Utilizing the Rapid Ignition Region of HCCI to Attain > 60% BTE

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•HCCI is inherently able to produce rapid combustion (10 – 100μs) - that is effectively constant volume combustion.

• Constant volume combustion offers significant opportunity for dramatically improving ICRE BTE.

• However, to be used with conventional ICRE slider-crank kinematics, HCCI *must* transformed to a moderated mode of combustion that is far from constant volume – as it continues over many CAD.

• Constant volume combustion can be realized in a free-piston engine along with high compression ratios, lean fuel/air ratios and high BTE.

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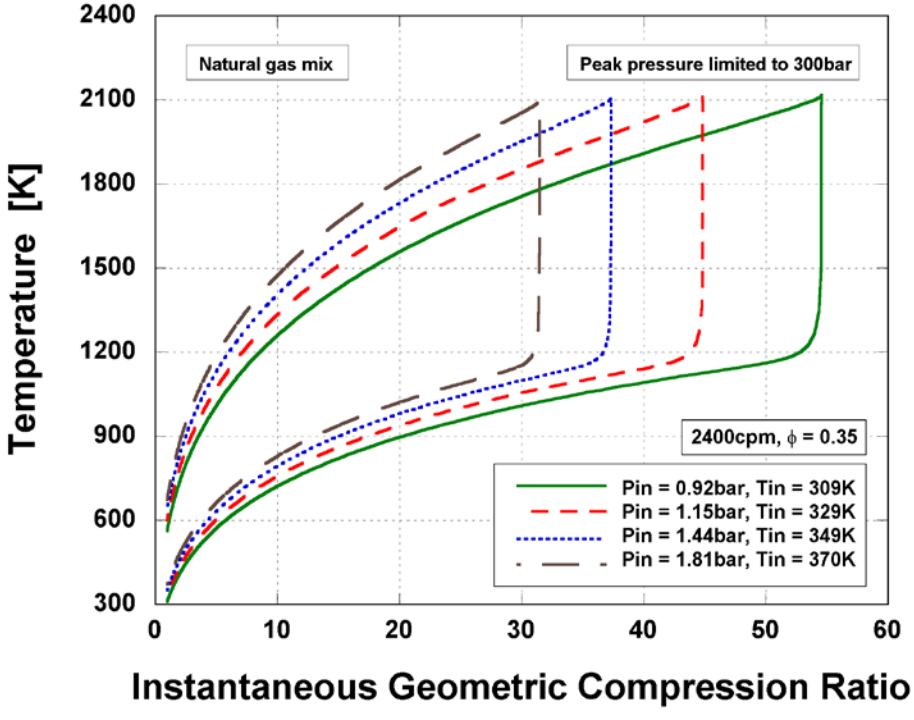
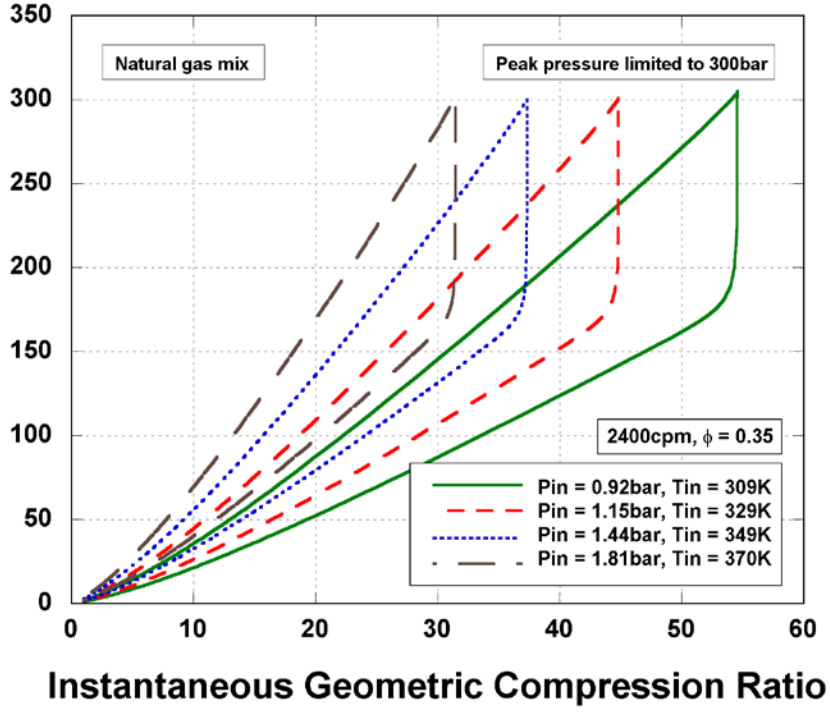
These two figures illustrate modeling of HCCI combustion of natural gas in our unique free-piston engine (U.S. 7,258,086). Note the rapid rate of temperature and pressure rise for each of the four different initial charge conditions. These pressure rise rates are on the order of 2,000 – 3,000 bar/ms!

We are developing ICRE architecture suitable for these conditions and capable of greater than 60% cycle average BTE (supercharged and turbo-compounded). Our latest engine innovation can be seen at poster eight.





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