

Influence of Valve Lift Timing on Producer Gas Combustion and Its Modeling Using Two-Stage Wiebe Function

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Abstract : Producer gas is a biomass derived gaseous fuel which is extensively used in internal combustion engines for power generation application. Unlike the conventional hydrocarbon fuels (Gasoline and Natural gas), the combustion properties of producer gas fuel are much different. Therefore, setting of optimal spark time for efficient engine operation is required. Owing to the fluctuating tendency of producer gas composition during gasification process, the heat release patterns (dictating the power output and emissions) obtained are quite different from conventional fuels. It was found that, valve lift timing is yet another factor which influences the burn rate of producer gas fuel, and thus, the heat release rate of the engine. Therefore, the present study was motivated to estimate the influence of valve lift timing analytically (Wiebe model) on the burn rate of producer gas through curve fitting against experimentally obtained mass fraction burn curves of several producer gas compositions. Furthermore, Wiebe models are widely used in zero-dimensional codes for engine parametric studies and are quite popular. This study also addresses the influence of hydrogen and methane concentration of producer gas on combustion trends, which are known to cause dynamics in engine combustion.

Keywords : combustion duration (CD), crank angle (CA), mass fraction burnt (MFB), producer gas (PG), Wiebe Combustion Model (WCM), wide open throttle (WOT)

Conference Title : ICTE 2017 : International Conference on Thermal Engineering

Conference Location : Prague, Czechia

Conference Dates : March 23-24, 2017