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ANALYSIS OF ENERGY, GRAIN & WATER STREAMS of a Steam Flaking Process

Compiled by, and the property of, Omega Ten Corporation

1	<u>INPUTS</u>	units	<u>CALCULATED</u>	units	
2					
3	25	STPH	19.750	STPH	Dry Matter Stream through Process
4	13.0%		2.951	STPH	Water Stream from Storage
5	21.0%		22.701	STPH	Total Stream from Storage = 811 BPH
6	50.0%		2.299	STPH	Water Stream Added = 9.2 GPM
7			4.60%	1.149	STPH Water Stream from SOAKING
8	85	°F	4.60%	1.149	STPH Water Stream from STEAM *
9	210	°F	25.000	STPH	Total Flaker Stream (H2O+Dry Matter)
10	80	PSIG	5.250	STPH	Total Water Stream through Flaker
11	85%	%	0.915	STPH	Water Stream Removed in Cooling/Drying
12	56	lbs/bu.	4.335	STPH	Residual Water Stream in Cooled/Dried Product
13	60	HP			Electric Motors
14	75%	%	323.9	°F	Temperature of 80 PSIG Steam
15	1.48	kJ/kg/°K	1,186.2	BTU/lb.	Energy Content of 80 PSIG Steam
16	18.0%		1.893	kJ/kg/°K	Corn Specific Heat **
17	1080	BTU's/CF	0.450	BTU/lb/°F	Corn Specific Heat, converted to English Units
18	\$ 8.00	/1000CF	81.4	BHP	Energy to generate 1.15 STPH Steam @ 80 PSIG & 323.9° 2.727
19			76.2	BHP	Energy to raise temp of 22.7 STPH Corn by 125°F 2.554
20	91,600	BTU/gal	8.6	BHP	Energy to raise temp of 1.15 STPH soak H2O by 125°F 0.287
21	\$ 1.95	\$/gal	166.1	Boiler HP	Total before Boiler Efficiency DeRating 5.568
22			195.4	Boiler HP	Req'd to Flake 25 STPH (33,520 BTU/hr/BHP) @ 85% Boiler Efficiency
23					
24	\$ 0.12	/KWH	6,066	CFH	Natural Gas Required @ 1080 BTU/CF
25	\$ 0.74	\$/therm	65.5	Therms/Hr	of Natural Gas @ 1080 BTU/CF
26	\$ 2.13	\$/therm	71.51	gal/hr	Propane Required @91600 BTU/gallon & 85% Boiler Efficiency
27			\$ 48.52	\$/hr	Natural Gas Cost = \$ 1.94/sTon
28			\$ 139.45	\$/hr	Propane Cost = \$5.58/sTon
29			\$ 4.03	\$/hr	Electricity Cost = \$ 0.16/sTon
30			\$ 52.55	\$/hr	Nat'l Gas & Electricity Energy Cost*** = \$ 2.1/sTon of Flakes
31			\$ 143.48	\$/hr	Propane & Electricity Energy Cost*** = \$ 5.74/sTon of Flakes
32					
33					*** 65.5 therms (either) gas & 33.6 kwh elect.
34					