



شبكة المعلومات الجامعية

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ





شبكة المعلومات الجامعية



شبكة المعلومات الجامعية

التوثيق الالكتروني والميكرو فيلم

جامعة عين شمس

التوثيق الالكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأفلام قد اعدت دون أية 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 %



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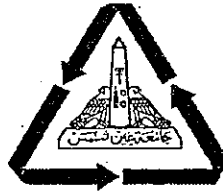
بعض الوثائق الأصلية تالفة



شبكة المعلومات الجامعية



بالرسالة صفحات
لم ترد بالأصل



Institute of Environmental Studies and Research

Ain Shams University

Design of a solar dryer for agricultural products to conserve the environment

By

KHALIL SAYED KHALIL

B. Sc. (Mech. Eng.), Faculty of Engineering, Zagazig University, (1979)

A Thesis Submitted in Partial Fulfillment

Of

The Requirement for the Degree of

MASTER OF SCIENCE

In

Engineering Environmental Science

Department of Engineering

Institute of Environmental Studies and Research

Ain Shams University

2002

BVONS

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APPROVAL SHEET

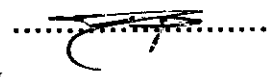
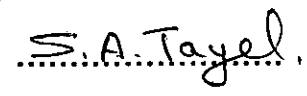
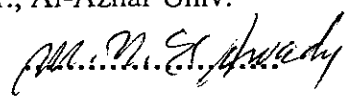
Design of a solar dryer for agricultural products to conserve the environment

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Abstract.

Khalil Sayed Khalil, studies on "Design of a solar dryer for agricultural products to conserve the environment " Unpublished Master of Science, Ain Shams University, Institute of Environmental Studies and Research (2002).

The aim of this study is to design and evaluate some cabinet solar dryers to utilize solar energy with optimum efficiency for drying grain products of rice crop, to keep the environment free from pollution and save fossil fuel.

Five types of solar dryers were constructed and elaborated:

- 1- Tent dryer.
- 2- Natural-convection dryer.
- 3- Dryer with air forced under tray.
- 4- Dryer with circulated air.
- 5- Forced air dryer with additional collector.

The hot-air temperatures in the loaded cabinet ranged between 39 and 48 °C according to type of dryer and environmental conditions (Oct. 1998, from 9 AM. to 4 PM.) .

Without cabinet load, the temperatures ranged between 46 and 56 °C. The highest temperatures corresponded to the natural-convection dryer, while the lowest corresponded to dryer of tent and forced-air with additional collector.

The study includes details of the following variables, within conditions of experiments :

- Relative humidities inside the cabinet of air-forced dryer ranged between 25 – 84 %.
- The inlet air velocities were 0.17 – 1.00 m/s.
- Moisture content experiments of rice grain decreased to min. of 11.9 % by the forced-air tray dryer.
- Cracking ratio 1.0 – 2.0 % according to drying coefficient and rate of grain moisture-removal.
- Thermal efficiencies 4.6 – 64.2 %. The lowest obtained from natural-convection dryer, and the highest from forced-air dryer with additional solar collector.
- The drying costs of air-forced under tray dryer (D_1), circulated air-forced dryer (D_2), air-forced dryer with additional collector (D_3), natural-convection dryer (D_4),

tent dryer (D_5) and traditional method (T_r) were 292, 355, 600, 530, 660, and 750 LE/ton respectively.

- The minimum drying cost (292 LE/ton) was obtained with air-forced under tray dryer. So, it is the best dryer, provided that other factors are indifferent.
- The dryer with air-forced under-tray gave useful energy of 2780000 kcal per year, which is equivalent to 370, 260, 252, or 244 kg of coal, diesel fuel, kerosene, and gasoline respectively.

Using designed dryer instead of diesel-powered one is estimated to decrease the environmental pollution by 2.04, 6.24, and 1.34kg per year of CO, hydro carbon gases and sulfur dioxide respectively.

Keywords: Solar dryer design, natural convection, temperature, air velocity, thermal efficiency, grain thickness, and cost.
Rice drying, moisture content, and crack ratio.