

Flooded Screw Temp Example

- Assume
 - Atmospheric pressure 12 psia
 - Gas Suction = 0 psig
 - Gas Discharge = 50 psig

	Gas	Oil
Fluid	Methane	Semi-Synthetic
Flow Rate	500 MSCF/day	40 gpm
SG	0.6	0.81
Temp In	80°F	180°F
c_p	0.52669 BTU/lbm-R	0.45 BTU/lbm-R
k	1.28	-

- What is the discharge temperature of the compressor?

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$$\dot{m}_{gas} = q_{gasMSCFd} \cdot \rho_{gasStd} = 500000 \frac{ft^3}{day} \cdot 0.046 \frac{lbm}{ft^3} = 23000 \frac{lbm}{day}$$

$$\dot{m}_{oil} = q_{oil} \cdot \rho_{water} \cdot SG_{oil} = 40 \frac{gal}{min} \cdot 8.34 \frac{lbm}{gal} \cdot 0.81 \cdot \frac{1440 \text{ min}}{day} = 389111 \frac{lbm}{day}$$

$$T_{disch-gas} = (80 + 460) \left(\frac{50 + 14.73}{0 + 14.73} \right)^{\frac{(1.28-1)}{1.28}} = 773R$$

$$Q_{gas} = 23000 \frac{lbm}{day} \cdot \left(0.52669 \frac{BTU}{lbm \cdot R} \right) \cdot (773R - 540R) = 2.822 \times 10^6 \frac{BTU}{day}$$

$$T_{disch} = \frac{Q_{gas} + T_{gasIn} \cdot \dot{m}_{gas} \cdot c_{pGas} + T_{oilIn} \cdot \dot{m}_{oil} \cdot c_{pOil}}{\dot{m}_{gas} \cdot c_{pGas} + \dot{m}_{oil} \cdot c_{pOil}}$$

$$T_{disch} = \frac{2.822 \times 10^6 \frac{BTU}{day} + 540R \cdot 23000 \frac{lbm}{day} \cdot 0.52669 \frac{BTU}{lbm \cdot R} + 640R \cdot 389111 \frac{lbm}{day} \cdot 0.45 \frac{BTU}{lbm \cdot R}}{23000 \frac{lbm}{day} \cdot 0.52669 \frac{BTU}{lbm \cdot R} + 389111 \frac{lbm}{day} \cdot 0.45 \frac{BTU}{lbm \cdot R}} = 188.9F$$

Too Cool, can raise discharge to 220 psig or lower q_{oil} to 12 gpm or raise oil inlet to 197F

Or some combination