

Oxygenation in Turbulent Flows over Block Ramps

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Abstract : Block ramps (BR) or rock chutes are eco-friendly natural river restoration structures. BR are made of ramp of rocks and flows over BR develop turbulence and helps in the entrainment of ambient air. These act as natural aerators in river flow and therefore leads to oxygenation of water. As many of the hydraulic structures in rivers, hinders the natural path for aquatic habitat. However, flows over BR ascertains a natural rocky flow and ensures safe and natural movement for aquatic habitat. Hence, BR is considered as a better alternative for drop structures. As water quality is concerned, turbulent and aerated flows over BR or macro-roughness conditions improves aeration and thereby oxygenation. Hence, the objective of this paper is to study the oxygenation in the turbulent flows over BR. Experimental data were taken for a slope (S) of 27.5% for three discharges (Q = 9, 15 and 21 lps) conditions. Air concentration were measured with the help of air concentration probe for three different discharges in the uniform flow region. Oxygen concentration is deduced from the air concentration as ambient air is entrained in the flows over BR. Air concentration profiles and oxygen profiles are plotted in the uniform flow region for three discharges and found that air concentration and oxygen concentration does not show any remarkable variation in properties in the longitudinal profile in uniform flow region. An empirical relation is developed for finding the average oxygen concentration (O_m) for $S = 27.5\%$ in the uniform flow region for $9 < Q < 21$ lps. The results show that as the discharge increases over BR, there is a reduction of oxygen concentration in the uniform flow region.

Keywords : aeration, block ramps, oxygenation, turbulent flows

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