بسم الله الرحمن الرحيم

شبكة المعلومـــــات الجامعية

التوثيق الالكتروني والميكروفيلم

شبكة المعلومات الجامعية

جامعة عين شمس

التوثيق الالكتروني والميكروفيلم

﴿ قـــسـم ﴾

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأفلام قد اعدت دون آية تغيرات

يجب أن

تحفظ هذه الأفلام بعيداً عن الغبار

في درجة حرارة من 15 – 20 مئوية ورطوبة نسبية من 20-40 %

To be kept away from dust in dry cool place of
15 – 25c and relative humidity 20-40 %

بعض الوثائق الأصلية تالفة

بالرسالة صفحات

لم ترد بالأصـــل

STUDY THE PERFORMANCE OF MICROTUBE AS AN EMISSION POINT IN MICRO-IRRIGATION SYSTEM

BY

BOSHRA LOUIZ BISHARA GIRGIS

B. Sc. Agric. Sc. (Agric. Mech.), Menoufiya University, 1988

M. Sc. Agric. Sc. (Agric. Eng.), Menoufiya University, 1997

A Thesis Submitted in Partial Fulfillment

Of

The Requirements for the Degree of

DOCTOR OF PHLOSOPHY

In

Agricultural Science

(Agricultural Engineering)

Agricultural Engineering Department

Faculty of Agriculture

Cairo University

2005

Approval sheet

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This thesis for Ph. D. degree has been approved by:

Prof. Dr. Mahmoud Abdel-Aziz Hassan .....
Prof. of Agric. Eng., Fac. of Agric., Zagazig Univ.

Prof. Dr. Abd Allah El-Amin Badr .....
Prof. and head of Agric. Eng., Fac. of Agric., Cairo Univ.

Prof. Dr. Azmy Mahmoud El-Berry (Supervisor) .....
Prof. of Agric. Eng., Fac. of Agric., Cairo Univ.

Prof. Dr. Mohamed Hanafy Hassan (Principal supervisor) .....
Prof. of Agric. Eng., Fac. of Agric., Cairo Univ.

Date of examination: / / 2005

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Under the supervision of:

Prof. Dr. MOHAMED HANAFY HASSAN
Prof. of Agricultural Engineering,
Agricultural Engineering Department,
Faculty of Agriculture, Cairo University.

Prof. Dr. AZMY MAHMOUD EL-BERRY
Prof. of Agricultural Engineering,
Agricultural Engineering Department,
Faculty of Agriculture, Cairo University.

Dr. Eng. AHMED RIDA ABU-HABSA
Lecturer of Mechanical Power,
Mechanical Power Department,
Faculty of Engineering, Helwan University.

2005

ACKNOWLEDGMENT

I would like to express my sincere thanks, deepest gratitude and appreciation to the supervisor Prof. Dr. Mohamed Hanafy Hassan, Prof of Agric. Eng. Dept., Fac. of Agric., Cairo University for his supervision, scientific support, valuable guidance and encouragement during the research.

My greatest appreciation goes to Prof. Dr. Azmy Mahmoud El-Berry, Prof of Agric. Eng. Dept., Fac. of Agric., Cairo University for providing facilities and supporting to carry out this manuscript presented in this work.

I wish to express indebtedness to Prof. Dr. Eng. Ahmed Rida Abu-Habsa, Prof of Mechanical Power Dept., Fac. of Eng., Helwan University for his expertise, careful comments and providing the development of this document.

I would like to express my deepest and most sincere gratitude to Prof. Dr. Mounir Aziz Morcos, Prof of Agric. Eng. Dept., Fac. of Agric., Cairo University for his valuable effort and great help during working in the thesis.

I heartily thank all staff members of Agric. Eng. Dept., Fac. of Agric., Cairo University.

I am also grateful to the staff members of Hydraulic National Lab of Agricultural Engineering Research Institute (AEnRI) in Dokki, Giza for their great efforts.

Finally I would like to address a very special thanks to my beloved family for their help and support through this study.

Name of Candidate: Boshra Louiz Bishara Girgis **Degree: Ph. D**

Title of Thesis: The Performance of Microtube as an Emission Point in Micro-Irrigation System.

Supervisors: Prof. Dr. Mohamed Hanafy Hassan
Prof. Dr. Azmy Mahmoud El-Berry
Dr. Eng. Ahmed Rida Abu-Habsa
Department: Agricultural Engineering, Fac. of Agric., Cairo University.

Branch: Soil and water Engineering **Approval: / /2005**

ABSTRACT

Studies were conducted to investigate the performance of microtube as an emission point in microirrigation system. The first one was to study the hydraulics of microtube emitters, to get a suitable empirical equation for predicting discharge rates, depending on the data of the experimental determination of these rates under different conditions. The second was to calculate the friction factor in polyethylene pipes applying Darcy-Weisbach equation. The third was to apply modeling techniques to form a simple model for designing single microirrigation lateral with the microtube as an emission device using the experimental data that was simulated the uniformity coefficient of water application.

The current investigation was carried out in Hydraulic National Lab of Agricultural Eng. Research Institute in Dokki, Giza. The first laboratory experiments were conducted to study the relationship between the parameters microtube diameter (d), microtube length (l), operating head (p), lateral diameter (D) and microtube discharge (q) as estimated for turbulent flow conditions. A computer numerical analysis program (the least square method) was used to determine empirical equation (4.1) for flow rate of microtube diameters 3.15 and 4.3 mm as follows:

$$q = kp^{a} d^{b} l^{c} (d / D)^{e} \qquad (4.1)$$

in which q = the discharge of the microtube (L/h); p = the pressure at entrance of microtube (bar); d = the inside diameter of microtube (mm); l = the length of microtube emitter (m); D = the internal diameter of lateral (mm); and k, a, b, c, e = the constants. The values of constants k, a, b, c and e are given as 2.8, 0.62, 2.54, -0.26 and -0.5 respectively. The equation has correlated the observed values with a correlation coefficient of 0.92. The microtubes length about of meter or less affects the discharge values for microtube (3.15 and 4.3 mm), and increasing of microtube length decreases the values of discharge. Each microtube diameter and lateral diameter has its effect on the microtube discharge. Increasing the ratio between microtube diameter and lateral diameter decreases the values of microtube discharge.

In the second laboratory experiments for evaluating the average friction factor, relative roughness and absolute roughness, these values were found 0.039081, 0.0063 and 0.084 mm respectively for the lateral size of 13.35 mm. The average friction factor, relative roughness and absolute roughness values were found 0.039074, 0.0073 and 0.118 mm for the lateral size of 16.15 mm. The average friction factor, relative roughness and absolute roughness values were found 0.037328, 0.005 and 0.09 mm for the lateral size of 18.2 mm. The Reynolds number was found to increase from 6376.8 to 16779.6 for the lateral size of 13.35 mm with increase in the flow velocity from 0.45 to 1.2 m/s. The Reynolds number was found to increase from 8971.6 to 21613.3 for the lateral size of 16.15 mm with increase in the flow velocity from 0.523 to 1.26 m/s. The Reynolds number was found to increase from 11327.2 to 26947.8 for the lateral size of 18.2 mm with increase in the flow velocity from 0.586 to 1.39 m/s. The total range of Reynolds number was found to be on the side of the turbulent range for the microirrigation lateral sizes of 13.35, 16.15 and 18.2 mm. The measured and calculated pressure drop is highest for small lateral diameter 13.35 mm and that with increasing of lateral diameter the measured and calculated pressure drop will decrease.

A computer model for designing single microirrigation lateral with the microtube as an emission device was constructed to evaluate the Christiansen's uniformity coefficient.