36.72 The inlet and exhaust enthalpies for the turbine of a gas turbine engine are $800\frac{Btu}{lb}$ and $450\frac{Btu}{lb}$, respectively. The mass flow rate through the turbine is $20,000\frac{lb}{hr}$. What is the gross work output of the cycle?

A. $700hp$

B. $1180hp$

C. $2750hp$

D. $4800hp$

The gross work output from the turbine is the product of the mass flow rate and the change in enthalpy between the inlet and the outlet. Convert the final units to hp.

$$\dot{W} = \dot{m}\Delta h$$

$$\dot{W} = \left(20,000\frac{lb}{hr}\right)\left(800\frac{Btu}{lb} - 450\frac{Btu}{lb}\right) = 7 \times 10^6\frac{Btu}{hr}$$

$$\dot{W} = \left(7 \times 10^6\frac{Btu}{hr}\right)\left(\frac{1hr}{60min}\right)\left(\frac{1hp}{42.4\frac{Btu}{min}}\right) = 2752hp$$

Answer C