

FIGURE 9.1

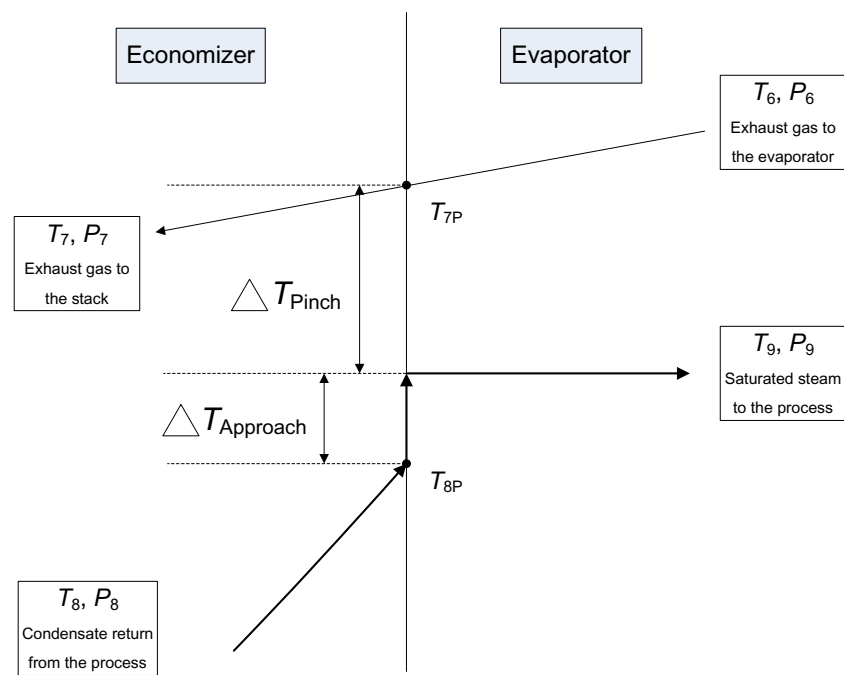


FIGURE 9.3

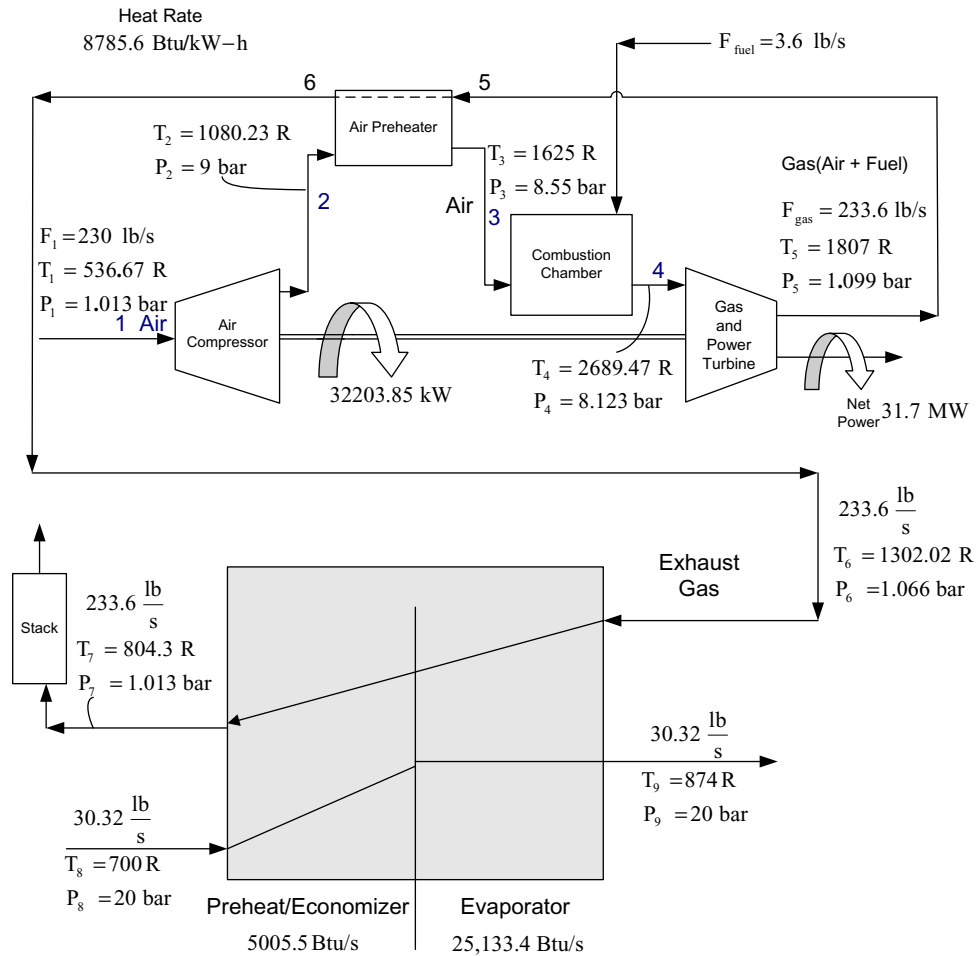


FIGURE 9.4

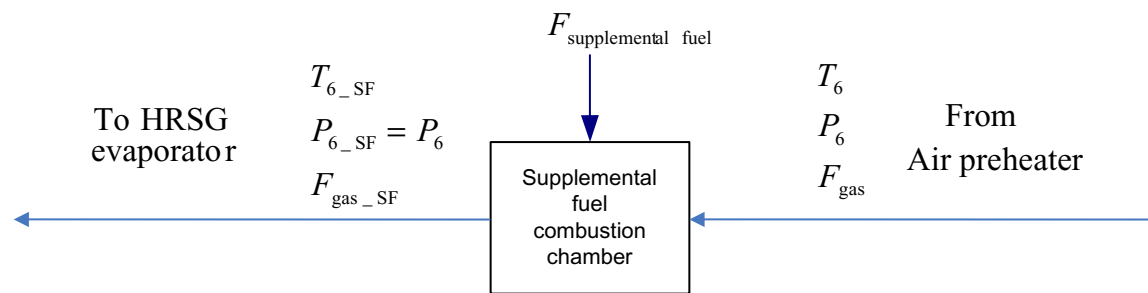


FIGURE 9.5

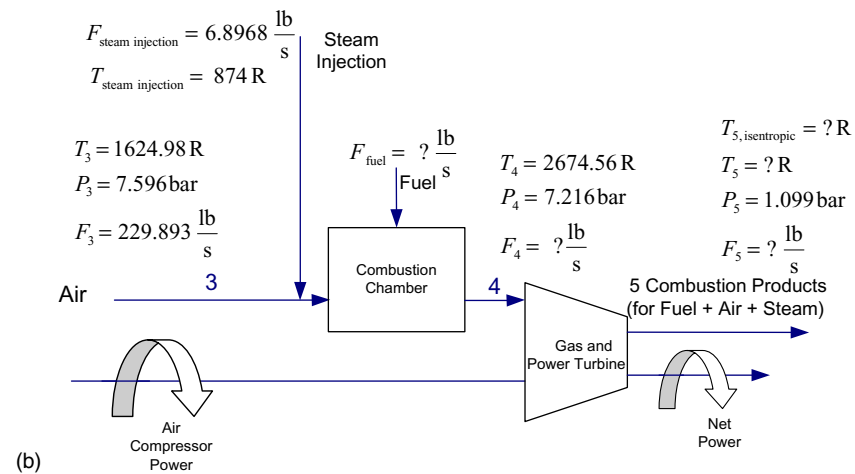
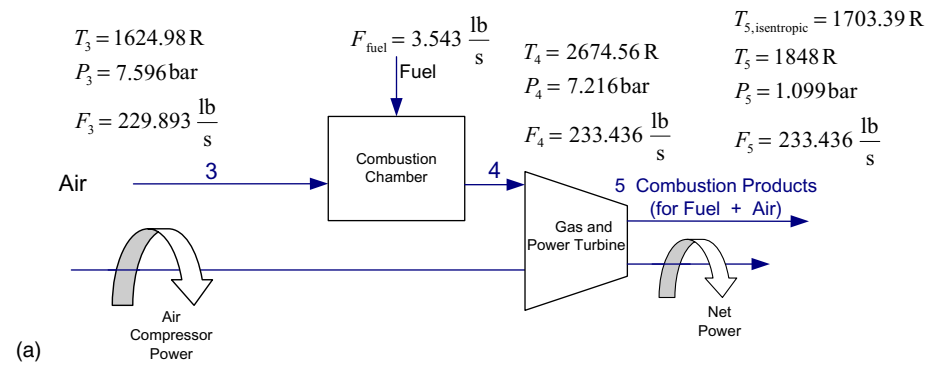


FIGURE 9.6ab

	A	B	C	D	E	F	G	H	I	J	K	L
21		IN Combustion Chamber										
22												
23		F (lb/s)	N (mol/s)									
24	Air	229.8931156	7.936927865									
25	CH4	3.901999928	0.243221338			combustion efficiency						
26	Steam/H2O	6.896793468	0.382814913			η_{cc}	0.98					
27												
28	P ₂	111.630816	psia									
29	T ₃	1624.98	R	T _{steam IN} =	874	R						
30						Reference						
31			N _{in}	F _{in}	H _{in} Btu/mol	H _{ref} Btu/mol	H _{in} Total Btu					
32		N2	6.19794697	173.62557	13400.839	5530.51877	48779.82759					
33		O2	1.662786388	53.208167	14708.766	6387.00653	13837.3085					
34		Ar	0.076194508	3.0438182	10184.39	4776.80469	412.028273					
35		H2O	0.382814913	6.8967935	22217.494	19505.414	1038.224583					
36		CO2	0	0	20206.884	8079.54664	0					
37		CH4	0.243221338	3.9019999	338041.73	0	82218.96244					
38		Sum		240.67635			146286.3514	Btu				
39												
40						h _{3a}	607.8135797	Btu/lb				
41												
42		Out Combustion Chamber							vary F _{CH4} and min (h _{4a} -h _{3a}) ²			
43						(h _{4a} -h _{3a}) ²	8.47033E-22	← using Solver				
44	P ₄	106.046336	psia									
45	T ₄	2674.614001	R									
46						Reference			Reference			
47			N _{out}	F _{out}	H _{out} Btu/mol	H _{ref} Btu/mol	H _{out} Total Btu	S _{ref} Btu/mol-R	S _{ref} Btu/mol-R	S _{out} Total Btu/R		
48		N2	6.19794697	173.62557	21811.149	5530.51877	100906.4856	37.42010858	29.43081159	49.51723907		
49		O2	1.176343711	37.642293	23635.466	6387.00653	20290.11672	41.57380119	32.9296038	10.16854724		
50		Ar	0.076194508	3.0438182	15399.571	4776.80469	809.3964169	28.51994472	24.46692565	0.308817792		
51		H2O	0.869257589	15.660545	40111.308	19505.414	17911.82944	40.65804148	29.6476	9.570909815		
52		CO2	0.243221338	10.704171	34263.611	8079.54664	6368.523224	38.0341501	23.34909172	3.571719551		
53		CH4										
54		Sum	8.562964116	240.6764			146286.3514	Btu		73.13723346	Btu/R	
55												
56						h _{4a}	607.8134569	Btu/lb	s _{4a}	0.303882039	Btu/lb-R	
57												
58		Out Gas and Power Turbine - Isentropic										
59												
60	P ₅	16.150904	psia						vary T _{5,isen} and min (s _{5f} -s _{4a}) ²			
61	T _{5, isentropic}	1719.303146	R			(s _{5f} -s _{4a}) ²	4.81959E-17	← using Solver				
62						Reference			Reference			
63			N _{out}	F _{out}	H _{out} Btu/mol	H _{ref} Btu/mol	H _{out} Total Btu	S _{ref} Btu/mol-R	S _{ref} Btu/mol-R	S _{out} Total Btu/R		
64		N2	6.19794697	173.62557	14121.677	5530.51877	53247.54169	37.6132336	29.43081159	50.71421775		
65		O2	1.176343711	37.642293	15482.495	6387.00653	10699.42041	41.54659664	32.9296038	10.13688626		
66		Ar	0.076194508	3.0438182	10651.686	4776.80469	447.6337109	30.06411497	24.46692565	0.426475083		
67		H2O	0.869257589	15.660545	30106.654	19505.414	9215.207918	39.79063731	29.6476	8.816912156		
68		CO2	0.243221338	10.704171	21419.867	8079.54664	3244.650462	35.85105355	23.34909172	3.040743887		
69		CH4										
70		Sum	8.562964116	240.6764			76854.4542	Btu		73.13723513	Btu/R	
71												
72						h _{5f}	319.3269299	Btu/lb	s _{5f}	0.303882046	Btu/lb-R	
73												
74												
75												
76												
77		Out Gas and Power Turbine - Real										
78												
79	P ₅	16.150904	psia						vary T _{5,a} and min (h _{5a} - h _{5calculated}) ²			
80	T _{5,a (real)}	1857.546824	R			(h _{5a} - h _{5calculated}) ²	2.84136E-18	← using Solver				
81						Reference			Reference			
82			N _{out}	F _{out}	H _{out} Btu/mol	H _{ref} Btu/mol	H _{out} Total Btu	S _{ref} Btu/mol-R	S _{ref} Btu/mol-R	S _{out} Total Btu/R		
83		N2	6.19794697	173.62557	15197.902	5530.51877	59917.92906	38.21525935	29.43081159	54.44554142		
84		O2	1.176343711	37.642293	16633.158	6387.00653	12052.99605	42.19229454	32.9296038	10.896108		
85		Ar	0.076194508	3.0438182	11338.129	4776.80469	499.9368496	30.44813159	24.46692565	0.455735041		
86		H2O	0.869257589	15.660545	31465.527	19505.414	10396.41887	40.55071692	29.6476	9.477617123		
87		CO2	0.243221338	10.704171	23209.248	8079.54664	3679.866223	36.85198185	23.34909172	3.284191007		
88		CH4										
89		Sum	8.562964116	240.6764			86547.14704	Btu		78.55919259	Btu/R	
90												
91												
92						h _{5a}	359.5996491	Btu/lb	s _{5a}	0.326410044	Btu/lb-R	
93												
94			Power Air Comp		-28303.558	Btu/s						
95			Power G&P Turbine		59739.2043	Btu/s						
96			Net Power		33158.0217	kW						

(c)

FIGURE 9.6c

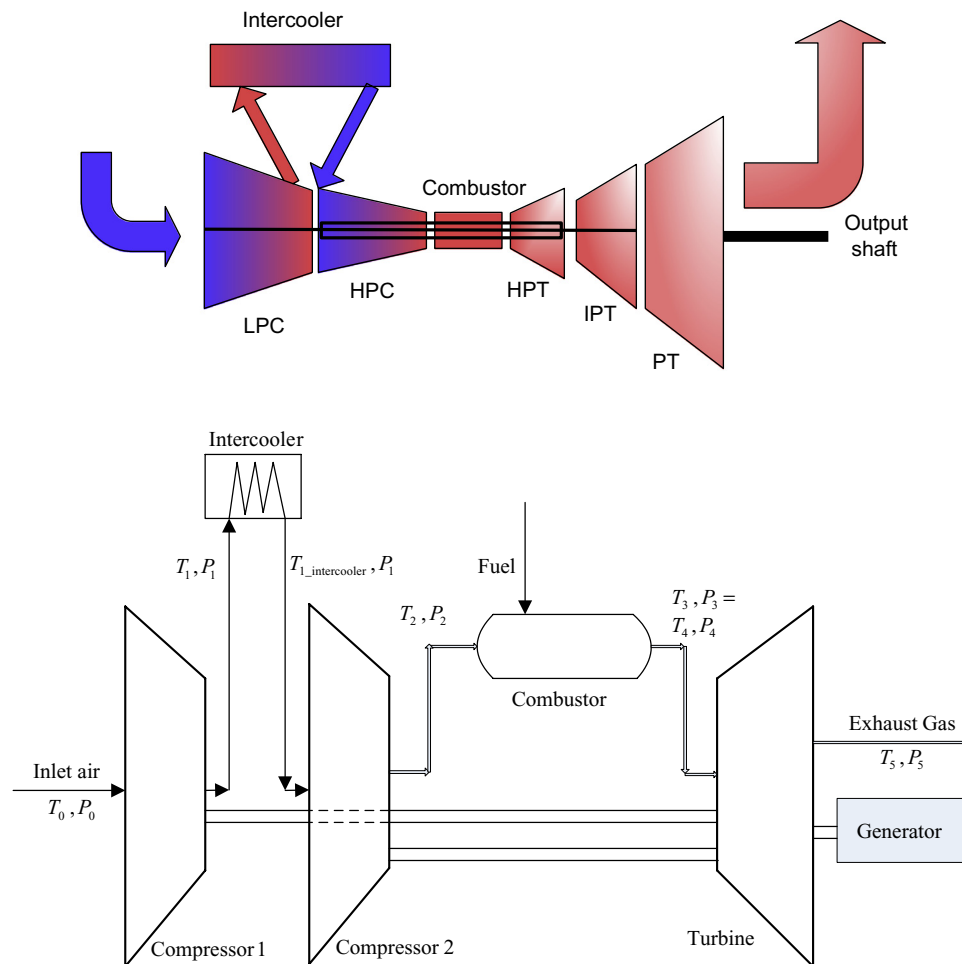


FIGURE 9.7