

INCREASE IN GROUND WATER RECHARGE BY BHUNGROO TECHNOLOGY

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Abstract -The necessity of artificial recharge of aquifers is increasing day by day due to excessive demand of water by the ever-growing population in India and also because of the scarcity of good dam sites available for construction. Aquifer recharge occurs artificially and naturally. Artificial recharge is the process of adding water to an aquifer through human effort. The main purpose of artificial recharge is to store water for later use while improving upon the quality of water. This paper will represent the method of artificial recharge of aquifers by bhungroo technology. With the help of case studies conducted in the recent past place. for the analysis of pvc pipe ansys workbench16 has been used.

Key words: artificial, recharge, human effort, aquifers, infiltrations, ansys.

1. INTRODUCTION:

The main reason to develop artificial aquifer is to increase ground water storage needs of future generation. It is one of the artificial manmade efforts to add water to aquifer. Number of different techniques have been developed by human in past few years for sufficient supply of water for human uses, thus increasing capacity of ground water and reducing salinity of water thus improving quantity and quality of water. The recharge of ground water occurs both naturally and artificially. The natural recharge occurs through the process of infiltration where the water percolates from the surface to the bed of the aquifer. But due to rapid development and growth of population in the recent past the areas for natural infiltration have been lessening day by day, hence the scope for natural recharge of the ground water is also declining. One of the artificial recharge technology bhungroo is a structure were constructed in a laxmi township bhusawal district Jalgaon. The area has a seasonal rainfall distribution from may to October with annual rainfall range from 400 to 800mm yr. due to the bhungroo technology the water is available for local people in laxmi township for irrigation and drinking purpose . In this part structural analysis for the tested pvc pipe by using ansys workbench 16.

1.2 Objectives of study:

1. To study bhungroo technology for its potential.
2. To analyse pvc pipe for bhungroo technology in Ansys workbench16.

2. LITERATURE REVIEW

1. Subhra Chakravarty: 'Technologies for enhancing ground water recharge' This paper relate with the artificial recharge technique such as: Artificial recharge through injection involves transfer of surface water to aquifers through boreholes drilled for the purpose. The technique requires availability of surface water, which is not always assured in the low rainfall region. This paper attempts to consolidate the experiences gathered in respect of the case studies in various rainfall regions with different soil characteristics.

2. Lect. Humam Mohammed Salih: 'Investigation of the External Loads Applied on the PVC and PE Pressurized Pipes' this paper relate with the test the pvc pipe under the external or internal load (pressure) which are buried under ground. Find out the deformation normal stress, strain due to this loads on pipe. In this part a structural analysis for pvc pipe under two conditions done by using ansys workbench and result showed that the total deformation, stress and strain.

3. Seth Owusu, Olufunke O. Cofie, Marloes L. Mul : 'Adapting Aquifer Storage and Recovery Technology to the Flood-prone Areas of Northern Ghana for Dry-season Irrigation'.in this working paper author say that The 'Bhungroo' is a floodwater harvesting and storage system developed and widely used in India .The Bhungroo harvests water and stores it in underground reservoirs or unsaturated layers. It is estimated that as much as 40,000 m³ of water can be stored, but the average is closer to 4,000 m³ , which is sufficient for supplying irrigation water for almost 7 months. Water is used for farming in the dry season of the same year, thereby improving food security.

3. OPERATIONAL FEATURES OF BHUNGROO TECHNOLOGY.

Bhungroo, a Gujarati colloquial, means straw or hollow pipe. Bhungroo is unique innovative and efficient rain water conservation technology, by use of pipes of ten to fifteen centimeters in diameter. The globally recognized disaster mitigation and irrigation guarantee technology filters, injects and stores excess farm water or storm water underground for uses in lean periods. Bhungroo delivers its services in waterlogged areas; drought affected areas as well as in areas affected by erratic rainfall. It also works in salt affected soils as well as seasonally eroded soil. The Bhungroo technology uses borehole infiltration wells for artificial recharging of groundwater.

Technology detail: Bhungroo scheme installed at laxmi township in this design the rectangular shaped infiltration bed has a dimension of 2.5 x 2 m. The length of the pipe ranges from 40-60 cm above ground level. In the infiltration bed, there are layers of particles of different sizes compactly arranged and covered with a wire mesh to facilitate the movement of floodwater to the Bhungroo well and the unconfined aquifer. Local skills and labor were used in constructing the Bhungroo with the materials that are available locally or accessible nearby. The materials used include coarse rocks, gravel and fine, and charcoal, particularly for the Bhungroo at the site, which had an odor problem with the water. According to the design in, the infiltration bed is 4 m and the borehole depth is 30 m, and screens are located within the system.

4. CASE STUDY OF LAXMI TOWNSHIP

- Name of site: Laxmi Township
- Location of site: Bhusaval Jalgaon, Maharashtra 411021
- Site Owner: Prashant patil and Prajakta patil.
- Area: : 9.3 acre

4.1 Details of study area

- Depth of Pipe: 30m
- Diameter of Pipe: 150mm
- Sand Layer: 2 M.
- Gravel Layer: 2 M
- Type of Pipe: Pvc
- Rainfall of Laxmi Township Bhusawal: 736mm
- Run Off of Laxmi Town Ship: 68.44cm
- Soil Type: Deep Black Cotton Soil
- Ground Water Quality: The Quality Of Ground Water Is Alkaline And Generally Suitable For Drinking And Irrigation Purpose, However Localized Nitrate Contamination Is Observed In Rural Areas.
- Hydrology: Basalt and alluvium -coarse sand and gravel under water table to semiconfined and confined condition.



Fig 4.1: Bird Eye View of Laxmi Township

- Before application of Bhungroo project on site the first bore well failed at 106.68m (700 ft and 10 casing pipes are used)



Fig4.2: bore well



Fig4.3: bhungroo

- After application of Bhungroo system in area the water is available at 30m depth.

The extra pumped water is stored in low cost storage called as farmpond (shettale), farmpond is constructed after successful completion of bhungroo project. This water then used for trees, irrigation, drinking and construction.

4.2 Modeling in Ansys of Bhoongroo Project:

Step 1: Add Material of Sand, Gravel, Soil and PVC. **Step 2:** Preparation of Sand Gravel and Soil Model in Ansys. **Step 3:** Preparation Of pipe Model in Ansys through Sand Gravel and Soil .**Step 4:** Add Material of PVC to the layer of PVC Pipe. **Step 5:** Add Material of Sand to the layer of Sand. **Step 6:** Add Material of Soil to the layer of Soil. **Step 7:** Add contact of to the layer Sand Gravel and Soil to the PVC pipe. **Step 8:** Add meshing of to the layer Sand Gravel and Soil .**Step 9:** Add Fix Support to the layer Soil At bottom.

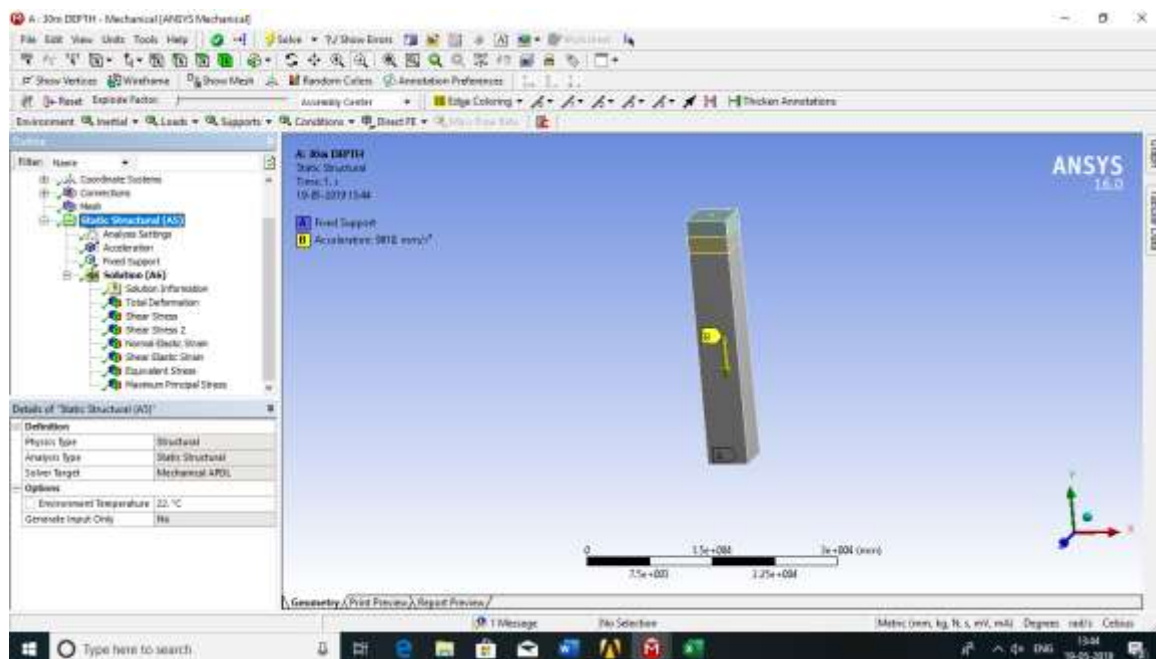
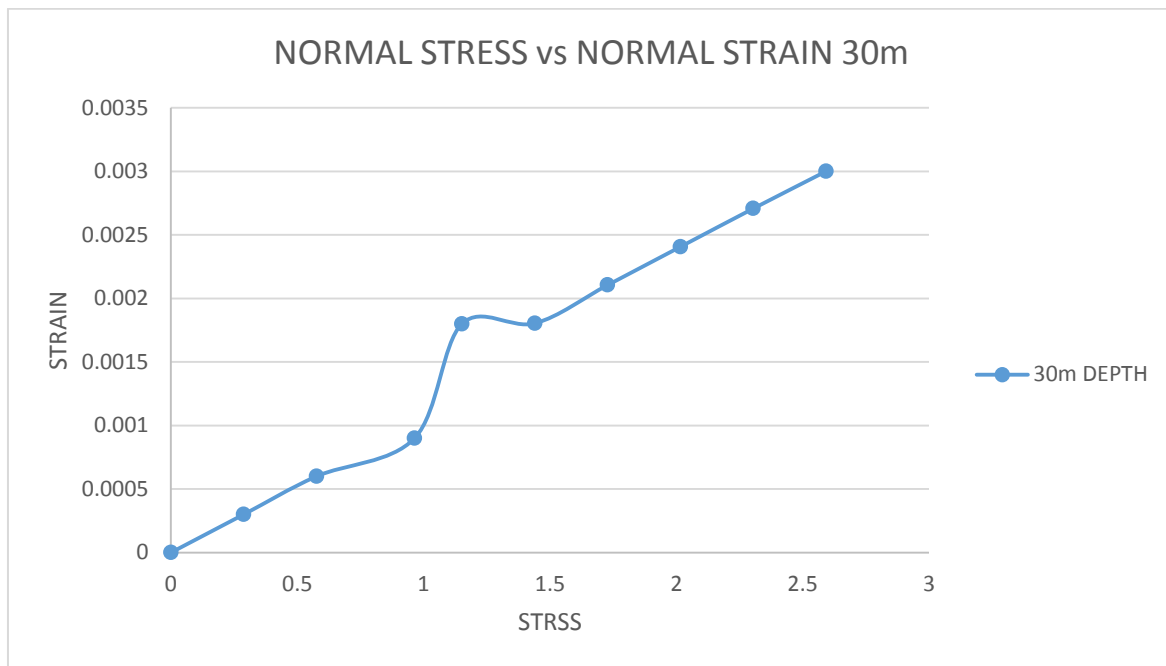


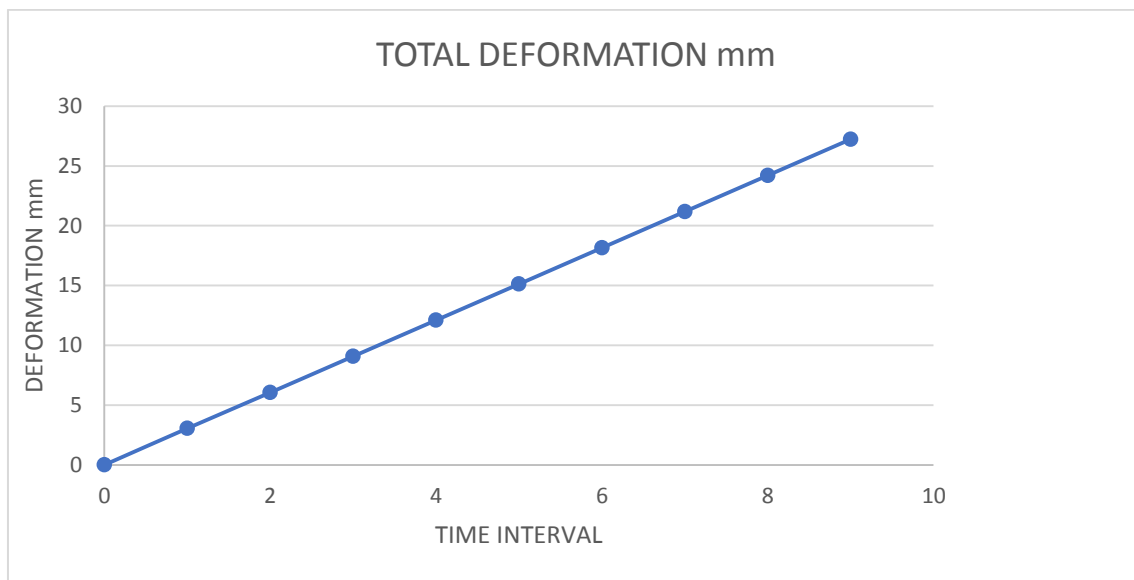
Fig 4.4. ansys model of pvc pipe

5. RESULTS AND DISCUSSION

ANSYS model is proposed to study of behavior of pvc pipes under influence of water pressure and self weight.



In above graph the 30m depth PVC pipe is analyse for self weight, soil weight and water pressure it is observed that the maximum stress observed 2.53 and strain observed 0.003.



In above graph the 30m depth PVC pipe is analyse for self weight, soil weight and water pressure it is observed that the maximum deformation is 27.5mm.

6. CONCLUSIONS

1. This project gives an overview of the existing techniques in the artificial recharge of aquifers. It can be now observed from the case studies mentioned in the paper, that the artificial recharge aids in improving the natural yield and capacity of the aquifers.
2. In the present case study, it is clear that implementation of Bhungroo project leads to increase in ground water recharge over the period of time.
3. ANSYS software is used to evaluate the stresses and strains, deformations developed in pipes for depth recommended by Bhungrooteam. The depth is compared from 30m to 40m.

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