

## HYDRAULIC PERFORMANCE OF SYPHONS UNDER CONTROL BY INLET AND OUTLET PIPE CUTTING ANGLES

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### Abstract

This study aims to improve the hydraulic performance of pipe siphon. An inlet and different outlet cutting angles were used to control the flow through the pipe and to minimize losses resulting from the sudden contraction of the pipe. Experimental works were carried out using rectangular circulating flume and pipe siphon model. The inlet pipe had a constant cutting angle of ( $\alpha_1 = 15^\circ$ ) anticlockwise from the vertical axis of the pipe inlet. The pipe outlet model had different cutting angles of ( $\alpha_2 = 0^\circ, 15^\circ, 30^\circ, 45^\circ, \text{ and } 60^\circ$ ) clockwise from the vertical axis of the pipe outlet. The pipe siphon was tested using different discharges ( $Q = 7.28 \text{ to } 57.20 \text{ lit. /sec}$ ) and different downstream submergence ratios ( $H_d/D = 0.0, 0.25, 0.50, 0.75, \text{ and } 1.0$ ). Dimensional analysis was employed to get the inter-relationships among the factors affecting the head losses through the siphon. The results of the study led to ( $\alpha_1 = 60^\circ$ ) with submergence ratios ( $H_d/D = 0.0 \text{ and } 0.25$ ) gives best results for losses and upstream water depth, while The outlet cutting angle ( $\alpha_1 = 30^\circ$ ) with a downstream submerged ratios of ( $H_d/D = 0.50, 0.75, \text{ and } 1.00$ ) gives best results for losses and upstream water depth.