ZIBELINE INTERNATIONAL™ PUBLISHING

ISSN: 2616-4302 (Online)
CODEN: AMMCFL

Acta Mechanica Malaysia (AMM)

DOI: http://doi.org/10.26480/amm.01.2024.78.79

REVIEW ARTICLE

CREATE A NEW SOLAR CONSTANTS (a,b) TO CALCULATE THE INTENSITY OF SOLAR RADIATION FROM THE EQUATION OF SOLAR BRIGHTNESS, SPECIFICALLY IN LIBYA

Osama D.H. Abdulrazig

Department of Mechanical Engineering -Bright Star University, MiSurata University, Libya.
**Corresponding Author Email: bndawodd@yahoo.co.uk*

ARTICLE DETAILS

Article History:

Received 02 August 2024
Revised 18 September 2024
Accepted 03 October 2024
Available online 24 October 2024

ABSTRACT

The fact of the matter is that the use of the equation for calculating the intensity of solar radiation in terms of the percentage of solar brightness developed, which is also one of my inventions. It is necessary to use solar constants (a, b), and these constants do not exist for any Libyan city, where the researcher who wants to calculate the intensity of solar radiation for any city in Libya uses the constants of the city of Algiers or the city of Cairo, as the nearest solar area to Libya, as a result of this use when applying the constants of the city of Algiers or Cairo in the equation for calculating the intensity of solar radiation in terms of the percentage of solar brightness, we will find that there is a very large difference between the values calculated by the equation for calculating the intensity of solar radiation in terms of the percentage of solar brightness and the values measured by the pyrometer.

KEYWORDS

Equation, solar constants, solar radiation, solar brightness

1. INTRODUCTION

The sun is the source of life and the source of the energies of Earth, the solar energy is reaching the surface of the earth turn into two main forms: chemical energy and geothermal energy, each of which is reflected in several aspects lead to the emergence of a number of energies (Osama, 2021). When the sun's rays fall on the leaves of plants it reserved as a chemical energy membership form, and form the structure of plants and its source of nutrition and other organisms in general. The emergence of an environmental problem caused by the increase in fossil energy and demand, especially by the industrialized countries, which are primarily responsible for this problem through the consumption of a large amount of carbon, oil and gas (Abdulrazig, 2021). Otherwise, the increase in the prices of these resources leads to the search by the international community for alternative sources of energy which can ensure energy saving in hand and environmental protection. This opens the mind to renewable energy and investment in such as: solar, wind and water. In this field, the world takes an important consideration for these energies and is geared towards developing and improving them, especially solar energy (ASHRAE, 1995-1996; Duarah et al., 2013).

2. THE AIM OF THIS STUDY

Finding and developing solar constants for the State of Libya, so that researchers use them in the field of calculating the intensity of solar radiation in order to obtain more accurate and correct results when calculating the intensity of solar radiation (Duffie and Beckman, 1980).

3. THE STUDY PROBLEM

Is that researchers in the field of calculating the intensity of solar radiation in Libya use solar constants for other countries and cities such as the city of Algiers and the city of Cairo, as they are closer geographically as well a climatically. measured by a pyranometer (Elmaryami et al., 2021; Anon, 2015).

''New equation (Bin Achibin Equation)

H = {a + (b * (n / N)) * Ho * 0.0036 * (n / N) * 5 / J'' .

Figure 1: The Pyrameter

Quick Response Code	Access this article online	
	Website: www.actamechanicamalaysia.com	**DOI:** 10.26480/amm.01.2024.60.77

Cite the Article: Osama D.H. Abdulrazig (2024). Create A New Solar Constants (a,b) to Calculate The Intensity of Solar Radiation from The Equation of Solar Brightness, Specifically in Libya. *Acta Mechanica Malaysia, 7(1): 60-77.*

Table 1: A comparison between the measured and computed by the equation of brightness ratio and using the constants of the city of Algiers.

M+	n	Hta w/m^2	ht2 w/m^2	error rate %
JAN	17	3560	831	-3.88
FEB	47	4271	1668	-1.560
MAR	75	5125	2692	-0.905
APR	105	6200	4144	-0.496
MAY	135	6609	5568	-0.186
JUN	162	7076	7345	0.036
JUL	198	7093	8701	0.184
AUG	228	6780	9127	0.257
SEP	258	5913	8787	0.327
OCT	288	4751	7520	0.368
NOV	318	3793	6621	0.427
DEC	344	3238	6151	0.473

Table 2: Explains the new constants a,b (developed) for Libya. (Bin Dawod constants).

M	a	b
JAN	1.90873	1.16539
FEB	0.92256	0.92856
MAR	0.58304	0.81466
APR	0.21117	0.98068
MAY	0.65699	0.09393
JUN	0.47844	0.18620
JUL	0.70334	0.16367
AUG	0.39995	0.11863
SEP	0.19293	0.29949
OCT	0.18796	0.27323
NOV	0.14956	0.27473
DEC	0.04936	0.37817

Average /Year ay= 0.537002 by=0.445833

Table 3: Comparison between the values calculated by the New equations,new constants a,b and the measured value by the pyranometer

M	n No. of day	hta Measured	ht1 New equation	Percentage of error %
JAN	17	3560	4330	0.17
FEB	47	4271	4460	0.04
MAR	75	5125	4360	-0.17
APR	105	6200	5170	-0.19
MAY	135	6609	5570	-0.18
JUN	162	7076	6910	-0.02
JUL	198	7093	7480	-0.05
AUG	228	6780	6780	0
SEP	258	5913	5710	-0.03
OCT	288	4751	4050	-0.17
NOV	318	3793	3230	-0.17
DEC	344	3238	2560	-0.26

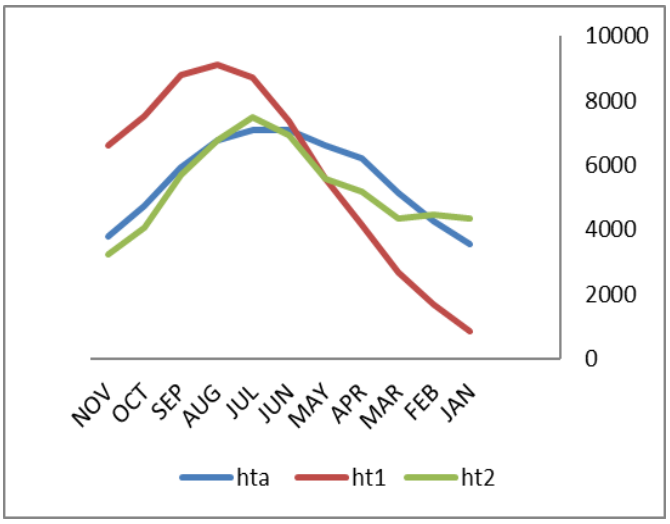

Figure 2: A Comparison between the intensity of solar radiation calculated (W/m^2) by the constants of city of Algeria and the new constants with the real measured value

4. Conclusion

When using the solar constants A, B for the city of Algiers (ht1) or Cairo in calculating the intensity of solar radiation with this equation, we notice that the error ratio between the calculated values and the values measured by the pyranometer (hta) is still large. At present, the researcher is trying to explore a way to reduce the error between the calculated values and the values measured by the pyranometer. Thus, solar constants were developed, which did not exist for any Libyan city (ht2), and which give closer values when comparing the measured values and the calculated values in this invented mathematical equation with these new constants, which, when compared to the measured values, give a small error rate or equal to zero, as shown in the table 3.

References

Abdulrazig, O., 2021. Invention and Development New Equation for Calculate the Intensity of Solar Radiation and Compared with the Measured Value by the Pyranometer, Libyan Journal of Engineering Science and Technology (LJEST), 1 (1), Pp. 25-31.

Anon, 2015. [Online] Available at: http ://(Figure 1-1) Essential parts of solar radiation falling on the surface of the PV cell [Accessed 16 Dec 2022].

ASHRAE, 1995-1996. (America Society of Heating, Refrigeration and Air Conditioning Engineers). ASHRAE Handbook of HVAC Applications.

Duarah, C., Das, A., and Singh, N., 2013. Dependence of solar mixing angle on CP violating phase δ under deviation from tri-bimaximal mixing. Indian Journal of Physics, 87 (12), Pp. 1269-1274.

Duffie, J., and Beckman, W., 1980. Solar engineering of thermal processes. New York: Wiley.

Elmaryami, A., Khalid, H.M., Alamaria, A., Alashebe, O., Ali, S., Salem, A., 2021. Determination the Corrosion Rate of Carbon Steel (0.4% C) Due to Thermal Cycling, Oil Cooled.Tecnica Italiana-Italian Journal of Engineering Science, 65 (1), Pp. 74-78.

Osama, D.H., Elmnifi, M., 2021. Assess the Potential Contribution of Municipal Solid Waste Power Generation Facilities in Libya. International Journal of Thermal Engineering © 2021 by SSRG - IJTE Journal.