Abstract

Session 34:
Fundamentals

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Title
34-3: Development And Test Of An Electrical Valve Actuator For Reverse Flow Capacity Control Of Reciprocating Compressors

Summary
Piston compressors are used for a broad range of applications in the process industry or in the natural gas supply chain. To control the amount of gas delivered by these machines, it is convenient to control the opening time of the suction valves during the compression stroke. This allows a portion of the fluid to flow back into the suction line.
An electrical actuation system is developed to meet the specific requirements of large piston compressors in terms of actuation speed and force. The actuator comprises a magnetic solenoid, which controls the opening time of each valve individually. The overall system is less complex compared to hydraulic or pneumatic systems since only electric infrastructure is needed.
A mathematical model is developed to predict the dynamic behavior of the actuator including the simplified gas dynamic behavior of the compressor. The design is optimized using finite element analysis. Experiments on prototypes are performed to validate the predictions and to demonstrate the feasibility of the concept.