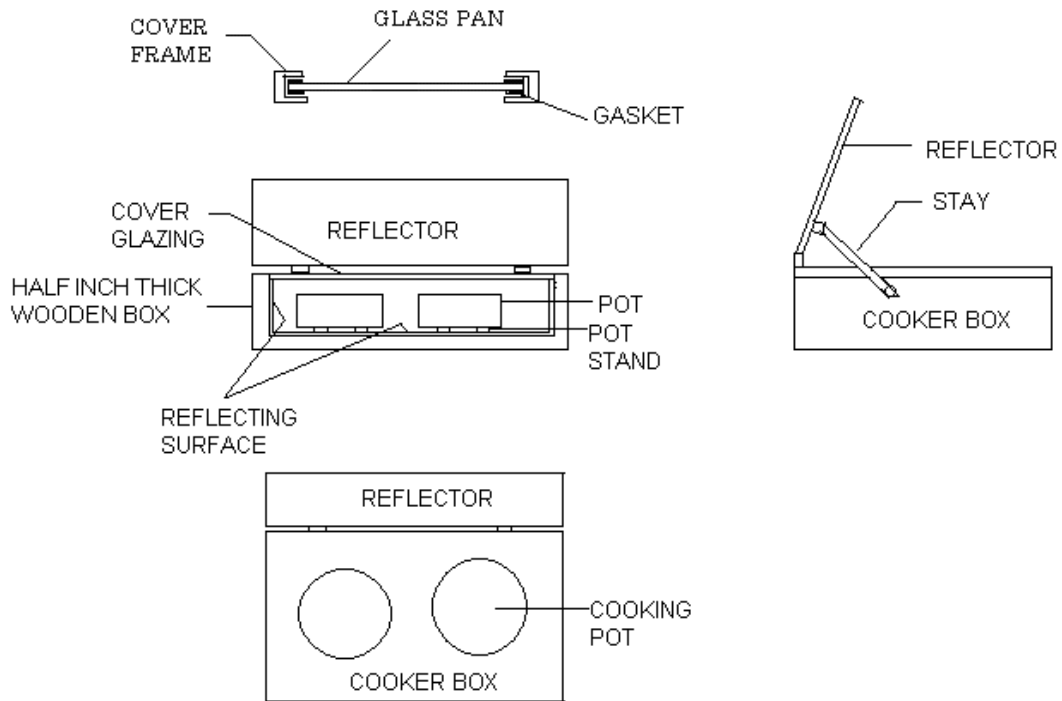


LOW COST WOODEN BOX SOLAR COOKER

In the present design, an attempt is made to reduce the cost of a conventional box type cooker. The cooker will be very appropriate for rural applications. Fabrication of the cooker is very easy and so cost of labour is also lowered down. This cooker can be built by semi-skilled village artisans by using simple hand tools and with locally available raw materials.



Constructional Features

The detailed constructional feature of the cooker is shown in Figures. The top open cooker box is made of half inch thick wooden box. Inside surface of the cooker box is covered by aluminium foil in all sides and bottom to direct solar radiation towards the cooking pots. Foil is pinned with wooden box. For reflecting surface, the wooden cooker box will not be able to absorb radiant heat. Heat will be transferred to cooker box only through the conduction process from aluminium foil but foil will not be able to transfer heat much as thin foil itself will absorb heat only from entrapped hot air and wood is not at all a good conductor. So, most of the absorbed heat will be retained in cooking pots only. Cooking pots should not be directly in touch with foil to avoid damage of the foil; rather these are to be kept on pot stands (common ring shaped stands made of steel wire available in utensil shops). Slotted seat is provided near the top of cooker box for cover glazing. Single cover glazing made of 3mm thick transparent window glass. Cooking pots are to be placed side by side inside of the cooker by opening hinged glass cover as usual. South facing booster reflector is hinged with the wooden cooker box. Frame of the glass cover is made from Lg. sheet. Booster Reflector is fabricated by fixing mirror glass on G.I sheet frame. Reflector can be adjusted in desired inclination through the adjustment of stays. To make leak proof joint in between wooden seating and closed cover glazing, nylon rubber pieces cut from old tube of motorcar tire is used as gasket material. For proper setting of gasket, small grooves may be cut at the top side of the wooden box seating. Gasket is also used inside of metallic channels of cover glazing for sealing of glass pans. Epoxy adhesive is used in addition for fixing gasket in all the joints. Dimensions of the cooker box are 18inch x 12inch x 6 inches. Length of the cooker, greater than its width is designed to increase the time gap in between reorientations. Diameter and height of the two aluminium cooking pots are 5inch and 3.2inch respectively. Cooking pots are painted dull black by automobile muffler paint.

Test Results

Intensity of solar radiation: 0.6 KW per sq.mt

Reorientation is done in every 30 minutes interval.

Ambient temperature: 28 degree Celsius

Peak temperature of empty cooking pot lid: 130 degree Celsius.

Cooking performance:

Time taken for cooking 0.5kg of rice (weight after preparation): 2hrs 15min.

Method of cooking- One part of rice mixed with water twice of rice volume and then placed in cooker.

Time taken for cooking 200gm Dal (lentil soup): 2hrs 30min.

Method of cooking- One part of Dal mixed with water (twice the volume of Dal) and then placed in cooker.

Time taken for cooking boiled potato (2nos): 2hrs 30min.

Method of cooking- Potatoes are cut into pieces and cleaned with water and then placed in cooking pot without adding of water. Wet surface of potato after water cleaning is sufficient for preparation of potato. Potato rather will not boil if water is added in the pot.

Test of prepared food: Good

Approximate Cost Estimation (for prototype making)

1. Wooden for cooker box-	Rs.70
2. G.I sheet, 2ft x 2ft, for cover glass frame and reflector back: (sheet for reflector back support and for frame of cover glazing)	Rs.60
3. Aluminium pot- 2Nos. -	Rs.80
4. Pot stands-	Rs.40
5. Aluminium foil, 4ft x 1.5ft @Rs.15 per ft.	Rs.60
6. Mirror glass 1.5ft x 1ft @ Rs.40 per sq.ft-	Rs60.
7. 3mm thick plain window glass- 1.5ft x 1ft @Rs.20 /sq.ft	Rs.30
8. Dull black paint (DUCO paint):100 ml.approx @ Rs.215 per Lt-	Rs.20
9. Paint for wooden box:	Rs.30
9. Gasket material and adhesive-	Rs.50
10. Hinge, stay links, handle, plastic seat, clips, screws etc.	Rs.90
11. Overall Fabrication charge (cost of labour)-	Rs.200

Total- Rs.790

(Say, Rs.800 in Indian currency)

Machineries Used for Fabrication

Hand Saw, Hand Drill, Hand Shear, Rubber and Wooden Mallets, Pliers, Screwdriver Set, Wrench Set, Measuring Tape etc.

Manpower Requirement

Carpenter: For making wooden cooker box- 1 head for 2hrs.

Sheet metal worker for glass cover frame and reflector frame making- 1 head for 3hrs.

Tin smith for soft soldering of joints at corners of glass cover frame and relector frame- 1 head for one hour.

Fitter for final assembly work- - 1 head for 2hrs.