M.Sc THESIS

STUDY OF SEDIMENT FLUSHING OPTIONS IN SMALL RESERVOIRS

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ABSTRACT

Dams and reservoirs are built on a river or a stream for various purposes like water storage, diversion, hydropower generation, or recreation. A menace associated with building of reservoirs is sedimentation. All rivers carry sediment load, and the decreased velocities of water in reservoirs lead to decrease in sediment transport capacity. As a result, the sediment carried by flowing water got deposited in reservoir.

Sedimentation in irrigation system is a major problems faced by experts responsible for water resources management. The sedimentation in a reservoir decreases its useful life. One way of recovering this lost storage is by sediment flushing. In this phenomenon, the hydraulic force of flowing water is used erode and remove the sediments deposited in a reservoir. Flushing offers the only cheaper way of recovering lost reservoir storage against costly mechanical measures like dredging and trucking.

Many small dams are built in Pothwar region of Pakistan for water storage, water diversion for irrigation, and for drinking purposes. Like any other dam in the world, they are also being hit severely by the problem of sedimentation. It is important to study and analyze the sedimentation problem and come up with a strategy for sediment management. In this study, the flushing option is considered for sediment management in these small dams.

This study is carried out taking Shahpur Dam and Tainpura-I Dam as study area. Shahpur Dam is situated about 50 km from Rawalpindi/Islamabad in Kala Chitta Range in the barani area of Punjab. The Dam was built in 1986 on Nadna Kas stream, with design life of 50 years. The command area of Shahpur dam is about 1231 acres, and it also provides 2 mgd of drinking water supply. The annual sediment inflow in

dam reservoir is about 283000 metric tonnes. The dam reservoir is almost filled up to the dead storage level and immediate measures needed to be taken.

Tainpura-I Dam is one of the twin dams of Tainpura, Jhelum namely Tainpura-I and Tainpura-II. Tainpura-I Dam was built in 1996 and has a storage capacity of about 9 Mm^3. The dam is built on Tainpura Bala Kass Nullah which is a tributary of Kahan Nullah.

The RESCON model for sediment management was selected to carry out this research. It is developed by World Bank to promote water conservations practices throughout the world. It takes up a sediment management strategy and calculates its applicability and efficiency. Using this model, sediment flushing mechanism was devised for both Shahpur Dam and Tainpura-I Dam. In order to achieve maximum flushing efficiency in Shahpur dam, low level outlets (LLO) needed to be installed having discharge capacity of more than or equal to 7.5 m^3/sec. The flushing operation should be carried out for 15 successive days, and flushing should be applied every year (N=1). For Tainpura-I dam, the flushing criteria devised is that flushing should be carried out through LLO with a discharge of 5 m^3/s for 5 successive days every year.

In order to make this study a comprehensive guideline for sediment management in Pothwar region reservoirs, the sediment flushing options were tested under various hydraulic and sediment conditions. This study in intended to provide mechanism for incorporating sediment flushing facilities in Shahpur dam and Tainpura-I dam, and to provide guideline for better sediment management strategy in Pothwar region.