

## Lecture –24

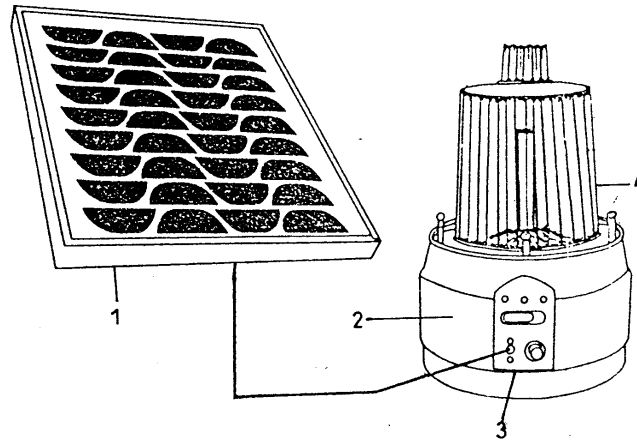
### **Solar PV systems – Principle-water pumping applications**

Solar photovoltaic systems are energy conversion systems which convert solar energy into electrical energy. Solar photovoltaic system operates on the basis of the photovoltaic effect on a silicon junction diode designed to facilitate the collection of usable magnitudes of electricity. Usually of the order of 1.5A at 0.5V. Such a junction diode is called a solar cell. Number of cells are string up in series to generate power at usable voltages. The solar photovoltaic system comprises of three main sub-systems, viz., solar panel, control unit and battery. The solar panel contains solar cells which produce electricity when exposed to sunlight. The electricity generated charges the battery / batteries and the power stored can be used at a later time. The control unit regulates the charging and discharging of the battery. The application has to be optimized according to the load profile and the geographic location in which it is used. The load is the most important choice from the user's point of view. There are more than five applications in practice. Thus are the solar lantern, solar water pumping system , solar street light, solar sprayer, solar insect trap and solar powered tricycle.

#### **Solar lantern**

The solar lantern is a portable solar photovoltaic lighting system which provides about 2-3 hours of light per night based on the days charge. The lantern is designed to be similar to a hurricane lantern in its shape and about a hundred times brighter. The system consists of 5 watt tube which is driven at a specially designed frequency choke / inverter operating at a frequency above 30 Khz. As these lanterns are portable, a person as per his requirements and convenience can carry it. As the battery is a sealed maintenance free type, no special maintenance is required except for daily charging.

**Fig 1.Solar lantern**



1. Solar module      2. Battery  
3. Control circuits    4. Lamp

### **Solar water pumping system**

A solar photovoltaic water pumping system, essentially consists of a SPV panel / array directly powering a water pump. The water pumped during the day can be stored in storage tanks for use during night. The generated electricity from the panel is fed to the pump through a switch and a 3 phase inverter, in case of AC submersible pumpset. Normally, no storage batteries are provided as the water can be stored in storage tanks, if required.

Features :

- Modular and hence easily field upgradable.
- Noise and pollution free operation
- Does not require any fuel
- Uses the abundantly available sunlight
- Simple to install, operate and maintain
- Designed to give optimum output even during low sunshine period

**Fig :2. Solar water pumping system**



Applications

- Minor irrigation
- Drinking water for unelectrified villages and remote locations
- Horticulture, poultry farming, silviculture and pisciculture
- Farm house
- Wild life sanctuary
- Tourist resort