

Designation and Construction of Solar Panel-based Washing Machine

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Abstract: Sunlight is a clean energy source taking advantages of which increasingly rises all over the world. But, constructing solar power plants incurs huge amounts of costs on the states. Therefore, designation and production of appliances which their energies are supplied from the sun can be an appropriate alternative to diffuse a solar power plant in the people homes. Thus, construction, implementation and maintenance costs are incurred to the public. By the way, solar washing machine production idea was formed. This washing machine of logic fuzzy type can wash 5kg of clothes once in three days without any requirements for electricity. Green color on its LCD indicates full charge batteries and also these data are recognizable on a smart phone. Energy stored in washing machine feed can be used to turn on other facilities at home. For example, there are any possibilities to turn on mixer, toaster or even cell phone and lap top. In the events of power outage, the building can operate as an independent energy source and guarantee home lighting for more 20 hours. Just with the production of 200,000 solar washing machines more than 10,000Mw can be annularly saved. This innovation has been recorded in Patent No. 63594 in Patent and Trademark Office. [Seyed Amin Hashemi, Saeed Zamani. **Designation and Construction of Solar Panel-based Washing Machine** . *Life Sci J* 2013;10(8s):178-182] (ISSN:1097-8135). <http://www.lifesciencesite.com>. 24

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Introduction

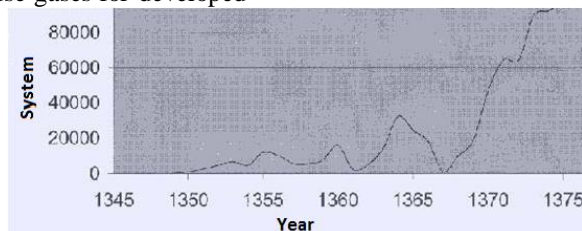
Energy is accounted for as the main strategic debate and accordingly as a policy. Achievement of power has many ways, within policy makings in few decades ago most electric power is resulted from fossil fuels or nuclear energy. This causes to global warming as well as environment destruction. So:

1. Vienna Convention was developed for conservation of ozone layer by UN in 1985.
2. Montreal protocol created the first international treaty which made some commitments for third world countries.
3. Kyoto protocol has a main importance for its timed constraints to reduce greenhouse gases for developed

countries because of external policies in the power and energy scope within electrical appliance productions.

Statistical data in public and private sectors indicate that state energy sector supports policies aligned with improvement, efficacy and energy consumption which effect on of positive appliance power consumption.

Data collected by Industries and Power Departments indicate 800% growth in washing machine productions during 1970-1997. Washing machine is among systems which increasingly are found at homes.



Currently more than 75% of urban households have this system. In the other words, there are more than 9 million washing machine systems in Iran and about 300,000 more systems are annularly added to this number. Washing machine lifetime has been estimated as 10,000wh. Average power consumption of washing machine is about 0.5kwh to 2kwh.

Nowadays, one of the biggest problems of the man is shortage of fossil fuels and environmental pollutions. Having increasingly developed the technology, using sunlight energy has been provided for the man as a

source on top of available energies so as its availability is feasible and its value is rare. Additionally, there would be no pollution for the environment.

Solar panel composed of photovoltaic cells is an instrument to convert sunlight to electric current. The first solar panel was made of Si in 1954. For this, it requires no public power feed consumption and can be considered as modern generation of washing machines in the world. This washing machine is capable of reserving electric energy converted by

solar panel inside its feed source and using that power for one time washing cycle.

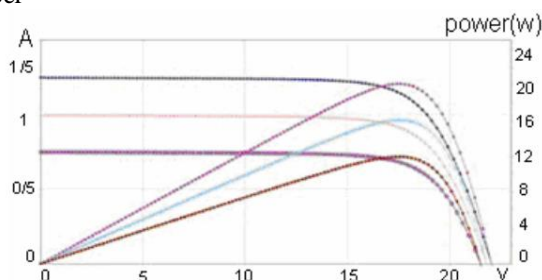
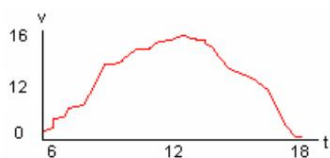


System components:

- 1) 20x30, 12v, 20W solar panel
- 2) 12v, 720W, 60A battery
- 3) 1kw inverter
- 4) Feed source charge circuit
- 5) Washing machine with 5kg capacity, 1.2hp and consumption of 0.5kw per cycle

2. Operation system

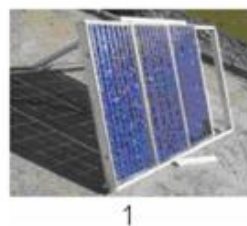
Solar washing machine is constructed such that for sunny cities with 300 days sunlight operates once per



Solar panel installation:



The panel should be placed in the sunlight to produce required energy. Installation and adjustment of solar panel base should be inclined 40deg toward SE.



Power supply:

Main task for the battery is electric energy reservation. The type of batteries in solar washing machine can be of types used in electric vehicles, lifetime of which is estimated at 10y.

Capacity of the battery used in this design is 720W; whereas the washing machine requires just 500w electric energy for a wash cycle, the time required for charge by solar panel is 20h and requires 3days of sunlight.

Power supply installation place: solar panel with 40deg inclination is on holding bracket. Also, battery and inverter are under solar panel and hold base, all of it are installed on the roof.

Also, feed power is 40% higher than a cycle washing consumption with two advantages:

- 1) To prevent loss of battery life
- 2) Effective battery power to setup the motor

Inverter:

Inverter converts dc voltage to ac voltage. 1kw selected inverter is capable of converting constant voltage of power supply to ac voltage compatible with washing components. Main advantage of this method is to prevent unwanted distortion and power produced by the inverter is sinusoidal.

Charger circuit:

This circuit converts electric energy produced by solar panel to power supply and having completely charged power supply, it is automatically disconnected.

Control circuit:

This circuit is aimed to calculate battery charge and when the battery completely is charged, this will inform via an LCD on the washing machine with green color to users. Also, these data can be shown via an application installed on a smart phone and user can order with his/her cell some instructions including amount of detergent consumption, drying time and powering off the machine by a timer.

Washing machine socket:

This socket provided with baby lock, when activated, it can supply public 220v electricity. Thus, if required, user can charge own lap top or cell phone and turn on many of instruments by this socket in the kitchen for a short time. Of course, charge of batteries should be cared and in addition when the public power is off, it can perform as an independent energy source.

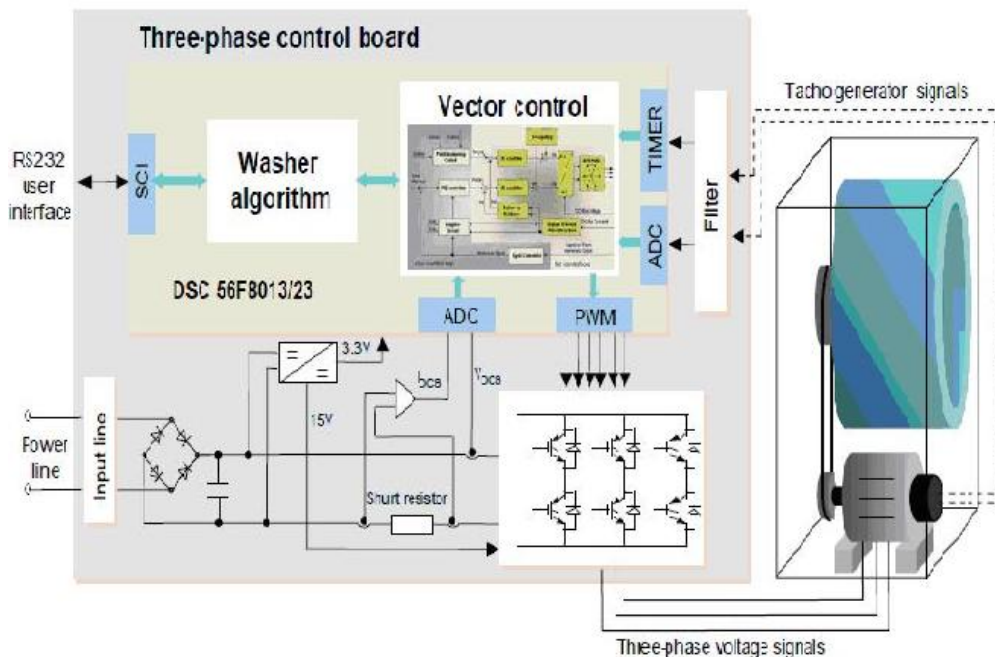
Washing machine emergency cable:

This cable is considered for when user may need two cycles of washing in a day and this can be provided with sunlight and energy reserved in the supply for the first cycle and public power for the second.

Washing machine:

It is of logic type in this design. The main advantages of this machine are performance, process and low cost, fuzzy logic, washing process, water level, water temperature, wash time, water drainage operation and fast speed controls. This process causes to improve washing machine lifetime. In modern models, washing machine weights load (so it is impossible to load more than nominal capacity of washing machine). Related to detergent consumption, it instructs user, diagnoses water hardness and cloth quality and even checks powder or liquid detergent and some of these washing machines make use of previous experiences and remember them, make regulations to make cost effective prices. Diagnostic failure circuit, if any problem, displays the error. Washing machines with fuzzy logic microprocessor can update when a new program or technology emerges. When domestic network realizes, these systems can download new programs or connected directly with internet, can debug. Most fuzzy logic machines have touch control and options for energy saving to reduce power consumption. Internal sensors monitor every time the conditions of washing machine interior and its performance such that the best quality is acquired.

New generation of washing machines have been designed with 3-phase brushless motors and are best replacement for AC induction motors and steady state magnetic sinusoidal motors. Both types of motors require a complicated algorithm for control functions and microcontroller-based methods. For this, DSP-based parts are preferred because of instantaneous signal process and control of AC motors.

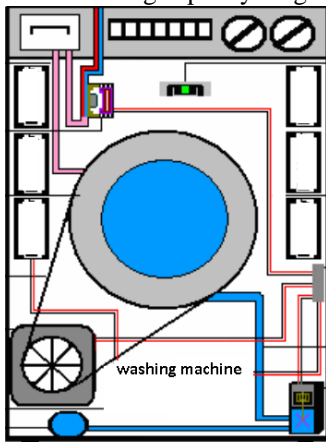


Above figure shows 3-phase control circuit using controller 56F802x with following properties:

1. AC 3-phase induction motor
2. Cost effective speedometer on motor shaft to measure velocity
3. Direct vector control algorithm
4. 0-1800rpm (motor speed); 0-1800rpm (drum speed)
5. Reconstructing 3-phase current from DC bus shunt resistor
6. Speed reduction control and irreversible brake
7. Minimum damage control
8. Protection against overvoltage, low voltage and overcurrent
9. Imbalance display in high speed cycle of dryer
10. Washing algorithm setup
11. Rotation (washing)
12. Imbalance display
13. High speed (dryer) cycle
14. Serial RS232 control interface

Washing machine properties for design operation:

1. Washing capacity: 5kg



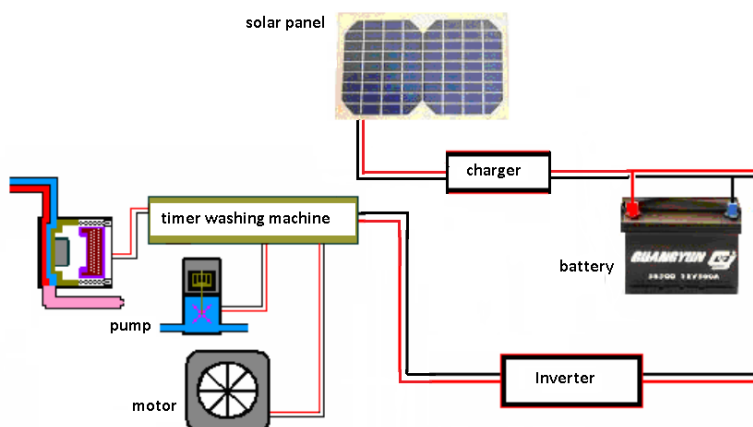
Main advantages:

1. Increasing washing machine rating
2. Renewable energy and environment protection
3. Reduce costs and energy consumptions
4. Possibility to turn on other kitchen tools and charging cell phone and lap top
5. An independent domestic supply for emergencies
6. Up to wash 5kg of clothes every 3 days without any need to public power
7. Power supply display and washing with smart phone
8. With regard to high costs of establishing solar power stations for the states, implementing this design and producing more than 200,000 solar washing machines,

2. Total weight: 60kg
3. Warm water required for washing via domestic water network
4. Motor consumption in washing state with low speed for 50min: 350W
5. Motor consumption in dryer state with low speed for 10min: 100W
6. Pump consumption in drainage state for 30min: 50W
7. Total electrical energy consumption for a washing cycle (60min): 500W
8. Maximum electrical energy consumption for fatty clothes: 600W

Operation method:

Charge circuit reserves electrical energy generated by solar panel in the battery. When the battery is completely charged, charging is stopped and battery color on washing machine LCD will be green. Turning on the machine, energy in the battery is converted to AC 220v by inverter and finally it reaches machine CPU in which instructions for motor, pump and other components are released. Best time for the machine use is 9 a.m. to 3 p.m.



a power station with annual capacity of 10,000MW electrical energy can be set up in people home without any maintenance cost and requirements for fund and a place to construct. For any solar washing machine more than 50kW is saved. Therefore, production of 200,000 ones can save annularly 10,000MW.

It should be noted that this innovation (solar washing machine) has been recorded with Patent No. 63594 at the Office of Registration.

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