RELATIONSHIP BEDFORM CONFIGURATION OF ROUGHNESS COEFFICIENT NON COHESIVE MATERIAL BED

Abstract

Alluvial channels are used for several purposes, including the provision of drinking water, agricultural irrigation, and navigation. In hydraulic engineering, dischange or flow velocity is an important parameter in designing hydraulic structures. The flow velocity through the channel with non-cohesive material is affected by the bed roughness and channel wall, slope and flow depth. The bed roughness in turn, is a key element in predicting the flow conditions and surface water fluctuations. The bed roughness of the channel has an effect on the flow characteristics and geometry of the bed configuration. Errors in determining the value of the bed roughness of the channel, especially the non-cohesive base material, can lead to errors in calculating the speed or flow of flow

The bed roughness of the channel that is often used, in the application in the field is the coefficient value of Manning roughness(n). Use of Manning coarseness coefficient (n table), only recommended for good condition channel. Under natural channel flow conditions, the application of Manning n tables often gives very rough results, since the flow state is more dependent on unknown factors. One factor is the bed configuration form. The existence of the bed configuration form will contribute form resistance. The effect of form resistance on the total resistance on the channel can be up to 90%. The method of form resistance was originally developed by Einstein and Barbarossa (1952). They used the hydraulic radiation separation approach on flow resistance in alluvial channels. Furthermore Bajorunas (1952) developed a form resistance on Manning coarseness coefficients based on the formulations of Einstein and Barbarossa (1952). Bajorunas formulates that, the form resistance is not due to the bed shape but the average grain size (d_{35}). This becomes irrelevant to the opinions of other researchers. The latest developments in form resistance research were carried out by Talebbeydokhti et al. (2006). Determination of form resistance in their research, still using the formulation of Manning coarseness coefficient, so it still needs to be developed further. Therefore, an in-depth study of the calculation of the coefficient value of Manning roughness as well as its relation to the bed configuration form, becomes very important to do, so it can be used in determining the coefficient value of the more objective roughness

The purpose of this study is to modify the formulation of Manning coarseness coefficient based on the form resistance (n''), due to the bed configuration form that occurs, on non cohesive alluvial channels. Data analysis approach is done by separating the coefficient coefficient of Manning into two. The first coefficient value of Manning roughness corresponding to the granules (n') and second, the coefficient value of Manning roughness relates to the bed configuration form. Laboratory experiments were conducted to investigate the bed shape geometry in the sand ducts and their effect on channel flow resistance. The experiment was carried out at the flume at the laboratory of River Hall in solo, using sand particles. A simple relationship is sought for bed geometric dimensions through analytical methods, regression analysis and dimensional analysis.

The result of the research is the relation of Manning coarseness coefficient value is not dimension in the bed form of ripples to dunes. Furthermore, the coefficients of Manning roughness coefficients are not dimensionless modified to obtain the coefficient value of Manning coarseness due to form resistance (n'') to the steepness of the bed configuration form (Δ / λ) And specific dimensionless power streams. Secondary data from experimental flume studies Talebbeydokhti et al. (2006), is used to investigate formulations on Manning coarse coefficients. The result of the research shows that the relation of coefficient value of Manning roughness due to form resistance (n'')to specific stream power has better result than Talebbeydokhti et al. (2006). While its relation to the sediment transport function, it has the opposite graph of the Bajorunas (1952) study.

Keywords: The bed configuration form, the Manning roughness coefficient, the roughness form.