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Study of Rubber Dam

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Abstract- **Rubber dams are inflatable and deflatable hydraulic structure. Thousands of rubber dam have been installed worldwide for various purpose: irrigation, power generation, tidal barrier, environmental improvement, flood control and recreation. The newest material in the construction of water structures in recent years, is the rubber material that is widely used in the construction of short dams or dams. The simplicity and flexibility of the rubber dam structure has proven reliability and are the key consideration in its wide scope of application. The estimation of rubber dam is based on personal communications with the expert of manufacturers and the practitioners of the subject areas as well as case studies of already constructed rubber dam in India install for the purpose other than hydropower. It is recommended to use inflated weir in small hydropower projects which is being cost effective and also energy efficient. Rubber dam is a new technology which control water in flexible way. Average life cycle cost of Imported rubber dam and life cycle cost of Indian rubber dam is about 3 times more than the cost of Indian rubber dam. In this paper we are going to study the working of Rubber Dam and conventional dam and compare the cost of both the dam. And based on the study, will conclude whether Innovation of Rubber dam is cost effective and useful or not.**

Keywords **– Hydraulic structure, flexibility, life cycle cost, cost effective.**

I. INTRODUCTION

Rubber dam was developed in the 1950s and the first one was installed on the Los Angeles River, California, for the purpose of groundwater recharge and flood control. Rubber dams are installed to function as weir or barrages which are relatively low-level dams constructed across a river for raising of river level for the diversion of the flow in full, or in part, into a supply canal or conduit for irrigation, domestic or industrial use. Since then, the use of rubber dams in different world countries such as Japan, Germany, the Netherlands, France and other European countries, were studied, so that now there are more than 4,000 rubber dams in the world.

Compared to conventional water retaining structure having gated and un-gated spillways and weirs to release the surplus water, such as dams and barrages, rubber dam is a different and unique type of hydraulic structure. These are not dams, but structures which are made of high strength fabric adhering with rubber, which forms a ballooned rubber bag when filled with water or air and are anchored to the concrete floor, and is used for water storage. These types of dams are placed across channels, streams and medium sized rivers to raise the upstream water level when inflated and thus play a vital role in increasing the water for irrigation capacity. Today rubber dams are also known as Fabridam, Rubber Dam and inflatable dam.

Fig. 1. Rubber Dam.

II. LITERATURE SURVEY

Tam and Paul (1998), implemented rubber dam technology in hong kong for replacement of the agricultural weirs which were still in practice. Also they concluded that since Rubber dam is constructed with rubber material itself, so there is often a concern if the dam material is subjected to repeated damage due to vandalism. Also they discussed the problems related to damaged caused due to flow-induced vibration, damage due to dam inflation and deflation, damage caused due to objects carried from upstream of the weir. Rubber Dam technology was a success in Hong Kong.

Zhang X. *et al.* (2002), used rubber dams in places where the temperature is below -40 degree Celsius and stated that it is not suitable in cold weather conditions

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and should be constructed in dry weather conditions. Also, they discussed about the research methodology, construction of Rubber dam and the operation mechanisms of the same. Also, preventive and corrective maintenance of dam is discussed.

Zhang and Diao (2011), studied various cascade rubber dams and analyzed it's fall discharge, fall velocity, duration and other factors like control and operations that influence maximum discharge and concluded that the greater the dam fall velocity and shorter the time , the greater is maximum fall discharge.

Hasan and Kabir (2014), analysed the Rubber Dam in Natore, Bangladesh and found that in terms of socio economic, agriculture and hydraulic indicators can be considered satisfactory. Also suitability on Mahanonda River has been analyzed and also studied its performance on irrigation and found that it's a great step to change socio-economic condition of the region. Also Bakkhali and Idgaon Rubber Dam were studied for the performance evaluation of Rubber Dam projects in Bangladesh for irrigation development. Thus, a comparative capital and operation and management cost analyses of different irrigation technologies has been carried out to ascertain the viability of Rubber Dam technology in irrigation development.

III. TYPES OF RUBBER DAM

- Colour Rubber Dam
- Arch Rubber Dam
- Slopes Rubber Dam
- Book Back type Rubber Dam

1. Colour Rubber Dam- The colour Rubber dams are given finishing with colours from outside. The water overflowing the dam tubes looks like colourful waterfall against green bushes around. Therefore use of rubber dam in urban areas and gardens not only functions for water control but also helps for development for water entertainment and tourism.

2. Arch Rubber Dam- Arch rubber dam is characterized on the basis of a new type of rubber dam technique, with innovation in the structure for a curved bar. Flexible curve to achieve practical results both the United States there are beautiful results.

3. Slopes Rubber Dam- Beautiful dam slope straight shape when the dam bags cloth bags of retaining uniform force Medium of filling and water overflowing conditions.

4. Book Back type Rubber Dam- The shapes of the Rubber dam are like the book structure with smooth appearance and vulcanized in the factory, this kind of Rubber dam improves the transverse tension which reduces the vibration and water overflow bump of the dam tube. Water overflow scene of the dam tube is attractive and beautiful.

IV. OPERATION AND MAINTENANCE OF RUBBER DAM

- Before inflating the rubber dam, the valve, motor, pipe line, pump and other system which are used to make the dam deflate and inflate; should be checked properly that it can function properly.
- Anchorage part and other key point should be checked and damaged part should be repaired.
- In front of the Dam site, the silt and sand should be removed from pipe line.
- At the time of inflating the bag, when the height of the Dam is reached at the top surface level of the river, at that time inflating operation must be stopped.
- The flooded time will be under observation so that the Dam will be emptied at the highest flood time, air mouth of the top will be opened. So, by this, the inside air will be removed fully.
- For inflated condition, if the overflow depth limits a definite height (generally 20% of the Dam) then vibration effects. The Dam height and overflow depth must be controlled within 20% of the Dam height by decreasing or increasing the Dam height. But, should never exceed the design Dam height.
- The dam design is done for one side storage of water and should never use for two side storage. Compared to upstream level, if the downstream water level rises, at that time the rubber bag must be emptied.

Fig. 2 Operation of Rubber Dam

V. CONCLUSION

The Rubber Dam is an alternate solution as a diversion structures across streams and rivers to mitigate foreshore submergence and Rest & Relaxation issues of conventional Irrigation gravity Dams. Also, they are further reusable after its purpose elsewhere in other needy places. In the Era of knowledge and engineering challenges, Rubber Dam is an innovative and unique solution as Alternate Head works component of Irrigation dams. Also use of such rubber dams for

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Small Hydropower projects should be encouraged because of its shorter construction time, structural simplicity, flexibility, proven reliability, ease of operation and low Life Cycle Cost.

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