A MODIFIED BASIN-TYPE SOLAR STILL

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To improve the efficiency and reduce the initial cost of solar stills a modified unit was designed and tried. The trials showed that besides the top cover, the side walls when fabricated from glass help in increasing its fresh water yield by about fifty per cent. Further a unit with glass sheet costs just half than that of R.C.C. materials.

Solar stills are used for the conversion of sea or brackish water into fresh water using solar radiation as a heat energy source, available free to the extent of 47% on the surface of the earth[1]. Most of these stills differ in 'geometry and material[2]' and are even today under active improvements with the main objectives (*a*) to increase their fresh water yields and (*b*) reduce their initial costs of construction.

Keeping this in view a few stills developed earlier, Delyannis[3] & Gomkale[4] were studied and a new unit of modified design and materials (Fig. 1) was attempted and subjected to field trials. Some of the salient observations made from few experiments, details stated below, are given as net inference in the end.

EXPERIMENTAL

Each morning the unit with an intake of 2 litres of sea water in the smaller still (top area $0\cdot16$ m^2, side walls area $0\cdot32$ m^2) or 3 litres, in the larger still (top area $0\cdot40$ m^2; side-wall $0\cdot396$ m^2) of same configuration, was exposed to the sun in the east-west direction on one of the terraces of the National Institute of Oceanography building. (Fig. 2) Fresh water yields from the top and the four side-wall glass covers were collected separately for 24 hours from 0900 hr till the next day and measured. In addition, the intensity of solar radiation in the vicinity of the unit was measured on hourly basis by using a pyranometer '*Star 688*' and the daily integrated heat energy (IHE) per square metre surface area was calculated on the lines as suggested by Anand & Jayaraman[5].

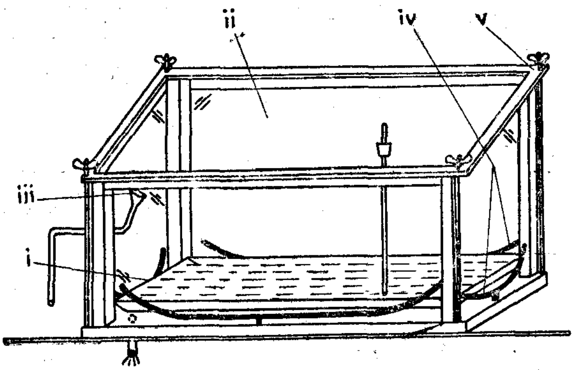

Fig. 1—A schematic cross-section of the modified basin-type solar still; (*i*) Water basin; (*ii*) Glass top cover; (*iii*) Top condensate collection gutter; (*iv*) Side wall condensate collection gutter and (*v*) M.S. rectangular flat to hold the top cover.

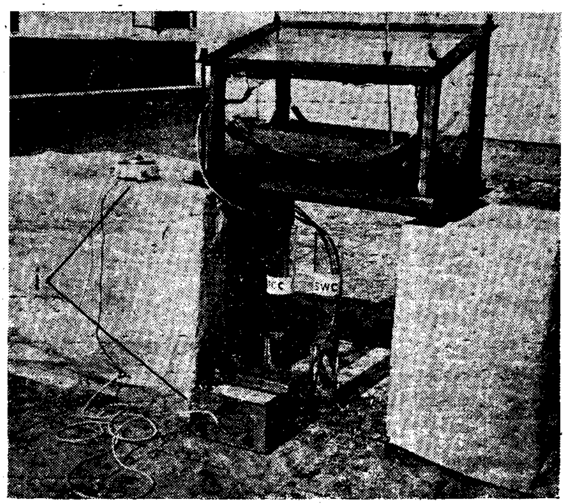

Fig. 2—Experimental set up of the still--Pyranometer.

RESULTS AND DISCUSSION

The data obtained from a few typical runs are presented in Table 1.

TABLE 1

FRESH WATER YIELDS FROM TOP AND SIDE-WALL COVERS, THEIR AREAS & DAILY INTEGRATED HEAT ENERGY

Sr. No.	Date	Area top cover (m^2)	Area side wall cover (m^2)	Top cover yield (litres)	Side-wall covers yields (litres)	IHE (K Cal m^{-2} day^{-1})
			Smaller still			
1	8-2-76	0·16	0·32	0·26	0·28	4,224
2	10-2-76	,,	,,	0·20	0·21	3,846
3	13-2-76	,,	,,	0·26	0·26	4,188
4	18-2-76	,,	,,	0·27	0·27	4,214
			Larger still			
5	4-10-76	0·40	0·396	0·80	0·39	4,650
6	7-10-76	,,	,,	0·87	0·44	4,412
7	12-1-77	,,	,,	0·73	0·35	3,950
8	13-1-77	,,	,,	0·78	0·38	4,180
9	14-1-77	,,	,,	0·75	0·37	4,390
10	15-1-77 (0900-1300)	,,	,,	0·42	0·21	—
11	17-1-77	,,	,,	0·72	0·36	4,135

The above data indicate that the fresh water yields both from the top and side-wall covers are obtained nearly in the ratio of 2 : 1 on equal area basis. The study reveals that the side-wall glass surfaces do play a quantitative role in the transmission of the solar energy as well as in the condensation of the vapours. But the present experiments do not show their contributive ratios. However, they do indicate that out of the five glass surfaces, depending upon the position of the sun two or three surfaces transmit the solar radiation directly while the rest receive only the diffused or scattered energy. Further, out of these two or three surfaces, only one at a time gets the direct solar radiation.

In addition to cover area, cover absorptivity, reflectivity and depth of water in a still which were kept similar in the present experiments, the efficiency of a still depends upon the atmospheric temperature, wind velocity and solar radiation intensity[6]. An analysis of other parameters shows that the integrated heat energy primarily controls the output of fresh water to greater extents.

Thus without increasing the surface area of a still and consequently occupying same terrace area, the output of fresh water of the unit can be substantiated by about 50 per cent.

Further, a comparison on cost basis shows that the side-walls made of glass sheets would cost half as much as the unit with R.C.C. materials.

CONCLUSION

Thus the modifications effected in design and materials ensure higher output of the fresh water as well as reduction in the initial cost; and would offer an adoptable and economical solution to the Defence establishments stationed at places where no other but marine or brackish waters are available for desalination.

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