USE OF CABLE CRANES FOR CONSTRUCTION OF LARGE CONCRETE DAMS

by

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Introduction

Cables cranes are widely used in the world over for the construction of large concrete dams.

Examples of large concrete dams constructed with the help of cable cranes in some countries are furnished in Table 1.

In the engineering practice of Sri Lanka, there have been instances of using of highline, for concreting of bridges, dagobas etc., designed and assembled by local experts.

For the construction of the first concrete arch dam in Sri Lanka at Victoria Project on river Mahaweli, a cable crane had been used.

Advantages

Constructors of hydropower complexes have opted for the cable crane due to the advantages the cable crane has over the tower, portal and other cranes. It is emphasized that the work of the cable crane could not be performed by any other one single type of crane. When other cranes cannot be used, the cable becomes the obvious choice.

Some of the obvious reasons for preferring a cable crane (to others) could be highlighted as follows:

1. Installation of the cable crane could be started early and independently not depending on the excavation work of the foundation of the dam. Usually the cable cranes are pivoted at a high elevation on either side of the banks of the river facilitating ready access.

2. It is possible to use the cable crane for excavation work (removing of earth and rock), making of the coffer-dam, river diversion, placing of necessary machinery, equipment, materials etc.

3. When large (high) dams are constructed in deep gorges and canyons, only cable crane could be effectively used to cover the length and height of dam to transport large volumes of concrete. Only the cable crane could lower concrete to a great depth at high speed.

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4. It has been found that the cost of delivery of one cubic metre of concrete to the dam is cheaper with the cable crane than with other cranes (concrete delivered with Conveyors is cheaper)

Disadvantages

Few disadvantages of the cable crane are the following;

1. Initial investment of the cable crane could be mentioned as very high compared to other cranes.

2. Installation needs longer period.

3. Restricted length or area of activity.

4. Frequent change of load bearing and lowering cables (high maintenance costs due to regular inspections, strict checking etc.)

Different types of Cable Cranes

At the Itaipu dam in Brazil, for concreting and other work, seven parallely movable cable cranes have been used. The cranes could effectively cover a distance of 1327 m with a maximum capacity of 20 tons each. Height of the pivot of crane reached 90 m and the intensity of monthly concreting attained about 185000 m^3 (total concreting at the dam 5 million m^3)

Due to the great length of the dam Dworshak in U.S.A., the concreting had to be carried out in two stages.

The first stage concreting was executed making use of three parallelly-movable cable cranes each of capacity 22.5 tons with effective length of 890m. As the full length of the dam could not be concreted with these cranes, for second stage concreting a cable crane with effective length of 1035m with inclined pivots were installed. The lifting capacity was less than the previous crane but just enough to meet the demand of the intensity of concreting.

In some instance, two cable cranes could be installed one above the other, fitted on rails at two different elevations. This increases the lifting capacity of both together up to about 100 tons.

At the Kernbrine dam of Austria where two cable cranes were functioning parallelly, the volume of the bucket was 9 cubic metres. Load could be moved horizontally at 360m per minute and lowered at 129m per minute.

At Massrock dam the horizontal movement of load reached 640m per minute and lowering 290m per minute.

There are instances when cable cranes are installed in radial direction to enable covering the full area of work-site.

At the Victoria concrete arch dam on Mahaweli, cable crane with an effective length of 700m with a bucket of 6 m^3 volume was utilised. On the left bank, the pivot was fixed while the right bank pivot was movable. The pivots were fixed on different elevations of the embankments making use of the topography.

Manoeurrability

The operator of cable crane is faced with the difficult task of moving the bucket or loads to a great length (few hundred metres) and lowering to a great depth precisely. To enable the operator to carry out the work easily, walkie-talkies and closed circuit televisions are installed. Switch board in the cabin of the operator indicates the coordinates of the load, the speeds etc.

Conclusion

Construction of dams in deep canyons, it has been found that the cable crane is the most economical means of transporting of concrete. The confidence gained at Victoria dam

should give us opportunity to consider using of cable crane in other suitable projects.

Bibliography

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Details	Name of Dam & Country			
	Dworshak U.S.A.	Manikuagah-5 Canada	Kelbrine Austria	Diz Iran
Number of cable cranes	3	3	2	2
Effective length, m	890	1267	950	770
Volume of bucket, m^3	6.12	6.12	6.12	6.12
Lifting capacity, T	22.5	22.5	20	20
Maximum lowering depth of bucket, m	234	305	140	219
Maximum movement of load, m/min	670	-	450	315
Maximum lowering speed, m/min	290	-	132	120
Maximum intensity of concreting, m^3/hour	437	285	200	160

TABLE 1