

37.55 A pump requires $120hp$ to transport $1400gpm$. What percent reduction in power will be realized when the flow rate is reduced to $800gpm$?

- A. 19%
- B. 33%
- C. 67%
- D. 81%

Reference the **Pump Affinity Laws** and use the equation for horsepower as a function of speed. Speed and volume flow rate are linearly proportional, therefore the ratio of the volume flow rates may be substituted for the ratio of the speeds.

$$\frac{Q_2}{Q_1} = \frac{N_2}{N_1}$$

$$bhp_2 = bhp_1 \left(\frac{N_2}{N_1} \right)^3$$

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Consider the original operating conditions as State 1, and the new conditions as State 2. Substitute and solve for the new power.

$$bhp_2 = (120hp) \left(\frac{800gpm}{1400gpm} \right)^3 = 22.4hp$$

Calculate the percent reduction relative to the original power.

$$\frac{(120hp - 22.4hp)}{120hp} = 81\%$$

Answer D