

Investigation Of Deposit Formation In Direct-Injection Spark-Ignition Engine Powered On Syngas

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Abstract

A direct-injection spark-ignition engine was investigated for deposit formation after running on syngas. The study was part of an initiative to substitute fossil derived gaseous fuels with syngas. The fuel injector and spark plug were periodically inspected during the shutdown and the preliminary inspection indicated traces of deposits. As a result, the cylinder head was dismantled and inspected thoroughly after the run. The surface morphology was characterized by FESEM and its elemental contents were evaluated by EDX. Among the components, the spark plug was found to be best suitable for scanning in FESEM and EDX. Tests were conducted on the sides with and without deposit of the spark plug. The results from both sides were compared. No feed marks were formed even at higher magnification at the clean side. However, the side with deposit of the spark plug shows a spongy texture foreign material. Besides, the colour and morphology was different at different locations. Chemical composition was evaluated on atomic and weight percentage. The deposit was found to be iron oxide produced from the decomposition of iron pentacarbonyl contaminant from the storage tank as the result of carbon monoxide reaction with metallic wall of the tank at high pressure storage.

Keywords: Syngas direct-injection spark-ignition combustion deposits

DOI: [10.1007/s12239-015-0050-1](https://doi.org/10.1007/s12239-015-0050-1)