Project analysis

Sunday, October 16, 2022 8:37 PM

$KE + PE = W_{in}$

$W_{in} = 156W$

$PE = mgh$

$KE = \frac{1}{2}mv^2$

$m = V\rho = V(997 \frac{kg}{m^3})$

velocity $= \dot{V}/A$

$\left(\frac{m^3}{s}\right)\frac{1}{m^2}$

$A = \frac{\pi}{4} d^2$

$d = 0.25 in \left(\frac{1m}{39.4in}\right)$

$A = 3.16 \times 10^{-5}$

$156W = (\dot{V})(997 \frac{kg}{m^3})(9.81 \frac{m}{s^2})(0.5m) + \frac{1}{2}(\dot{V})(997 \frac{kg}{m^3})\left(\frac{\dot{V}}{A}\right)^2$

$156W = 4890.3\dot{V} + 5.0 \times 10^{-5}\dot{V}^3$

$0 = 5 \times 10^{-5}\dot{V}^3 + 4890.3\dot{V} - 156$

$\dot{V} = 0.0319 \frac{m^3}{s}$

$v = \frac{\dot{V}}{A} = \frac{0.0319 \frac{m^3}{s}}{3.16 \times 10^{-5} m^2} = \boxed{1009.5 m/s}$