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**Content Based
Chemical Engineering**

GAS/VAPOR MIXTURES - AVERAGE PROPERTIES

REFERENCES: MARKS' MECHANICAL ENGINEERS HANDBOOK; PERRY'S CHEMICAL ENGINEERS HANDBOOK; FLUID FLOW by Sabersky & Acosta

LIMITATIONS: Calcs based on perfect gas, except steam. **See notes below.**

NOTE: Always begin a new case by retrieving the original file. Direct entry of data in cells that originally contain table lookups could cause functions to be lost, or incorrect calculation: I format cells requiring entry colored **RED**; calculated values are black.

- 1.) Enter identification at [C4].
- 2.) Enter the pressure of the mix at [C6].
- 3.) Enter fluid by using [=], then going to fluid name in the gas or liquid tables, and double-clicking th or high-lighting and hitting ther [return key]. Fluid specifics will be returned via lookup tables. Fo NOT in my tables enter values in the appropriate cells.
- 4.) Enter each fluid's flow rate at [C9] thru [C17].
- 5.) If there is no steam in the mix, enter each fluid's temperature at [G9] thru [G17]. (see notes)

Print out using direct Excel commands. This application is provided by Chem Engineers Resource Website, visit cheresources.com for additional selections.

NOTES:

For all gases except steam, table values of k, and Cp are at standard conditions. For significantly c pressures or temperatures, directly enter the correct k and Cp values in rows 10 thru 15.

For mixtures with steam, the steam condensed to heat up the other gases is ignored, and all are s the steam temperature. Do not enter gas temperatures in rows 10 thru 15 for these mixes.

GAS/VAPOR MIXTURES - AVERAGE PROPERTIES

Equip: Hazard Summary for Tank #3622

Pressure: 29 psig

	fluid	lb/hr	mw	k	cps	°F	Vol %	ACFH	SCFH
1.)	AIR	500	28.97	1.41	0.241	70	31.68793	2242.563	6666.667
2.)	STEAM	500	18	1.3131	0.0136	272.36	68.31207	4834.462	13399.5
3.)		0	0	0	0	0	0	0	0
4.)		0	0	0	0	0	0	0	0
5.)		0	0	0	0	0	0	0	0
6.)		0	0	0	0	0	0	0	0
7.)		0	0	0	0	0	0	0	0
8.)		0	0	0	0	0	0	0	0
9.)		0	0	0	0	0	0	0	0

fluid	lb/hr	mw	k	cps	°F	Vol %	ACFH	SCFH
GAS MIXTURE	1000	22.204	1.3616	0.1273	80.843	100	7077.025	20066.17

Properties of the Mixture

Pa = 43.7 psia	PRcrit = 0.5348
Ta = 540.4429 °R	lambda = 1158.1 (at PRcrit)
v = 7.077025 ft ³ /lb	sp.gr. = 0.7664
dens = 0.141302 lb/ft ³	Tmax = 272.36 °F

GAS MIXTURE, SCFH IN TERMS OF SCFH AIR

$$\text{Equiv}_{\text{air}} := \left(\text{Gas Mixture.SCFH} \right) \cdot \sqrt{\frac{\text{Gas Mix.MW}}{\text{Air MW}}} = 17567.31 \text{ SCFH}_{\text{AIR EQUIVALENT}}$$

$$= 1317.549 \text{ lb/hr}_{\text{AIR EQUIVALENT}}$$

Note 1: - Steam Conditions are at Saturated Conditions by default, ADJUST ACCORDINGLY !!**Note 2: - Superheat Specific Volume can be Adjusted in the SCFH Equation [Column - J] !!**

GAS/VAPOR MIXTURES - AVERAGE PROPERTIES
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Equip: Hazard Summary for Tank #3622

Pressure: 200 kPa, or 2.00 bar

	fluid	kg/s	mw	k	Pa.s	°C	Vol %	m ³ /s	Nm ³ /s
1.)	AIR	500	28.97	1.41	0.000241	0	56.76352	396.1649	6666.667
2.)	STEAM	500	18	1.31311	1.36E-05	133.537	43.23648	301.7568	13399.5
3.)		0	0	0	0	0	0	0	0
4.)		0	0	0	0	0	0	0	0
5.)		0	0	0	0	0	0	0	0
6.)		0	0	0	0	0	0	0	0
7.)		0	0	0	0	0	0	0	0
8.)		0	0	0	0	0	0	0	0
9.)		0	0	0	0	0	0	0	0

fluid	kg/s	mw	k	Pa.s	°C	Vol %	m ³ /s	Nm ³ /s
GAS MIXTURE	1000	22.204	1.36	0.000127	7.16	100	697.9217	20066.17

Properties of the Mixture

Pa = 200 kPa	PRcrit = 0.53484
Ta = 280.16 °K	lambda = 1158.06 (at PRcrit)
v = 0.697922 m ³ /kg	sp.gr. = 0.76645
dens = 1.432826 kg/m ³	Tmax = 133.537 °C

GAS MIXTURE, Nm³/s IN TERMS OF Nm³/s AIR

$$\text{Equiv}_{\text{air}} = \text{Gas Mixture Nm}^3/\text{s} \cdot \left(\text{Gas Mix MW} / \text{Air MW} \right)^{0.5} = 17567.31 \text{ Nm}^3/\text{s}_{\text{AIR EQUIVALENT}}$$

Note 1: - Steam Conditions are at Saturated Conditions by default, ADJUST ACCORDINGLY !!**Note 2: - Superheat Specific Volume can be Adjusted in the SCFH Equation [Column - J] !!**