Experiments on Dissimilar Valve Lift (DVL) for Turbulence Increment on a Bi-Fuel Compressed Natural Gas (CNG) Engine

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Abstract. Current engines are readily available for CNG bi-fuel conversions because it requires only minor engine modifications. However, CNG flame speed is lower than gasoline, therefore reducing the power and range of the vehicle when operating on CNG. This situation can be improved by increasing the flame speed via higher turbulence generated by swirl motion. A computational fluid dynamics (CFD) model was used to analyse the swirl generated by dissimilar valve lift (DVL) profiles on the intake valve. A 3D engine simulation shows differences in swirl motion and turbulence between the original symmetric valve lift profile and the DVL. The swirl before combustion was found to increase almost 25%. The higher swirl number can increase the turbulence kinetic energy (TKE) level which improves better fuel mixing. The 1 mm DVL proved to be the better choice from CFD analysis and later was tested on a K3-VE engine. Pressure analysis shows peak pressure increased by 5.6% and burn rate shows CNG had a slower burning speed on the small engine.