Carnot Cycle

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ABSTRACT:

This app can be utilized to understand the concept of thermodynamics and working of a simple engine. The Carnot cycle is based upon the second law of thermodynamics which allows partial conversion of heat into work. We will utilize the app to explain the following concepts:

I. Understanding the four stages of a Carnot cycle
II. Discuss the P-V and T-S diagrams
III. Calculate the efficiency of Carnot engine for a given setup

The Carnot cycle was theorized in the year 1824 by a French physicist named Sadi Carnot. It was designed to have 100% efficiency, but the second law of thermodynamics denied it. The cycle is reversible and passes through four thermodynamic processes to convert heat into work.

The Pressure-Volume and Temperature-Entropy plots give an insight into the dynamics of the processes and quantitative information. We will study the diagrams for each step in the cycle from the app and understand the physics behind it.

The Carnot cycle can be modified as an engine where heat is converted to mechanical work. The idealized engine uses an ideal gas as working substance and the efficiency depends only on the temperatures of source and sink. We will use the app to calculate efficiency for a given system. The efficiency for the Carnot cycle is

$$\eta = 1 - \frac{T_c}{T_h}$$

Where; T_c is the temperature of the cold reservoir (in Kelvin),

T_h is the temperature of the hot reservoir (in Kelvin).

KEYWORDS:

Carnot cycle, Thermodynamics, Adiabatic, Isothermal, Efficiency, Entropy, Heat-Work conversion