

The engines with variable compression ratios significantly increase the engine's power and decrease fuel consumption and pollutions. The modified engine was designed to produce the new technology for variable compression ratio (VCR) engine by using two methods: the first method is assumed that there is the piston lift was adjusted before operating the engine, second method idea is using instantaneous variable piston's lift, Where the piston consists of two parts: upper part and lower part, the lift of piston varies by press hydraulic between these parts via pipe within the cylinder head .and control hydraulic flow rate by electronic valve

The engines studied in MATLAB R2020a program at speed engine 2000 r.p.m were divided into four groups: the first group is Otto engines (standard, pre-variable compression ratio, instantaneous variable compression ratio without turbocharger). A second group, such as Otto engines with a turbocharger. The third group is Miller with early valve close engines (standard, pre-variable compression ratio, instantaneous variable compression ratio without turbocharger). The fourth group is Miller with early valve close engines with turbocharger, initial conditions for operating the engines with a turbocharger are Inlet Pressure 250 kPa, Inlet Temperature 400 K, while without a turbocharger are Inlet Pressure 100 kPa, Inlet Temperature 333 K, the four favorite engines were compared and found that the best engine is (instantaneous Miller engine with turbocharger) because it achieves the highest thermal characteristics, thermal efficiency 65%, volumetric efficiency 238%, net brake output work 2.9 kJ, indicated mean effective pressure 3972.3 kPa, indicate power ,248.79 kJ, brake power 268.38 kJ, torque 735.98 N.m, brake mean effective pressure 3556.2 kPa

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brake specific power 0.8346 kW/m³, brake specific fuel consumption 3.9898e-05 kg/s/kW, while .thermal efficiency 52%, volumetric efficiency 94% for a standard engine

Using SOLID WORKS 2017 program to design an internal combustion chamber model and import in ANSYS 2020R1 program, study cold flow analysis includes pressure simulation, temperature distribution, magnitude and trends of velocity, swirl ratio, and tumble ratio, where the analysis was conducted for two engines (Otto cycle engine, instantaneous Miller cycle engine with turbocharger) and the comparison between them, where it was found that the pressure, speed, swirl and tumble ratios of the Miller's instantaneous engine are best than the standard Otto engine due to the .increase in the compression ratios of the first engine