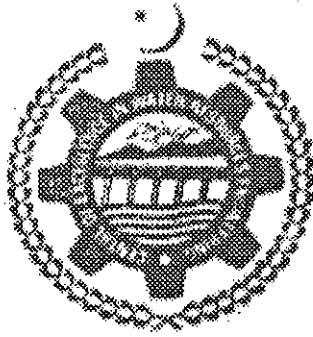


THESIS

**EVALUATION OF DISTRIBUTION CANALS IN KHANKI
COMMAND AREA BY VARIOUS DESIGN THEORIES**



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ABSTRACT

Irrigation from the Indus River and its tributaries constitutes the world largest contiguous irrigation system, capable of watering over 16 million hectares. The system includes three major storage reservoirs and numerous barrages, head works, canals and distribution canals. The total length of canal system exceeds 58,000 kilometers alongwith 1.6 million kilometers of farm and field ditches. This irrigation system represents a significant engineering achievement and accounts for 90% of agricultural production. In spite of that some serious problems in design of this irrigation system prevent in achieving the highest potential agricultural output. One of the important aspects is proper and hydraulically efficient design of conveyance system. The behaviour of flow in an erodable channel is influenced by so many physical factors and complex and uncertain field conditions.

Due to these circumstances the precise design of such channels is very difficult. Different hydraulic engineers have conducted a lot of work and they developed different approaches for design of irrigation canals. Broadly speaking there are two school of thought in tackling the design parameters for a regime/erodable channels. One is the practical or the empirical approach and the other is the theoretical or rational approach.

If a canal is not properly design then a series of problems will appear and all the losses will be conveyed to the beneficiaries i.e. farmers and ultimately to the Government in the form of less revenue collection. In case of inadequate designed of irrigation canal, the section of the channel may reduce or enhance, bed of the canal may raise or erode,

authorized full supply level may raise or fall etc. These all problems reflect the shortage of water supply to the end consumer.

The study covers the command of Upper Gugera Branch. The distributary canals studied are shown in project location map. The system lies between latitude $31^{\circ}-09'$ and $32^{\circ}-15'$ North and longitude $73^{\circ}-02'$ and $73^{\circ}-55'$ East and it is approximately rectangular in shape.

In this study seventeen numbers existing distribution canal of Khanki Command Area are selected. These canals have variable discharges and slopes. The prevailing hydraulic parameters of these distributaries and minors are observed and then existing parameters are compared with the different design theories both rational and empirical categories.

Initially each canal, from head to tail, is evaluated in accordance with the last design methodology, which is Kennedy's theory. No significant design inadequacy was found. Further with designed discharge and designed slope, the other sectional properties of canals are computed by applying ten numbers design approaches. The computed hydraulic properties by these approaches are compared with the existing hydraulic parameters of these matured irrigation canals.

The results obtained by this study revealed that the Manning approach is the most compatible method that seems applicable to the ranges of discharges observed.

After Manning theory Simon's Approach II is another method which has shown most appropriate approach to the existing parameters. As for as Kennedy theory, on which the canals are designed, shows relevance close to the discharge range 10 cusecs to 100 cusecs.

In the light of this study it is recommended that in case of designing of erodable canals Manning's Approach may be applied. For this purpose, the selection of Manning's rugosity coefficient is very important. Thus an appropriate value of "n" be computed by applying different concepts, as done in this study.

Broadly speaking all such studies may be divided into two categories: study which is kept in book shelves and other which is kept on the desk, for the designer's daily work. It is hoped that this study is an attempt in the second category, as it contains all the prevailing applicable approaches best suited to our country condition and circumstances. It will also help in improving the design and hydraulic performance of irrigation canals and ultimately improving the economic characteristics of the areas. The results of this study should be taken as an effort to provide a basis for further exploration of the behaviour of existing canals of different areas and also in development of some empirical relation, best suited for the prevailing old system.