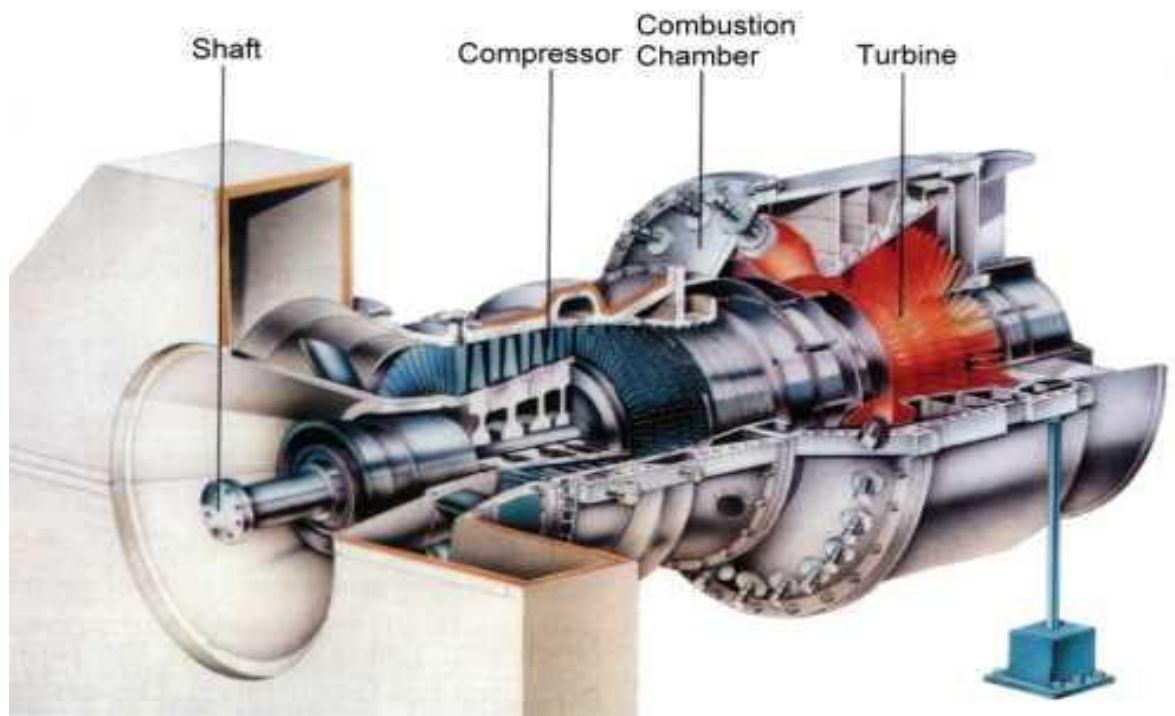


## GAS TURBINE POWER PLANT

A **gas turbine**, also called a **combustion turbine**, is a type of internal combustion engine. It has an upstream rotating compressor coupled to a downstream turbine, and a combustion chamber in-between.

Energy is added to the gas stream in the combustor, where fuel is mixed with air and ignited. In the high pressure environment of the combustor, combustion of the fuel increases the temperature. The products of the combustion are forced into the turbine section. There, the high velocity and volume of the gas flow is directed through a nozzle over the turbine's blades, spinning the turbine which powers the compressor and, for some turbines, drives their mechanical output. The energy given up to the turbine comes from the reduction in the temperature and pressure of the exhaust gas.

Energy can be extracted in the form of shaft power, compressed air or thrust or any combination of these and used to power aircraft, trains, ships, generators, or even tanks.



**Theory of operation:**

Gasses passing through an ideal a gas turbine undergo three thermodynamic processes. These are isentropic compression, isobaric (constant pressure) combustion and isentropic expansion. Together these make up the Brayton cycle.

In a practical gas turbine, gasses are first accelerated in either a centrifugal or radial compressor. These gasses are then slowed using a diverging nozzle known as a diffuser, these process increase the pressure and temperature of the flow. In an ideal system this is isentropic. However, in practice energy is lost to heat, due to friction and turbulence. Gasses then pass from the diffuser to a combustion chamber, or similar device, where heat is added. In an ideal system this occurs at constant pressure (isobaric heat addition). As there is no change in pressure the specific volume of the gasses increases. In practical situations this process is usually accompanied by a slight loss in pressure, due to friction. Finally, this larger volume of gasses is expanded and accelerated by nozzle guide vanes before energy is extracted by a turbine. In an ideal system these are gasses expanded isentropically and leave the turbine at their original pressure. In practice this process is not isentropic as energy is once again lost to friction and turbulence.

If the device has been designed to power to a shaft as with an industrial generator or a turboprop, the exit pressure will be as close to the entry pressure as possible. In practice it is necessary that some pressure remains at the outlet in order to fully expel the exhaust gasses. In the case of a jet engine only enough pressure and energy is extracted from the flow to drive the compressor and other components. The remaining high pressure gasses are accelerated to provide a jet that can, for example, be used to propel an aircraft.