IC Engine HW 2 Results

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1. **Reaction with 120% theoretical air:**

Unit Settings: [kJ]/[K]/[bar]/[kmol]/[degrees]

$a = 24.6$

$a_{stoic} = 20.5$

$b = 14.72$

$c = 1.277$

$d = 17$

$\Delta G_1^\circ = 83581$ [kJ/kmol]

$\Delta G_2^\circ = 121979$ [kJ/kmol]

$e = 92.34$

$f = 0.5828$

$g = 0.3115$

$g_{CO}^\circ = -655084$ [kJ/kmol]

$g_{CO2}^\circ = -1.021E+06$ [kJ/kmol]

$g_{H2O}^\circ = -784701$ [kJ/kmol]

$g_{N2}^\circ = -529787$ [kJ/kmol]

$g_{NO}^\circ = -486666$ [kJ/kmol]

$g_{O2}^\circ = -565524$ [kJ/kmol]

$HP = -452014$ [kJ/kmol]

$HR = -452014$ [kJ/kmol]

$h_{CO} = -42053$ [kJ/kmol]

$h_{CO2} = -282505$ [kJ/kmol]

$h_{f,C16H34} = -458300$

$h_{f,N2} = 53.61$ [kJ/kmol]

$h_{f,O2} = 53.94$ [kJ/kmol]

$h_{H2O} = -152376$ [kJ/kmol]

$h_{N2} = 67792$ [kJ/kmol]

$h_{NO} = 159987$ [kJ/kgmol]

$h_{O2} = 71475$ [kJ/kmol]

$K_1 = 0.01318$

$K_2 = 0.001803$

$n_{tot} = 126.2$

$P = 5$ [bar]

$P_{ref} = 1$ [bar]

$R = 8.314$ [kJ/kmole-K]

$T = 2322$ [K]

$y_{CO} = 0.01012$

$y_{CO2} = 0.1166$

$y_{H2O} = 0.1347$

$y_{N2} = 0.7315$

$y_{NO} = 0.002468$

$y_{O2} = 0.004616$

2. Reaction with 90% theoretical air:

Unit Settings: [kJ]/[K]/[bar]/[kmol]/[degrees]

$a = 18.45$	$a_{stoic} = 20.5$	$b = 3.899$
$c = 12.1$	$d = 17$	$\Delta G_1^o = 103026$ [kJ/kmol]
$\Delta G_2^o = 127899$ [kJ/kmol]	$e = 69.37$	$f = 0.00001492$
$g = 0.0008091$	$g_{CO}^o = -593845$ [kJ/kmol]	$g_{CO2}^o = -947818$ [kJ/kmol]
$g_{H2O}^o = -721714$ [kJ/kmol]	$g_{N2}^o = -470100$ [kJ/kmol]	$g_{NO}^o = -422048$ [kJ/kmol]
$g_{O2}^o = -501895$ [kJ/kmol]	$HP = -453586$ [kJ/kmol]	$HR = -453586$ [kJ/kmol]
$h_{CO} = -50599$ [kJ/kmol]	$h_{CO2} = -296758$ [kJ/kmol]	$h_{f,C16H34} = -458300$
$h_{f,N2} = 53.61$ [kJ/kmol]	$h_{f,O2} = 53.94$ [kJ/kmol]	$h_{H2O} = -164597$ [kJ/kmol]
$h_{N2} = 59301$ [kJ/kmol]	$h_{NO} = 151357$ [kJ/kgmol]	$h_{O2} = 62521$ [kJ/kmol]
$K_1 = 0.002649$	$K_2 = 0.0006325$	$n_{tot} = 102.4$
$P = 5$ [bar]	$P_{ref} = 1$ [bar]	$R = 8.314$ [kJ/kmole-K]
$T = 2088$ [K]	$y_{CO} = 0.1182$	$y_{CO2} = 0.03809$
$y_{H2O} = 0.1661$	$y_{N2} = 0.6776$	$y_{NO} = 0.000007904$
$y_{O2} = 1.458E-07$		

Calculation time = 7.7 sec

Conclusion:

Clearly, amount of CO with 90% theoretical air is greater than the amount when the reaction was take place with 120% theoretical air.

Note: HW1 code was already submitted before.