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1: "Termoquímica bajo operación de flujo turbulento"
2:
3: m_dot_air = 0,1507 [kg/s]
4: PCI_propano = 46367,088 [Kj/Kg]
5: PCI_butano = 45764,592 [Kj/Kg]
6: Q_in = q * m_dot_air
7: q = 457,8
8:
9: "Para el propano C_3H_8"
10: "C_nH_m + (n+(m/4))*((O_2)+(3,76*N_2)) = n*C*O_2 + (m/2)*H_2O + (n+m/4)*N_2"
11:
12: n = 3 [kmol]
13: m = 8 [kmol]
14: M_O = MolarMass(O)
15: M_N = MolarMass(N)
16: M_C = MolarMass(C)
17: M_H = MolarMass(H)
18:
19: (AC_propano) = ((n+m/4)*(2*M_O + 3,76*2*(M_N)))/(n*(M_C)+m*(M_H))
20: lambda_propano = m_dot_air/m_dot_air_steq_prop "Coeficiente de exceso de aire"
21:
22: m_dot_fuel_propano = Q_in/PCI_propano
23: m_dot_air_steq_prop = m_dot_fuel_propano*(AC_propano)
24:
25:
26:
27: "Para el Butano C_4H_10"
28: "C_xH_y + (x+(y/4))*((O_2)+(3,76*N_2)) = x*C*O_2 + (y/2)*H_2O + (x+y/4)*N_2"
29:
30: x = 4 [kmol]
31: y = 10 [kmol]
32:
33: (AC_butano) = ((x+y/4)*(2*M_O + 3,76*2*(M_N)))/(x*(M_C)+y*(M_H))
34: lambda_butano = m_dot_air/m_dot_air_steq_but "Coeficiente de exceso de aire"
35:
36: m_dot_fuel_butano = Q_in/PCI_butano
37: m_dot_air_steq_but = m_dot_fuel_butano*(AC_butano)

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Termoquímica bajo operación de flujo turbulento

$$\dot{m}_{\text{air}} = 0,1507 \text{ [kg/s]}$$

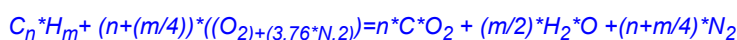
$$PCI_{\text{propano}} = 46367,088 \text{ [kJ/kg]}$$

$$PCI_{\text{butano}} = 45764,592 \text{ [kJ/kg]}$$

$$Q_{\text{in}} = q \cdot \dot{m}_{\text{air}}$$

$$q = 457,8$$

Para el propano C₃H₈



$$n = 3 \text{ [kmol]}$$

$$m = 8 \text{ [kmol]}$$

$$M_O = \text{MolarMass} [O]$$

$$M_N = \text{MolarMass} [N]$$

$$M_C = \text{MolarMass} [C]$$

$$M_H = \text{MolarMass} [H]$$

$$AC_{\text{propano}} = \frac{\left[n + \frac{m}{4} \right] \cdot [2 \cdot M_O + 3,76 \cdot 2 \cdot M_N]}{n \cdot M_C + m \cdot M_H}$$

$$\lambda_{\text{propano}} = \frac{\dot{m}_{\text{air}}}{\dot{m}_{\text{air;steq;prop}}} \quad \text{Coeficiente de exceso de aire}$$

$$\dot{m}_{\text{fuel;propano}} = \frac{Q_{\text{in}}}{PCI_{\text{propano}}}$$

$$\dot{m}_{\text{air;steq;prop}} = \dot{m}_{\text{fuel;propano}} \cdot AC_{\text{propano}}$$

Para el Butano C_4H_{10}

$$C_x H_y + (x + (y/4)) \cdot ((O_2) + (3,76 \cdot N_2)) = x \cdot C \cdot O_2 + (y/2) \cdot H_2 \cdot O + (x + y/4) \cdot N_2$$

$$x = 4 \quad [\text{kmol}]$$

$$y = 10 \quad [\text{kmol}]$$

$$AC_{\text{butano}} = \frac{\left[x + \frac{y}{4} \right] \cdot [2 \cdot M_O + 3,76 \cdot 2 \cdot M_N]}{x \cdot M_C + y \cdot M_H}$$

$$\lambda_{\text{butano}} = \frac{\dot{m}_{\text{air}}}{\dot{m}_{\text{air;steq;but}}} \quad \text{Coeficiente de exceso de aire}$$

$$\dot{m}_{\text{fuel;butano}} = \frac{Q_{\text{in}}}{PCI_{\text{butano}}}$$

$$\dot{m}_{\text{air;steq;but}} = \dot{m}_{\text{fuel;butano}} \cdot AC_{\text{butano}}$$

SOLUTION

Unit Settings: SI C kPa kJ mass deg

$$AC_{\text{butano}} = 15,36 \quad [\text{kg/kg}]$$

$$\lambda_{\text{butano}} = 6,509$$

$$m = 8 \quad [\text{kmol}]$$

$$\dot{m}_{\text{air}} = 0,1507 \quad [\text{kg/s}]$$

$$\dot{m}_{\text{air;steq;prop}} = 0,02317 \quad [\text{kg/s}]$$

$$\dot{m}_{\text{fuel;propano}} = 0,001488 \quad [\text{kg/s}]$$

$$M_N = 14,01 \quad [\text{kg/kmol}]$$

$$n = 3 \quad [\text{kmol}]$$

$$PCI_{\text{propano}} = 46367 \quad [\text{kJ/kg}]$$

$$Q_{\text{in}} = 68,99 \quad [\text{Kj/s}]$$

$$y = 10 \quad [\text{kmol}]$$

$$AC_{\text{propano}} = 15,57 \quad [\text{kg/kg}]$$

$$\lambda_{\text{propano}} = 6,504$$

$$M_C = 12,01 \quad [\text{kg/kmol}]$$

$$\dot{m}_{\text{air;steq;but}} = 0,02315 \quad [\text{kg/s}]$$

$$\dot{m}_{\text{fuel;butano}} = 0,001508 \quad [\text{kg/s}]$$

$$M_H = 1,008 \quad [\text{kg/kmol}]$$

$$M_O = 16 \quad [\text{kg/kmol}]$$

$$PCI_{\text{butano}} = 45765 \quad [\text{kJ/kg}]$$

$$q = 457,8 \quad [\text{Kj/kg}]$$

$$x = 4 \quad [\text{kmol}]$$

No unit problems were detected.

There are a total of 21 equations in the Main program.

Block	Rel. Res.	Abs. Res.	Units	Calls	Time(ms)	Equations
0	0.000E+00	0.000E+00	OK	1	0	$m_dot_air=0,1507[\text{kg/s}]$
0	0.000E+00	0.000E+00	OK	1	0	$PCI_propano=46367,088[\text{Kj/Kg}]$
0	0.000E+00	0.000E+00	OK	1	0	$PCI_butano=45764,592[\text{Kj/Kg}]$

0	0.000E+00	0.000E+00	OK	1	0	q =457,8
0	0.000E+00	0.000E+00	OK	1	0	n =3[kmol]
0	0.000E+00	0.000E+00	OK	1	0	m =8[kmol]
0	0.000E+00	0.000E+00	OK	1	0	x =4[kmol]
0	0.000E+00	0.000E+00	OK	1	0	y =10[kmol]
0	0.000E+00	0.000E+00	OK	4	0	M_O =MolarMass(O)
0	0.000E+00	0.000E+00	OK	4	0	M_N =MolarMass(N)
0	0.000E+00	0.000E+00	OK	4	0	M_C =MolarMass(C)
0	0.000E+00	0.000E+00	OK	4	0	M_H =MolarMass(H)
0	0.000E+00	0.000E+00	OK	4	0	(AC_propano) =((n+m/4)*(2*M_O+3,76*2*(M_N)))/(n*(M_C)+m*(M_H))
0	0.000E+00	0.000E+00	OK	4	0	(AC_butano) =((x+y/4)*(2*M_O+3,76*2*(M_N)))/(x*(M_C)+y*(M_H))
0	0.000E+00	0.000E+00	OK	4	0	Q_in =q*m_dot_air
0	0.000E+00	0.000E+00	OK	4	0	m_dot_fuel_propano =Q_in/PCI_propano
0	0.000E+00	0.000E+00	OK	4	0	m_dot_air_steq_prop =m_dot_fuel_propano*(AC_propano)
0	0.000E+00	0.000E+00	OK	4	0	m_dot_fuel_butano =Q_in/PCI_butano
0	0.000E+00	0.000E+00	OK	4	0	m_dot_air_steq_but =m_dot_fuel_butano*(AC_butano)
0	0.000E+00	0.000E+00	OK	4	0	lambda_propano =m_dot_air/m_dot_air_steq_prop
0	0.000E+00	0.000E+00	OK	4	0	lambda_butano =m_dot_air/m_dot_air_steq_but