

"Forward Balancing for CHON Combustion w/Air Mixtures"

alpha = 1 "atoms of carbon in fuel"
 beta = 4 "atoms of hydrogen in fuel"
 gamma = 0 "atoms of oxygen in fuel"
 delta = 0 "atoms of nitrogen in fuel"
 lambda = 1 "excess air coefficient - must be greater than or equal to one"

"Moles of Products"

Co2 = alpha "moles carbon dioxide in exhaust"
 H2o = beta/2 "moles water vapor in exhaust"
 Oxygen = (lambda-1)*(alpha+beta/4-gamma/2) "moles oxygen in exhaust"
 Nitrogen = lambda*(alpha + beta/4-gamma/2)*3.76+delta/2 "moles nitrogen in exhaust"

"Dry Gas Analysis"

Dry_Total = Co2 + Oxygen + Nitrogen
 Dry_Co2_fraction = Co2/(Dry_Total) "Co2 fraction in dry exhaust"
 Dry_Oxygen_fraction = Oxygen/(Dry_Total) "Oxygen fraction in dry exhaust"
 Dry_Nitrogen_fraction = Nitrogen/(Dry_Total) "Nitrogen fraction in dry exhaust"

"Actual air/fuel data"

Theoretical_Air = lambda*100
 air_act_coef = lambda*(alpha + beta/4-gamma/2)
 AF_act = air_act_coef*(32+3.76*28)/(alpha*12+beta*1+gamma*16+delta*14) "actual air/fuel - gravimetric basis"

"Stoichiometric air/fuel data"

air_stoich_coef = alpha+beta/4-gamma/2 "stoichiometric air/fuel - molar basis"
 AF_stoich = air_stoich_coef*(32+3.76*28)/(alpha*12+beta*1+gamma*16+delta*14) "stoichiometric air/fuel - gravimetric basis"

SOLUTION**Unit Settings: SI C kPa kJ mass deg**

AF _{act} = 17.16	AF _{stoich} = 17.16
air _{act,coef} = 2	air _{stoich,coef} = 2
α = 1	β = 4
Co2 = 1	δ = 0
DryCo2,fraction = 0.1174	DryNitrogen,fraction = 0.8826
DryOxygen,fraction = 0	DryTotal = 8.52
γ = 0	H2o = 2
λ = 1	Nitrogen = 7.52
Oxygen = 0	TheoreticalAir = 100

No unit problems were detected.

KEY VARIABLES

Co2 = 1 *Moles Carbon Dioxide/Mole Fuel*
 H2o = 2 *Moles H2o/Mole Fuel*
 Nitrogen = 7.52 *Moles Nitrogen (in exhaust)/Mole Fuel*
 Oxygen = 0 *Moles Oxygen (in exhaust)/Mole Fuel*
 AF_{act} = 17.16 *Actual air/fuel on mass basis*
 AF_{stoich} = 17.16 *Stoichiometric air/fuel on mass basis*