شبكة المعلومات الجامعية

بسم الله الرحمن الرحيم

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

شبكة المعلومات الجامعية

جامعة عين شمس

التوثيق الالكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأفلام قد أعدت دون أية تغيرات

يجب أن

تحفظ هذه الأفلام بعيدا عن الغبار

في درجة حرارة من ١٥-٢٥ مئوية ورطوبة نسبية من ٢٠-٤٠%

To be Kept away from Dust in Dry Cool place of 15-25- c and relative humidity 20-40%

بعض الوثائـــــــق الاصليـــــة تالفـــة

بالرسالة صفحات لم ترد بالاصل

Cairo University
Faculty of Agriculture

DEVELOPMENT OF A MACHINE FOR BRIQUETTING PLANT RESIDUES

By

Mohamed Mahmoud Ibrahim Ahmed

B.Sc. Agric. (Agric. Mech.), Cairo University, Faculty of Agriculture, 1997

M.Sc. Agric. (Agric. Eng.), Mediterranean Agron. Inst. of Bari, ITALY, 2001

THESIS

Submitted In Partial Fulfillment of
The Requirements For The Degree of

DOCTOR OF PHILOSOPHY

In
Agricultural Sciences

(Agricultural Engineering)

2006

DEVELOPMENT OF A MACHINE FOR BRIQUETTING PLANT RESIDUES

By

Mohamed Mahmoud Ibrahim Ahmed

B.Sc. Agric. (Agric. Mech.), Cairo University, Faculty of Agriculture, 1997

M.Sc. Agric. (Agric. Eng.), Mediterranean Agron. Inst. of Bari, ITALY, 2001

THESIS

Submitted In Partial Fulfillment of
The Requirements For The Degree of

DOCTOR OF PHILOSOPHY

In
Agricultural Sciences

(Agricultural Engineering)

Supervised by:

1. **Prof. Dr. Samy Mohamed Younis**
   Professor of Agricultural Engineering
   Faculty of Agriculture, Cairo University (**Principal Supervisor**)

2. **Dr. Abd El -Aal Zaki Taieb**
   Associate professor of Agriculturarl Engineering
   Faculty of Agriculture, Cairo University

3. **Dr. Badr Shaban Nagy Azzam**
   Associate professor of Mechanical Design and Production,
   Faculty of Engineering, Cairo University

Name of Candidate: Mohamed Mahmoud Ibrahim Ahmed **Degree:** Ph.D.

Title of Thesis: ***DEVELOPMENT OF A MACHINE FOR BRIQUETTING PLANT RESIDUES***

Supervisors: Prof. Dr. Samy Mohamed Younis - Dr. Abd El-Aal Zaki Taieb - Dr. Badr Shaban Nagy Azzam.

Department: Agricultural Engineering

Branch: **Approval:**

ABSTRACT

The aim of this study was to develop a machine that deals with the plant residues (cotton stalks). This aim was planed to be realized through consecutive stages and the findings are as follows:

1) Compaction behavior of cotton stalks: the results showed that densities of the compaction material ranged from 958 to 1180 kg/m^3. The particles size ranged from 3-mm to 1.4-mm, material is categorized as very compressible. The compaction energy represents about (0.047-0.01) % of cotton stalks energy.

2) Coefficient of friction between cotton stalks grinds and metal surfaces ranged from 0.68- 0.86.

3) From the theoretical analysis of the pelleting process, the required force and power are 3616 N and 3 kW.

4) Numerical analysis by using computer package helped to predict any high stresses before the manufacturing.

5) The machine was operated at speeds 60, 80 and 100 rpm of the main shaft, at different levels of the water content (7, 15, 20%), particle size (0.7, 1.7, 3 mm) and bonded material (molasses 5, 10, 15%). The productivity ranged 56.7, 75.7 and 96.5 kg/h with different speeds

6) Technical and financial evaluation of the machine:

- Using water as bonded material is not good for the quality of the pellet but using the molasses is recommended for good quality of the pellet.
- The heating value of cotton stalks is 3938 kCal/kg and ash content is 3.4 %.
- The total required energy of the pelleting (from the cutting to pelleting process) is 66.35 kW.h/Ton that represents about 1.45 % from the total energy of cotton stalks.
- The total cost of the machine is 10 LE/h. The IRR is 52% and NPV is 3139.19 LE. The pay pack period is 2.65 year.

ACKNOWLEDGMENTS

I wish to express his gratitude and appreciation to **Prof. Dr. SAMY MOHAMED YOUNIS**, Professor of Agricultural Engineering, Faculty of Agriculture, Cairo University for his sincere guidance, valuable advice and stimulating supervision during the course of development of the thesis.

Also, I wish to express his deep thanks for **Dr. ABD EL -AAL ZAKI TAIEB**, Associate Professor of Agricultural Engineering, Faculty of Agriculture, Cairo University, for his great help, continuous encouragement, guidance and enormous contribution in preparing this thesis.

I wish to express my appreciation, and grateful to **Dr. BADR SHABAN NAGY AZZAM** Associate professor of Mechanical Design and Production, Faculty of Engineering, Cairo University, for his effort, advice and numerous discussion, guidance, sincere deep help and encouragement during of this work, who supported and sustained me in build this work. Thanks for him, for considering me as his younger brother.

I want to take the opportunity to thank them all, especially to **Prof. Dr. ABDALLAh AL-AMIN BADR** Professor and Head of Agricultural Engineering Department, Faculty of Agriculture, Cairo University, **Prof. Dr. AHMED EL-RAIE EMAM SULIMAN** Professor of Agricultural Engineering, Faculty of Agriculture, Cairo University and **Dr. MOHAMED IBRAHIM GHONIMY**, Associate Professor of Agricultural Engineering, Faculty of Agriculture, Cairo University.

I am sincerely thankful to the friendly professional help of all the staff of Agricultural Engineering Department, Faculty of Agriculture, Cairo University.

TABLE OF CONTENTS