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COMPUTER MODELING OF A UNIQUE, DRY, NONHELICAL ROTOR, POSITIVE DISPLACEMENT ROTARY COMPRESSOR - COMPARISON OF THEORETICAL AND EXPERIMENTAL RESULTS

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A new type of compressor has recently been introduced to the industrial market. A computer model of this nonlubricated, rotary, positive displacement compressor has been developed. The geometry of the rotors, generated surfaces, discharge ports, control volumes, and leakage paths are described. The inlet model includes the affects of compressibility, heating and displacement of inlet flow by hot leakage gas, and inlet gas heating by the housing and rotor walls. Gas compression is modeled by a polytropic process.

The compressed gas is discharged axially through ports uncovered by the rotors. The inertial affects of gas in and around the discharge ports are included in the calculations. A nonreflecting expansion wave which is generated during the discharge process is used to determine the pressure downstream of the discharge port.

The results of the computer model are compared to experimental results. Performance of rotor diameters from 190 mm to 380 mm with thickness to diameter ratios of 0.133 through 0.46 is predicted accurately by the computer model. The affects of both discharge timing and rotor clearances on measured and predicted performance are presented. Performance data is presented as a function of rotor speed and is shown for various pressure ratios. The analysis also yields important design data such as radial and torque loads as a function of angular position.