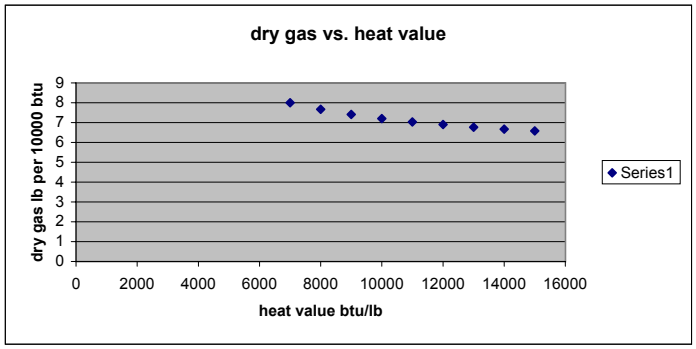
btu/lb	dry gas
7000	8
8000	7.67
9000	7.41
10000	7.2
11000	7.03
12000	6.9
13000	6.77
14000	6.67
15000	6.58



lb dry gas per 10000 btu = 24.1939164 - 1.8387301 * Ln(volatile heating value) = 7.63

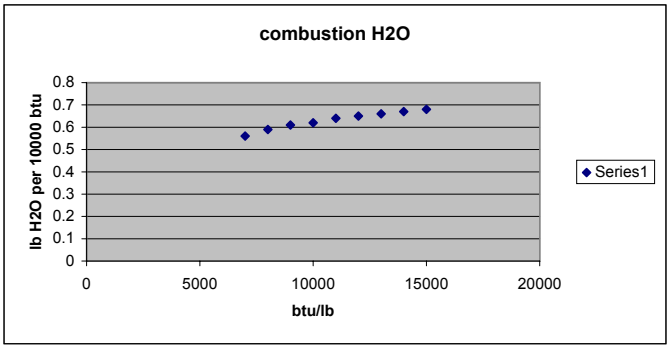
	C %	H2 %	O2 %	S %	Cl %	N2 %	control				
Q =	30.28	4.41	46.07	0.25	0.83	0.82	82.66	4500	btu/lb	2500	kcal/kg

solid waste (wet feed) 9190 lb/h **100.0 tons/day** (if it were to run around the clock, I.e. 24 hours)
percent moisture 25 %
percent ash as fired 20 %
moisture rate = 2297.5 lb/h dry feed = 6892.5 lb/h
ash rate = 1838 lb/h

volatile = dry - ash = 5054.5 lb/h

total heating value as charged 41358069.46 btu/h 41.36 Mbtu/h
volatile heating value **8182 btu/lb** -> 7.63 lb dry gas per 10000 btu
dry gas produced 31546 lb/h dry gas

btu/lb	combustion H2O lb per 10000 btu
7000	0.56
8000	0.59
9000	0.61
10000	0.62
11000	0.64
12000	0.65
13000	0.66
14000	0.67
15000	0.68



y = a * x^2 + b * x + c = 0.35030303 + x * 3.8214 / 10^5 - x * x * 1.093 / 10^9 = 0.59
0.59 lb per 10000 btu

combustion H2O produced 2439 lb/h moisture

dry gas + combustion H2O = 33985 lb/h

100 percent air requirement = 28930 lb/h

total air fraction 1 + 100 % excess 2
total air = 57860.8 lb/h
excess air = 28930 lb/h

entering air humdity 0.01 lb moisture per lb dry air
moisture in 579 lb/h

total H2O out 5315 lb/h (=feed moisture+combustion moisture+ air humidity)

total dry air out 60476 lb/h (=dry gas produced + excess air)

			Base 60°F calcs	60 °F	15.6 °C		
shell cooled by	2298	SCFM	10338.8 lb/h air	leaving temperature	450 °F	232.2 °C	
				leaving enthalpy	94.45		
waste air heat loss =	976495	btu/h	**0.98 Mbtu/h**				
ash rate =	1838	lb/h		leaving temperature	600 °F	315.6 °C	
ash discharge loss =	238205	btu/h	**0.24 Mbtu/h**				
				radiation loss percent	1.5 %		
radiation loss =	620371	btu/h	**0.62 Mbtu/h**				
correction factor =	-561250	btu/h	**-0.56 Mbtu/h**	relative to 60°F			
total loss =	1273821	btu/h	**1.27 Mbtu/h**				

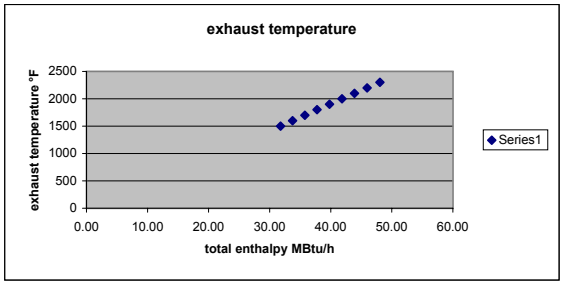
heat in flue gas = heat in - losses

40084249 btu/h 40.08 Mbtu/h

	dry air out		moisture out		total enthalpy	
	btu/lb	lb/h	btu/lb	lb/h		
1500	369.37	60476	1775.52	5315	31775679.7 btu/h	31.78 Mbtu/h
1600	397.17	60476	1832.12	5315	33757765.7 btu/h	33.76
1700	425.08	60476	1890.11	5315	35753892.6 btu/h	35.75
1800	453.24	60476	1948.02	5315	37764713.2 btu/h	37.76
1900	481.57	60476	2007.17	5315	39792405.8 btu/h	39.79
2000	510.07	60476	2067.42	5315	41836226.4 btu/h	41.84
2100	538.72	60476	2128.7	5315	43894593.3 btu/h	43.89
2200	567.52	60476	2189.92	5315	45961712.6 btu/h	45.96
2300	596.45	60476	2252.6	5315	48044454.4 btu/h	48.04

Table 1.

enthalpy	°F
31.78	1500
33.76	1600
35.75	1700
37.76	1800
39.79	1900
41.84	2000
43.89	2100
45.96	2200
48.04	2300



exhaust temperature = A * enthalpy + B

40.08 Mbtu/h -> **1908.6 °F** **1042.5 °C**

we want to reach 2000 °F -> supplemental fuel needed to reach 41.84 Mbtu/h

the difference is = 1.75 Mbtu/h

say we use fuel oil and total air 1.2 -> 57578 btu/gal are available at 2000 °F

fuel oil required =	30.4 gallons/hour	
air required =	3805.4 lb/h	125.062
dry gas produced =	3819.8 lb/h	125.537
H2O produced =	266.3 lb/h	8.751

total dry gas out with fuel	64295.8 lb/h
total moisture out with fuel	5581.7 lb/h
total air in	61666.2 lb/h

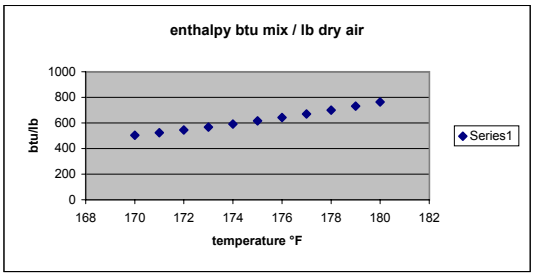
Outlet flue heat content with fuel 44.3 Mbtu/h note: 139,703 btu per gal available

44.3 Mbtu/h -> **2117.6 °F** **1158.7 °C**

heat out btu per lb dry gas = outlet flue content with fuel / total dry gas out with fuel = **690 btu/lb**

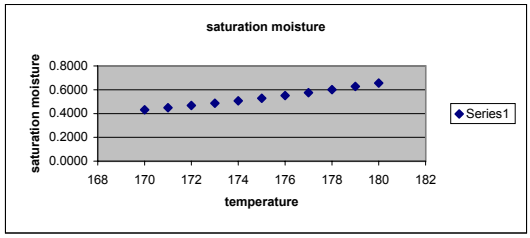
table 11.32

	heat
170	504.29
171	524.31
172	545.38
173	567.61
174	591.07
175	615.86
176	642.11
177	669.92
178	699.48
179	730.86
180	764.31



temperature = 0.03842923 * heat + 151.050901

	saturation moisture
170	0.4320
171	0.4493
172	0.4675
173	0.4867
174	0.5070
175	0.5284
176	0.5511
177	0.5752
178	0.6008
179	0.6279
180	0.6560



saturation moisture = 0.02232181 * temperature - 3.3716 =

e.g. adiabatic temperature saturation moisture 0.5916

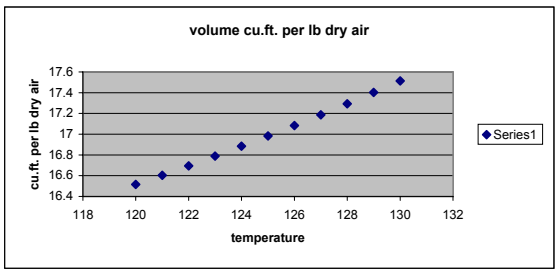
690 177.5 °F 0.5916

moisture flow = total dry gas flow with moisture * saturation moisture = 38039.43 lb/h

quench water = moisture flow - total moisture out with fuel = 32457.7 lb/h 64.9 gpm

outlet temperature, anywhere between 120 to 160°F, say 120 °F 48.9 °C

120	16.515
121	16.603
122	16.695
123	16.789
124	16.885
125	16.983
126	17.084
127	17.187
128	17.293
129	17.402
130	17.514



16.515 cu.ft. per lb dry gas

CFMs = total dry gas out with fuel lb/h * cu.ft. per dry gas lb/ 60 = **17697 CFM** 30068 m3/h