Journal of Agroecology and Natural Resource Management
Print ISSN: 2394-0786, Online ISSN: 2394-0794, Volume 1, Number 2; November-January, 2014 pp. 32-33

http://www.krishisanskriti.org/janrm.html

Design and Fabrication of Solar Operated Boat Type Water Pump

Abhishek Singh

Bachelor of Manufacturing Technology Graduated from JSS Academy of Technical Education, Noida
Residential Address: 11/168 Indira Nagar, Lucknow-226016
E-mail: abhishek.singh1426@gmail.com

Abstract: *In this project the attempt is to make an arrangement of water transmission system by using a solar operated monoblog pump fitted in a boat. This prototype shows its working that it can deliver water from the river and canal to its sides for drinking and irrigation. In this project we used a water boat and a monoblog pump is mounted on the base surface of the boat and this pump is operated by a D.C. motor. This motor is operated by solar panels which are mounted on the roof of the boat.*
The purpose of making this project to save underground water and deliver river and canal water to the agricultural land. In table areas where is no underground water, in those area this project can be very useful for irrigation. In some coastal areas like Kerala ,during high tides water overflow through bays and reach the lands, to sent this overflow water back to seas and save up the lands this method will be useful

1. INTRODUCTION

This project is on design and fabrication of a boat type pump which can deliver water from the river surface to the agricultural land and to the societies. Our target is to make such type of model which can pullout the water and deliver it to the banks of river without depending upon the water level of rivers.

Now a day's water is supplied by the medium of canal and boring pump. In both the medium there are many problems faced by the irrigation department. The problem with the canal is that it can be made only in plane area but for the mountain and hill area it cannot be used. And the problem with the boring pump that it requires too much power to operate and a pump cannot deliver water to the large area.

The target of this project is to provide an alternative of canals and the boring pumps, because these conventional methods are not suitable in all the conditions. In this model a boat type pump is used which would always be in the contact of water either the condition is of high tide or low tide and this pump would deliver water from the river surface to the riverside so the pump doesn't require much power in operation . This pump is operated by a d.c. motor which is run by solar panel so it would not involve high running cost.

This model can face problem of length of pipe which deliver water to the riverside from the pump during when the river sinks. For avoiding this problem the bellow pipe or the folding pipe can be used. And for delivering water from riverside to the agricultural land and filter plants by the drain pipes. This model will be useful in plane and hill areas where canals cannot be made.

2. DESIGN

2.1 Design of Pump

In irrigation department 12inch diameter pipe is used in boring pump so all the calculation is made for this data.

Water nozzle diameter=.078m
Cross-sectional area of pipe (nozzle)=.005m^2
Let the velocity of water v= 10m/s
Volume flow per hour q=180m^3/hr
Let the height (h= 5m) at which water has to be delivered,
Density of water ρ= 999.97 kg/ $m^3 \approx$ 1000 kg/ m^3
Power of pump P_h= qρgh/3.6*10^6
=2.4525kW =3.3 H.P.
So for smooth operation 3.5 H.P. pump would be used.

2.2 Design of Motor

A D.C. motor is required for running the pump. D.C. motor delivers only 60% power to the pump.

Power of motor $P_{m=}P_h$/o.6
= 3.5/0.6=5.83 H.P.
= 4.35 kW
So for smooth operation 4.5 kW d.c. motor would be preferred.

2.3 Design of Solar Panel

For operating the 4.5kW motor, 5 kW solar panel is required.
Let's assume that 5kW solar panel is used to run the setup properly.
From Tata solar if 5 panels of 1000 watt is used then

A 500 watt solar panel dimensions (length*width*thickness)=(994mm*1971mm*46mm)
For maximum efficiency of solar panel in India, in U.P. is-
Vertical angle between panel and stand θ=86˚ (maximum) in month of June
Vertical angle between panel and stand θ=40˚ (minimum) in month of December

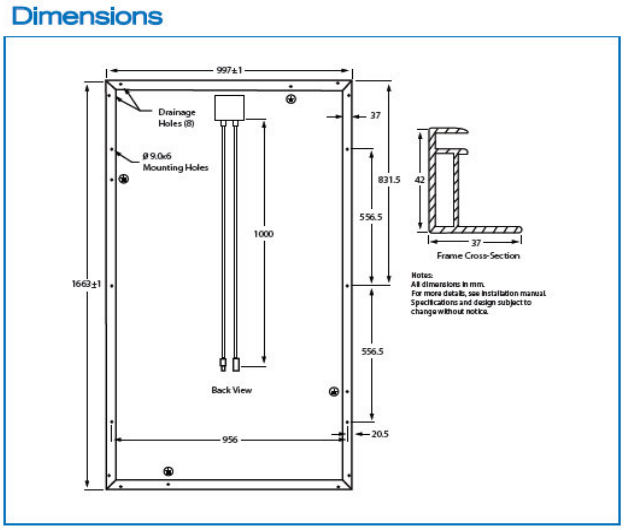

Fig. 1: 1000 watt solar panel

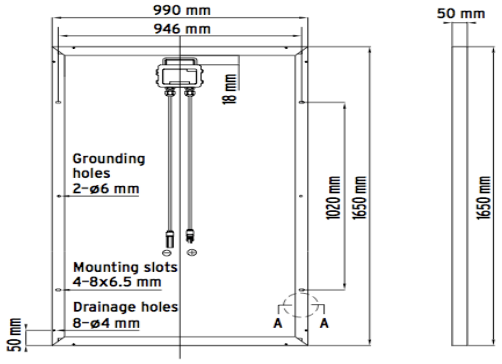

Fig. 2: Dimensions of 1000 watt solar panel

2.4 Design of Boat

Boat should be designed of the size that 5kW solar panel can be fixed on the boat in all weather.
Maximum area required for 5kW panel arrangement= 10 m^2
Weight of the panel arrangement=(25kg*17)
=425 kg

3. USES

3.1 In irrigation

This project can be used in irrigation in tableland and at those areas where canals cannot be made but rivers are there in those areas, so to provide water for each and every field it will be an effective method.

3.2 Backwater in Coastal Areas

In some coastal areas like Kerela ,during high tides water overflow through bays and reach the lands, to sent this overflow water back to seas and save up the lands this method will be useful.

3.3 In Tidal Power Plants

In tidal power plants the water gets stored in reservoir during high tides and when tides are low it gets released and transforms it into electrical energy. But with this equipment we can store the water in reservoir without the high tides and can generate electricity.

4. BENEFIT OVER CONVENTIONAL WATER PUMP

1. In now a day the pumps driven by diesel engine or electric motor are used in irrigation which results high running cost in operation.
2. In this project the pump is operated by solar operated d.c. motor so it's running cost is very less.
3. In this project the pump is fitted with the boat so it is very useful in those areas where underground water is not a resource of water.
4. Because the pump is mounted with the boat and solar panel is installed over the roof of the boat so it can be carried very easily and it can also deliver water if the level of water in canals drop down.

5. ACKNOWLEDGEMENTS

This project is supported by ***"Krishi Sanskriti"*** because the foundation gave me an opportunity to present my project papers This project is prepared to help the farmers of the tablelands and by this project we can save underground water.

REFERENCES

[1] Dr. Tushaar Shah, Senior Fellow International Water Management Institute, C/o INREM Foundation Near Smriti Park Apartments, Mangalpura, Anand–388 001, Gujarat, India, on "India's Ground Water Irrigation Economy: The Challenge of Balancing Livelihoods and Environment."

[2] Shiferaw BA, Wani SP and Nageswara Rao GD. 2003. Irrigation investments and groundwater depletion in Indian semi-arid villages: The effect of alternative water pricing regimes. Working Paper Series no. 17. Patancheru 502 324,Andhra Pradesh, India: International Crops Research Institute for the Semi-Arid Tropics. 24 pp.

[3] Chakravarty, S. and Singh, L. B., 1994, Water economy through drip irrigation, in Proceedings of the 20th WEDC Conference, Colombo, Sri Lanka. [http://www.lboro.ac.uk/departments/cv/wedc/papers/20/session g/chakrava.pdf]

[4] Namara, R. E.; Upadhyay, B.; Nagar, R. K. 2005. Adoption and impacts of micro irrigation technologies: Empirical results from selected localities of Maharashtra and Gujarat states of India. Research Report 93. Colombo, Sri Lanka: International Water Management Institute.