CHAPTER 6

CONCLUSION AND FURTHER SCOPE OF STUDY

Spur dyke is the hydraulic structure can construct or build in river or channels as a bank safeguard from erosion deepens the upstream channel or river. Scour formed around the spur dyke attracted researchers very much in the past several years. That spur dyke studied more which locates at the straight channel. Recently the researcher would focus on the direction of the bed and the curved channel of flow. This content included the recent research and development of flow characteristics, scour process in the vicinity of spur dyke placed in the channel and gives all the important parameters for the scour development in meandering channel. Here discussing, in brief, all the parameters that influenced the scour process, empirical formulations for temporal and maximum scour depth, flow characteristics, and bed topography around the spur dyke. The experiment was setup for investigating the flow field of the channel and scour depth around the spur dyke in various locations at the reverse meandering channel. This reverse meandering channel has a maximum deflection of the flow field, generating high turbulence and secondary flow conditions for simulating the maximum scour around the dyke. This study would be helpful in future engineering applications in the river channel when the last stage of the meandering channel is reached, that is, before the formation of an oxbow lake. Vortex flow was observed at the start of the experiment run; it causes the secondary current flow.

The secondary flow transported the sediment toward the inner bank and created few dunes near the inner wall. The local scour hole formed is extended in a high flow discharge rate or high Froude number. The diverted flow on the spur dyke head can be attributed to the return current flow toward the river bank flow. Hence the sound can be reduced near the spur dyke. this is a significant drawback from the engineering prospective. Suppose in experimental study an appropriate counter measure was not done carefully. In that case, both the river bank and structure are at risk, leading to failure, and the structure can collapse with each other. The experiment can prove that increases in the Froude number, the scour depth and the spur dyke location from the channel bend entry. Temporal variation of scour depth is the longitudinal trend with time. The empirical relation in temporal and maximum scour depth is a function of Froude number and the position of the structure in the channel bend; the equation developed shows good accuracy with experimental data. In the experimental data of the literature, overestimated the maximum scour depth related to 180° channel. So the discrepancy in result can be found because of neglecting some parameters of the scour depth. The range of the Froude number of approach flow is kept narrow due to experimental setup constraints. For future study based on the spur dyke, it is advised to include all the various parameters that influence the scour, such as spur dyke, channel parameter, and other neglecting parameters that do not have the estimation. A wide range of the Froude number is used. In this experiment, we only use tracer for qualitative surface flow field and will be limited to an extent. It also suggests that the quantitative assessment of the channel flow field around the spur dyke includes different locations on the meandering channel concave side in the future research era. At last, we concluded that the study also incorporated numerical investigation and model study. The investigated parameter is well fitted in the simulation model and various estimations of the equation.

We used the detection of local scour depth of a dyke relatively very general to understand the new soft computing technique approach, GEP. A GEP & ANNs models help for predicting the relative scour depth value from laboratory measurement. A new technical approach to estimating the equilibrium depth scours of spur dyke with optimum data sets and genetic programming, artificial neural network logarithm, or model soft technique. These programming models also help in predicting depth estimation methods for pipes. We finally concluded that the new soft computing technique gives a more precise and accurate result for depth scour in rivers than previous depth evaluation. The over performance of the ANNs model is superior to the GEP model. The high rise of coefficient of determination ($R^2 = 0.97$) proves that the GEP model has shown the perfect fit for the data set measured. The result was demonstrated that the GEP model was useful for practitioners.

6.1 Further scope of study

1. The research in this field is limited to include very few influencing parameters such as Fr number of approach flow, geometry of spur dyke and channel, position of the dyke in a bend, and submergence ratio that affect the scour process in the vicinity of a spur dyke located in a bend.

2. The influence of other parameters also needs to be studied and evaluated.

3. The limited experimental results make it difficult to validate the numerical models and hence, make the numerical models less reliable at present. Therefore, researches which include experimental study and observations, followed by its use to validate the numerical model, are required to be promoted.

4. In the future scope of studies, it is advised to incorporate various parameters that influence the scour, such as the dimensions of the spur dike, channel parameters, and so on, and to run experiments for a wide range of Froude numbers. In this study, only tracers were used to carry out a qualitative assessment of the surface flow field, which is very limited to a greater extent.

5. The experimental study can be further carried out for simultaneous positioning of a spur dike at different locations on the concave side of the meandering channel. Also , the result can also be obtained for the flow field around the different size spur and thus an effort can be made to obtain the optimum dimension of spur as a function of various flow and channel geometry parameters.