

THE NEED FOR REGULATION

In the renewable energy industry, voltage regulators are synonymous with batteries and battery charging. Batteries need to be maintained within precise voltage limits or accelerated aging and premature failure will result. Prolonged over charging of batteries due to over voltage results in internal corrosion and buckling of the plates, excessive gassing and water loss. Prolonged under charging of batteries results in permanent loss of capacity due to plate sulphation, and stratification of the electrolyte, causing uneven plate wear. Thus we have two basic requirements for correct battery control; an over voltage switch, known as a *charge regulator*, and an under voltage switch known as a *discharge limiter*. These two distinctly separate functions are not always provided with a single regulator unit and this can be a cause of confusion.

REGULATOR TYPES

There are three basic regulator types; series, parallel and dump. The most common for controlling the charge from solar panels is the *series* regulator as shown in figure 3.1. As its name implies this is simply a switch in series with the flow of electric current from the solar panels to the battery. As soon as the battery reaches its fully charged voltage the switch opens and interrupts the flow of current. Once the voltage sinks, charging is recommenced.

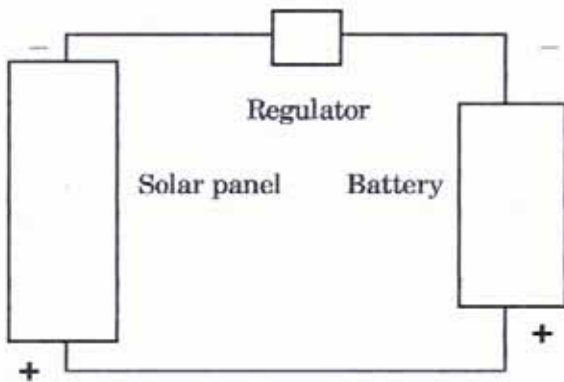


Fig 3.1 Series regulator

The switch is in line with the current flow and opens to interrupt it once a preset voltage is reached.

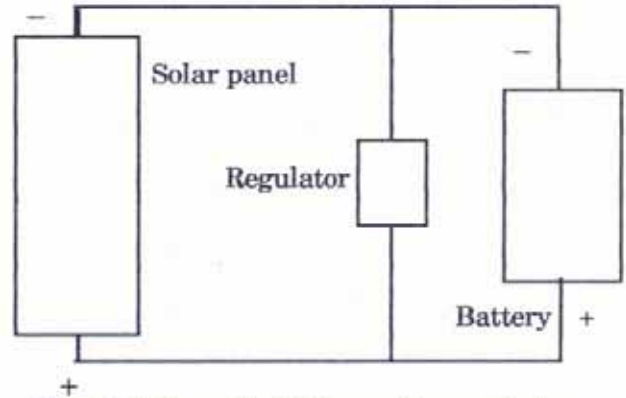


Fig 3.2 Parallel (shunt) regulator

Current is diverted through the regulator, which is in parallel with (across) the charge source (solar panel) and the battery.

The second type of regulator is the *parallel* regulator as shown in figure 3.2. This is placed across the incoming supply in parallel with it. Once the battery reaches its fully charged voltage, excess current is diverted through the switching element, which in this case is a zener diode. The charge source is not disconnected as in the case with a series regulator. For this reason, a parallel regulator is more popular in controlling the output of a wind generator as it maintains a load on the machine and prevents it from over speeding.

The third regulator type is the *load dump* as shown in figure 3.3. This simply diverts the charge current into an auxiliary load such as a heating element. Again, this is more popular for controlling wind generators as it does not remove the load, thus preventing overspeed.

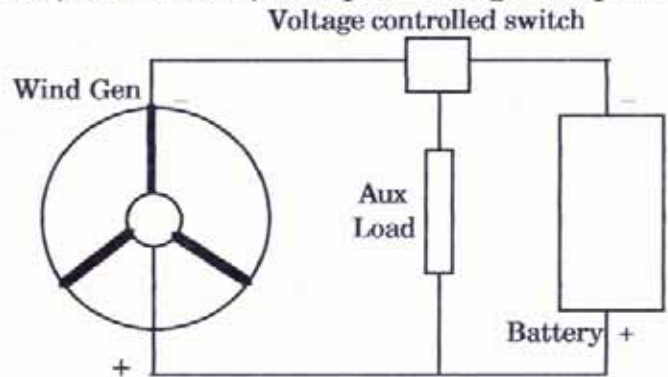


Fig 3.3 Load dump

The charger is diverted to an auxiliary load such as a heater element. Often used with wind generators.