Calculate the percent reduction relative to the original power.

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

Answer D

47.56 A fluid with a specific gravity of 1.1 is pumped by a $150hp$ pump which generates $300ft$ of head. What is the increase in pressure observed at the pump outlet?

A. $130psi$

B. $143psi$

C. $3300psi$

D. $20,600psi$

Refer to the section under the Bernoulli Equation. The change in pressure is essentially the head added by the pump converted from ft to psi, and after adjusting for the specific weight of fluids other than water, as is the case in this problem.

$$\Delta p = \gamma h$$

Head added by the pump, h, is given. The specific weight is a function of the Specific Gravity. Solve for γ and substitute into the original equation.

$$SG = \frac{\gamma}{\gamma_w}$$

$$\gamma = SG \cdot \gamma_w$$

$$\Delta p = SG \cdot \gamma_w h$$

Evaluate the increase in pressure, Δp, and convert units to psi.

$$\Delta p = (1.1)\left(62.4\frac{lb_f}{ft^3}\right)(300ft)\left(\frac{1ft^2}{144in^2}\right) = 143psi$$

Answer B

47.57 A pump running at $1750rpm$ delivers $250gpm$ and generates $150ft$ of head. What is the head generated by the pump after the impeller is trimmed by 25%, assuming the speed remains the same?

A. $84ft$

B. $113ft$

C. $150ft$

D. $267ft$

Use the Pump Affinity Laws for Impeller Diameter Change. Consider the original pump conditions as State 1 and pump attributes after modification as State 2. A 25% reduction in diameter retains 75% of the original diameter such that $\frac{D_2}{D_1} = 0.75$. The speed is unchanged and the volume flow rate is extra information. Selet the formula below and determine the head for the new conditions.

$$h_2 = h_1 \left(\frac{D_2}{D_1}\right)^2$$

$$h_2 = (150ft)\,(0.75)^2 = 84.4ft$$

Answer A

47.58 A pump is used to distribute $90°F$ water from an open tank at $5gpm$. The centerline of the pump is located $8ft$ above the surface of the water. The manufacturer's specifications state the inlet pressure for this arrangement must be at least $30psi$. What is the net positive suction head required?

A. $35ft$

B. $61ft$

C. $69ft$

D. $103ft$

Net Positive Suction Head Required, or $NPSH_R$, is always provided by the pump manufacturer. In this case, the manufacturer has provided the required inlet pressure, which is the same information given in psi rather than ft of head. The additional information in the problem statement will impact the net positive suction head *available*, but the net positive suction head *required* is purely a specification from the manufacturer. Simply convert the units from psi to ft. There is no need to add atmospheric pressure. The atmosphere may help contribute to the required head / pressure.

$$NPSH_R = (30psi)\left(2.31\frac{ft}{psi}\right) = 69ft$$

Answer C