Res. Agr. Eng.

Loukanov I.A.: Investigating the pumping process of a resonance-vibrating pump for medium-depth boreholes

Res. Agr. Eng., 53 (2007): 172-181

This paper deals with the pumping process of a resonance-vibrating pump, which utilizes the resonance vibrations of one degree-of-freedom oscillating system. The pump is powered by a mechanical shaker consisting of two counter rotating offset masses and operating in resonance. The study investigates the nature of the pumping process and conditions required to achieve pumping action. Equations for the flow rate, pressure developed at ground level or any height above it, the pump efficiency, and the power delivered by the shaker are derived. The analysis of the pumping process revealed that the flow rate of the pump may be maximized either by increasing the acceleration imparted on the oscillating system, and/or by reducing the resonance frequency. It was found that the pressure developed by the pump is independent of the depth of pumping, provided that the same acceleration is imparted, and its efficiency may be increased either by reducing the resonance frequency and/or by increasing the depth of pumping. The preliminary test results about the flow rate and pressure developed at ground level appeared to be close to the values

on the analysis of the theoretical and experimental findings it is concluded that the equations derived in this study may be employed in designing resonance vibrating pumps for a desirable flow rate, pressure, and efficiency in pumping water from a specified depth.

Keywords:
resonance vibrating pumps; dual-shaft shaker; spring suspension system; foot valve; oscillating pipe; water column

[fulltext]