**Materials and its Characterization**
**Vol: 2(3), 2023**
**REST Publisher; ISBN: 978-81-948459-0-4**
Website: https://restpublisher.com/book-series/mc/

# Investigation Of Vital Impact Factor For Rectangular Solar Still Under The Slanding Angle Of 250 Using Energy Absurbing Material Granite And Goli By Its Construction Of Empirical Formula

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**Abstract.**Solar still is important equipment while the abundant solar energy is available in the earth. Rectangular still is used to get large area of illumination by the sun light. When compared with other shape of solar still. It is essential to optimize the vital yield. The main important factors to be considered here are solar radiation and water basin temperature. The rectangular shape is selected due to high exposure of sun light on the apparatus. Here the slanting angle is 25 degrees
**Keywords:** Solar still, Desalination, slanting angle 250, solar distillation, single basin, peak impact factors.

## 1. EXPERIMENTATION

We are using rectangular solar still having the slope glass of angle 250with energy absorbing material goli and granite.

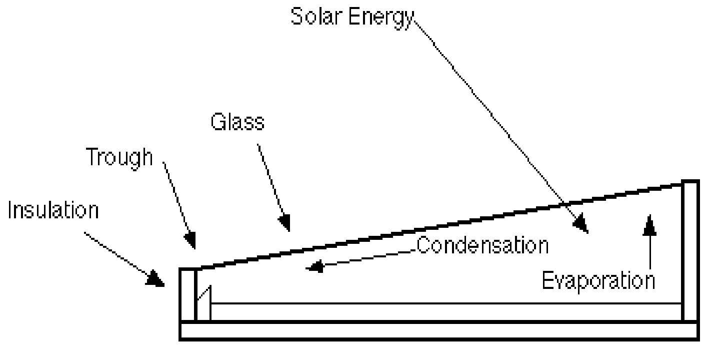
***Construction:***This still is fully constructed by glass plates. The bottom side of still is available in the shape of rectangular. Above that a single slope glass plate creating 25 degrees with horizontal is placed. Rubber tubes are provided to fit the slope glass plate on the bottom rectangular shape as a tight seal.

***Technical specification***

| | |
|---|---|
| Length of glass | : 42 cm |
| Height of glass | : 30 cm |
| Length of slope glass | : 24 cm |

***Glass metal:***The basin is partially filled with water which is fully surrounded by 5 mm thickness glass plate. The slope glass allows the sun heat into the basin by meansofradiation. The basin water gets evaporated and it is made to fall on the slanting glass for collecting in the channel around the basin as the passage to yield the output from a tube.

***Drawing***



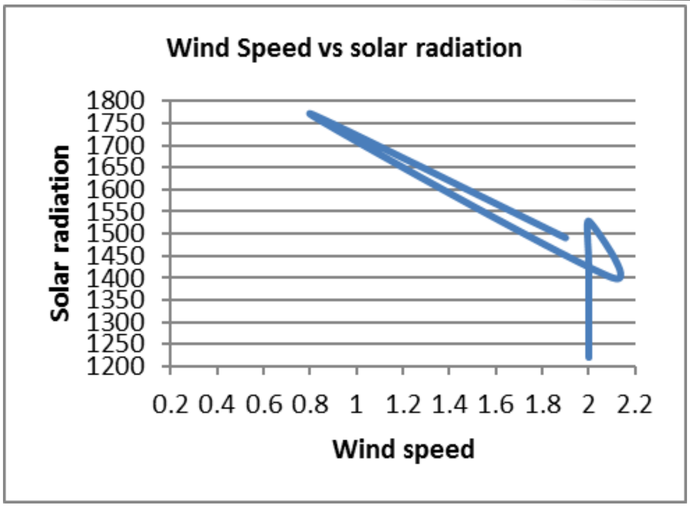



**FIGURE 1.** Wind speed vs Solar radiation

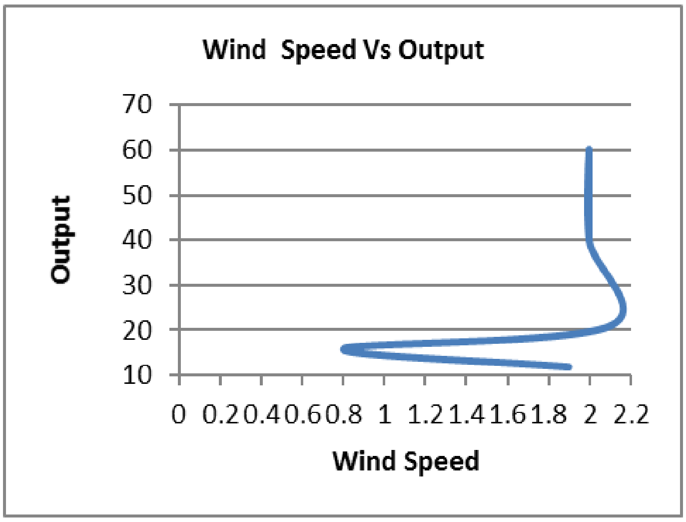



**FIGURE 2.** Wind speed vs output

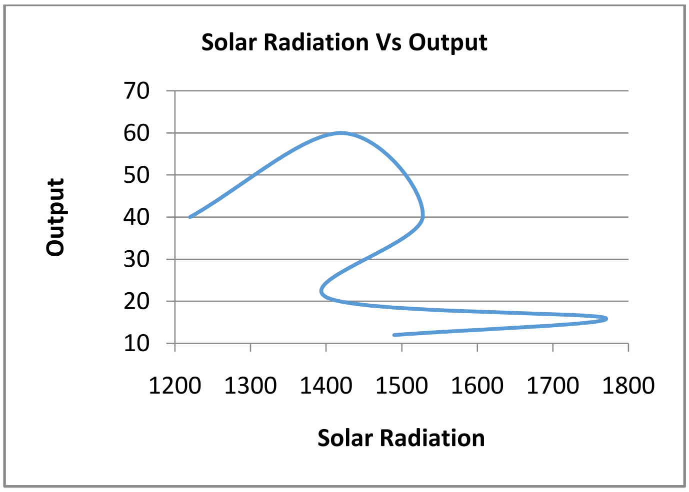



**FIGURE 3.** Solar radiation vs output

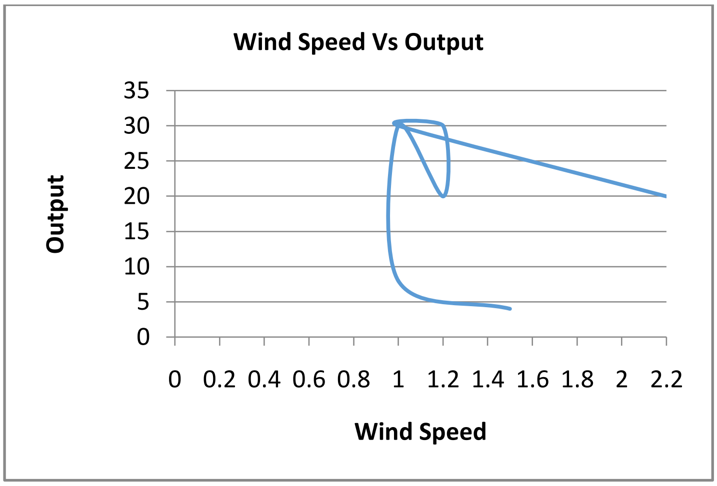



**FIGURE 4.** Wind speed vs Output

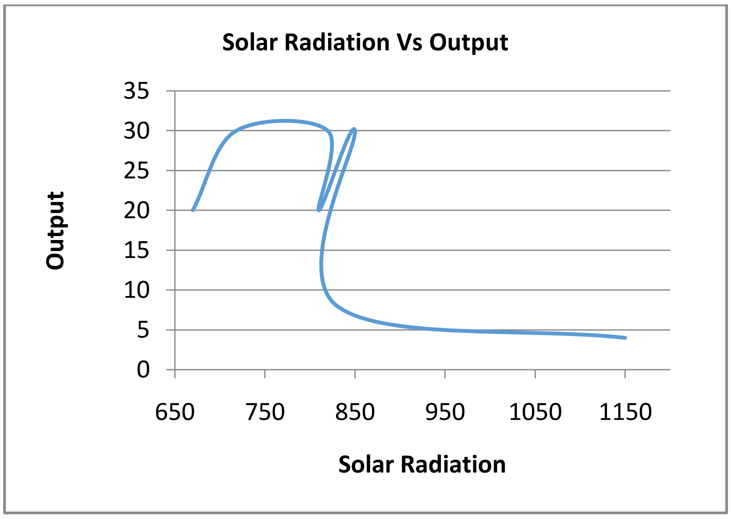



**FIGURE 5.** Solar radiation vs output

## 2. METHODOLOGY

The mirror and paste are purchased from local mirror shop. Then the rectangular glass basin is constructed according to the design. The edges of mirror were sharpened by means of filing by a file. Here 500 ml water is taken to experimentation. Energy absorbing material:Marbonite – Angle 25

| Time (hr) | Atm temp | Lux meter (lux) | Anemo meter m/sec | Water temp (0c) | Condensate temp (0c) | Output (ml) |
|---|---|---|---|---|---|---|
| 9-10 AM | $38^0$ | 1490 | 109 | $38^0$ | $40^0$ | 12 |
| 10–11 AM | $33.5^0$ | 1770 | 0.8 | $55^0$ | $42^0$ | 16 |
| 11-12 AM | $45.5^0$ | 1400 | 2.1 | $60^0$ | $48^0$ | 21 |
| 12–1 PM | $45^0$ | 1528 | 2.0 | $61^0$ | $45^0$ | 40 |
| 1–2 PM | $42^0$ | 1420 | 2.0 | $65^0$ | $45^0$ | 60 |
| 2-3 PM | $49^0$ | 1220 | 2.0 | $60^0$ | $42^0$ | 40 |

Energy absorbing material: Goli – Angle 25

| **Time (hr)** | **Atm temp** | **Lux meter (lux)** | **Anemo meter m/sec** | **Water temp (0c)** | **Condensate temp (0c)** | **Output (ml)** |
|---|---|---|---|---|---|---|
| 10–11 AM | $36.4^0$ | 1150 | 1.5 | $33^0$ | $32^0$ | 4 |
| 11-12 AM | $35.4^0$ | 830 | 1 | $54^0$ | $33^0$ | 8 |
| 12–1 PM | $36^0$ | 850 | 1 | $61^0$ | $34^0$ | 30 |
| 1–2 PM | $35^0$ | 810 | 1.2 | $61^0$ | $31^0$ | 20 |
| 2-3 PM | $36^0$ | 820 | 1.2 | $60^0$ | $40^0$ | 30 |
| 3-4 PM | $35^0$ | 718 | 1.0 | $57^0$ | $38^0$ | 30 |
| 4-5 PM | $32^0$ | 670 | 2.2 | $52^0$ | $37^0$ | 20 |

Here the fluctuation of output occurs due to the various solar radiation and wind velocity at different climate condition so we have to optimize the wind velocity and solar radiation to yield high output.

| **Observation** | **Solar radiation** | **Wind Velocity** | **$x_1$** | **$x_2$** | **Output** |
|---|---|---|---|---|---|
| 1 | 1490 | 1.9 | -0.018 | 0.6923 | 12 |
| 2 | 1770 | 0.8 | 1 | -1 | 16 |
| 3 | 1400 | 2.1 | -0.3454 | 1 | 21 |
| 4 | 1528 | 2.0 | 0.12 | 0.8461 | 40 |
| 5 | 1420 | 2.0 | -0.2727 | 0.8461 | 60 |
| 6 | 1220 | 2.0 | -1 | 0.8461 | 40 |

Above fluctuation is reading occurs due to the cloudy and clear sky with the level of earth above the sea level. for max $\Sigma_1 = 1770^0$c, min $\Sigma_1 = 1220^0$c. for max $\Sigma_2 = 2.1$ m/sec min $\Sigma_2 = 0.8$m/sec

$\Sigma_1 - [\max\Sigma_1 + \min \Sigma_1] /2$

$X_1 = [\max \Sigma_1 - \min \Sigma_1]/2$

1490– [1770 + 1220] /2

$X_1 = [1770 - 1220]/2$

1490– [1495] /2

$X_1 = [275]/2$

**$x_1 = -0.018$**

$\Sigma_2 - [\max\Sigma_2 + \min \Sigma_2] /2$

$X_2 = [\max \Sigma_2 - \min \Sigma_2]/2$

1.9 – [2.1 + 0.8] /2

$X_2 = [2.1 - 0.8]/2$

1.9 – [1.45] /2

$X_2 = [0.65]/2$

**$X_2 = 0.6923$**

We will fit the model

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \Sigma$$

The least squares fit with regression co- efficient repotted to one decimal place is

$\bar{Y} = 1512.7 - 393.2X_1 + 1133.4X_2$

For angle 250 with energy absorbing material Marbonite

$\Sigma_1 - 1495$ $\Sigma_2 - 1.45$

$\bar{Y}$ = 1512.7 - + 1133.4

275 0.65

From the empirical formula. We conclude that $\Sigma_1$ must be greater than 1495 lux and $\Sigma_2$must be lower than 1.45 m/sec to yield high output.Here the contradiction occurs due to the varying climatic condition at time to time. So we have to take Σ1must be as high as above the value of 1495 lux and Σ2 must be as low as below the value of 1.45 m/sec. The error value must also be added with this to yield high result. otherwise it is taken as the solar radiation as optimum value of 1495 lux and wind speed of 1.45 m/sec without considering error duo to varying climatic condition at time to time.For angle 250 Energy absorbing material as Goli

| Observation | Solar radiation | Wind Velocity | $x_1$ | $x_2$ | Output |
|---|---|---|---|---|---|
| 1 | 1150 | 1.5 | 1 | -0.2 | 4 |
| 2 | 830 | 1 | -0.3333 | -1.2 | 8 |
| 3 | 850 | 1 | -0.25 | -1.2 | 30 |
| 4 | 810 | 1.2 | -0.4166 | -0.8 | 20 |
| 5 | 820 | 1.2 | -.375 | -0.8 | 30 |
| 6 | 718 | 2.0 | -0.8 | 0.8 | 30 |
| 7 | 670 | 2.2 | -1 | 1.2 | 20 |

The above fluctuation is readings happens due to different climatic condition. Cloudy atmosphere and clear sky. As well as evaporation rate of water is de- motivated by the high wind speed.for max $\Sigma_1 = 1150^0$c, min $\Sigma_1$ = $670^0$c. for max $\Sigma_2$ = 2.1 m/sec min $\Sigma_2$ = 0.8m/sec

$\Sigma_1$ – [max$\Sigma_1$ + min $\Sigma_1$] /2

$X_1$= [max $\Sigma_1$ - min $\Sigma_1$]/2

1150– [1150 + 670] /2

$X_1$= [1150 -670]/2

1150– 910

$X_1$= 240

$\Sigma_1$ - 910

$X_2$= 240

$\Sigma_2$– [max$\Sigma_2$ + min $\Sigma_2$] /2

$X_2$= [max $\Sigma_2$ - min $\Sigma_2$]/2

1.5 – [2.2 + 1] /2

$X_2$= [2.2 -1]/2

1.5 –1.6

$X_2$= 0.5

$\Sigma_2$ – 1.6

$X_2$= 0.5

We will fit the model

$Y = \beta 0 + \beta 1 X1 + \beta 2 X2 + \Sigma$

The least squares fit with regression co- efficient repotted to one decimal place is

$\bar{Y}$ = 2224.8 – 499.9$X_1$- 504.3X2

For angle 250 with energy absorbing material goli

Σ1 – 910 Σ2 – 1.6

$\bar{Y}$=2224.8 -499.9 -------------- -504.3 ------------

240 0.5

From the empirical formula. The wind speed should be minimum and solar radiation should be maximum. We conclude that $\Sigma_1$ must be greater than 910 lux and $\Sigma_2$ must be lower than 1.6 m/sec to yield high output. From the two empirical formula Goli as absorbing material yields high output hen compared with Marbonite. because at solar radiation jusr greater than 910 lux yields high output. For marbonite. But at solar radiation greater than 1495 only yields high output. So Goli as energy absorbing material only yields high output when compared with marbonite.

## 3. CONCLUSION

1. Under the slanting angle of 25-degreemarbonite as energy absorbing material yields maximum efficiency at day time 1 to 2 pm valued 60 ml. The day output is 189 ml whereasgoli is 142 ml
2. Theemperical formula is derived for peak impact factors as solar radition and basin water temperature
3. Finally the very high impact factors is found out as firstly solar radition and then basin water temperature at various climatic cindition
4. From the emperical formula∑_1and ∑_(2 ) must be high toyield best result
5. For marbonite the solar intensity should be more then1495lux and wind speed must be lower than 1.45 m per second
6. Forgoli the solar intensity should be more than 910 lux and wind speed must be lower than 1.6 m per second

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