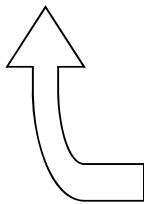


Final 2011-2012 EME312

Q4 b)

Q (m3/hr)	0	15	30	45	60	75
hm (m)	75	72	65	53	38	19
η (%)	0	43	69	73	65	49
h piping	42	42.92	45.67	50.25034	56.67	64.92
h pnew	35	35.92	38.67	43.25034	49.67	57.92



$$h \text{ piping} = H_{st} + K * Q^2$$

$$h \text{ piping} = 42 + K * (47)^2 = 51 \text{ m from chart}$$

$$\text{Then } K = 0.004$$

For the same pipelines

K is the same

$$h \text{ piping new} = 35 + 0.004 * Q^2$$

$$\text{from chart } Q_{\text{new}} = 52 \text{ m}^3/\text{hr}$$

$$\begin{aligned} \text{Shaft Power} &= wQh / \eta = 9800 * 45.8 * 52 / 0.7 \\ &= 33342400 \text{ N.m/hr} \\ &= 9261.7778 \text{ N.m/sec} \end{aligned}$$

