

EQL Program

Example Screens

Version 1.0

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Equilibrium (EQL) Program – Example Screens

EQL EQUILIBRIUM combustion of ideal gases

REACTANTS FROZEN PROCESSES EQUILIBRIUM PROCESSES CYCLES

FUELS available

- C2H2 Acetylene
- C2H4 Ethene
- CH3OH Methanol
- C2H5OH Ethanol
- C2H6 Ethane
- C3H8 Propane
- C3H8O .
- C6H6 Benzene

>> Add >>
Delete <<

FUELS	MOLS
CH4	1.000

Fuel/Air MIXTURE

F/A equivalence ratio = 1.000
 F/A mass ratio = 0.058
 F/A mol ratio = 0.105
 A/F mass ratio = 17.119
 A/F mol ratio = 9.520

DILUENTS available

- AR Argon
- HE Helium
- CO2 C-dioxide
- H2O Water vapor
- N2 Nitrogen

>> Add >>
Delete <<

AIR	MOLS
O2	1.000
N2	3.760

INITIAL STATE of reactants

Pressure p1 = 101.33 kPa
 Temperature T1 = 298.00 K

? QUIT HELP !!!

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Select a chemical equilibrium combustion process

- [h.p] Adiabatic flame temperature at constant enthalpy and assigned pressure
- [T.p] Product gas composition at assigned temperature and pressure
- [u.v] Adiabatic flame temperature and pressure at constant internal energy and density
- [T.v] Product gas composition at assigned temperature and constant density
- [s.p] POST-COMBUSTION isentropic expansion or compression to assigned pressure
- [s.v] POST-COMBUSTION isentropic expansion or compression to assigned pressure
- *C-J* Mach number and speed of a Chapman-Jouguet (self-propagating) detonation

OK

Property	State1	State2	UNITS
pressure	p = 101.325	101.325	kPa
temperature	T = 298.000	2225.994	K
specific volume	v = 8.849E-01	6.659	m3/kg
engineering gas constant	R = 3.009E-01	3.031E-01	kJ/kg-K
mean molecular weight	MW = 27.633	27.428	kg/kmol
enthalpy	h = -2.578E+02	-2.578E+02	kJ/kg
internal energy	u = -3.474E+02	-9.325E+02	kJ/kg
entropy	s = 7.239	9.873	kJ/kg-K
constant-p specific heat	Cp = 1.078	1.510	kJ/kg-K
constant-v specific heat	Cv = 7.771E-01	1.207	kJ/kg-K

? QUIT TRACE = 1.e-15 HELP !!!

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REACTANTS FROZEN PROCESSES EQUILIBRIUM PROCESSES CYCLES

Select a process for fixed or frozen composition of reactants:

- (s.p) - isentropic compression or expansion to assigned pressure p2
- (s.v) - isentropic compression or expansion to assigned specific volume v2
- (s.T) - isentropic compression or expansion to assigned temperature T2

Enter the end-state value p2 = 1000.0000 kPa AIR ONLY? OK

Property	State1	State2	UNITS
pressure	p = 101.325	1000.000	kPa
temperature	T = 298.000	554.269	K
specific volume	v = 8.849E-01	1.668E-01	m3/kg
engineering gas constant	R = 3.009E-01	3.009E-01	kJ/kg-K
mean molecular weight	MW = 27.633	27.633	kg/kmol
enthalpy	h = -2.578E+02	27.804	kJ/kg
internal energy	u = -3.474E+02	-1.390E+02	kJ/kg
entropy	s = 7.239	7.239	kJ/kg-K
constant-p specific heat	Cp = 1.078	1.160	kJ/kg-K
constant-v specific heat	Cv = 7.771E-01	8.591E-01	kJ/kg-K

? QUIT HELP !!!

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REACTANTS FROZEN PROCESSES EQUILIBRIUM PROCESSES CYCLES

Select an internal-combustion gas power cycle

- Brayton cycle (turbojet, ramjet, SCramjet)
- Diesel cycle (compression-ignited Diesel engine)
- Otto cycle (spark-ignited gasoline engine)

Enter the pressure rise ratio, PR = p2/p1 = 10.0000 FROZEN 3-4? OK

Property	State 1	State 2	State 3	State 4	UNITS
pressure	p = 101.325	1013.250	1013.250	101.325	kPa
temperature	T = 298.000	569.395	2419.732	1594.134	K
specific volume	v = 8.476E-01	1.691E-01	7.241E-01	4.734	m3/kg
engineering gas constant	R = 2.882E-01	3.009E-01	3.032E-01	3.009E-01	kJ/kg-K
mean molecular weight	MW = 28.851	27.633	27.421	27.629	kg/kmol
enthalpy	h = -1.616E-01	45.397	45.397	-1.344E+03	kJ/kg
internal energy	u = -8.604E+01	-1.259E+02	-6.883E+02	-1.823E+03	kJ/kg
entropy	s = 6.884	7.266	9.305	9.305	kJ/kg-K
constant-p specific heat	Cp = 1.011	1.166	1.524	1.439	kJ/kg-K
constant-v specific heat	Cv = 7.230E-01	8.653E-01	1.221	1.138	kJ/kg-K
specific heat ratio	Cp/Cv = 1.399	1.348	1.248	1.264	-
mole numbers	TRACE = 1.e-15				

? QUIT TRACE = 1.e-15 HELP !!!