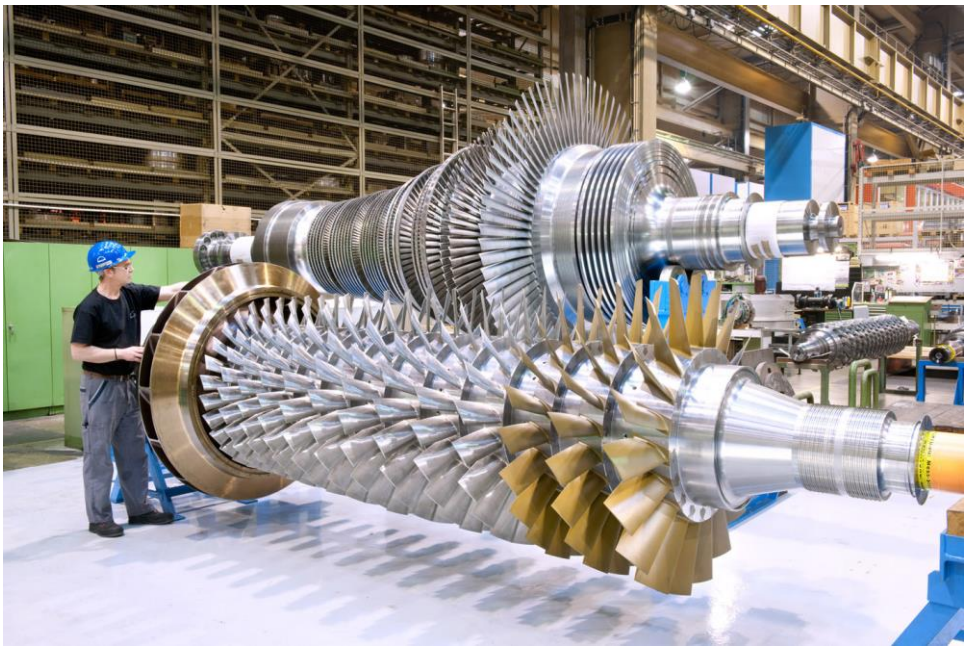
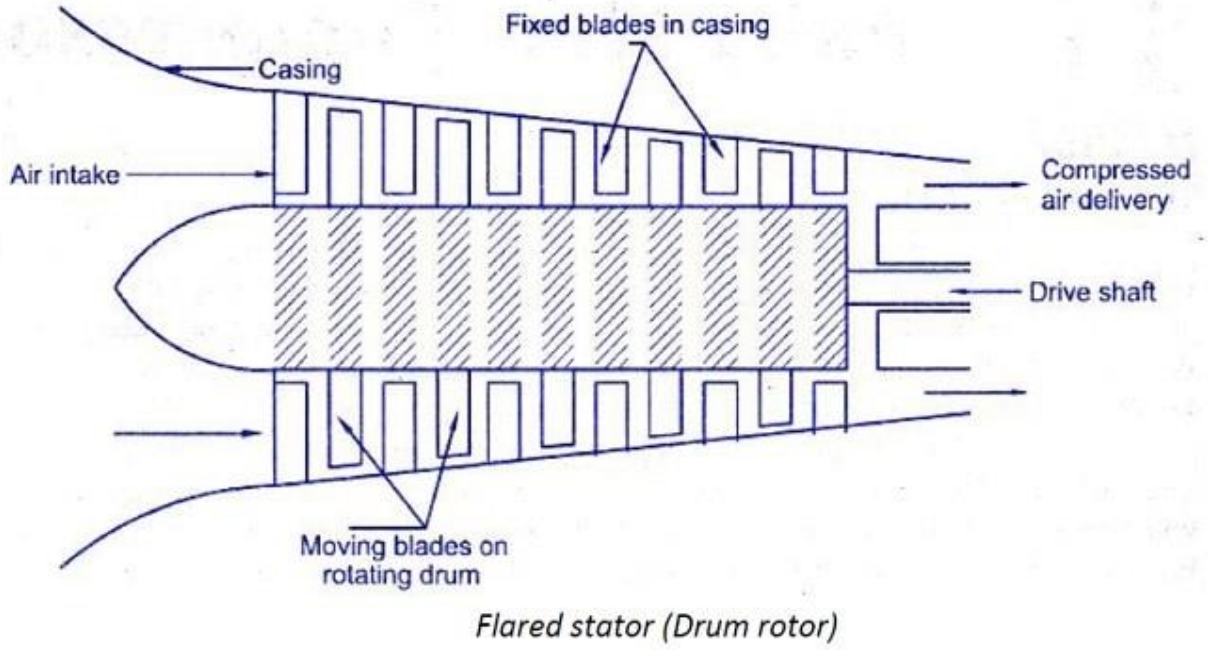
Axial Compressor



Axial compressors are one of the two main types of dynamic compressors that continuously compress air. Axial compressors in their very simple form are also known as axial flow fans. They are called axial compressors because the flow through the compressor travels parallel to the axis of rotation.

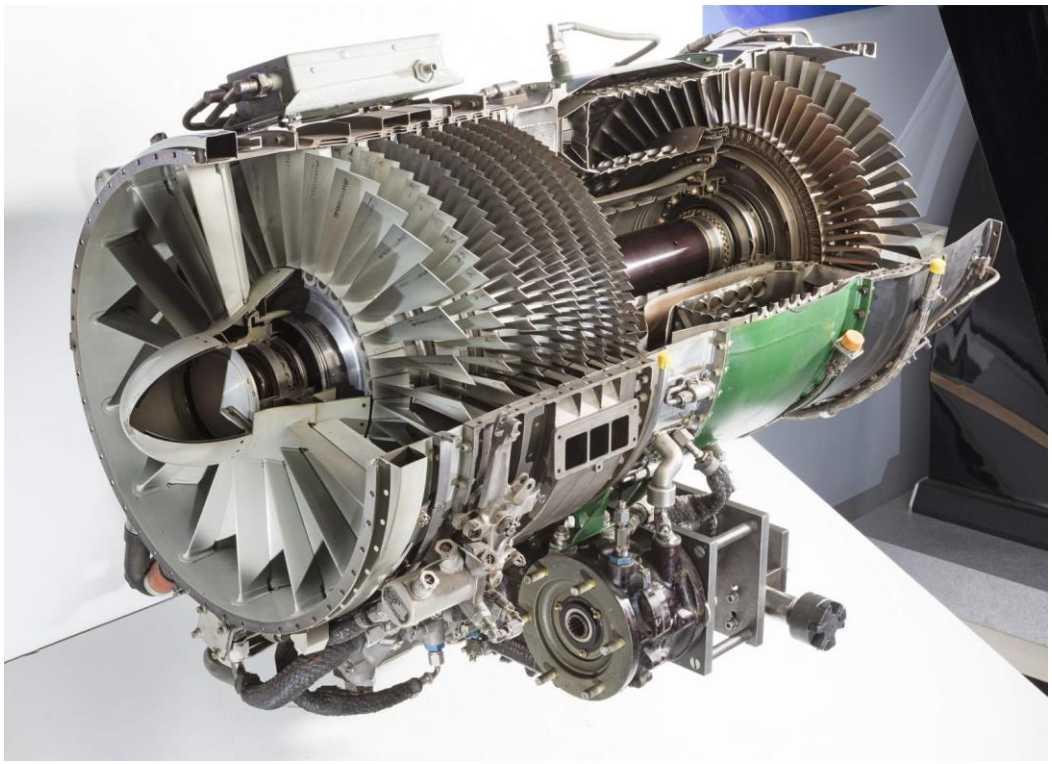


Flared stator (Drum rotor)

A typical axial compressor consists of a drum, to which blades of specific geometry are attached. As the compressor sucks the air axially and increases its energy level by flowing air through the rotor blades that rotate and exert a torque on the air. Now the stationary blades slow down the speed of the fluid and convert the circumferential component of air into pressure. So the air gets compressed in this way. A few facilities in the world have axial compressors to generate high match number flow for continuous wind tunnel testing.

They do require several axial stages to achieve large pressure rises, making them complex and fragile relative to other compressor designs such as centrifugal compressors. Modern engines can use 10-15 compressor stages.

Axial compressors have the benefits of high efficiency and large flow rates, particularly concerning their sizes and cross-sections. They offer the most compact and lightweight compressor design for large volumes and the lowest cost per-flow rate for large flow rate applications.



Advantage

- High peak efficiency
- Small frontal area for a given flow
- Straight through flow, allowing high ram efficiency

- Increased pressure rise due to an increased number of stages with negligible losses
- Good efficiency over the narrow rotational speed range

Disadvantages

- Difficult manufacturing
- Very expensive
- Heavyweight
- High starting power requirements
- Sensitive to the aerodynamic stall and angle of attack
- Sensitive to flow disruptions
- Not effective as a single-stage axial compressor in increasing the gas pressure

Applications

- High-speed ship engines
- In small scale power stations
- Blast furnace air
- Air separation plants
- Aircraft turbojet engines
- Land-based gas turbines