EFFECT OF UNDERDRAIN TYPES AND MEDIA SPECIFICATION ON FRICTION HEAD LOSSES OF MEDIA FILTER

By

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B.Sc. of Agric.Sci (Agricultural Engineering), Fac.Agric., Cairo Univ., 2010

THESIS

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In

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APPROVAL SHEET

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Date: 5 / 11 / 2019

SUPERVISION SHEET

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DEDICATION

First, I would like to express my deepest thanks to ALLAH (God) for helping me to carry out and complete this work.

I dedicate this work with whom my heart feels thanks; to my family, for his Patience, help and for all the support they lovely offered throughout the period of my post-graduation. I have no one to love more than my family.

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Name of Candidate: Mohamed Gamal Hussien Zaki **Degree:** M.Sc.

Title of Thesis: Effect of Underdrain Types and Media Specification on Friction Head Losses of Media Filter**.**

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ABSTRACT

The main objective of this study was to assess the combination effect of media types, media bed depths, drain types and number of drains on friction head losses in media filter. An experimental study with scaled media filter prototype was conducted with three different media types basalt (1-2.8 *mm*), crushed marble (1.4-1.9 *mm*) and sand (1-1.4 *mm*), three media bed depths (30, 50 and 70 *cm*), and three commercial underdrain types referred as a single drain (SD1, SD2 and SD3) and double drain (DD1, DD2 and DD3) under three superficial velocities (50, 87.5 and 125 mh^{-1}). Under single drains, The best operating combination i.e. minimum friction head losses H_L was achieved using.. (SD2, 30 cm of basalt and 50 mh^{-1}), which was 63.5 mbar. While the maximum H_L was 991 *mbar* resulted by the following combination: SD3, 70 *cm* of sand and 125 mh^{-1}. On the other hand, as expected the H_L values under DD for the three underdrain types were lower than SD. the minimum H_L value was 41 *mbar* under the following combination DD2, 30 *cm* basalt and 50 mh^{-1}.While the maximum H_L was 578.3 mbar for: DD3, 70 *cm* of sand and 125 mh^{-1}. The results showed that the H_L of basalt produced reliable results ($p < 0.05$; $R^2 = 0.865$) in relation to values derived from the independent variables superficial velocity, underdrain type, number of drains and media bed depth. The results emphasized the role of proper selection of underdrain types and number as an impacting factor for saving power in comparison to the other mentioned variables.

Keywords: Media filter, friction Head loss, underdrain, superficial velocity, granular bed.

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