

## 1.2. LEARNING OBJECTIVES OF THE EXPERIMENT

Specific technical aim of this experiment is to

- To analyse the performance of a solar water pumping system.
- To determine the system efficiencies under different conditions.
- To find the relationship between various end-fixing conditions and collapse load
- To analysis nature of deflection and deflected shapes with various end-fixing conditions
- To writing up element of a professional technical report
- Review of theoretical knowledge

## 2 INTRODUCTION TO EXPERIMENT

Water is one of the most important sources that human life depends on. Water from lakes, ponds, rivers and wells for uses such as agriculture, livestock breeding, industry and general use has always been one of the main obstacles to the development of human societies, especially rural communities. In many areas, there is water in underground reservoirs and exhausting them by hand or by hand pumps or by diesel engines powered by fossil fuels. In the desert or mountainous areas where there are electrical problems, as well as water at a fairly large depth of land, it is not possible to discharge water in the above methods. In these areas, the use of solar water pump system can have many benefits as bellow

- The use of solar pumps in areas that are far away from the power transmission network.
- Uncertainty about the future price of electricity (in case of electricity tariffs by removing subsidies)
- Non-use of fossil fuels
- No need for expensive expert experts to start up and use solar pumps.
- Due to limited system complexity solar pumps need less maintenance and maintenance than diesel pumps.
- Due to the purity of renewable energy resources, no harm to the environment is introduced.
- It requires much less care and repair, as well as their efficiency.

The main part of a water pump system is the photovoltaic panel. Photovoltaic panels exposed to the sun consist of photovoltaic cells. These cells are made of silicone a semiconductor material which operates when the sun light energy in visible spectrum excites the electrons within the crystal structure and Panel consists of 36 units (cells) that are arranged in rows of six in order to generate voltage difference between tow surfaces which is recognise as photovoltaic effect.

Additionally, charging MPPT controllers regulates the current and voltage of the solar array so that they can absorb the maximum power from the panel and absorb more power than the conventional charge controllers.

Independent network inverters are also used to convert the direct DC voltage stored in the battery to an AC voltage suitable for consumers.

The goal is to measure the amount of energy consumed in relation to the region's water requirements. In this way, the photovoltaic pump design can be presented in such a way that it has optimum economic efficiency and is able to install it.

## 10.2 Unperpendicular to the sun ray

Date	8/4/2016
Number of panel	4
Length of each Panel	1090mm
Width of each Panel	480mm
Panel orientation	

Time	10.30am
Density	1000Kg/m <sup>3</sup>
Bucket capacity	8.5Litres

Recorded value and average value							
Pressure (P <sub>p</sub> )	Inclined Solar radiation (S <sub>i</sub> )	Array Voltage (V <sub>A</sub> )	Array Current (I <sub>A</sub> )	Motor Voltage (V <sub>M</sub> )	Motor Current (I <sub>M</sub> )	Motor Speed (N)	Time (t)
25	855	56	2.5	138	1.8	1350	10.93
25	848	56	2.7	139	1.8	1350	10.97
25(AVG)	851.5	56	2.6	139	1.8	1350	10.84
50	920.5	56	2.7	127	1.9	1230	13.04
50	917	56	2.7	127	2	1230	13.22
50(AVG)	918.75	56	2.7	127	2	1235	13.13
75	872.0	56	2.7	118	2	1140	14.75
75	872.0	56	2.7	118	2	1140	14.30
75(AVG)	874.5	56	2.7	118	2	1140	14.53
100	927.4	56	2.7	108	2.2	1060	15.70
100	926.0	56	2.7	108	2.2	1050	16.56
100(AVG)	926.7	56	2.7	108	2.2	1055	16.13
125	902.0	56	2.7	100	2.2	980	18.71
125	932.0	56	2.7	100	2.2	980	18.74
125(AVG)	917.0	56	2.7	100	2.2	980	17.73
150	905	60	2.5	92	2.4	890	21.69
150	943	60	2.5	92	2.4	900	22.16
150(AVG)	924	60	2.5	92	2.4	895	21.93
175	935	60	2.5	85	2.5	830	27.07
175	935	60	2.5	85	2.5	830	27.19
175(AVG)	935	60	2.5	85	2.5	830	27.13
200	940	58	2.7	82	2.7	790	32.85
200	912.0	57	2.7	82	2.6	790	31.61
200(AVG)	926	58	2.7	82	2.7	790	32.23

Table 5. Experimental data for 0° from north