
SYNOPSIS:

In a gas turbine, the linear motion of gas causes rotors to spin, creating electricity. The forward rotating blades pump air under high pressure into the combustion chamber where natural gas ignites on contact with the heated air. At 1,500 degrees Celsius, the stream of gas rushes past the rear turbine blades, causing the entire rotor to spin. A generator transforms that rotational energy into electricity. This program shows the extreme precision required to build a turbine and how it works

CURRICULUM UNITS:

Computer Engineering
Engineering
Physics

CAREER OPPORTUNITIES:

Machinist
Mechanical Engineer
Metallurgist

PROGRAM OVERVIEW:

Gas turbine engines have a greater power to weight ratio and are smaller than reciprocating engines of the same power. Common to power plants, jet aircraft, helicopters and tanks, gas turbines have a simple design. Despite high operation speeds, turbines operate with little vibration and low lubricating oil costs. Engineers are making advances in materials development and computer design techniques such as computational fluid dynamics, which uses algorithms to simulate the interaction of fluids and gases over complex surfaces. This technology will help achieve increased compression ratios, higher temperature tolerances, more efficient combustion, better air-cooling, and reduced emissions.

ISSUES & CRITICAL THINKING:

- 1) Ask students to research the history of gas turbines, with attention to where gas turbines are utilized.
- 2) Ask students how gas turbines play a significant role in minimizing greenhouse gas emissions. Why do gas turbines work more efficiently and burn lower carbon fuels compared to other types of combustion-based power generation and mechanical drive applications?

GLOSSARY:

Aerodynamic- Designed with rounded edges to reduce wind drag and thereby increase fuel efficiency.

Centripetal Force- The component of force acting on a body in curvilinear motion that is directed toward the center of curvature or axis of rotation; Centripetal force is necessary for an object to move with circular motion.

Combustion Chamber- An enclosure in which combustion of a fuel or propellant is initiated and controlled.

Eddy Current- An electric current in a conducting material that results from induction by a moving or varying magnetic field.

Electron Beam Vaporization- A form of physical vapor deposition in which a target anode is bombarded with an electron beam given off by a charged tungsten filament under high vacuum; The electron beam causes atoms from the target to transform into the gaseous phase - These atoms then precipitate into solid form, coating everything in the vacuum chamber with a thin layer of the anode material.

Gas Turbine- Internal-combustion engine consisting essentially of an air compressor, combustion chamber, and turbine wheel that is turned by the expanding products of combustion.

Generator- A machine that converts mechanical energy into electrical energy.

Heat Exchanger- A device, such as an automobile radiator, used to transfer heat from a fluid on one side of a barrier to a fluid on the other side without bringing the fluids into direct contact.

Hirth-Coupling- Connects two pieces of a shaft together and is characterized by teeth that mesh together on the end faces of each shaft.

Stator- The stationary part of a motor, dynamo, turbine, or other working machine about which a rotor turns.



GAS TURBINES- ENERGY POWERHOUSES

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