



Valve Dynamics and Internal Waves in a Reciprocating Compressor

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Abstract:

Internal pressure waves influence the performance of reciprocating compressors in two ways: Firstly they interact with the valve dynamics and secondly they excite an oscillating moment onto the piston. On the basis of 2-D and 3-D simulations using a commercial CFD code and the experiences of compressor manufacturers a 1-D flow model is introduced. Valve dynamics are described by a modified Costagliola-model which takes pressure waves in the cylinder into account. Comparison with experiments shows that this 1-D model is sufficient to predict accurately not only gas flow and pressure distribution inside the cylinder but also important design criteria of the valves such as impact velocity of the valve plate and valve losses.