

Ammonia Working Group Meeting
Nov 12, 2024

- Cosmin Dumitrescu (WVU)
 - Ammonia Use in Medium/Heavy-Duty Internal Combustion Applications
 - Review of laminar burning velocity measurements up to 10 bar
 - Experiments in internal combustion engines with NH₃ substitution
 - Constant-volume combustion chamber experiments with NH₃/H₂ blends
 - Research progress at WVU (publications coming)
 - Successfully ran engine with 100% NH₃ with no engine optimization and comparable IMEP
 - Relating emissions to engine performance challenging
 - Q&A
 - Cody Diaz
 - Is ammonia slip going to cause an issue with heat release?
 - They found no difference in comparison to hydrocarbon
 - Clint Bedick
 - Was 1% NH₃ in exhaust independent of equivalence ratio?
 - Actual values depend on many things, including equivalence ratio. Some optimization could affect ammonia slip.
 - Cody Diaz
 - Did you notice any component degradation after operation?
 - Have been running for more than a year now. Would expect engine performance reduction if components are degrading, but have not noticed any yet. Need more exhaustive tests.
 - Hassan Abdul Sater
 - How did you measure emissions?
 - FTIR analyzer.
 - Thomas Sattelmayer
 - Can you give more information about the ignition system?
 - More powerful coil (~100 mJ) and regular spark plug. Engine is a diesel engine converted to spark. Compression ratio not too high or low and runs very well on ammonia. But also plan to look at other ignition strategies in the future.
- Santosh Shanbhogue (MIT)
 - Dynamic Stability and Emissions in Premixed CH₄/NH₃ Swirling Flames with Nanosecond Pulsed Discharges
 - Combustion instability experiments with CH₄/NH₃ flames
 - Combustion instability experiments with NRPD
 - Effects of NRPD on NO_x emissions
 - Q&A
 - Thomas Sattelmayer
 - They correlated instability amplitude with extinction strain rate; what about correlating with convective time scale.
 - Yes, that works also.
 - How does changing combustor length affect things?
 - It changes but scaling remains the same.
 - Luis Fernando Alvarez Correa
 - Was it non-thermal plasma?
 - Yes, non-thermal plasma. They were not able to suppress with corona.

- Do you have problems with EM interference?
- They have made a number of modifications to solve issues with interference. Most problems come with coaxial cable connections - use thermal putty.
- Tay Wo Chong Hilares Luis
 - Partial or fully premixed?
 - Fully premixed
- Cody Diaz
 - Is plasma used commercially today?
 - Not deployed in the field but components are there to deploy commercially. There are ways to control NOx as well.
- Clint Bedick
 - Are you modeling plasma?
 - Yes, look for a recent paper in Combustion and Flame. They run 0D simulations with a reaction mechanism combined with plasma mechanism.
- Tay Wo Chong Hilares Luis
 - What % of total energy was in plasma.
 - Less than 2%.
- Clint Bedick
 - Who makes the plasma generator?
 - TPS