Experimental analysis of H_2-fired Bosch boiler: linear thermoacoustic stability analysis

The DYNAF project

This master thesis proposal is part of the DYNAF project. This UT project focusses on the combustion *DYN*amics and *A*coustic oscillations in large industrial *F*urnaces and boilers. In cooperation with industrial partners we analyse the onset and growth of acoustic oscillations in combustion systems.

These oscillations are called thermoacoustic instabilities. By an unfortunate coupling of the heat released by the flame and the acoustic properties of the system, a positive feedback loop can form between these to physical properties. If allowed to grow, the resulting (acoustic) pressure waves can become so strong that damage to the equipment can occur.

As it stands, thermoacoustic instabilities are dealt with as and when it happens using a trial-and-error approach. The aim of the project is to predict whether an oscillation will grow or not, and if so, systematically guide the burner design to a stable point.

Figure 1: Left: damage to a burner liner. Right: a Bosch condensing boiler.

Your contribution

The experimental research project will analyse the thermoacoustic stability of a Bosch domestic heater. First, the Bosch system will be installed in the Kleinhorst lab. Then, tests will be done to validate the correct operation of the system. Subsequently, forced response experiments will be performed using hydrogen as fuel. The obtained Flame Transfer Function is then incorporated into the acoustic network model to assess the linear stability of the system. The findings from the study will work as validation for the parallel numerical study that is already underway. As ultimate result, recommendations for changes to the burner design could be made based on the experimental outcome.

This work will be done in close collaboration with engineers from Bosch. Therefore you can, next to doing the research, also build your social and communicative muscle.

Are you interested or do you have any questions? Feel free to come by the office or send us an email.

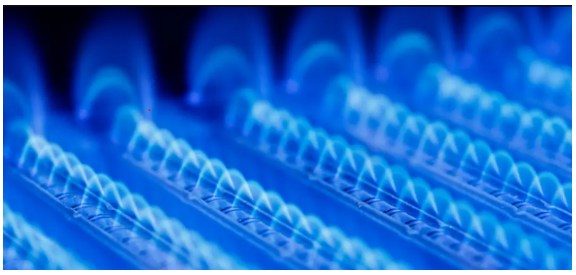

Figure 2: Laminar lean flames in slot burner.

BOSCH

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