

Study the quality of soil around the synthetic filter in subsurface drainage (Case study: Ramhourmoz Plain)M. Tamimi¹, A. A. Naseri², Z. Izadpanah³, M. Ghobadina⁴¹ M.Sc. Student Irrigation and Drainage Department, Faculty of Water Sciences Engineering, Shahid Chamran University of Ahvaz, Iran.² Professor, Irrigation and Drainage Department, Shahid Chamran University of Ahvaz, Iran.³ Assistant Professor, Irrigation and Drainage Department, Shahid Chamran University of Ahvaz, Iran.⁴ Assistant Professor of Water Engineering Department, Shahrekord University, Shahrekord, Iran.maede.tamimi@yahoo.com

Abstract: An essential part of each drainage system is the filter of drains. Drains filter is one of important factors in underground drainage system performance. The goal of this study was study Soil chemical quality in artificial filters in 2000 hours testing. The soil of Ramhourmoz area is studied in three treatments with three replication. First treatment in a continuous exploitation condition, second treatment is done by continuous and discontinuous flow and the third treatment is done through heating. Sampling process is done in 1/5 meter depth of installed drains in Soltan Abad region (In area lands of Fajr Ramhourmoz project). The model was made of Polyethylene Cylinder which consists of lace, sand, artificial filters, soil and water. The exit water is used again. The quality of water and soil of the region was measured before the test. After three months soil quality is measured again and the result is presented in tables. The results indicates rises in all elements after 2000 hours data processing. Element rises percentage is the most in the over heating treatment due to the gravity of this treatment, Then is discontinuous treatment and the one is constant treatment. Gyps and Carbonate amount in all measuring parts were zero.

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1. Introduction

Using artificial filters in any location needs familiarity about benefits and challenges of its usage. Currently artificial filter is widely used in many places in the world. But it hasn't been accepted in Iran because there isn't enough knowledge and information about benefits and disadvantages of artificial filters (Ritzema, 2006). Drainage filters are the spongy materials around drainage pipes which protect them from soil movement and its sedimentation. In many cases the name at this spongy materials around drainage pipes "drainage filter". The role of filter is to maintain the soil elements on its back, and the small elements may be congregated inordinately. So filter and soil around it will be clogged. While an appropriate drainage cover prevent the sedimentation gravity (Stuyt et al, 2007). Filters and Geotextile cover which were used more than 50 years and they brings us successful and unsuccessful experiences results in making an equipment which is assessed by engineers now. In this 50 years the filters sometimes were appreciated and sometimes were condemned. Now a day there is no eager to use Filters and Geotextile filter in other Geotechnic engineering science in Iran. A lot of studies and researches is done about the artificial cover in all over the world (Giround, 1997). Naseri and Arvahi (2005) compared the performance of two artificial cover PP450, PP700 with standard sand filter

and region sand. As the results indicated, the best Technical and economical option in applying the underground drainage system is the best filter to underground drainage filtration. The option which has the best performance in statics and salinity level controlling. Ramezani Moghadam (2009) considered three kinds of PP450 artificial filters of Domestic and foreign productions in one of heavy soil in khozestan by using Sand Tank physical model. The results showed that primary clogging and sedimentation in drainage pipes with Dutch filters is less than Iranian filters. Ghobadina and Rahimi (2012) analyzed Geotextile cover clogging. The results if their studies show that in the exit apertures, the areas which have aerobic and anaerobic conditions, the sedimentation is more than other areas. Wilson-Fahmy et al (1996) in their studies found that clogging is happened more than in the middle part of current moving into drainage (pipe or through its elements) and the fiber clogging is less. So it is obvious that the more studies should be done on this aspect. Youshan et al (2001) in their analysis about Geotextile filtration found that testing by hydraulic Gradient has reliable result rather than other testing like discharge.

2. Material and Methods

The project area has arid and semiarid climate with the hot and longtime summer, climate and short

winter. The rainfall pattern is following the Mediterranean rainfall pattern. So most of raining is in the winter and the region is totally arid in the summer. Sampling process is done in 1/5 meter depth of installed drainas in Soltan Abad region. This study consists of three treatments: First treatment in a continuous exploitation condition, second treatment is

done by in wetting and drying and the third treatment is done through changing the temperature. After 2000 hours testing, the soil of each cylinder is got out and its chemical features was measured. Water and soil features Measuring method is summarily indicated in the table 1.

Table 1- Measuring method of Water and soil properties

Measuring method	Type Factor
Reading by Ec meter	EC
Reading by PH meter	pH
Titration by EDTA	Ca ²⁺
Titration by EDTA	Mg ²⁺
Titration by Silver nitrate	Cl ⁻
Titration by sulfuric acid	CO ₃ ²⁻
Titration by sulfuric acid	HCO ₃ ⁻
Flame photometer	Na ⁺
Flame photometer	K ⁺
Hydrometer	Soil texture

3. Results

Physical and chemical properties of soil is shown in the tables 2 and 3. As it can be seen silt, sand and clay percentage is collected by soil pattern, clay-loam soil pattern. In tables from 4 to 6 chemical properties of soil at the end of testing is shown.

Table 2- Physical properties of studied soil

soil pattern	clay percentage	Sand Percentage	Silt Percentage
clay- loam	31.5	30.5	38

Table 3- Primary Chemical properties of soil

EC (dS/m)	pH	CaCO ₃ (%)	CaSO ₄	HCO ₃ ⁻ (meq/lit)	CO ₃ ²⁻ (meq/lit)	Cl ⁻ (meq/lit)	Ca ²⁺ (meq/lit)	Na ⁺ (meq/lit)	Mg ²⁺ (meq/lit)	K ⁺ (meq/lit)
5.02	7.64	24.56	0	23	0	35	30	10	25	8

Table 4- Chemical properties of soil in continuous treatment at the end of test

EC (dS/m)	pH	CaCO ₃ (%)	CaSO ₄	HCO ₃ ⁻ (meq/lit)	CO ₃ ²⁻ (meq/lit)	Cl ⁻ (meq/lit)	Ca ²⁺ (meq/lit)	Na ⁺ (meq/lit)	Mg ²⁺ (meq/lit)	K ⁺ (meq/lit)
5.76	7.74	24.87	0	25	0	55	35	11.6	35	0.9

Table 5- Chemical properties of soil in discontinius treatment at the end of test

EC (ds/m)	pH	CaCO ₃ (%)	CaSO ₄	HCO ₃ ⁻ (meq/lit)	CO ₃ ²⁻ (meq/lit)	Cl ⁻ (meq/lit)	Ca ²⁺ (meq/lit)	Na ⁺ (meq/lit)	Mg ²⁺ (meq/lit)	K ⁺ (meq/lit)
6.13	7.81	24.91	0	28	0	60	40	12.2	40	0.9

Table 6- Chemical properties of soil in heating treatment at the end of test

EC (dS/m)	pH	CaCO ₃ (%)	CaSO ₄	HCO ₃ ⁻ (meq/lit)	CO ₃ ²⁻ (meq/lit)	Cl ⁻ (meq/lit)	Ca ²⁺ (meq/lit)	Na ⁺ (meq/lit)	Mg ²⁺ (meq/lit)	K ⁺ (meq/lit)
6.27	7.89	25.23	0	35	0	65	45	12.8	45	1

By comparing the results of table 2 with tables 4,5 and 6 it can be seen that all elements are increasing. In all water and soil samples, the amount of gyps and carbonate is zero.

In the continuous treatment the amount of Potassium increases 12/5%, Magnesium 28/5 %, Sodium 16%, calcium 16/6%, chlorine 57/1%, Bicarbonate 8/6 %, lime 1/28%, electrical conductivity

14/7 %, Acidity 1/3%. The increases of elements is because of salinity and water quality changes.

In the discontinuous treatment the amount of Potassium increases 12/5%, Magnesium 60 %, Sodium 22%, calcium 33/3%, chlorine 71/4%, Bicarbonate 21/7 %, lime 1/42%, Acidity 2/22%. As you see the element has the most increasing in the heating treatment because of gravity of this treatment, then is

the discontinuous treatment and the least one is continuous treatment.

In the heating treatment the amount of Potassium increases 25%, Magnesium 80 %, Sodium 28%, calcium 50%, chlorine 85/7%, Bicarbonate 52/1%, lime 2/72%, Acidity 3/27% electrical conductivity 24/9 %. Elements increasing percentage is shown in the table 7.

Table 7 - Percentage of elements and parameters increases in different treatments.

EC (dS/m)	pH	Lime (%)	HCO ₃ ⁻ (meq/lit)	Cl ⁻	Ca ²⁺	Na ⁺	Mg ²⁺	K ⁺	
14.7	1.3	1.28	8.6	57.1	16.6	16	28.5	12.5	continuous treatment
22.1	2.22	1.42	21.7	71.4	33.3	22	60	12.5	Fitful treatment
24.9	3.27	2.72	52.1	85.7	50	28	80	25	heating treatment

The reason of electrical conductivity increasing is that the exit water is used again as an input.

Testing continuous, fitful and heating treatment showed that heating treatment had the most changes, then fitful treatment and finally continuous treatment had the least changes. The most change is for chlorine in heating treatment about 85.7 percent and the least changes for acidity in continuous treatment about 1.3 percent.

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