Science Virtual Learning

MPI Physics 240
Thermodynamics 18: Intro to Engines
May 15, 2020

Lesson: MPI Thermodynamics 18
Intro to Engines
May 15, 2020

Objective: To understand in general terms the thermodynamics of engines

This video discusses engines, how they create heat flows and work, and their efficiency.

https://youtu.be/rL74lq6Lnnw

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Video: Intro to Engines

Example Video: https://youtu.be/snleyEJXrk4

Ex 1: A certain engine absorbs 2400 J of heat, and emits 844 J of heat to the atmosphere.
      a) How much Work did the engine do?
      b) What is its efficiency?

Ex 2: A diesel engine has an efficiency of 0.45 (45%). A gallon of diesel fuel releases $1.47 \cdot 10^8$ J of heat when burned. How much of that heat ends up being exhausted to the atmosphere?

Video: Examples

Homework

- Try to solve the problems yourself, then watch the solution video:
- https://youtu.be/qjTx48taYc0

HW 1: One of the reasons we no longer use steam engines is that they are far less efficient (8.0%) than internal combustion engines (30%). To produce 1000 J of Work, how much heat must you add to each type of engine?

HW 2: A steam train has a mass of $8.00 \cdot 10^5$ kg (800 tons). Its engine burns coal, turning heat into work. The efficiency of the engine is 0.07 (7%). The train speeds up from rest to 5.44 m/s.

a) How much work was done on the train? (Think about the KE.)

b) How much heat was created by burning the coal?

c) How much heat was dumped into the atmosphere?

That's it!