Combustion instability in future hydrogen combustors for power generation applications

Introduction

My work is investigating the instability of hydrogen combustion inside the gas turbine systems. The 'FlameSheet' is a versatile gas turbine combustor that can accommodate various fuel types. Pressure and heat release fluctuations are the primary factors of combustion instability, which can potentially damage the combustor.

Primary objective

- Analyzing the dynamics of 'FlameSheet' combustor model system which is relevant to combustion instability

Secondary objectives

- Analyzing the resonance frequency and vortex shedding of the 'FlameSheet' combustor model system.

Recent Progress
Non-Reactive flow analysis

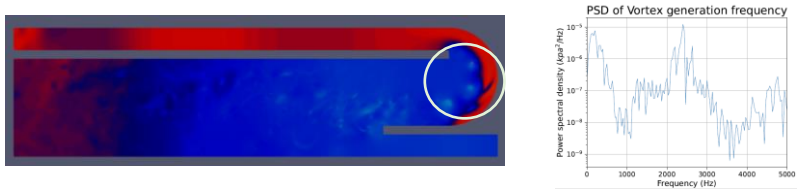

Fig 1. Vortex generation analysis; Left-Location of vortex generation, Right-Pressure Power Spectrum Density measured at vortex generation point

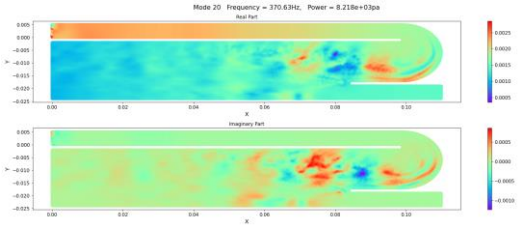

Fig 2. Dynamic Mode Decomposition (DMD) pressure eigenvectors (associated frequency: 370.63 Hz) expressed on the gas turbine system

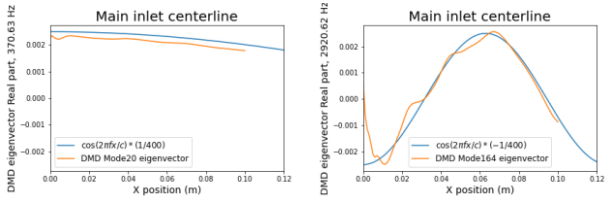

Fig 3. Acoustic wave observed at Main inlet centerline; Left-Mode 20 associated with 370.63 Hz, Right-Mode 164 associated with 2920.62 Hz

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Related projects: LowEmission , Carbon-free firing of gas turbines

MSc. Energy and Environment Technology from University of South-eastern Norway

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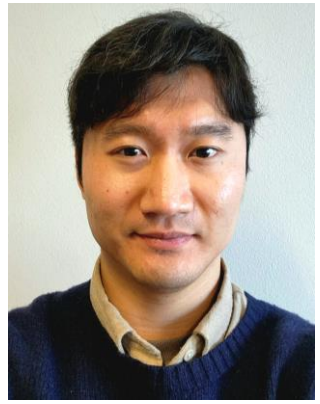

Estimated progress of the PhD project:

Just started ...	< 50 %	> 50 %	Almost done ☺

Publications

- Shin J., Henriksen M., Bjerketvedt D., Hydrogen and Ammonia Combustion (Master's thesis)
- M.Ibrahim O.1, Shin J.1, Sikka R.1, Hansen P.M.1, Vågsæther K.1, Experimental study on hydrogen pipeline leakage: Negative pressure wave characteristics and inline detection method (Progress)

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LOWEMISSION