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COMPUTATIONAL FLUID DYNAMIC MODEL FOR CRANKCASE FLOW ANALYSIS OF NEW TWO STROKE DIESEL ENGINE

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ABSTRACT

A multipurpose computational engine crankcase model of KUKTEM two-stroke modular diesel engine has been developed to analyze the crankcase interior flow. The complexity of crankcase flow is due to the occurrence of reed valve before the crankcase and upstream the crankcase at the auxiliary port of the engine. Furthermore, current computational fluid dynamic solver is unable to handle the multi-physics interaction of reed valve petal with air. The crankcase flow is investigated by profiling the pressure built-up inside the crankcase geometry and examination of flow pattern during transient operation. The methodology is based on solution of computational fluid dynamic (CFD) formulation. The governing equation of CFD and robust k-e model are coupled with moving dynamic mesh model and sliding mesh model to represent the isotropic motion of piston and rotational motion of crankshaft and balancing shaft. The inputs to this model are based on motoring results of the same base engine. The pressure fluctuation inside the inlet tract is used as the pressure inlet boundary while the cylinder pressure upstream of the crankcase is set as the pressure outlet boundary. The modeling results shows that the maximum pressure inside the crankcase can achieve its ideal compression pressure. The compression ratio is about 1.14 bar based on nominal crankcase compression ratio but the trend of plot having large deviation due to ineffective reed valve model. Better solution of the flow can be achieved if proper reed valve model is available where the pressure at inlet and the outlet boundary can be calculated simultaneously.

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