

Question #79205

Determine the heat transfer rate, in Btu/h, required to cool a 200. kW electric generator that is driven by a 300. hp diesel engine.

Note: The generator will run cool if it has a zero net energy transport rate.

Answer:

The power of the generator in Btu/h is:

$$200 \text{ kW} \cdot 3412.14 \text{ Btu/h.kW} = 682,428 \text{ Btu/h.}$$

The power of the diesel engine in Btu/h is:

$$300 \text{ hp} \cdot 2544.43 \text{ Btu/h.hp} = 763,329 \text{ Btu/h.}$$

Thus, to have a zero net energy transport rate we should cool the generator with heat transfer rate of:

$$763,329 \text{ Btu/h} - 682,428 \text{ Btu/h} = 80,901 \text{ Btu/h.}$$