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INVESTIGATION OF GAS PRESSURE PULSATION INFLUENCE IN AN OUTLET PIPELINE ON RECIPROCATING COMPRESSOR WORK

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Gas pressure pulsations in an outlet pipeline have a negative effect upon reciprocating compressor work. In result of the pulsation effect, the indicated power and mass flow rate are changed. There are instances when energy losses caused by pressure pulsations reached the 40% values of indicated power of a given compressor stage. A decrease of mass flow rate results from the unfavorable effect of pressure pulsations upon a pressure-volume diagram as well as the deterioration of cylinder filling due to the increased temperature of its walls. Apart from that, gas pressure pulsations cause the increase of maximum pressure in the cylinder during a work cycle, which in turn produces the excessive stresses both in the cylinder elements and crank mechanism thus reducing their life. Additionally, pressure pulsations cause a considerably faster wear and contribute to frequent failures of compressor valves. There are cases when the elimination of the excessive pressure pulsations increased a period of valve operation by several times.

In the paper, the influence of pressure pulsations on a pressure-volume diagram as well as the components of feeding ratio are discussed. Next, an attempt is made to determine a quantitative increment of power demand for compression when induced by pressure pulsations in an outlet pipeline. A way of calculating is explained and the required dependencies are given to determine this increment. The presented theoretical considerations have been verified experimentally using a laboratory test station specially prepared for that purpose. The results of experimental investigations confirmed the correctness of the theoretical considerations presented.