

What happens when a small permanent magnet DC generator is used to charge a battery.....

1. As the generator starts turning, the output voltage begins to rise, but no current flows, so there is no resistance to turning the generator.
2. As soon as the generator voltage reaches the terminal voltage of the battery (if discharged, a 12V battery might be down to about 10volts) current starts to flow into the battery, to begin charging it back up, but the generator voltage now remains exactly the same as the battery voltage, even as the generator rpm increases, causing more current to flow into the battery.
3. As the battery becomes fully charged (13.8 volts is the “float voltage” for a 12V battery) the battery cannot absorb any more current, so the load on the generator decreases. When the battery is fully charged, there is no load on the generator, and no resistance to turning the shaft.
4. If the generator shaft continues to be turned, the output voltage, with no load, will now start to rise above the battery terminal voltage, according to whatever rpm the generator is turned at. In this situation, the battery could heat up or discharge gas, and could be damaged if the overvoltage is sustained. This is where a voltage regulator or charge controller is useful, if the generator is unattended, such as in a wind turbine. All the voltage regulator does is prevent the voltage from ever rising above a present level, that is, the float voltage of the battery it is charging.
5. The voltage regulator or charge controller has no effect on current (or amperage).