Experimental Methods:

APPROACH

By simply plugging in the pressure (atm) and temperature (K) of the fuel, a designer can determine the ignition delay time (in seconds) with reasonable accuracy. The goal of this work is to extend this correlation to further operating conditions and other types of hydrogen rich fuels.

APPRAOCH

Experimental Methods: Continuous Flow Reactor. A simplified continuous flow reactor can be found in Figure 2. Figure 3 shows the test rig.

Numerical Tools: CFD, Chemical Kinetics Studies

GOALS

The goal of this program is to establish the understanding of autoignition in lean premixed combustion systems as a function of fuel composition for various inlet temperature, pressure, equivalence ratio, and mixture velocity in the flow reactor. Some of the latest results are shown below on an Arrhenius plot below, Figure 4. The results are compared to previous works in both flow reactors and shock tubes.

RESULTS

To date ignition delay times of pure hydrogen have been conducted at pressures and temperatures up to 10 atm and 950K (1250°F) respectively. Ignition delay times have been observed to be strongly dependent upon temperature and pressure while only modestly dependent upon the equivalence ratio, and mixture velocity in the flow reactor. Some of the latest results are shown below on an Arrhenius plot below, Figure 4. The results are compared to previous works in both flow reactors and shock tubes.

PUBLICATIONS AND PRESENTATIONS


PERSONNEL

Investigators: V.G. McDonell and G.S. Samuelsen
Staff: R.L. Hack
Students: D.J. Beerer