

## Master Thesis Brief Description

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<b>Thesis Title</b>	<b>Optimization of solid biomass boiler's combustion chamber using CFD</b>
<b>Programme of Studies</b>	MSc in Sustainable Energy Systems
<b>Course</b>	MES 580 MSc Thesis
<b>Area of Study</b>	Sustainable Energy Technologies – Biofuels
<b>Student's Name</b>	Theoklitos Klitou
<b>Students Reg. Number</b>	18755
<b>Supervisor</b>	Dr.-Ing. Paris A. Fokaides, Asst. Professor, Mechanical Engineering Department
<b>Supervisory Committee</b>	Dr Chris Christodoulou, Professor, Mechanical Engineering Department Dr. George Karagiorgis, Professor, Mechanical Engineering Department
<b>Semester</b>	Fall Semester 2021
<b>Short Description</b>	<p>This master thesis is part of the MSc in Sustainable Energy Systems program at Frederick University. The use of Computational Fluid Dynamics (CFD) has gained popularity in the engineering world, proving beneficial in reducing design and production time and costs. In recent years, CFD has been increasingly employed for optimizing the combustion process in biomass furnaces, serving as a crucial tool for boiler design and analysis under various working conditions. The study focuses on the existing solid biomass EcoBio 25 (29 kW) boiler, utilizing CFD simulations in Solidworks Flow Simulation to optimize its combustion chamber. A comprehensive literature review was conducted to explore previous methods and approaches employed for biomass boiler optimization. Different design specifications were employed, modifying parameters and conditions to generate various simulation studies. Through a comparative analysis of these studies, the most efficient design processes were identified. The thesis concludes with a parametric analysis, recommendations, and conclusions extracted from Solidworks Flow Simulation, presenting the optimized design study yielding the best results, particularly the highest outlet water temperature. These findings contribute valuable insights into enhancing the performance and efficiency of biomass boilers in sustainable energy systems.</p>