57 m³: Neglecting losses, what power is kW

The horizontal pump discharges 20 water at

\[
\frac{120 \times 10^3}{2(9.81)} + \frac{(22.4)^2}{2(9.81)} + 0 - h_p = 96 + 9.6 = 0
\]

\[
\begin{align*}
\frac{V_2}{A_2} &= \frac{Q}{A_1} = \frac{\pi D_2^2}{\pi D_1^2} = \frac{57/3600}{140/3600} = \frac{57}{140} \\
v_2 &= \frac{\sqrt{2g} + z_1}{P_2} = \frac{2.49}{2g} + \frac{z_2}{2} - h_p
\end{align*}
\]
\[ P = 8.4 \text{ kW} \]
There is a loss in the flow.

\[ \text{Minimize } \lambda_p \to \lambda_p = 0 \]

\[ \begin{align*}
\frac{\rho g}{g} & = 1 - \frac{1}{\lambda_p} + \frac{2g}{v} (z_1 - z_2) \\
& = 1 - \frac{1}{\lambda_p} + \frac{2g}{v} (z_1 - z_2)
\end{align*} \]

\[ \text{Find fan head } h_p \]

\[ \text{air constant } P \]

\[ \text{though a duct } \]

\[ \text{fan blows air vertically } \]

\[ \text{neglect friction } \]
Find conversion efficiency.

Power = 25 MW

pipe. Find river flow rate that extracted

\( P = P_2 = P_{\text{kin}} \Rightarrow P_1 = 0 \)

\( \dot{V} = \dot{V}_2 = 0 \)

\[ \frac{2g}{V_2^2} + \frac{y}{V_1^2} + \frac{y}{V_1} + h_f + h_t \]

\[ = 1 + \frac{2g}{V_1^2} + \frac{y}{V_1} \]

The large turbine diverses the river flow under

\( h_t = 3.5 \sqrt{2g} \), \( V \) is average velocity is supplied

A dam as shown.
\[ h_t = 7.59 \pm 1.34 \]

\[ a = 2.9 \pm 0.9 \]

\[ 2 = 10 + 3.5 \]

\[ 50 = 10 + 3.5 + h_t \]

\[ z_1 = z_2 + h_f + h_t \]
\[ h_f = 6.5 \text{ m} \]

\[ h_f = 21.5 \text{ m} \]

\[ \frac{(16) \ \frac{4}{11}}{6.9} \text{ or } \frac{(16) \ \frac{4}{11}}{6.5} = 9 \text{ or } 10 \]