Feasibility of ammonia assisted combustion using pulser technology

Oscar Hernandez, Victor Chen (Citrus College)
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Abstract

Aiming to use pulsed spark technology to overcome ammonia's ignition resistance, thereby reducing greenhouse gasses by ammonia-assisted ignition.

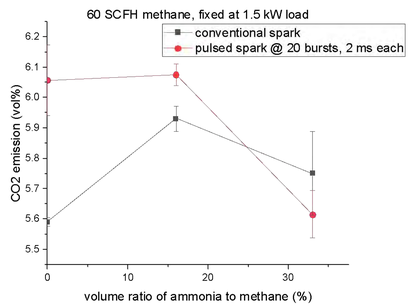
Introduction

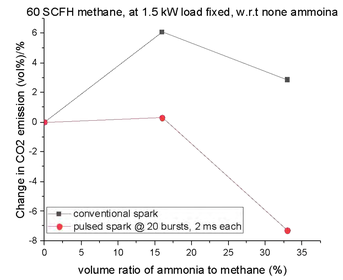
It is known that ammonia-assisted combustion can reduce the amount of greenhouse gasses being emitted. However, ammonia has a ~120 octane number, making it impractical to be ignited using conventional spark technology. This research project aims to utilize pulsed spark technology to overcome that, reducing the amount of greenhouse gasses being emitted.

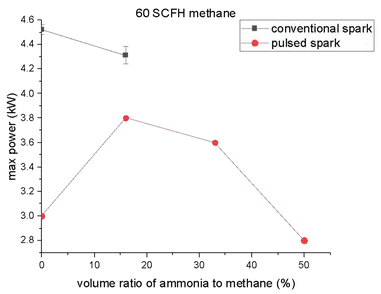
Materials

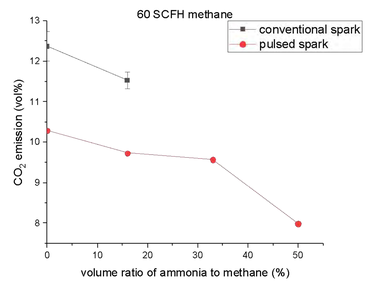
- Generator with pulsed spark technology
- Generator with conventional spark technology
- Methane and ammonia cylinders
- Mechanical flowmeters
- Exhaust analyzer (Horiba)
- Pulse spark technology components

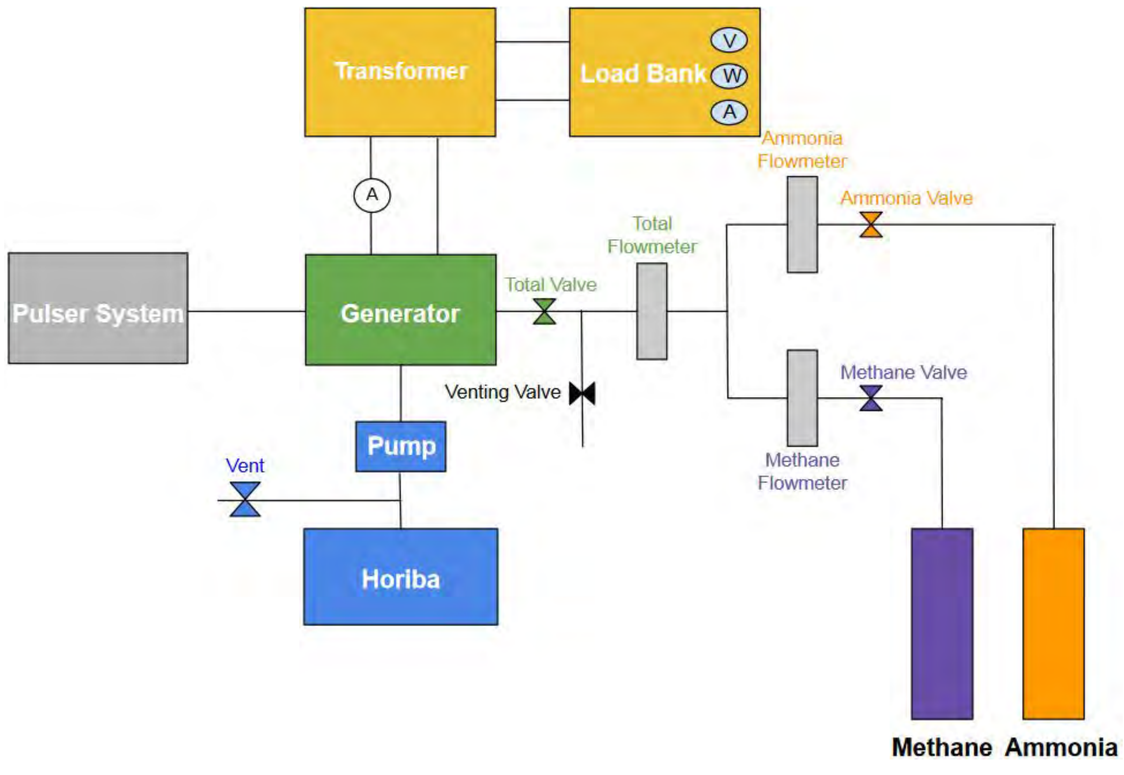
Results











Methods

Two sets of comparison tests were conducted: Finding the maximum power output using a set fuel mixture, and finding the emission levels using a set power output. The power output and emission levels were recorded to determine the pulse spark technology's impact on ammonia-assisted combustion, if any.

Conclusions

- The conventional spark plug outputs higher max power but can't increase max power with ammonia, versus the pulsed spark plug
- Adding ammonia has a promising impact on 55-60 SCFH methane, namely increasing max power and decreasing CO_2, but no improvement past that
- More tests are needed to solidify the results

Acknowledgements

The presenters would like to thank Dr. Cronin and Boxin Zhang from USC, the Citrus College Foundation, and Dr. Smith and Ms. Hernandez of the Citrus College Summer Research Experience program for the research opportunity.

Alternate text

Oscar Hernandez & Victor Chen (Citrus College)
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Introduction: It is known that ammonia-assisted combustion can reduce the amount of greenhouse gasses being emitted. However, ammonia has a ~120 octane number, making it impractical to be ignited using conventional spark technology. This research project aims to utilize pulsed spark technology to overcome that, reducing the amount of greenhouse gasses being emitted.

Materials: Generator with pulsed spark technology, Generator with conventional spark technology, Methane and ammonia cylinders, Mechanical flowmeters, Exhaust analyzer (Horiba), Pulse spark technology components.

Results: Pictures include result graphs and a diagram for ammonia assisted combustion.

Methods: Two sets of comparison tests were conducted: Finding the maximum power output using a set fuel mixture, and finding the emission levels using a set power output. The power output and emission levels were recorded to determine the pulse spark technology's impact on ammonia-assisted combustion, if any.

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