World Academy of Science, Engineering and Technology
International Journal of Mechanical and Industrial Engineering
Vol:13, No:12, 2019

Variation of Manning's Coefficient in a Meandering Channel with Emergent Vegetation Cover

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Abstract : Vegetation plays a major role in deciding the flow parameters in an open channel. It enhances the aesthetic view of the revetments. The major types of vegetation in river typically comprises of herbs, grasses, weeds, trees, etc. The vegetation in an open channel usually consists of aquatic plants with complete submergence, partial submergence, floating plants. The presence of vegetative plants can have both benefits and problems. The major benefits of aquatic plants are they reduce the soil erosion, which provides the water with a free surface to move on without hindrance. The obvious problems are they retard the flow of water and reduce the hydraulic capacity of the channel. The degree to which the flow parameters are affected depends upon the density of the vegetation, degree of submergence, pattern of vegetation, vegetation species. Vegetation in open channel tends to provide resistance to flow, which in turn provides a background to study the varying trends in flow parameters having vegetative growth in the channel surface. In this paper, an experiment has been conducted on a meandering channel having sinuosity of 1.33 with rigid vegetation cover to investigate the effect on flow parameters, variation of manning's n with degree of the denseness of vegetation, vegetation pattern and submergence criteria. The measurements have been carried out in four different cross-sections two on trough portion of the meanders, two on the crest portion. In this study, the analytical solution of Shiono and knight (SKM) for lateral distributions of depth-averaged velocity and bed shear stress have been taken into account. Dimensionless eddy viscosity and bed friction have been incorporated to modify the SKM to provide more accurate results. A mathematical model has been formulated to have a comparative analysis with the results obtained from Shiono-Knight Method.

Keywords : bed friction, depth averaged velocity, eddy viscosity, SKM
Conference Title : ICFM 2019 : International Conference on Fluid Mechanics
Conference Location : London, United Kingdom
Conference Dates : December 09-10, 2019