$$PV_{20} = -\$300,000\left(\frac{1}{1+i}\right)^n = -\$300,000\left(\frac{1}{1.06}\right)^{20} = -\$93,541$$

Take the sum to find the present value:

$$PV_0 + PV_1 + PV_2 + PV_3 + PV_{20}$$

$$\$500,000 + \$235,849 + \$222,499 + \$83,962 - \$93,541 = \$948,769$$

Use the same approach as in the original solution to find the annualized cost:

$$\$948,769\,(A/P, 6\%, 20) = \$948,770\,(.0872) = \$82,733$$

Answer A

47.6 The air horsepower produced by a fan is $6.3hp$. The fan has a mechanical efficiency of 80% and the fan motor has an efficiency of 95%. The fan runs for 12 hours per day. What is annual electricity consumption for the fan?

A. $21,000kWh$

B. $27,000kWh$

C. $36,000kWh$

D. $54,000kWh$

To find the electrical consumption, start by finding the electrical demand by dividing the air horsepower by both the fan efficiency and the motor efficiency and converting from hp to KW.

$$\dot{W} = \frac{AHP}{\eta_f \eta_m} = \frac{(6.3hp)\left(0.7457\frac{KW}{hp}\right)}{(0.8)\,(0.95)} = 6.18KW$$

Find the annual consumption by multiplying the demand by the amount of time the fan runs throughout the year.

$$Consumption = (6.18KW)\left(12\frac{hr}{day}\right)(365days) = 27,074kWh$$

Answer B

47.7 A fan delivers $10,000cfm$ of $70°F$ air at sea level. How much volume will the same fan deliver when used at $4000ft$ elevation to distribute $50°F$ air?

A. $8,000cfm$

B. $9,000cfm$

C. $11,000cfm$

D. $12,000cfm$

Qualitatively, it stands to reason that increasing the elevation at which the fan is used will increase the capacity of the fan in terms of volume flow rate because air is less dense higher in the atmosphere. However, reducing the temperature of the air makes it more dense, and reduces the capacity of the fan. These factors will compete and must be considered separately.

Search for Temperature and Altitude Corrections and use the table to look up the Density Factors for both the temperature and elevation change.

The Density Factor for the temperature requires interpolation.

Temperature [$°F$]	Density Factor
0	1.152
50	DF_T
70	1

$$\frac{70-50}{70-0} = \frac{1-DF_T}{1-1.152} = 0.2857$$

$$1 - DF_T = -0.0434 \rightarrow DF_T = 1.043$$

Look up the Density Factor for the altitude.

$$DF_A = 0.864$$

Although it is not explicitly stated in the reference handbook whether the original cfm should be multiplied or divided by the density factors, the previous reasoning provides the expectation that the decreased temperature will tend to reduce the fan capacity and the increased altitude will tend to increase the fan capacity. Therefore, the original cfm should be *divided* by the density factors.

$$Q_{4000ft} = \frac{Q_{sea\ level}}{DF_T \cdot DF_A} = \frac{10,000cfm}{(1.043)\,(0.864)} = 11,097cfm$$

Answer C