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Computer Eng

(1) Real flowrate = 10 dm^3/min,
T = 12.5 Nm = $\frac{10 \times 10^{-3}}{60}$

= 1.67×10^{-4} m^3/s

Pressure = 12 bar = 12×10^5 N/m^2
Speed = 1500 rev/min = 25 rev/sec
Nominal displacement
= 2.5×10^{-4} m^3/sec

i) Volumetric efficiency
= $\frac{\text{Real flowrate}}{\text{ideal flowrate}} \times 100$

= $\frac{1.67 \times 10^{-4}}{2.5 \times 10^{-4}} \times 100$ = 66.8%

ii) Fluid Power (Q × ΔP)
= $1.67 \times 10^{-4} \times 12 \times 10^5$ = 2004 watt

= Shaft power = T × ω
ω = 2 × π × 25 = 157.08
Shaft power = 125 × 157.08
= 1963.5 watts

iii, Overall Efficiency
= $\frac{\text{Fluid power}}{\text{Shaft power}} \times 100$

= $\frac{2004}{1963.5} \times 100$ = 10.206
≃ 10.21%

(2) Pump Delivery = 35 dm^3/min
= $\frac{35 \times 10^{-3}}{60}$ = 5.83×10^{-4}

P = 100 bars = 100×10^5 N/m^2
Overal efficiency = 87%

Fluid power = (Q × ΔP)
= $5.83 \times 10^{-4} \times 100 \times 10^5$
= 5830 watts.

ii) Overall efficiency
$\frac{5830 \times 100}{87}$
= 6701.1491 watts

3, Nominal displacement 50 cm^3/rev
= 50×10^{-6} m^3/rev
Pressure = 100 bar = 100×10^5 N/m^2
Shaft power = 15 kw = 15000 watt
Actual flowrate = 35 dm^3/min
= $\frac{35 \times 10^{-3}}{60}$ m^3 = 5.85×10^{-4} m^3

Speed = 850 rev/min = $\frac{850}{60}$

= 14.17 rad/sec

Ideal flowrate = Nominal displacement × speed
= 50×10^{-6} m^3/rev × 14.7 rad/sec
= 7.085×10^{-4} m^3/sec