

Direct Injection of Hydrogen, Oxygen, and Water in a Novel Two Stroke Engine.

ABSTRACT

This short communication proposes novel two stroke engine burning hydrogen in oxygen in presence of large amounts of steam as residual gases. This engine has a bowl-in-piston combustion chamber, exhaust valves only and it uses direct injection of hydrogen, oxygen and water. Diesel-like compression ignition combustion is achieved by injecting the oxygen and the hydrogen in the surrounding steam close to a continuously operated glow plug. The operation of the engine is simulated by commercial softwares. The water injection enables acceptable metal temperatures and reduced heat losses. First computational results show brake efficiencies above 55% achieved with mass of water injected about twice the mass of oxygen and hydrogen mixture and operation with a significant amount of exhaust gas recirculation. It seems reasonable to guess efficiencies of the fully optimised and developed engine approaching the 60% mark, 20% higher than those of the state-of-the-art H₂ICEs designed for operation with air using the spark-ignition engine concept as well as of those projected for Diesel engines operating with exhaust energy recovery. Worth of mention is also the much higher power density following the two stroke operation.

Keyword: Hydrogen internal combustion engines; Oxy-fuel combustion; Direct injection; Water injection; Exhaust energy recovery; Variable valve actuation