Types of Steam Turbines

First steam turbine and History of steam turbines

Historically, the first steam turbine of which we have proof was built by Heron of Alexandria around 175 BC, which consisted of a metal sphere with two nozzles at their poles and oriented in the same direction where the steam escaped. The sphere rotated diametrically, resting on the boiler through the steam inlet nozzles. Until 1629 there is no record of a new independent design of a steam turbine, Giovanni Brance used a steam jet to drive the rotation of a water mill wheel, although I can not apply it to any useful industrial use. Speed staggering occurs in the reaction turbine. This staggering consists in producing a large pressure drop in a group of nozzles and using the resulting velocity of the steam in as many groups of blades as necessary by means of a set of straighteners reorienting the steam output of the first stage so that it enters in a second runner.
Types of steam turbines

The classification and types of the steam turbines can be done according to the form of use of the energy contained in the steam flow (reaction or impulse), according to the number of stages (multistage or single stage), according to the steam flow direction (axial or radial), if there is steam extraction or not before reaching the exhaust and finally by the steam outlet pressure (back pressure, free exhaust or condensation).

- **Impulse turbine**: In impulse turbines, the steam has the same static pressure before and after the rotor. The conversion of the pressure energy into kinetic energy occurs in the fixed nozzles of the distributor and not in the rotor of the steam turbine. ie pressure drops only takes place in nozzles.

- **Reaction steam turbine**: The steam expands in the moving blades of the reaction turbine with consequent pressure drop and velocity increase in these moving blades. In the reaction turbine, the pressure drop occurs continuously through the turbine.

- **Single-stage steam turbine**: They are used for turbines up to 2 MW of power, being of simple construction are the most robust and safe, in addition to lower installation and maintenance costs than multistage.

- **Multi-stage steam turbine**: The objective of the stages in the steam turbine is to reduce the speed of the impeller, keeping a speed of the blades close to the optimal value in relation to the speed of the steam jet. If we have a very high vapor pressure without the necessary steps, it would be necessary for the turbine to rotate at a very high speed, which would not be mechanically viable due to the dimensions that the reducer should have (gearbox that would adjust the final speed of The desired). They also achieve higher yields than single-stage pumps and can absorb higher-pressure steam flows, which is why they are used for high-power
turbines. Mixed turbines are usually used, with the first stages of action and the reaction ends.

Single and Multi-stage steam turbines

- **Axial flow turbine**: It is the most used method, the steam passage is made following a cone that has the same axis as the turbine.
- **Radial flow turbine**: The steam flow is carried out following all directions perpendicular to the axis of the turbine.
- **Turbine with steam extraction**: It is carried out in high-pressure stages, sending part of the steam back to the boiler to overheat it and re-send it to intermediate stages. In some occasions, the steam can also be extracted from some stage to derive it to other industrial processes.
- **Backpressure turbine**: The steam pressure at the turbine outlet is higher than the atmospheric pressure, it is usually connected to an initial condenser that condenses to steam, obtaining hot or superheated water, which allows its subsequent thermal use.
- **Condensing turbines**: The steam comes out below atmospheric pressure, in this design there is a greater energy use than back pressure, cooling water is obtained from its condensation. This design is used in high power turbines that look for high performance.