THESIS

MEASUREMENT OF DISCHARGE BY USING AIR BUBBLES TECHNIQUE IN AN OPEN CHANNAL

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ABSTRACT

Accurate measurement of irrigation water allows its efficient use. In small channels flow depths may not be sufficient for accurate working of current meters. In this study, rising air bubbles technique was used for flow measurement in small irrigation channels. The experimentations were conducted on a tilting flume. A flow control valve was installed with pump to control the flow. An overshot weir gate was at the downstream of the flume's channel to control the flow depth. This flume is also provided with a jack assembly to change its bed slope. The depth of flow was measured with the help of tipping rod which was attached in middle of the flume. Holes of different sizes were drilled in bottom of the flume for air inlet. Air was introduced into the flume in these holes with the help of air pump to produce the bubbles in flowing water. The flow velocity was also measured by pitot tube and current meter.

Various combinations of air inlet ports and discharges were used in the present study. Four ports of different diameters ranging from 2.6 to 0.65 mm were inserted at the midpoint of the flume. For each experiment six different discharges were used. The results of the study show that there is a direct relationship between discharge and the bubble rise length (L). As the water discharge is increased the rise length also increases. More accurate discharge results were observed with the nozzle size ranging from 1.65 to 2.0 mm for laboratory experiments, and 2.0 to 2.6 mm for field experiments. The bubbles which were observed in the present study were of spherical shape ranging from 5 to 8 mm diameter. Air bubbles technique is valid for subcritical flow having Froude number less than 0.3. The water flowing velocity should be less than 1 meter per second and channel should be small, prismatic and having small bottom slope.