of consumption of these resources continues. This has led to various developmental projects in the energy sector industry to prolong their use. Since, due to the industrial process, the infrastructure, the state of development and the availability, a conversion of industrial processes to regenerative energies is currently not possible to the full extent, it is necessary to make the most effective use of existing resources. To this end, various potentials for reducing fuel use, and the associated emissions of pollutants and greenhouse gases in the industrial sector are being investigated and utilized.

1.1 Aim of thesis

Within the scope of the research project, it is planned to develop a new type of burner assembly, which enables an energy-saving and low-emission production of process heat through recuperatively preheated, modulated gas combustion. This goal is to be achieved by an additive manufactured combination of a fuel/air mixing unit and a recuperative air preheater, which uses exhaust gas heat at higher temperature levels than currently used systems. Based on the possibilities of additive manufacturing, a very compact component is to be developed, which is optimized in terms of pressure loss and heat transfer. This is also achieved by designing the recuperator for maximum heat transfer with regard to the choice of materials. A series of tests are to be undergone using the burner without the recuperator unit. The burner is to be observed under two different settings and results therefore recorded. Furthermore, an excel sheet is to be prepared with definite parameters to calculate relevant characteristics of the heat exchanger.