# INVESTIGATION ON LOCATION & ALIGNMENT OF A HEAD REGULATOR OF A CANAL

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Storage, diversion and conveyance structures are constructed time to time all over the world because of expected shortfall of water. Kachhi Canal Project is recently proposed important project at Right Bank of Taunsa Barrage on Indus River, Distt. D.G.Khan, Pakistan. This barrage was originally designed for a discharge capacity of 1,000,000 Cusecs. But due to retrogression, the present safe discharge capacity has been fixed at 750,000 Cusecs. Three canals (T. P. Link Canal, D. G. Khan Canal and Muzaffar Garh Canal) are already being fed by the barrage. The length of the barrage is 4346 feet with clear waterway of 3862 feet. The guide banks are symmetrical and length of U/S guide banks is 7292 ft. while that of the D/S portion is 1035 ft. Muzaffar Garh Canals draw 8301, D.G.Khan 14200 and TP Link 14000 cusec from barrage. There are two divide walls, left bank divide wall is 452 ft long and right bank divide wall is 319 ft long.

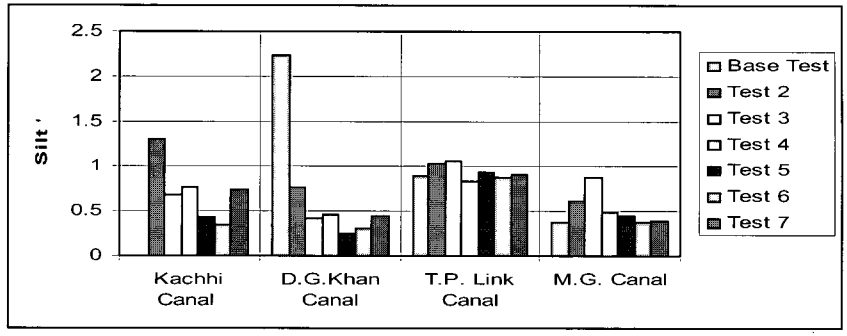
Extensive modeling is usually required for the design of hydraulic structures. Pakistani Rivers carry a lot of sediment. So intelligent modeling is required for determination of optimal position of head regulator of any new canal so that it may take its due share of silt. Mathematical models utilize a number of mathematical equations governing the motion of water and sediments in a channel [Vicksberg MS 1998]. Regardless of the potential of mathematical models, to date, they have been best utilized to study channel response in simple cases using even three-dimensional approximations. Still there are situations for complex three-dimensional channel responses where it is very difficult to accurately formulate mathematically a hydraulic phenomenon. For such studies, physical modeling is adopted. Hydraulic modeling has proven its practical utility in the design of complex hydraulic structures. [Khurmi, 1988].

The complexity of water flow and sediment transport phenomena in rivers does not allow achieving the full similarity of a prototype in its small-scale physical model [Davis CA, 1994] [Vries et al 1990,1970], [Khalid, Mahmood. 1966]. One should be careful in estimating possible scale effects, which can lead to an erroneous interpretation of model tests. [Sanma K., Ganathan, 1989]. In Pakistan, hydraulic modeling has been used extensively since 1952 at "Hydraulic Research Station Nandipur".

Main goal of this paper is to investigate optimal location and alignment of head regulator to pass a design discharge of 7000 cusec for a newly proposed Kachhi Canal Project. A physical model was prepared at Hydraulic Research Station, Nandipur, Pakistan. A base test and seven other tests for alternate positions of the head regulator were conducted to determine the optimal position. The position in which canal does not take more than its fair share of silt is recommended. The results of this research will provide guideline to properly locate and align head regulator for Kachhi Canal Project at Taunsa Barrage. The first test called the base test was run to achieve existing field conditions without adding new canal. The model was run for normal and flood discharges.

For River Indus, discharge up to 300,000 cusec is considered normal. The discharges passed in various tests ranged from 50,000 cusec to 300,000 cusec for normal conditions and 450,000 cusec to 600,000 cusec for floods. Six other tests were conducted by changing position of the head regulator, number of under-sluice bays and length of divide wall.

It was observed that the flow pattern within the guide banks changes and a decreasing trend in sediment entry in canal off-taking from Right Bank was recorded whereas silt entry was almost the same in the canals off-taking from left bank. No shoaling tendency along left and right guide banks was noticed within guide banks. Silt entry results are shown in Fig-1 which show that test 7 and 6 gave optimal conditions for the head regulator with divide wall length increased from 319 ft to 519 ft and 3 more bays added in Right side under-sluice part.

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