

36.69 A hydronic piping system is re-designed to improve efficiency. The 250gpm pump is re-selected from 200ft TDH to 175ft TDH to suit the reduction in pressure loss throughout the system and capture savings. Both the old and new pump selections have an efficiency of 85% and are driven by a 94% efficient motor. The pump will run 9AM-5PM Monday through Friday year round. Electricity costs \$0.18 per kWh. What are the annual savings?

- A. \$550
- B. \$950
- C. \$1250
- D. \$1650

Consider the original pump selection as Case 1 and the new pump selection as Case 2. Find the **Water Horsepower, whp**, for both scenarios.

$$WHP = \frac{Q\Delta h}{3960}$$

$$WHP_1 = \frac{(250)(200)}{3960} = 12.63hp$$

$$WHP_2 = \frac{(250)(175)}{3960} = 11.05hp$$

Find the electrical power for each scenario by applying the pump and motor efficiency and converting units to KW.

$$P_1 = \frac{WHP_1}{\eta_p \eta_m} = \frac{12.63hp}{(0.85)(0.94)} \left(0.7457 \frac{KW}{hp} \right) = 11.8KW$$

$$P_2 = \frac{WHP_2}{\eta_p \eta_m} = \frac{11.05hp}{(0.85)(0.94)} \left(0.7457 \frac{KW}{hp} \right) = 10.34KW$$

Calculate the annual costs for each scenario by applying the annual run time and electricity rate.

$$Cost_1 = (11.8KW) \left(8 \frac{hr}{day} \right) \left(5 \frac{days}{wk} \right) \left(52 \frac{wk}{yr} \right) \left(\frac{\$0.18}{kW \cdot hr} \right) = \$4,418/year$$

$$Cost_2 = (10.34KW) \left(8 \frac{hr}{day} \right) \left(5 \frac{days}{wk} \right) \left(52 \frac{wk}{yr} \right) \left(\frac{\$0.18}{kW \cdot hr} \right) = \$3,871/year$$

Calculate the savings.

$$Savings = \$4,418/year - \$3,871/year = \$547/year$$

Answer A