

SAVE ENERGY - SAVE COSTS

EXAMPLE : CALCULATE THE YEARLY ENERGY COST FOR 8 INCH (200MM) INCONEL VORTEX FLOWMETER AND FOR AN ORIFICE FLOWMETER MEASURING 38°C WATER FLOWING AT 5.7 M³/MIN. FOR THE ORIFICE $\beta = 0.689$ AND THE DIFFERENTIAL PRESSURE IS 50 KPa. ASSUME 80 PERCENT PUMP AND MOTOR EFFICIENCY AND AN ENERGY COST OF RS. 4.29/KW-H

$$\text{ENERGY COST} = \frac{W}{1000} \times \frac{\text{OPERATING HOURS}}{\text{YEAR}} \times \text{BILLING RATE (RS/KW-HR)}$$

$$\text{WHERE } W = \frac{\Delta P_L \times Q}{60 \times \eta} \text{ (WATTS)}$$

ΔP_L = PERMANENT PRESSURE LOSS DUE TO THE FLOWMETER (KPa)

Q = FLOW (LPM)

η = EFFICIENCY OF MOTOR AND PUMP

DENSITY OF WATER (AT 38°C) $\rho = 992.96 \text{ KG/M}^3$

INCONEL VORTEX FLOW METER

$$\begin{aligned} \Delta P_L &= \text{PERMANENT PRESSURE LOSS (KPa)} \\ &= 1.2 \times 10^{-5} \times \rho \times V^2 \times 98.06650 \end{aligned}$$

$$\begin{aligned} \text{WHERE } \rho &= \text{DENSITY (KG/M}^3\text{)} \\ V &= \text{VELOCITY 2.9434 (M/SEC)} \\ \Delta P_L &= 9.95 \text{ KPa} \end{aligned}$$

$$\begin{aligned} W &= \frac{\Delta P_L \times Q}{60 \times \eta} \\ &= \frac{9.95}{60} \times \frac{5.7}{0.8} \times 1000 \end{aligned}$$

$$= 1181.56 \text{ WATTS}$$

$$\text{ENERGY COST} = \frac{W}{1000} \times \frac{\text{OPERATING HOURS}}{\text{YEAR}} \times \text{BILLING RATE (RS/KW-HR)}$$

$$= \frac{1181.56}{1000} \times \frac{8760}{1} \times 4.29$$

$$\text{ENERGY COST} = \text{RS. 44403.49}$$

ORIFICE FLOW METER

$$\begin{aligned} \Delta P_L &= \text{PERMANENT PRESSURE LOSS (KPa)} \\ &= (1 - 0.24\beta - 0.52\beta^2 - 0.16\beta^3) \Delta P \end{aligned}$$

$$\begin{aligned} \text{WHERE DIFF. PRESSURE } \Delta P &= 50 \text{ KPa} \\ \beta &= 0.689 \end{aligned}$$

$$\Delta P_L = 26.8 \text{ KPa}$$

$$\begin{aligned} W &= \frac{\Delta P_L \times Q}{60 \times \eta} \\ &= \frac{26.8}{60} \times \frac{5.7}{0.8} \times 1000 \end{aligned}$$

$$= 3182.5 \text{ WATTS}$$

$$\text{ENERGY COST} = \frac{W}{1000} \times \frac{\text{OPERATING HOURS}}{\text{YEAR}} \times \text{BILLING RATE (RS/KW-HR)}$$

$$= \frac{3182.5}{1000} \times \frac{8760}{1} \times 4.29$$

$$\text{ENERGY COST} = \text{RS. 119599.62}$$

$$\text{NETT SAVINGS RS. 75196=13}$$