WATER LIFTING SYTEM WITH HELP OF SOLAR ENERGY

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ABSTRACT

In Today's world there are many areas where drinking water is problem. In most of the case hand pumps are used at villages and remote places to solve the problem. These are operated with hands .It is difficult to operate it for children and women as it consumes human power. Solar power is one of the alternatives but is costly and unaffordable. This research work through innovative ideas has tried to eliminate human power and use solar PV system with automatic motor system. Their main concern is to minimize the loss rather than to maximize the economic gain. Low growth of agricultural production accompanied with high magnitude of variability therein is the major problems of agriculture. Therefore, irrigation facilities are required to be developed. Now if we install Lifting systems, we could lift water to the fields and to the tanks where drinking water can be stored without exhausting effort of walking and carrying water all long way between water sources and houses. Control the height of water lift by using microcontroller with solar energy. A proto type of solar water lifting system designed and enveloped has lifted the 30 LPH water to 40 c

M height with the solar panel of 12W to charge the12 V 5AH battery to run motor of 300 RPM. Environmental pollution is prevented with renewable energy and energy production from local resources is encouraged. An advantage of system is that system needs no maintenance. The use of this photo irrigation system will be able to contribute to the socio-economic development in the Aurangabad region.

Keyword: - *Microcontroller, Solar panel, Arduino uno Software, Motor driver mechanism etc….*

1. INTRODUCTION

Agriculture in Maharashtra is carried out mostly under rain fed conditions. Almost 80 to 85% of farming in Maharashtra is dependent on the whims of the seasonal rains. In fact 30% of the state's geographical area is subject to frequent drought conditions. Therefore, in such regions farmers choose their crops in such a way that even under adverse climatic conditions, they get something to subsist on. Their main concern is to minimize the loss rather than to maximize the economic gain. Low growth of agricultural production accompanied with high magnitude of variability therein is the major problems of agriculture. Therefore, irrigation facilities are required to be developed. The main sources of water in Maharashtra include canals, lakes, reservoirs, seepage lakes – wells, Lift irrigation, sprinkler irrigation, drip irrigation and tube-wells. There are various attempts being made to make water available in seasons

other than rainy reasons. It is particularly hard in the Deccan plateau districts because of the terrain and unavailability of groundwater resources in these plateau areas. One way to overcome this problem is to build water interventions across rivers and use the water stored in the remaining seasons. Not only irrigation, drinking water is tough to find too in these regions in summers.

1.1 Why Lifting systems are required

In the above villages, people have to travel a lot of distance to get water. During the monsoons the farm of the villagers would be irrigated by rain water and farming could be done. Whereas during the summers all the wells dry up, so even getting drinking water would be difficult so agriculture can be neglected in summers.

Now if we install Lifting systems, we could lift water to the fields and to the tanks where drinking water can be stored without exhausting effort of walking and carrying water all long way between water sources and houses.

2. LITERATURE REVIEW

The energy management is not proper in India. India is both densely populated and has high solar insulation, providing an ideal combination for solar power in India. much of the country doesn't have does not have an electricity grid, so one of the first application of solar power has been for water pumping to begin replacing India's 4-5 million diesel power water pump, each consuming about 3.5 kilowatts and off grid lighting. Some large projects have been proposed, and 35000 km^2 area of that desert has been set aside for solar power projects, sufficient to generate 700 to 2100 gig watts.

Lack of electricity infrastructure is one of the main hurdles in the development of rural India. India's grid system is considerably underdeveloped, with major sections of it populace still surviving off grid. As of 2004 there are about 80000 unelectrified villages in India. Of these villages 18000 could not be electrified through extension of conventional grid. A target for electrifying 5000 such villages was fixing for the 10th National five year plan 2000 to 2007. As on 2004, more than 2700 villages and hamlets had been electrified mainly using SPV system. Development on chip solar technology is considered as potential alternative that allows and electricity infrastructure comprising of network of local grid clusters with distributed electricity generation that could allow by passing, or at list relieving the need of installing expensive and loss long distance centralized power delivery system and yet brings cheap electricity to the masses. Thus application of solar is possible in India. There is just need of alarming the people of energy conservation and management.

Botoshi and Kurlod are villages in Mokhada taluka of Thane district of the state Maharashtra. There is a severe shortage of Drinking water and Livelihood water in these districts in spite of having a rainfall of 2000 to 3000 mm annually. Also the available water sources far away from village and the way to reach there is not easy. This makes it difficult for villagers to carry this water home. Also since the water is not able to reach fields due to elevation different, there is no source of livelihood in the village.

If solar water Lifting system is made available in these villages, drinking water crisis will be solved and irrigating the fields will provide a source of livelihood. In this report we have firstly described the theoretical process of designing each component needed in a solar Lifting system. Then we formulated a solar Lifting design process. This was applied to drinking water and irrigation requirement of 11 villages.

3. SYSTEM DEVELOPMENT

3.1 Objective

Beneficial for agriculture field.
Reduce the work of human.
Reduce consumption of energy.
Introducing automation.

3.2 Photovoltaic Power Generation

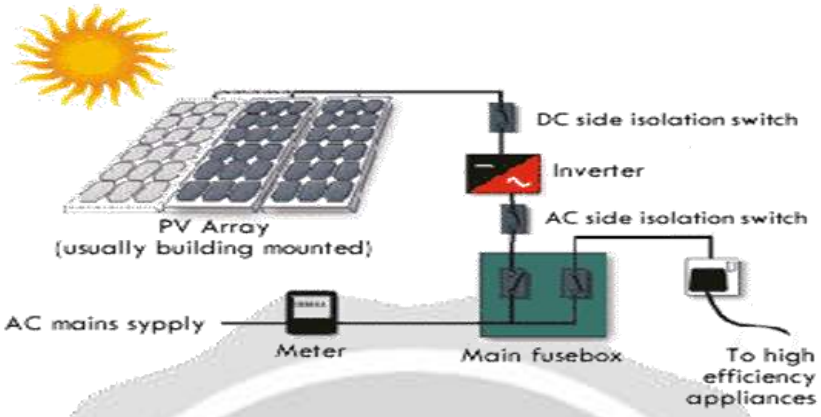

Fig -1: Photovoltaic power generation

Photovoltaic cells frequently referred to as solar cells, convert the light part of the solar spectrum (sunlight) into electricity. They are the most rapidly expanding energy sources in the world. Large scale manufacture of the photovoltaic cells, coupled with continued research and development is expected to further make photovoltaic within the economic framework of rural areas in developing countries.

3.3 Concept

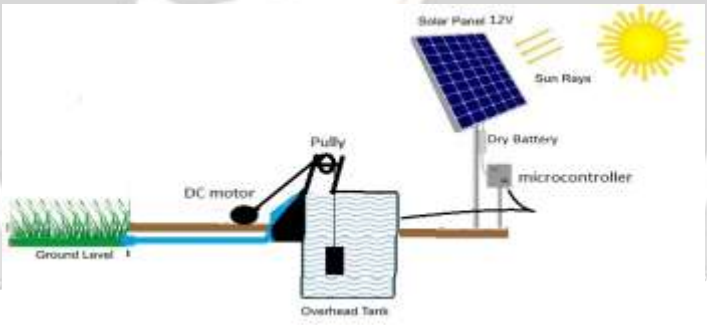

Fig -2: Conceptual Diagram

Our idea is to implement a solar powered Lift. That could be fixed in a small movable carriage/trolley and the Lift that is needed can be of 300 RPM capable of discharging more than 30 liters of water per hour (lph) at total head range of 0.025 meters. So, the pulley to be powered requires AC/DC supply based on its type. AC is the right option and with additional advantage for rural areas. So, there should be constant supply to the pulley to gain maximum efficiency. To receive maximum and constant supply a (Maximum Power Point Tracking) MPPT charger should be used to capture maximum power from the solar panels during a day.

The Lift can be of 12V based on the Lift type the dry cell is to be made or purchased. Now days, they are readily available in the market with a good price value.

3.3 Operation of Lift

Fig -3: Actual Diagram

Lift is the most challenging part of the design it reflects the efficiency and application. Operates best at total head of 0.025 meters. Although a small irrigation system based on solar power that we have come up with Lifts less water as compared to a diesel engine its efficiency never fails being NONE POLLUTING and self-owned.

The Lift that operates is a SURFACE CENTRIFUGAL AC Lift. We can also use SUBMERSIBLE LIFTS with equivalent rating as the centrifugal Lift. Submersible Lifts are the best to be implemented in a group.

The discharge rate of submersible Lift is less as compared to the SURFACE CENTRIFUGAL LIFT within the range of 1HP, although the TDH of the submersible is very high as compared to the centrifugal Lifts. The pulley can supply constant water to the field for irrigation purpose without any fail to satisfy the crop demands seasonally. Operation is incomplete without proper analysis here comes the simple mathematics to give clear idea of the developing the entire system in simple and logical way.

3.4 Calculations:

15 sec per cycle time
15 sec = 125 ml
L cycle = 152 ml water lift 4 cycle/ min
Means, 500 ml/min water lift
500 x 60 = 30,000 ml/hr
Means, 30 liter/hr
Human need 25 liter water for drinking per day.
Motor rpm = 150 rpm
150 x 2 (2 motor) = 300rpm
Battery= 12v, 5 amp
Solar panel = 12v, 5 amp

4. SYSTEM COMPONENT AND SOFTWAER DISCRIPTION

4.1 System Component

Sr. No.	Component	Quantity
1	Solar Panels	1
2	D.C. Motor	1
3	Micro-Controller	1
4	Dry Cell	1
5	L293D Module	1
6	Belt	1
7	Pulley	2
8	Wires	10ft
9	Switch	1
10	Steel Frame	0.2kg
11	Drum	1
12	Foundation	1
13	Foundation Bolts	2

Table 1: List of Components

4.2 Soft ware Description

1 Get an Arduino board and USB cable
2 Download the Arduino environment
3 Connect the board
4 Install the drivers
5 Launch the Arduino application
6 Open the blink example
7 Select your board
8 Select your serial port

9 Upload the program

5. ADVANTAGES

Cost effective: The life cycle and the cost to ultimate beneficiary make the SPV systems cost effective as compared to conventional systems. IN addition the farmer is saved from the capital investment he has to make for drawing lines from the grid to his field/farms. The govt. may save huge resources which otherwise may be uneconomical to network every agriculture field under the state electricity grid.
Reliable: The SPV is more reliable, consistent and predictable power option as compared to conventional power system in rural areas.
Free fuel: Sunlight, the fuel source of SPV system is a widely available, inexhaustible, and reliable and free energy source. Hence the SPV system has no monthly fuel bills.
Low maintenance: The system operates on little servicing and no refueling, making them popular for remote rural areas, hence the operation and maintenance is very low. The suppliers provide maintenance at a very low annual maintenance contract rates.
Local generation of power: The SPV system makes use of local resource-sunlight. This provides greater energy security and control of access to energy.
Easy transportation: As SPV systems are modular in nature they can easily be transported in pieces/components and are easily expandable to enhance the capacity.
Energy Conservation: Solar energy is clearly one of the most effective energy conservation programs and provides a means for decentralized PV-generated power in rural areas. Solar pump is energy efficient and a decentralized system avoids any unnecessary expenditure on T & D networks
Water conservation: The SPV sets are highly economical when combined with water conservation techniques such as drip irrigation & night time distribution of (day time pumped & stored) water. The SPV system leads to optimum exploitation of scarce ground water.
Environmental friendly: The use of sunlight as a source of fuel leads to clean, eco-friendly and decentralized generation of energy which saves the fossil fuel, controls deforestation and prevents environmental pollution.

6 COCLUSION

In this study, automatic irrigation of dwarf cherry trees planted to 8 decades of area is realized with solar energy powered two different BLDCs and RF units. Pulley with deep well lift has been utilized for water storage from Dam Lake to pool and pulley with centrifugal lift is utilized for the purpose of transferring of water kept in pool to drip irrigation system. An installed capacity of 12V with 2 pieces of solar panels was designed to satisfy water requirement by growing of trees. Battery and water tank are utilized for the purpose of storing energy obtained from solar panels and in the meanwhile the stability of the system is also increased. Sun tracking circuit was utilized for the purpose of providing energy more efficiency than the installed power.

Water demands of trees were defined with soil moisture sensors and were satisfied with output pressure and flow rate is achieved by lift. Site-specific irrigation provides effective management of scarce water resources and inhibits tree dead cause of too much irrigation. Also this sensor-based drip irrigation prevents moisture stress of trees, erosion, provided less growth of weeds and decreased the amount of water utilized by these weeds. In addition to this system removes workmanship that is needed for flooding irrigation.

Environmental pollution is prevented with renewable energy and energy production from local resources is encouraged. An advantage of system is that system needs no maintenance. The use of this photo irrigation system will be able to contribute to the socio-economic development in the Aurangabad region.

7. REFERENCES

1) Guide to solar powered water Lifting system in New York State.
2) http://www.mahaagri.gov.in/CropWeather/AgroClimaticZone.html#wgz
3) Crop evaporation – Guidelines for computing crop water requirements published in Food and Agricultural Organization of the United Nations.
4) Design of Small Photovoltaic (PV) Solar-Powered Water Lift Systems by United States Department of Agriculture.
5)http://www.agriculturesolar.com/3b_irrigation_Lift_solar_methods.html#.VT8x0iFViko
6) http://energyinformative.org/best-solar-panel-monocrystalline-polycrystalline-thin-film/
7) http://www.pveducation.org/pvcdrom/modules/mismatch-effects-in-arrays
8) http://www.enfsolar.com/pv/panel/8
9) http://www.solar-facts.com/panels/panel-efficiency.php#shading