Student Project / Thesis

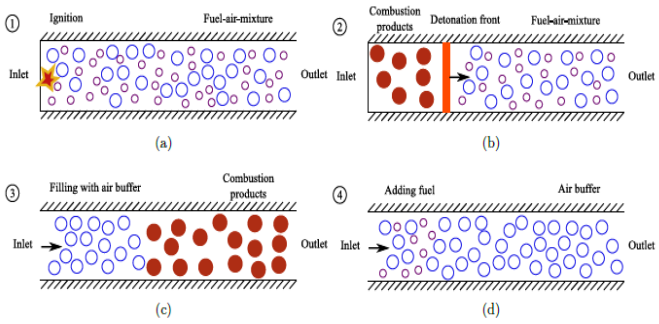
Chair of
Aero Engine Design

Title of the research:

Turbine plenum design and optimization for pressure gain combustion engine

Description:

Due to the unsteady nature of pressure gain combustion, either in the form of rotation detonation or pulsed detonation, the exhaust flow of this hydrogen-driven combustion is characterized by highly unsteady flow which is deteriorative for the downstream turbine. Therefore, the question of extracting energy from such an unsteady hot exhaust flow may answer in two directions. One is to look for an uncommon expander that can cope with the unsteady flow and the other way is to minimize the flow fluctuation while preserving the flow energy to a level that the conventional turbomachines can work efficiently with. While the former requires an extraordinary design, the latter is more practical and feasible through the use of a plenum between the combustor tubes and the turbine. The goal of this study is to go deep into the plenum geometry features, which is connected to an array of detonation tubes, and investigating the role of plenume in mitigating the unsteadiness and the accosiated entropy generation. The study includes unsteady CFD simulations and optimizations.



An illustration of a typical PDC periodic operation in a tube (Asli et. al 2022)

Start: As soon as possible.

Expected qualifications:

- Fundamental knowledge on gas dynamic and combustion
- Basic CFD knowledge and CFD software e.g., ANSYS Fluent, CFX
- Ability to work as a team and independently

What we offer:

- Working in an international team
- Joint supervision by Tokyo Metropolitan University (TMU) and BTU members
- Possibility of a short research stay (~8 weeks) at TMU
- Possibility of extending the research as a master thesis
- Co-authoring research papers, e.g., in ASME TurboExpo or journals

If interested, please send an email to **asli@b-tu.de**, including CV and transcript.

Brandenburgische Technische Universität Cottbus - Senftenberg

TOKYO METROPOLITAN UNIVERSITY