

**THESIS**

**OPTIMAL DESIGN OF SILT EXCLUDER OF KHANKI  
HEAD WORK**



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## ABSTRACT

Irrigation is the backbone of the agriculture and hence economy of Pakistan. In order to ensure the efficient working of hydraulic structures like barrages in the irrigation network, it is necessary to safeguard them against the looming problem of sedimentation. Sedimentation is the most dangerous problem of these days both in rivers and irrigation canals. With the rapid rate of sedimentation in irrigation canals, both of life and capacity of canals is reduced. Change in climatic pattern and rapid rate of sedimentation are making the less availability of irrigation water and insecure day by day. Due to insecurity, it is important to solve the sedimentation problem at peak priority. Keeping in view the sediment free water in irrigation canals a technique was adopted to reduce this problem which is known as silt excluder. The silt excluder is a device constructed in the river bed just upstream of the regulator to exclude silt from the water (source) entering the canal. It is so designed that the top and bottom layers of flow are separated with the least possible disturbance, the top sediment-free water being led towards the canal while the bottom sediment-laden water is discharged downstream of the diversion structure through under sluices. It is reported that the adoption of silt excluder device is most efficient these days. Silt excluder at Khanki headwork is adopted at 2 bays out of 5 bays of left under sluices with appropriate arrangements so that proper sediment exclusion was achieved. This study was conducted by analysis of historical sediment and discharge data at Khanki headwork and suggests optimal design of silt excluder, so that proper velocity is achieved which cause no erosion or deposition of sediment .and also achieved proper efficiency The total discharge at silt excluder was 6,060 cusec and silt excluder with eight tunnels of rectangular section was constructed in left under sluice. Based upon

Manning's formula, the analytical computation of losses at different section of excluder was done with proper loss coefficients and compare with hydraulic simulation of Sediment & Hydraulic Analysis for Rehabilitation of Canals. "SHARC". Results of study this study reveal that total loss throughout the tunnels was varies from 0.44 m to 0.54 m against the average inlet velocity of 1.70 m/s and water depth of 4.78 m as close to SHARC computed velocity of 1.587 m/s and 4.125m of water depth. According to proposed design sediment size of 0.4 mm (i.e. Sand of medium size) is completely excluded by the silt excluder with the settling velocity of 0.0645 m/s. The efficiency of excluder varies from 93.5 % to 95.2% against 90 % of extraction ratio.

**Key words:** River Chenab, Khanki Headwork, Silt Excluder, SHARC, DACE, Sedimentation