CFD analysis of a two-stroke 70cc moped engine to reduce spillage losses

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One of the major reasons for lower efficiency and higher unburned hydrocarbon and carbon monoxide emission for two stroke engine is short circuit losses that occur during the scavenging process. An attempt has been made in this study to understand and improve this phenomenon.

A three dimensional transient CFD model is developed for a schnullar type 70 cc two stroke engine. The engine is installed in a small moped used for personal transport and load carrying.

Three major processes, namely blow down (expansion), scavenging and compression have been modelled with pseudo combustion process. The model is validated with experimental data for trapping and scavenging efficiency. A good correlation is observed between experimental and simulation results. The CFD model is used to quantify various parameters, such as, delivery ratio, trapping efficiency, scavenging efficiency and an amount of fresh mass short circuit at different load and speed points. Around 20-25% short circuit losses are observed at all the load cases analysed.

The mechanism for this short circuit loss is understood with the help of a passive scalars based visualisation method. Two major root causes identified are port design and exhaust pressure wave dynamics. Three different designs of ports are analysed. With the best design the short circuit loss is reduced by 12%.

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