*IOSR Journal Of Environmental Science, Toxicology And Food Technology (IOSR-JESTFT)*
*e-ISSN: 2319-2402,p- ISSN: 2319-2399. Volume 7, Issue 4 (Nov. - Dec. 2013), PP 10-13*
*www.iosrjournals.org*

# Solar Oven

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***Abstract:*** *The solar energy is an important component of the renewable energies. Niger has immense resource of solar energy. To resolve problem of sahara and poverty in Niger using solar oven can be alternative solution. This construction in very simple and any carpenter can make. In concerns to popularize this technology, the solar oven is used in the training of the students in renewable energies..*

***Keywords :*** *solar ovenr, Niger oven, renewable energy Niger, oven solar sabo murfu V2*

## I. INTRODUCTION

The solar cooker " SABO MURFU V2"* - is a simple device which transforms the solar radiations into heat for the preparation of the food without running Gas, oil or the electrical energy. The principle of functioning of the solar furnace as well as the solar collector is based on the greenhouse effect and the principle of the parabola that is the solar orientation of shelves towards the center.

Sunbeams reflected by mirrors; penetrate inside the oven through the glass with the greenhouse effect the heating takes place into the oven. Given that the inside of the oven is tight the heat is kept. Then in run away as the solar radiations increase, the temperature inside the oven is increased as long as the radiation and the influx of energy counterbalance. In such way the temperature in the oven can achieve 120-150°C. What is enough to prepare any meal of the housewife.

## II. HEADINGS

The sun rays are a compound electromagnetic radiation essentially:

- Of visible light of wavelength between 400 nm and 800 nm;
- Of infrared radiation of wavelength lower than 400 nm;
- Of ultraviolet radiation of wavelength upper to 800 nm.

The sun rays cross the atmosphere, which: absorb a part (29 %) and return towards the space a part (23 %). The diffuse and direct sun rays are called global incidental radiation arriving at the ground.[1], [2] ,[3] , [4]

## III. INDENTATIONS AND EQUATIONS

The necessary data: geometrical data and physical properties of materials.

The thermal phase itself, including geometrical calculations (thicknesses of reflectors (mirror, window) then calculations of thermal transfer of heat and losses, requiring both the call to adequate correlations;

The results, under brief shape (thermal power receipt and heat losses) or under more detailed shape (local values of the coefficients of exchange, count adimensionnels characteristic).

The thermal calculation of transfer of heat can be approached by two manners very different algorithmics:

By a mode simulation: knowing the geometry complete of the oven. As well as the characteristics of the reflector to be used.

By mode check: knowing food about leather and the thermal power to be transferred for the cooking and having by experience a rough idea of the geometry of the oven, we try to have if the oven is adapted well or not to the demand service.

For it the algorithm supplies a criterion of over sizing under the shape of a relationship representing the excess (or the lack) of surface of transfer for the demand service.

It happens frequently that certain software also supply another mode of calculation, the mode conception (design).[5] , [6] ,[7] , [8]

The mode supplies directly the device the best adapted to the problem, after a systematic examination of various solutions? By making vary geometrical parameters following the choice of the user. From the point of view algorithmic, this mode of conception is only a repetition of an algorithm of check applied successively to several geometries, followed by a sorting of the obtained solutions.

Method of the Determination of the Temperature Logarithmic

The local value of the elementary power exchanged $d\phi$ through an element of surface dS is given by the equation:

$$d\phi = K(T_1 - T_2)dS$$

With K – coefficient of global exchange
$T_1$ – Temperature of food
$T_2$ - Temperature of the wall of the bowl

$$\phi = C_1(T_{e1} - T_{s1}) = \pm C_2(T_{s2} - T_{e2})$$

With $C_1$ and $C_2$ debits of capacities ( mcp ) of both liquids.
The total surface of exchange obtains by integrating the previous equation:

$$S = \int \frac{d\phi}{K(T_1 - T_2)}$$

The integration can be made only step by step if we know the evolution of coefficient of exchange K according to the temperatures $T_1$ and $T_2$.
Globally, the surface of exchange can be calculated only by admitting the following hypotheses:

- We define a characteristic average temperature;
- We suppose constant the coefficient of global exchange K determined to the characteristic temperature of exchange.

The surface obtains by the relation:

$$S = \frac{\phi}{K\Delta T_{12}} = \frac{\phi}{FK\Delta TML}$$

With average $\Delta T_{12}$ difference of temperature between the food and the wall
logarithmic gap:

$$\Delta TML = \frac{\Delta T_a - \Delta T_b}{\ln(\frac{\Delta T_a}{\Delta T_b})}$$

$\Delta T_a$ and $\Delta T_b$ the differences of temperature gap inside the pot and outside.

**Solar Collection efficiency**

An indication of relative performance or character, usually indicated on a grah incorporating important variables in shown in the equation:

$$Q = F(\Psi I - U\Delta T)$$

In which
Q – Useful heat collected
F – Heat transfer effectiveness
Ψ – Transmittance absorptance product
I – Incidence solar radiation
U – Heat loss coefficient
ΔT – Difference of temperature between collector mean temperature and ambient air temperature
Collector efficiency varies from sunrise to sunset.[9]

**The various activities of construction of the solar oven are:**

1. Cutting of laminates
2. Assembly of the box
3. Assembly part of the showcase
4. Cutting of the reflector frame (mirror)
5. Paint in black inside the oven
6. Fixing of the insulating paper
7. Assembly of glasses in their frames
8. Fixation of mirrors in the box
9. Some finishes on the frame of showcases
10. Put some silicone in angles in the box so that there is no flight
11. Put some Varnish or paint outside of the solar oven
12. Test in the sun of the oven

13. Taking of temperature per hour

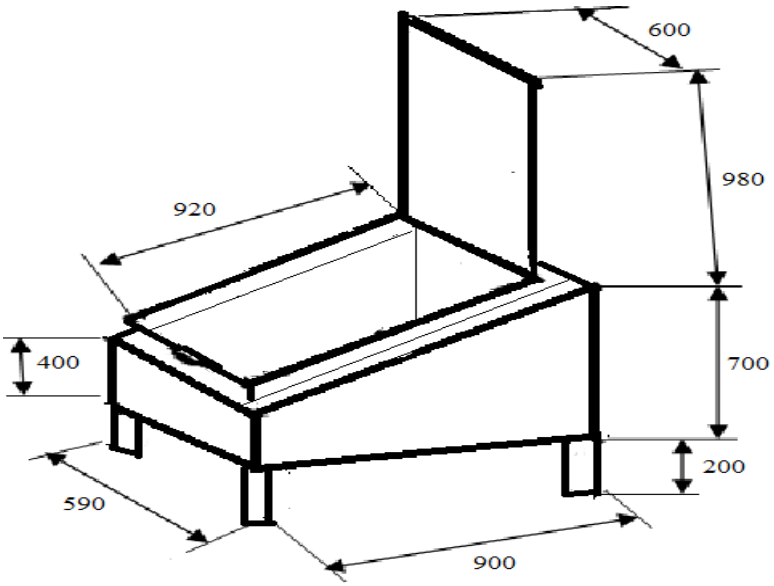


Fig. 1.1 Solar Oven design

Fig. 1.2 Solar Oven

**Acknowledgements**

Special thanks go to the Rector Pr SAADOU Mahamane;The dean Pr MAHAMANE Ali University of Maradi Republic of Niger to have a gift for the work; and to the foremen Ing. Ousmane Kouri Aboubacar of the Technical Secondary school DAN-KASSAWA of Maradi.

## IV. CONCLUSION

The review paper defined schematically, the solar oven, the direct steam generation concept. The theoretical studies results carried out in the context of the republic of Niger the efficiency of a solar oven is important.

The solar oven participates in the local economy, struggle against poverty and protects the environment.[10]

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