

NASA-GLENN CHEMICAL EQUILIBRIUM PROGRAM CEA2, FEBRUARY 5, 2004
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 REFS: NASA RP-1311, PART I, 1994 AND NASA RP-1311, PART II, 1996

CEA analysis performed on Fri 08-Nov-2024 18:04:24

Problem Type: "Rocket" (Infinite Area Combustor)

prob case=_____6580 ro equilibrium frozen

Pressure (2 values):

p,atm= 100, 1

Chamber/Exit Pressure Ratio (1 value):

pi/p= 100

Oxidizer/Fuel Wt. ratio (1 value):

o/f= 3.0

You selected the following fuels and oxidizers:

reac

fuel H2 wt%=100.0000 t,k=3200.000

oxid O2 wt%=100.0000

You selected these options for output:

short version of output

output short

Proportions of any products will be expressed as Mass Fractions.

output massf

Heat will be expressed as siunits

output siunits

Input prepared by this script:/var/www/sites/cearun.grc.nasa.gov/cgi-bin/CEARU
 N/prepareInputFile.cgi

IMPORTANT: The following line is the end of your CEA input file!
 end

THEORETICAL ROCKET PERFORMANCE ASSUMING EQUILIBRIUM

COMPOSITION DURING EXPANSION FROM INFINITE AREA COMBUSTOR

Pin = 1469.6 PSIA

CASE = _____

	REACTANT	WT FRACTION (SEE NOTE)	ENERGY KJ/KG-MOL	TEMP K
FUEL	H2	1.0000000	96190.727	3200.000
OXIDANT	O2	1.0000000	0.000	0.000

O/F= 3.00000 %FUEL= 25.000000 R,EQ.RATIO= 2.645561 PHI,EQ.RATIO= 2.645561

	CHAMBER	THROAT	EXIT
Pinf/P	1.0000	1.7471	100.00
P, BAR	101.33	57.995	1.0132
T, K	3950.50	3710.41	2143.85
RHO, KG/CU M	2.2968 0	1.4206 0	4.5757-2
H, KJ/KG	11929.1	9560.80	-2992.07
U, KJ/KG	7517.60	5478.27	-5206.49

G, KJ/KG	-98796.4	-94435.4	-63080.5
S, KJ/(KG)(K)	28.0283	28.0283	28.0283
M, (1/n)	7.446	7.557	8.050
(dLV/dLP)t	-1.04024	-1.03281	-1.00087
(dLV/dLT)p	1.6007	1.5200	1.0226
Cp, KJ/(KG)(K)	15.8846	14.8730	5.7659
GAMMAS	1.1627	1.1602	1.2292
SON VEL,M/SEC	2264.7	2176.4	1649.8
MACH NUMBER	0.000	1.000	3.311

PERFORMANCE PARAMETERS

Ae/At	1.0000	12.369
CSTAR, M/SEC	3277.3	3277.3
CF	0.6641	1.6669
Ivac, M/SEC	4052.2	5868.2
Isp, M/SEC	2176.4	5462.8

MASS FRACTIONS

*H	0.01452	0.01211	0.00040
H02	0.00006	0.00003	0.00000
*H2	0.14744	0.14820	0.15514
H20	0.74234	0.76717	0.84387
H202	0.00002	0.00001	0.00000
*O	0.00821	0.00533	0.00000
*OH	0.08392	0.06480	0.00059
*O2	0.00349	0.00235	0.00000

* THERMODYNAMIC PROPERTIES FITTED TO 20000.K

NOTE. WEIGHT FRACTION OF FUEL IN TOTAL FUELS AND OF OXIDANT IN TOTAL OXIDANTS

THEORETICAL ROCKET PERFORMANCE ASSUMING FROZEN COMPOSITION

Pin = 1469.6 PSIA

CASE = _____

	REACTANT	WT FRACTION (SEE NOTE)	ENERGY KJ/KG-MOL	TEMP K
FUEL	H2	1.0000000	96190.727	3200.000
OXIDANT	O2	1.0000000	0.000	0.000

O/F= 3.00000 %FUEL= 25.000000 R,EQ.RATIO= 2.645561 PHI,EQ.RATIO= 2.645561

	CHAMBER	THROAT	EXIT
Pinf/P	1.0000	1.7986	100.00
P, BAR	101.33	56.335	1.0132
T, K	3950.50	3524.67	1504.10
RHO, KG/CU M	2.2968 0	1.4313 0	6.0326-2
H, KJ/KG	11929.1	9481.33	-1293.74
U, KJ/KG	7517.60	5545.32	-2973.37
G, KJ/KG	-98796.4	-89309.1	-43451.0
S, KJ/(KG)(K)	28.0283	28.0283	28.0283

M, (1/n)	7.446	7.446	7.446
Cp, KJ/(KG)(K)	5.7975	5.6972	4.7926
GAMMAS	1.2386	1.2438	1.3038
SON VEL,M/SEC	2337.5	2212.6	1479.8
MACH NUMBER	0.000	1.000	3.475

PERFORMANCE PARAMETERS

Ae/At	1.0000	10.208
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CSTAR, M/SEC	3199.5	3199.5
CF	0.6915	1.6073
Ivac, M/SEC	3991.5	5469.2
Isp, M/SEC	2212.6	5142.5

MASS FRACTIONS

*H	0.01452	H02	0.00006	*H2	0.14744
H2O	0.74234	H2O2	0.00002	*O	0.00821
*OH	0.08392	*O2	0.00349		

* THERMODYNAMIC PROPERTIES FITTED TO 20000.K

NOTE. WEIGHT FRACTION OF FUEL IN TOTAL FUELS AND OF OXIDANT IN TOTAL OXIDANTS

THEORETICAL ROCKET PERFORMANCE ASSUMING EQUILIBRIUM

COMPOSITION DURING EXPANSION FROM INFINITE AREA COMBUSTOR

Pin = 14.7 PSIA

CASE = _____

	REACTANT	WT FRACTION (SEE NOTE)	ENERGY KJ/KG-MOL	TEMP K
FUEL	H2	1.0000000	96190.727	3200.000
OXIDANT	O2	1.0000000	0.000	0.000

O/F= 3.00000 %FUEL= 25.000000 R,EQ.RATIO= 2.645561 PHI,EQ.RATIO= 2.645561

	CHAMBER	THROAT	EXIT
Pinf/P	1.0000	1.7260	100.00
P, BAR	1.0132	0.58705	0.01013
T, K	3207.12	3070.05	2164.85
RHO, KG/CU M	2.6533-2	1.6349-2	4.4511-4
H, KJ/KG	11929.1	9907.89	-1841.66
U, KJ/KG	8110.34	6317.28	-4118.08
G, KJ/KG	-95012.7	-92463.1	-74028.7
S, KJ/(KG)(K)	33.3451	33.3451	33.3451
M, (1/n)	6.983	7.109	7.907
(dLV/dLP)t	-1.07257	-1.06375	-1.00977
(dLV/dLT)p	2.3165	2.2054	1.2526
Cp, KJ/(KG)(K)	34.2352	32.4074	12.0862
GAMMAS	1.1287	1.1258	1.1451
SON VEL,M/SEC	2076.2	2010.6	1614.6
MACH NUMBER	0.000	1.000	3.250

PERFORMANCE PARAMETERS

Ae/At	1.0000	14.072
CSTAR, M/SEC	3082.4	3082.4
CF	0.6523	1.7026
Ivac, M/SEC	3796.4	5681.8
Isp, M/SEC	2010.6	5248.0

MASS FRACTIONS

*H	0.02844	0.02529	0.00450
H02	0.00002	0.00001	0.00000
*H2	0.13797	0.13901	0.15146
H2O	0.68809	0.71660	0.83673
*O	0.02385	0.01783	0.00024
*OH	0.11123	0.09317	0.00694
*O2	0.01040	0.00810	0.00013

* THERMODYNAMIC PROPERTIES FITTED TO 20000.K

NOTE. WEIGHT FRACTION OF FUEL IN TOTAL FUELS AND OF OXIDANT IN TOTAL OXIDANTS

THEORETICAL ROCKET PERFORMANCE ASSUMING FROZEN COMPOSITION

Pin = 14.7 PSIA

CASE = _____

	REACTANT	WT FRACTION (SEE NOTE)	ENERGY KJ/KG-MOL	TEMP K
FUEL	H2	1.0000000	96190.727	3200.000
OXIDANT	O2	1.0000000	0.000	0.000

O/F= 3.00000 %FUEL= 25.000000 R,EQ.RATIO= 2.645561 PHI,EQ.RATIO= 2.645561

	CHAMBER	THROAT	EXIT
Pinf/P	1.0000	1.8175	100.00
P, BAR	1.0132	0.55750	0.01013
T, K	3207.12	2823.46	1094.78
RHO, KG/CU M	2.6533-2	1.6583-2	7.7729-4
H, KJ/KG	11929.1	9786.47	943.91
U, KJ/KG	8110.34	6424.53	-359.65
G, KJ/KG	-95012.7	-84362.0	-35561.5
S, KJ/(KG)(K)	33.3451	33.3451	33.3451

M, (1/n)	6.983	6.983	6.983
Cp, KJ/(KG)(K)	5.6395	5.5263	4.5468
GAMMAS	1.2677	1.2746	1.3548
SON VEL,M/SEC	2200.2	2070.1	1328.9
MACH NUMBER	0.000	1.000	3.527

PERFORMANCE PARAMETERS

Ae/At	1.00000	9.4220
CSTAR, M/SEC	2951.7	2951.7
CF	0.7013	1.5880
Ivac, M/SEC	3694.1	4965.4
Isp, M/SEC	2070.1	4687.3

MASS FRACTIONS

*H	0.02844	H02	0.00002	*H2	0.13797
H2O	0.68809	*O	0.02385	*OH	0.11123
*O2	0.01040				

* THERMODYNAMIC PROPERTIES FITTED TO 20000.K

NOTE. WEIGHT FRACTION OF FUEL IN TOTAL FUELS AND OF OXIDANT IN TOTAL OXIDANTS