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RUBBER DAM

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ABSTRACT

Inflatable dams are flexible cylindrical inflatable and deflatable structures made of rubberized material attached to a rigid base and inflated by air, water, or a combination of air/water. The interest in inflatable dams is increasing because of the ease of placement and construction. In this study the behavior of air or water-inflated dams is physically and theoretically analyzed under different conditions of internal pressure, upstream and downstream water depth. Experimental data obtained on air-inflated and water-inflated dams were presented and compared with the theoretical results estimated on the basis of height, cross-sectional profiles and cross-sectional areas of the dams. Good agreement was obtained between the theoretical and experimental results. Further theoretical analyses were conducted to investigate the behavior of the dams under different conditions.

Keywords: Inflatable dam, hydrostatic pressure, internal pressure, dam shape, tension

I.INTRODUCTION

Water is important and its need is very essential for human living. The storage of water is an important aspect that should be considered for sustainable life. Whenever there is storage the thing which strikes the mind is construction of dams. Dams are the most effective means for water storage. They also serve various purposes like irrigation, hydropower generation, flood control, water supply and pollution control. The conventional dams may not serve various purposes in particularly for small projects. Cost and time consumption are the most important aspects of the conventional dams. In order to curb such unavoidable factors the construction of dams with other cheaper materials has come into existence, one such material been implemented successfully for construction of dams is rubber.

Water is an essential requirement for survival of any living being. And it is becoming a scarce resource day by day. Prediction of floods and droughts is very difficult as they are random events and the availability of water varies with time and in space, depending on the season. This calls for an urgent need to conserve it. So in hydrology and water management dams play an important role in creation of reservoirs for irrigation purpose apart from hydropower generation.

In order to control the flow of water in rivers, streams and canals, it is essential to construct hydraulic structures. Some of these structures are used to control water level. An example of a structure used to control the water level is the inflatable dam. An inflatable dam is a simple and portable barrier made of a flexible membrane, Which is filled with air or water or both, and fixed to a canal bed? This type of structure is considered as more economical compared with the rigid types of control structures constructed from concrete, masonry, and steel

Rubber Dam is a different type of hydraulic structure compared to a conventional water retaining structure with gated or un-gated spillways and weirs to release the surplus water, such as dams and barrages. Strictly speaking these are not dams, but structures made of high strength fabric adhering with rubber, which forms a ballooned rubber bag when filled with water or air and anchored to the basement concrete floor, and are used for water retention. Such type of a water retaining structures (Rubber dam) themselves could also serve the purpose of releasing the surplus water over the body of the dam by emptying filled water or air from the dam bag, which are mostly used for flood release. The primary advantages of rubber dam construction are:

a) Quick in construction and

b) Convenient for flexible operation.

II. LITERATURE SURVEY

According to literature survey after studying various IEEE paper, collected some related papers and documents some of the point describe here:

1. Hydraulics of rubber dam overflow

Author : H. CHANSON

Current design techniques include the installation of a fin an the upper quadrant of the rubber dam, to deflect the flow away from the flexible membrane wall.

2. Impacts of Groundwater Recharge from Rubber Dams on the Hydrogeological Environment in Luoyang

Author : Shaogang Dong, Baiwei Liu, Huamin Liu, Shidong Wang, and Lixin Wang

In 2007, seven years after the rubber dam was constructed, the amount of $NH4+$and $NO3-$that had been adsorbed in the aeration zone was instead turned into the aquifer. As a result, the concentrations of NH4-N and NO3-N in this area were elevated. TDS of the south side of the Luohe River increased under strong evaporation and water-rock interactions in the sandy clay layer starting in 2010. With the rise of the groundwater level, pollutants discharged by human activities reached the aquifer in a shorter time than before. This is is another reason why the concentration of TDS, NH4-N, and NO3-N increased

3. Assessment the stability of embankment dams during rapid depletion of reservoir

Author : Yousef Parish

Sensitive parts of dam might be damaged because of various factors during exploiting an embankment dam, for example some cracks might be seen in crust or some phenomena such as hydraulic fracturing in core, piping phenomenon in the downstream wall and reduction of input to the reservoir as a result of deviation in river path. These factors and similar ones will be inevitably followed rapid depletion of the reservoir. Even after an earthquake in dam area rapid depletion of reservoir might be the only solution for preventing dam's destruction for several hours or some days. Therefore, considering the importance of case, accurate studying about the effects of rapid depletion of the reservoir is necessary to prevent destruction of wall that would lead to dam break through providing appropriate fields about rapid depletion of the reservoir. Environmental problems about assessment the stability of embankment dams during rapid depletion of reservoir and coping strategies with the destruction of the body will be investigated in this article.

4. Evaluating the design, construction and use of Rubber dams

Author: Yousuf Parish

One of the newest materials in the construction of water structures in recent years, is the rubber material that is widely used in the construction of dams or short dams. In rubber dams, the remarkable flexibility of materials against external factors, compatible with the environment, simplicity of design, short time of building, safety and stability of these structures, such dams than rigid, simplicity and ease of use and ultimately reducing operating costs caused has been used in large and small water projects. Due to the limited information in the field of rubber dams, this article provides the possibility of rubber dams introducing, how to design, building and maintaining

III. PROPOSED SYSTEM

Basics about design

A subsurface dam consists of a cut-off wall, intake facilities, drainage facilities, operation and maintenance facilities, and groundwater aquifer charging facilities. These facilities should be designed to have the necessary functions of a subsurface dam and to be environmentally friendly by considering the ambient natural and social conditions. In addition, it is important to minimize the construction costs and future maintenance and management costs of the subsurface dam.

Design notes

(1) Reservoir scale and facility functions

If the dam height is increased and the full reservoir level is set high, the gross reservoir capacity of a subsurface dam will increase. However, this may raise the reservoir level excessively and disturb the use of land in the reservoir area. Consequently, drainage facilities may become necessary. If the dam height is reduced and the reservoir level is set high, the adverse effects of an excessively high reservoir level will become small but the gross reservoir capacity will decrease. As the reservoir level is higher, water intake is generally easier. Reducing the dam height and lowering the reservoir level will increase the operating costs for intake. Thus, the subsurface dam reservoir scale (reservoir level, gross reservoir capacity, reservoir area range, etc.) and the drainage and intake functions are closely related to each other. Therefore, when determining the reservoir scale and designing

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a cut-off wall, drainage facilities, and intake facilities, it is important to coordinate the facility functions and ensure that the design is functionally and economically optimum.

2) Hydraulic analyses

A subsurface dam comprises facilities to control groundwater flow than cannot be seen directly. By using a computer, a groundwater simulation model is created on the basis of various survey results for hydraulic analysis. Hydraulic analysis reproduces the current groundwater flow and clarifies the groundwater flow after subsurface dam construction qualitatively and quantitatively to provide data for facility design. the types and purposes of hydraulic analyses necessary for designing a subsurface dam.

(3) Uncertainty of design values

The reservoir layer of a subsurface dam is distributed underground and its components and hydraulic properties (hydraulic conductivity, effective porosity, etc.) vary between places. Therefore, it is generally difficult to grasp the distribution and hydraulic properties of a reservoir layer even by a detailed survey. At the design stage of a subsurface dam, the groundwater behaviors after subsurface dam construction are estimated by groundwater simulation and the facility dimensions and other are determined. Some parameters used for this simulation are based on presumptions or assumptions and may produce analytical errors. Therefore, some uncertainty cannot be avoided about the subsurface dam reservoir capacity, exploitable groundwater quantity, and other design values or the effects of various facilities. To evaluate whether or not the subsurface dam is exhibiting its intended functions, monitor the groundwater level and other factors during survey and planning, construction, and operation. Based on the results, facilities are added and the subsurface dam operation plan is reviewed as required.

(4) Evaluation of environmental influences and measures

A subsurface dam has a small impact on the environment, compared with a surface dam. Once a cut-off wall is constructed for a subsurface dam, however, it is almost impossible to remove the cut-off wall and restore the original status. This means that a cut-off wall may produce long-term and semi-permanent influences on the environment. When determining the location and dimensions of a cut-off wall, however, environmental influences should be fully studied and considered.The environmental influences of subsurface dam construction can be classified into ones on the downstream of the cut-off wall and ones on the upstream. At the downstream of the cut-off wall, the groundwater flow rate may fluctuate or decrease depending on cut-off wall construction and subsurface dam operation (intake). In a coastal area, the progress of salinization downstream of the cut-off wall may be facilitated and affect the current groundwater use. When constructing a subsurface dam, therefore, it is necessary to consider and compensate for groundwater use in the downstream area. If there is a spring (including a seabed spring) in the downstream area, cut-off wall construction may reduce the amount of spring water and affect spring water use and the ecosystem surrounding the spring.

At the upstream of the cut-off wall, cut-off raises the groundwater level. If heavy rainfall raises the reservoir level excessively, inundation or soil wetting in a low-altitude area may affect the land use and the ecosystem. In

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addition, blocking surface water permeation into the ground may increase the surface water flow rate. The groundwater level rise may cause salt accumulation on the soil of a dry area.

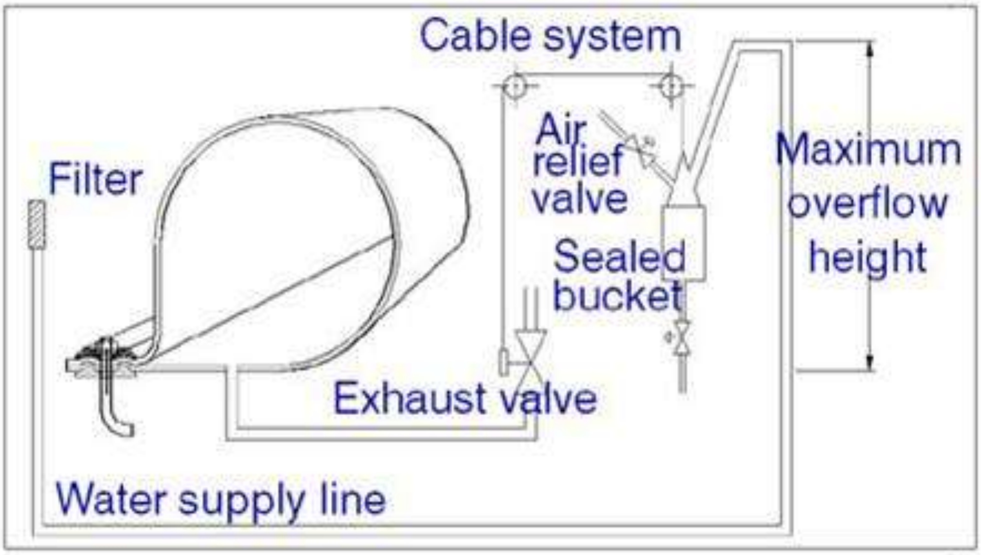
To solve these problems, forecast possible places and scales of damage by groundwater simulation or other method and reflect the results in the design, construction, and operation of the subsurface dam. When groundwater pumped from the subsurface dam is used to irrigate the catchment area, the irrigation water may partially permeate again into the subsurface dam reservoir layer and be recycled. Some researchers say that salts and other dissolved substances may be condensed in the reservoir water. Where the groundwater has a high degree of salinity from the beginning, salt accumulation and reservoir water changes by irrigation should be studied. Whether or not there is a subsurface dam, excess fertilization and other acts on farmland in the aquifer distribution area may contaminate the groundwater.

Rubber dams are cylindrical membrane structures, which are attached to a rigid foundation along two of their generators. The membrane will check the seepage of water from the canals from bottom. Dams are inflated either with water, air, or a combination of water and air to impound the river during floods and deflated to release excess water. The synthetic rubber used (EPDM-ethylene propylene diene monomer) is 8.6 mm thick for dams of height less than 1.0 m and 22.5 mm for height ranging from 1 to 6 m. The dam is reinforced with nylon and webbing. It is ceramic-coated for protection against cuts.First the tube is fixed securely to the already constructed concrete base with clamps and anchor bolts. The foundation is generally done with light base concrete with a surface having a concave profile for the provision of inflated rubber dam.

Rubber dam can be inflated with water or air. When inflated with water it increases the weight of the dam and allows it to stay at the place and sustain any vibration forces caused by the waves. The dam profile can be seen effective cross sectional area of the dam is reduced and the height is also decreased. So the levels of flood inflow should be low. When inflated totally with air the cross sectional area is increased and likewise the height is also increased. But this cannot sustain the forces caused by excess flow due to its lightweight. So a design was made in which the rubber dam is only partly filled with water; the remaining part is filled with compressed air.

This new design has the advantage that the water mass in the rubber dam adds to counteract the groundwater pressure under the foundation, while the circumferential length of the sheet is still relatively small. When bestowed in the recess, the sheet is subjected to flow forces and forces caused by passing ships. It must remain stable in the recess in order to prevent damage by the navigation. The anchorage of the rubber dam fixed to abutments with the help of bolts and These bolts firmly secure the dam when it is For inflation and deflation purposes an air supply pipe is provided in both abutments. The water inside the dam is connected through an open pipe with the water outside; this pipe has its opening at the side Prior to inflation, the valve of the pipe is opened, which facilitates the free inflow of water.

IV. SYSTEM DESIGN



V.ADVANTAGES

Cost of construction:

The capital cost is very less when compared to that of conventional dams. Most of concrete work can be avoided which is a primary material for conventional dams. The only material is rubber which may be costly however when compared to others.

Installation:

Installation process is very quick, as it done mostly by manual or remote sensors. It mainly consists of inflating and deflating as and when needed based on operating principles.

Silt and sedimentation removal:

When the dam is deflated it facilitates free flow of water over it, without allowing the silt to deposit along the length of the dam and hence the effective storage and life can be increased.

Water tightness*:*

The material used for rubber dam installation is totally watertight. So there is no problem of water leakage and excess flow of water from the dam.

Corrosion and abrasion resistance:

This factor depends on the quality of the rubber used. Generally EPDM (ethylene propylene dyne monomer) rubber is used which is good in resisting abrasion and corrosion.

Flexibility:

The rubber dam is very much flexible in operation since the dam height can we varied depending on the water inflow and outflow requirement.

Environmental Considerations:

The installation technique helps in reducing the risk of disasters like bank erosion and the water flow also will not be disturbed in the process.

Transportation convinience:

They can be easily replaced and transported anywhere when needed due to lightweight nature of material.

VI.CONCLUSION

After reading research paper and other information problem is been identified and process of finding alternative for the protection of rubber dam is going on .

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