Distribution: limited
Provisional reproduction
without figures or bibliography

UNESCO/NS/AZ/354
Teheran Symposium PaperNo.18
Paris, 27 August 1958

UNITED NATIONS EDUCATIONAL,
SCIENTIFIC AND CULTURAL ORGANIZATION

MAJOR PROJECT ON SCIENTIFIC RESEARCH ON ARID LANDS

Unesco-Iran Symposium on Salinity Problems in the Arid Zones

Teheran, 11-15 October 1958

An experiment with a vertical solar still

by

Giorgio NEBBIA

Istituto di Merceologia, Università di
Bologna (Italy)

The distillation of saline water with solar energy presents practical interest where other energy sources are not available and where relativ·ely small quantities of water are required.

It is in fact well known that in the best working conditions the maximum obtainable amount of distilled water is about 0.25 gallons/(sq.ft.)(day).

In the past years a great number of experimental models has been investigated; although the exposed surface was generally less than 100 sq. ft. many important informations have been collected (1-7).

In order to build great solar stills for the work in arid zones it is necessary (a) to lower the cost of the stills with simpler designs, (b) to improve the design of the stills reducing the losses and increasing the water yield per surface unit and (c) to increase the knowledge on building materials and on their behaviour in the severe conditions of work.

In the present paper, a solar still of new design is described (8) characterized by a vertical structure; in general the solar stills are assembled with horizontal trays containing the salt water, covered with a tight inclined glass roof.

During the Saline Water Symposium held in Washington, D.C., U.S.A., in November 1957 (6) Dr. Wilson of the Commonwealth Scientific and Industrial Research Organization of Melbourne, Australia, described a solar still in which four trays were assembled one upon the other in a room closed by glass plates.

Such a still had been designed in order to collect the solar radiation when the inclination of the sun is low, as in the arctic regions.

The author has extended such design and has built the solar still illustrated in Figures 1 and 2. In this still there are four rectangular trays, each 1' x 3' x 0.13' (3 sq. ft.) assembled in a glass cage closed at the bottom by an inclined iron plate. The trays are made of aluminium, electrolytically blackened.

The distance between the trays is about 10 inches. The trays are surrounded by hot still air and this assures a good insulation to the water heated by the solar radiation and minimizes the heat losses through the bottom of the trays; such losses may be large in horizontal solar stills.

The orientation of the still is East-West with the inclined face orientated to the South.

The water to be distilled is introduced in the first upper tray through an inlet tube and then passes in the lower trays. The sun heat is absorbed by the water in the black trays; the water evaporates and the water vapour condenses on the inner surfaces of the glass cage and is collected at the bottom and then in the measuring vessel.

The preliminary results relative to the first two months of work are contained in graph No.1 representing the daily water production vs. the daily sun radiation on horizontal surface.

From such a graph it appears that about 550 BTU/(sq.ft.)(day) are necessary to warm the still in order that distillation begins.

When the distillation has begun about 1850 BTU of solar energy are required to distill 0,100 U.S. gallons of water. This represents an utilization of 50 per cent of the incident radiation, considering that in a ~~simple~~ single effect distillation process (operating at atmospheric pressure) about 9200 BTU are required per gallon of distilled water.
U.S.

All these considerations refer to the whole surface of the trays, i.e. 12 sq.ft.

NVD For this whole-surface the yield of distilled water corresponds to an utilization of 35 per cent of the incident radiation.

However, the tray surface reached by the solar radiation varies greatly at the various day hours; it is about 1,2 sq.ft. until the sun inclination is lower than 35°; when such inclination increases the upper tray is always exposed but the lower ones are decreasingly exposed being shadowed by the other ones.

The amount of distilled water per unit of covered ground area is very large.

The apparent high efficiency and simplicity of assembly suggest that the vertical solar stills are promising.

Distribution limitée

UNESCO/NS/AZ/354
Colloque de Téhéran Abstract n° 18
PARIS, le 29 août 1958
Traduit de l'anglais

ORGANISATION DES NATIONS UNIES
POUR L'EDUCATION, LA SCIENCE ET LA CULTURE

Compte rendu d'une expérience portant sur l'emploi d'un distillateur solaire "vertical"

par G. NEBBIA

RESUME

On a expérimenté un distillateur solaire dont les plateaux sont placés dans la position verticale - et non horizontale comme ils le sont d'habitude - en vue de réduire les pertes de chaleur qui se produisent à travers le fond, et de diminuer la superficie occupée par l'appareil.

L'eau salée est contenue dans quatre plateaux de 0,27 m^2 chacun et placés dans un espace clos de plaques de verre.

Les plaques de verre et les plateaux sont montés sur un châssis de fer ; les plateaux sont en aluminium noirci.

L'auteur indique quelles quantités d'eau ont été obtenues et il commente les résultats de cette expérience.