

Project Title: Modelling and simulation of low temperature combustion of flare gas for heat to power conversion
Supervisor's Name: Ftwi Yohannes Hagos
Co-Supervisor(s): <i>(if already known)</i>
Sources of Fund: To be applied for internal grant

Research Field(s): Thermofluids and Energy
<p>Summary and Problem Statement:</p> <p>In the petroleum industry, flare gas is a waste gas when emitted to the atmosphere causing ozone layer depletion due to its higher methane content. Therefore, the industry has no other option other than burning it directly to avoid pressure build-up. According to the report by Tollefson, 3.5% of the world's natural gas supply or 143 billion cubic meters was wasted as flare gas burning or venting to the atmosphere in 2012 [1]. However, the relatively high energy content of the gas is attracting more focus in recent days. Besides, the pressure build-up on the flare gas can be harnessed in the form of power if it is properly managed. This is in line with the cost optimization of the petroleum production. Recovering of the flare gas and channelling back to the process as a value adding resource for the power generation in the petroleum production platform would highly contribute in the reduction of the production cost. Utilization of this gas through different mechanisms are found to be less effective. Therefore, proper investigation of potential power conversion technologies such as the low temperature combustion should be undertaken.</p>
Keywords: flare gas; low temperature combustion; gas recovery; heat to power
<p>Objectives: The overall objective of the study is to minimize the venting of flare gas to the environment in the gas fields by recovering and utilizing the flare gas for power generation. This need to be done taking into consideration of the space limitation in off-shore gas fields. The specific objective of the current study is to conduct modelling and simulation on the low temperature combustion of flare gas as a potential for the heat to power conversion.</p>
<p>Tentative Methods of Approach:</p> <p>Low temperature combustor design Modelling and simulation through Ansys</p>

Required backgrounds and skills
Backgrounds: Good background in Thermofluids Good background in CFD
Computing Skills: Autodesk or Solidworks, Ansys
Other requirements:
References: [1]. Jeff Tollefson, 'Flaring' wastes 3.5% of world's natural gas, Nature doi:10.1038/nature.2016.19141, 11 January 2016