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On the Shuttling Transverse Combustion (STC)

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Abstract

The pressure gain combustion concept based on continuous detonation combustion, e.g. rotating detonation combustion in an annular chamber, is of paramount interest due to its higher operation frequency and thermal efficiency. With a novel combustor design of quasi two-dimensional channel, continuous detonation combustion is achieved by repeated reflection of shock waves at two closed ends of the combustor, namely shuttling transverse combustion (STC). STC features similar advantages as rotating continuous detonation combustion, e.g. smaller scale, one-time ignition and high thermal efficiency. Differently, due to the quasi-two-dimensional geometry of combustor, STC promotes more straightforward visualization and measurement techniques. It would help to investigate the wave dynamics in more detail because STC shares similar phenomena with rotating detonation combustion such as wave propagation and wave collision originating from counter-rotating wave mode. In addition, STC supports less cooling complexity and more compact size for modular design. The current research of STC in TL@NUS, computational and experimental, have involved studies of the flow structure, operation mechanism, wave mode and wave dynamics and operating condition sensitivity etc., which will be discussed in the presentation.