CHAPTER 7
SUMMARY AND CONCLUSIONS

7.1 General

In reservoirs sediment formation and accumulation are complex processes involving various types and sizes of sediments, duration of storage and head available in the reservoir etc. Similarly removal of deposited sediments is also a complex process involving displacing the accumulated sediments from its original position, removing and transporting it to a desired location.

Hydro suction dredging of reservoir sediments is a combination of dredging and flushing. The method is very similar to hydraulic dredging except that the system uses energy represented by the difference in upstream and down stream water levels to drive water and sediments into the submerged pipe line rather than a mechanical pump. The figures 7.1 to 7.6 is illustrating the hydrosuction dredging of reservoir sediments.

It is established that the hydro suction dredging of reservoir sediments is practically very effective in the removal of reservoir sedimentation. This method of removal of reservoir sedimentation is cost effective since it uses the available potential energy of the reservoir to remove and transport the dredged slurry. Hence it satisfies the basic objective of a cost effective technique for the removal of reservoir sedimentation.
7.2 Conclusion

The hydro suction dredging is an effective method to remove the sediment in a reservoir. The main parameters in this investigation are head of water, diameter of the suction pipe and type of sediments. The observed data are analyzed and best-fit curves are drawn. The following conclusions are drawn from this investigation.

1. The change in diameter of the suction pipe influences sediment-water mixture discharge. The increase in diameter increases the discharge for all heads irrespective of the types of sediments even though the types of sediments have a small influence over the discharge.

2. The discharge of sediment-water mixture increases with the increase in diameter of the suction pipe, but sediment concentration ratio is changing under various heads. Observations reveals that increase in head may have an negative influence on the sediment concentration ratio in the case of non-cohesive soils because of faster removal of sediments near the inlet. This may be due to higher energy is available at the inlet because of higher head. Hence, more water is sucked into the pipe after the removal of sediments in close proximity to the inlet. Therefore, a proper diameter of inlet may be selected depending upon the head and type of sediment.

3. In pure water transport, all the head is used for transportation and discharge of water, whereas in case of sediment-water mixture discharge a part of the head is used to scour and entrain the sediments and only remaining part of the head is utilized in the transport and discharge of sediment-water mixture. As a result the sediment water mixture discharge is always less than pure water discharge.
4. The type of soil sediment has an influence on sediment-water mixture discharge even though the influence is marginal. Different types of sediments behave differently based on specific gravity, uniformity coefficient, fineness modulus, and coefficient of permeability. The fineness modulus is a significant factor. It can be inferred that lower the fineness modulus, lower the discharge (silt) and higher the fineness modulus discharge is higher (sand).

5. In hydrosuction dredging, sediment concentration ratio is varying since hydro suction dredging of sediments is not solely dependent on diameter and head but also other factors such as compaction and consolidation, scouring efficiency, age, type and size of inlet, movement of the suction pipe near the inlet and the sediments available near the inlet.

6. Increase in diameter and head results in increase in the Reynolds number. The types of sediment have a marginal influence on Reynolds number and thereby marginal influence on the sediment-water mixture discharge. The increase in Reynolds number increases the sediment-water mixture discharge.

The direct relationship between the sediment-water mixture discharge and Reynolds number is given by Equation 5.1 as,

\[ Q_\infty = AR_{\infty}^n \]

7. Mathematical Model for sediment-water mixture discharge is obtained from the trend lines combining head and diameter of the suction pipes and is given in Equation 6.1 as

\[ Q_\infty = K[sqrt(hd^2)] \]
8. The predicted and observed values of sediment-water discharge vary from 78% to 135%.

9. The mathematical model developed can be applied in the field with no scale effect to find the diameter of the suction pipe since it is analogous to discharge through Borda mouthpiece.
Fig. 7.1 Experimental setup with sediments before hydro suction dredging
Fig. 7.2 Experimental setup during hydro suction dredging
Fig. 7.3 Discharge of sediment-water mixture during hydro suction dredging
Fig. 7.4 Sampling for sediment concentration ratio
Fig. 7.5 Weighing of sediment – water mixture
Fig. 7.6 Experimental setup with sediments after hydro suction dredging
7.3 Scope for further research

1. This investigation was carried out considering the different types of sediments separately to find out its influence on the sediment-water mixture discharge and sediment concentration. Since the types of sediment on sediment concentration ratio exert considerable influence, mixture of soils can be used to simulate actual field conditions.

2. The inlet openings may be varied and its effects can be studied since it may have a considerable influence over sediment-water discharge and sediment concentration.

3. The influence of mechanized operation of the movement of the suction pipe inlet may be also studied.