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Effect of intake channel design to cylinder charge and initial swirl

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Abstract: The department of Energy Technology in Aalto University School of Science and Technology has designed and built a one cylinder research engine EVE. For the future demands the engine needs to be upgraded. The EVE engine has had a cylinder head of Waertsilae 20 engine up to the present. To get more air to the cylinder during the intake stroke, it has seen to be needful to design a new cylinder head. With the new head the amount of cylinder charge should be higher than currently. The head design should also take into an account a possible need for a higher swirl number. This might be done by closing another intake channel. It is a well known fact that the design of intake channels has a substantial effect to flow phenomena during the intake stroke. The diffuser shape of the channel causes higher velocities. The placement of two intake channels and two exhaust channels effects to the swirl number in the start of compression stroke. In this study two types of cylinder heads are examined. Two CFD mesh for four valve cylinder are created. The cases are run with boundary conditions and initialization got from 1D simulations. The results are compared at point of view of amount of cylinder charge, swirl and turbulence levels at the beginning of the compression stroke. Also the effect of closing of another intake channel will be studied.