ALTON PACKAGING CORPORATION
A member of the Jefferson Smurfit Group

Jacksonville Containerboard Mill
1915 Wigmore Street
P. O. Box 150
Jacksonville, Florida 32201
Telephone 904/353-3611

May 17, 1985

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

C. H. Fancy, P.E.
Deputy Chief
Bureau of Air Quality Management
Twin Tower Office Building
2600 Blair Stone Road
Tallahassee, FL. 32301-8241

Subject: Application to construct Lime Kiln with Venturi Scrubber and Lime Silo with Bag Filter
Alton Packaging Corporation
File Number AC126-95614

Dear Mr. Fancy:

Our consultant, J.M. Ros Jr. visited with your Messers, Bill Thomas and Mike Harley on Monday, May 13, 1985 and discussed the status of the construction permit for our proposed Lime Kiln. Bill Thomas stated that our permit application could be considered complete if we were able to clarify our answers and diagrams. Bill was kind enough to provide us with a copy of his hand written notes. The notes with our answers are as follows:

OIL AS FUEL:

1. Our excess O_2 correction to 10% was different from another mill, but under both conditions it was within the limits.

2. We failed to justify the assumption 4-lbs/hr SO_2 removal in the scrubber water. Our reference is AP-42 table 10.1.2-1. (Copy attached)
CALCULATIONS:

$$\frac{\text{1000 Air Dried Tons X 0.3 lbs/Ton}}{\text{24 Hours/Day}} \quad \text{(AP-42 Untreated } SO_2 \text{ Emissions)}$$

$$\frac{300}{24} = 12.5\text{\#/Hr from Kiln}$$

$$\frac{\text{1000 Air Dried Tons X 0.2 lbs/Ton}}{\text{24 Hours/Day}} \quad (\text{AP-42 Scrubber } SO_2 \text{ Emissions})$$

$$\frac{200}{24} = 8.33\#/\text{Hr from Scrubber}$$

$$12.5\#/\text{Hr} - 8.33\#/\text{Hr} = 4.17\#/\text{Hr } SO_2 \text{ Removal}$$

3. Attached are revised calculation sheets to show the reactions involving $CaSO_4$ shown on Flow Diagram.

4. There is no difference in the Gas Flow from Combustion, it was a failure in checking to include the air leakage into the kiln.

GAS AS FUEL:

1. The Scrubber Pressure drop has been increases from 7" to 8" from Oil to Gas. This is required to meet the more stringent requirement of Gas versus Oil on particulate. It is also more energy intensive to operate in the gas mode.

2. The SO_2 loading to the Scrubber from the Kiln is shown as 12.5#/Hr, for both Oil and Gas, is again taken from AP-42. AP-42 does not distinguish between fuels in the amount of SO_2 unreacted with the Calcium Oxide in the Kiln.

3. We must agree that most of the Scrubber inputs are roughly equal for Oil and Gas, while one output is almost halved for Gas, this is particulate. The calculations show 6#/Hr of particulate from the Oil and a total output of 19.17#/Hr of particulate. The Gas contains no particulate and the outputs of particulate is 10.27#/Hr with Gas. While only 6#/Hr of particulate was removed from the incoming gas stream, the Scrubber is required to remove an additional 2.9#/Hr of particulate when burning gas in the Kiln (i.e. 19.17#/Hr - 6.0#/Hr = 10.27#/Hr = 2.9#/Hr additional removal).

Alton has purchased a state of the art lime kiln system with an H-K Scrubber which is less energy intensive than a High Pressure Drop Scrubber meeting the air pollution requirements of the U.S., E.P.A. and various States. We have furnished you with a list showing kilns approved in five other states with simular equipment (Alabama, South Carolina, Washington, Mississippi, and Louisiana). The Kiln in South Carolina at Union Camp, Eastover, has been certified on oil. The Kiln at Leaf River burns propane gas and is undergoing compliance test now and expects certification in the near future. The other kilns are at various stages of completion.

Alton and its consultants have confidence in the design of its kiln and related air pollution equipment. The manufacture has guaranteed compliance with NSPS. Alton intends that this guarantee be fulfilled including reasonable equipment modifications, if necessary. We understand that this committment will allow the department to find our application complete and proceed with its processing.

Yours very truly,

J. Franklin Mixson

J. Franklin Mixson
General Manager/Vice-President

Attachments
cc: Lloyd Stebbins RS&H
E.R. Burr
R.D. Quina
J.B. Cox
J.M. Ros

① Xs O_2 can on other plant questionable but either way comes out under limits.

② No justification for assumption of 4#/hr SO_2 removal in scrubber water. (Assumption reasonable)

③ Mat'l Bal. (oil) ~~Eats~~ Flow Diag shows $CaSO_4$ — Calc show Na_2SO_3)

④ Gas flow from combustion — ≈ 46 Klb/hr flow plus 51 " Calc. sheet. Is it calc. error or different assumptions

---

Gas

① Scrubber drop Oil → gas 7" → 8"

② Oil → gas — both 12.5#/hr SO_2

③ Scrubber inputs roughly equal — Outputs in some cases are halved — (What has changed scrubber performance.?

Summary — looks like what-out & revisions done to outputs w/o requested revisions — How to prevent leverage for "as is" op permit if limits not met?

Follow Ups

Table 10.1.2-1. EMISSION FACTORS FOR SULFATE PULPING[a]
(unit weights of air-dried unbleached pulp)
EMISSION FACTOR RATING: A

Source	Type control	Particulates[b]		Sulfur dioxide (SO_2)[c]		Carbon monoxide[d]		Hydrogen sulfide($S^=$)[e]		RSH, RSR, RSSR($S^=$)[e,f]	
		lb/ton	kg/MT	lb/ton	kg/MT	lb/ton	kg/MT	lb/ton	kg/MT	lb/ton	kg/MT
Digester relief and blow tank	Untreated[g]	–	–	–	–	–	–	0.1	0.05	1.5	0.75
Brown stock washers	Untreated	–	–	0.01	0.005	–	–	0.02	0.01	0.2	0.1
Multiple effect evaporators	Untreated[g]	–	–	0.01	0.005	–	–	0.1	0.05	0.4	0.2
Recovery boiler and direct contact evaporator	Untreated[h]	150	75	5	2.5	2 - 60	1 - 30	12[i]	6[i]	1[i]	0.5[i]
	Venturi scrubber[j]	47	23.5	5	2.5	2 - 60	1 - 30	12[i]	6[i]	1[i]	0.5[i]
	Electrostatic precipitator	8	4	5	2.5	2 - 60	1 - 30	12[i]	6[i]	1[i]	0.5[i]
	Auxiliary scrubber	3 - 15[k]	1.5 - 7.5[k]	3	1.5	2 - 60	1 - 30	12[i]	6[i]	1[i]	0.5[i]
Smelt dissolving tank	Untreated	5	2.5	0.1	0.05	–	–	0.04	0.02	0.4	0.2
	Mesh pad	1	0.5	0.1	0.05	–	–	0.04	0.02	0.4	0.2
Lime kilns	Untreated	45	22.5	0.3	0.15	10	5	0.5	0.25	0.25	0.125
	Scrubber	3	1.5	0.2	0.1	10	5	0.5	0.25	0.25	0.125
Turpentine condenser	Untreated	–	–	–	–	–	–	0.01	0.005	0.5	0.25
Miscellaneous sources[l]	Untreated	–	–	–	–	–	–	–	–	0.5	0.25

[a] For more detailed data on specific types of mills, consult Reference 1.

[b] References 1, 7, 8.

[c] References 1, 7, 9, 10.

[d] References 6, 11. Use higher value for overloaded furnaces.

[e] References 1, 4, 7-10, 12, 13. These reduced sulfur compounds are usually expressed as sulfur.

[f] RSH-methyl mercaptan; RSR-dimethyl sulfide; RSSR-dimethyl disulfide.

[g] If the noncondensible gases from these sources are vented to the lime kiln, recovery furnace, or equivalent, the reduced sulfur compounds are destroyed..

[h] These factors apply when either a cyclonic scrubber or cascade evaporator is used for direct contact evaporation with no further controls.

[i] These reduced sulfur compounds (TRS) are typically reduced by 50 percent when black liquor oxidation is employed but can be cut by 90 to 99 percent when oxidation is complete and the recovery furnace is operated optimally.

[j] These factors apply when a venturi scrubber is used for direct contact evaporation with no further controls.

[k] Use 15(7.5) when the auxiliary scrubber follows a venturi scrubber and 3(1.5) when employed after an electrostatic precipitator.

[l] Insludes knotter vents, brownstock seal tanks, etc. When black liquor oxidation is included, a factor of 0.6(0.3) should be used.

ALTON PACKAGING CORPORATION
CAUSTIC / LIME KILN PERMIT

REVISED-MAY 17, 1985

MATERIAL BALANCE

1) All O_2, N_2, H_2O vapor from atmosphere, H_2O evaporated, H_2O of combustion, CO_2 from calcining and CO_2 from combustion accounted for in fuel combustion, Evaporator vent gas and Ambient air calculation.

2) Total SO_2 in: 138 $\#SO_2/hr$ fuel oil combustion

By Combustion 20.49 $\#SO_2/hr$ evap. vent combustion

TOTAL 158.49 $\#SO_2/hr$

TOTAL FROM COMBUSTION EXPRESSED AS SULFUR = $158.49 \times \frac{32S}{64SO_2} = \underline{79.25\#S/hr}$

TOTAL OUT STACK EXPRESSED AS S:

$\#S/hr$ from SO_2 out stack = $8.33\ \#SO_2/hr \times \frac{32S}{64SO_2} = 4.17\ \#S/hr$

$\#S/hr$ from H_2S out stack = $.7265\ \#H_2S/hr \times \frac{32S}{34H_2S} = .68\ \#S/hr$

TOTAL SULFUR OUT STACK = 4.85 $\#S/hr$

THEREFORE:
79.25#S/hr into Kiln
- 4.85#S/hr out of Stack
74.40#S/hr Retained in system

When Sulfur is captured in the system the following simplified reaction may be used to represent this.

$74.4\#S/hr = 74.4 \times \frac{64SO_2}{32S} = 148.8\#SO_2/hr$

$CaCO_3 + SO_2 \longrightarrow CaSO_4 + CO_2$

232.5#/hr + 148.8#/hr ⟶ 302.5#/hr + 102.3#/hr

REVISED-MAY 17, 1985

INERTS

TOTAL INERTS IN FROM:

597.8#/hr	Smelt Tank
156 #/hr	Lime Silo
6 #/hr	Oil
759.8#/hr	TOTAL INERTS INTO SYSTEM

TOTAL INERTS OUT:

597.8#/hr	Green Liquor Clarifier
1.82#/hr	To atmosphere out stack
160.2 #/hr	Slaker classifier
759.8#/hr	TOTAL INERTS OUT OF SYSTEM

SULFUR

TOTAL SULFUR IN FROM:

Smelt tank	9225.8#/hr Na_2S	X $\frac{32S}{78Na_2S}$	= 3784.9#/hr S
Evap. Vent Gas	11.9#S/hr	X $\frac{32S}{32S}$	= 11.9#/hr
Fuel	138 #SO_2/hr	X $\frac{32S}{64SO_2}$	= 69.0#/hr
	TOTAL SULFUR INTO SYSTEM		= 3865.8#/hr

TOTAL SULFUR OUT:

White liquor clarifier	7687.13#Na_2S/hr	X $\frac{32}{78}$	= 3153.7
To atmosphere (SO_2)	8.33#SO_2/hr	X $\frac{32}{64}$	= 4.2
Lime mud washer	1686.9#Na_2S/hr	X $\frac{32}{78}$	= 692.1
To atmosphere (H_2S)	.7265#H_2S/hr	X $\frac{32S}{34H_2S}$	= .7
Slaker classifier	19.3#Na_2S/hr	X $\frac{32}{78}$	= 7.9
Green liquor clarifier	19.3#Na_2S/hr	X $\frac{32}{78}$	= 7.9
To atmosphere (Na_2S)	.01#Na_2S/hr	X $\frac{32}{78}$	= ---(trace)
	TOTAL SULFUR OUT FROM SYSTEM		= 3865.8#/hr

CALCIUM

TOTAL CALCIUM IN FROM:

Smelt tank	27.2#/hr	X	$\frac{40Ca}{100CaCO_3}$	=	10.9#/hr
Purchased Lime	886#CaO/hr	X	$\frac{40Ca}{56CaO}$	=	632.9#/hr
	TOTAL CALCIUM INTO SYSTEM			=	643.8#/hr Calcium

TOTAL CALCIUM OUT:

White Liquor clarifier	12.5#/hr	X	$\frac{40Ca}{100CaCO_3}$	=	5.0#/hr
Scrubber stack	17.24#/hr	X	$\frac{40Ca}{100CaCO_3}$	=	6.9#/hr
Lime mud washer	27.2#/hr	X	$\frac{40}{100}$	=	10.9#/hr
Green Liquor clarifier	27.2#/hr	X	$\frac{40}{100}$	=	10.9#/hr
Slaker	1128.7#/hr	X	$\frac{40}{74}$	=	610.1#/hr
	TOTAL CALCIUM OUT OF SYSTEM			=	643.8#/hr Calcium

SODIUM

TOTAL SODIUM IN FROM:

Smelt tank	33813.7#/hr	X $\frac{46Na_2}{106Na_2CO_3}$	=	14673.7#/hr
Smelt tank	6178.7#/hr	X $\frac{23Na}{40NaOH}$	=	3552.8#/hr
Smelt tank	9225.8#/hr	X $\frac{46Na_2}{78Na_2S}$	=	5440.9#/hr
	TOTAL SODIUM INTO SYSTEM		=	23667.4#/hr Na

TOTAL SODIUM OUT:

White liquor clarifier	20791.4#/hr	X $\frac{23Na_2}{40NaOH}$	=	11955.1#/hr
White liquor clarifier	7687.1#/hr	X $\frac{46Na_2}{78Na_2S}$	=	4533.4#/hr
White liquor clarifier	6654.6#/hr	X $\frac{46Na_2}{106Na_2CO_3}$	=	2887.8#/hr
Scrubber stack	.01#/hr	X $\frac{46Na_2}{106Na_2CO_3}$	=	-----(trace)
Scrubber stack	.03#/hr	X $\frac{23Na}{40NaOH}$	=	-----(trace)
Scrubber stack	.01#/hr	X $\frac{46Na_2}{78Na_2S}$	=	-----(trace)
Lime mud washer	4410.3#/hr	X $\frac{23Na}{40NaOH}$	=	2535.9#/hr
Lime mud washer	1686.9#/hr	X $\frac{46Na_2}{78Na_2S}$	=	994.8#/hr
Lime mud washer	1509.1#Na_2CO_3/hr	X $\frac{46Na_2}{106Na_2CO_3}$	=	654.9#/hr
Green liquor clarifier	19.3#Na_2S/hr	X $\frac{46Na_2}{78Na_2S}$	=	11.4#/hr
Green liquor clarifier	84.5#Na_2CO_3/hr	X $\frac{46Na_2}{106Na_2CO_3}$	=	36.7#/hr
Green liquor clarifier	15.4#NaOH/hr	X $\frac{23Na}{40NaOH}$	=	8.9#/hr

(CONT):
TOTAL SODIUM OUT:

Slaker	19.3#Na_2S/hr	X $\frac{46Na_2}{78Na_2S}$	= 11.4#/hr
Slaker	16.6#Na_2CO_3/hr	X $\frac{46Na_2}{106Na_2CO_3}$	= 7.2#/hr
Slaker	52.0#NaOH/hr	X $\frac{23Na}{40NaOH}$	= 29.9#/hr
	TOTAL SODIUM OUT OR SYSTEM		= 23667.4#/hr

WATER

TOTAL WATER IN FROM:

Combustion of fuel and Evaporator vent gases	= 2583#/hr
Water vapor in ambient air used and evaporator gases	= 1126#/hr
Fresh water	= 231834#/hr
Smelt tank	= 264077#/hr
TOTAL WATER INTO SYSTEM	= 499620#/hr H_2O

TOTAL WATER OUT:

Scrubber to atmoshpere	= 19913#/hr
White liquor clarifier	= 215155#/hr
Slaker	= 57#/hr
Green liquor clarifier	= 418#/hr
Lime mud washer	= 264077#/hr
TOTAL WATER OUT OF SYSTEM	= 499620#/hr H_2O

ALTON PACKAGING CORPORATION
CAUSTIC / LIME KILN PERMIT
NATURAL GAS AS FUEL
PAGE 1

REVISED-MAY 17, 1985

MATERIAL BALANCE

TOTAL SO_2 IN: 20.49#/hr from evaporator vent combustion

Expressed as Sulfur: $20.49 \times \frac{32S}{64SO_2} = 10.245\#S/hr$

TOTAL SULFUR OUT:

From SO_2, as Sulfur $= 8.33\#SO_2/hr \times \frac{32}{64} = 4.165\#S/hr.$ from SO_2

From H_2S Out Stack, as Sulfur $= 0.7458\ \#H_2S/hr \times \frac{32}{34} = 0.702\#S/hr$ from H_2S

TOTAL SULFUR OUT 4.867#S/hr

Sulfur retained in system = 10.245#S/hr - 4.867#S/hr = 5.378#S/hr

Expressed as $SO_2 = 5.378\#S/hr \times \frac{64}{32} = 10.756\#SO_2/hr$

SIMIPLIFIED REACTION:

$$\frac{1}{2}O_2 \quad X \quad CO_2 + SO_2 \longrightarrow X \quad SO_4 + CO_2$$

$$10.756\#SO_2/hr \longrightarrow 7.39\#CO_2/hr$$

Approximately $7\#CO_2/hr$ will be evolved due to SO_2 removal.

IF CALCIUM IS THE ION SELECTED THEN THE BALANCE COULD BE REPRESENTED AS:

$$\frac{1}{2}O_2 + CaCO_3 + SO_2 \longrightarrow CaSO_4 + CO_2$$

$$10.8\#/hr \longrightarrow 23.0\#/hr + 7.4\#/hr$$

ALTON PACKAGING CORPORATION
CAUSTIC / LIME KILN PERMIT
NATURAL GAS AS FUEL
PAGE 2

REVISED-MAY 17, 1985

INERTS

TOTAL INERTS IN FROM:

597.8#/Hr	Smelt tank
156 #/Hr	Lime Silo
753.8#/Hr	TOTAL INERTS INTO SYSTEM

TOTAL INERTS OUT:

597.8#/Hr	Green Liquor Clarifier
0.98#/Hr	To atmoshpere out stack
155 #/Hr	Slaker classifier
753.8 #/Hr	TOTAL INERTS OUT OF SYSTEM

ALTON PACKAGING CORPORATION
CAUSTIC / LIME KILN PERMIT
NATURAL GAS AS FUEL
PAGE 3

REVISED-MAY 17, 1985

SULFUR

TOTAL SULFUR IN FROM:

Smelt tank	9225.8#/hr Na_2S	X	$\frac{32S}{78Na_2S}$	= 3784.9#/hr S
Evap. Vent Gas	10.3#S/hr	X	$\frac{32S}{32S}$	= 10.3#/hr
			TOTAL SULFUR INTO SYSTEM	= 3795.2#/hr

TOTAL SULFUR OUT:

White liquor clarifier	7687.13#Na_2S/hr	X	$\frac{32}{78}$	= 3153.7
To atmosphere (SO_2)	8.33#SO_2/hr	X	$\frac{32}{64}$	= 4.2
Lime mud washer	1514.9#Na_2S/hr	X	$\frac{32}{78}$	= 621.5
To atmosphere (H_2S)	.7265#H_2S/hr	X	$\frac{32S}{34H_2S}$	= .7
Slaker classifier	19.3#Na_2S/hr	X	$\frac{32}{78}$	= 7.9
Green liquor clarifier	19.3#Na_2S/hr	X	$\frac{32}{78}$	= 7.9
To atmosphere (Na_2S)	.01#Na_2S/hr	X	$\frac{32}{78}$	= ---(trace)
			TOTAL SULFUR OUT FROM SYSTEM	= 3795.2#/hr

ALTON PACKAGING CORPORATION
CAUSTIC / LIME KILN PERMIT
NATURAL GAS AS FUEL
PAGE 4

REVISED-MAY 17, 1985

CALCIUM

TOTAL CALCIUM IN FROM:

Smelt tank	27.2#/hr	X	$\frac{40Ca}{100CaCO_3}$	=	10.9#/hr
Purchased Lime	886#CaO/hr	X	$\frac{40Ca}{56CaO}$	=	632.9#/hr
	TOTAL CALCIUM INTO SYSTEM			=	643.8#/hr Calcium

TOTAL CALCIUM OUT:

White Liquor clarifier	12.5#/hr	X	$\frac{40Ca}{100CaCO_3}$	=	5.0#/hr
Scrubber stack	9.25#/hr	X	$\frac{40Ca}{100CaCO_3}$	=	3.7#/hr
Lime mud washer	31.25#/hr	X	$\frac{40}{100}$	=	12.5#/hr
Green Liquor clarifier	31.25#/hr	X	$\frac{40}{100}$	=	12.5#/hr
Slaker	1128.7#/hr	X	$\frac{40}{74}$	=	610.1#/hr
	TOTAL CALCIUM OUT OF SYSTEM			=	643.8#/hr Calcium

ALTON PACKAGING CORPORATION
CAUSTIC / LIME KILN PERMIT
NATURAL GAS AS FUEL
PAGE 5

REVISED MAY 17, 1985

SODIUM

TOTAL SODIUM IN FROM:

Smelt tank	33813.7#/hr	X $\frac{46Na_2}{106Na_2CO_3}$	=	14673.7#/hr
Smelt tank	6178.7#/hr	X $\frac{23Na}{40NaOH}$	=	3552.8#/hr
Smelt tank	9225.8#/hr	X $\frac{46Na_2}{78Na_2S}$	=	5440.9#/hr
	TOTAL SODIUM INTO SYSTEM		=	23667.4#/hr Na

TOTAL SODIUM OUT:

White liquor clarifier	20791.4#/hr	X $\frac{23Na_2}{40NaOH}$	=	11955.1#/hr
White liquor clarifier	7687.1#/hr	X $\frac{46Na_2}{78Na_2S}$	=	4533.4#/hr
White liquor clarifier	6654.6#/hr	X $\frac{46Na_2}{106Na_2CO_3}$	=	2887.8#/hr
Scrubber stack	.01#/hr	X $\frac{46Na_2}{106Na_2CO_3}$	=	-----(trace)
Scrubber stack	.03#/hr	X $\frac{23Na}{40NaOH}$	=	-----(trace)
Scrubber stack	.01#/hr	X $\frac{46Na_2}{78Na_2S}$	=	-----(trace)
Lime mud washer	4586.6 #/hr	X $\frac{23Na}{40NaOH}$	=	2637.3#/hr
Lime mud washer	1514.9#/hr	X $\frac{46Na_2}{78Na_2S}$	=	893.4#/hr
Lime mud washer	1509.1#Na_2CO_3/hr	X $\frac{46Na_2}{106Na_2CO_3}$	=	654.9#/hr
Green liquor clarifier	19.3#Na_2S/hr	X $\frac{46Na_2}{78Na_2S}$	=	11.4#/hr
Green liquor clarifier	84.5#Na_2CO_3/hr	X $\frac{46Na_2}{106Na_2CO_3}$	=	36.7#/hr
Green liquor clarifier	15.4#NaOH/hr	X $\frac{23Na}{40NaOH}$	=	8.9#/hr

ALTON PACKAGING CORPORATION
CAUSTIC / LIME KILN PERMIT
NATURAL GAS AS FUEL
PAGE 6

REVISED-MAY 17, 1985

(CONT)
TOTAL SODIUM OUT:

Slaker	19.3#Na_2S/hr	X $\frac{46Na_2}{78Na_2S}$	= 11.4#/hr
Slaker	16.6#Na_2CO_3/hr	X $\frac{46Na_2}{106Na_2CO_3}$	= 7.2#/hr
Slaker	52.0#NaOH/hr	X $\frac{23Na}{40NaOH}$	= 29.9#/hr
	TOTAL SODIUM OUT OR SYSTEM		= 23667.4#/hr

WATER

TOTAL WATER IN FROM:

Combustion of fuel and Evaporator vent gases	= 5129#/hr
Water vapor in ambient air used and evaporator gases	= 1167#/hr
Fresh water	= 231834#/hr
Smelt tank	= 264077#/hr
TOTAL WATER INTO SYSTEM	= 502207#/hr H_2O

TOTAL WATER OUT:

Scrubber to atmoshpere	= 22500#/hr
White liquor clarifier	= 215155#/hr
Slaker	= 57#/hr
Green liquor clarifier	= 418#/hr
Lime mud washer	= 264077#/hr
TOTAL WATER OUT OF SYSTEM	= 502207#/hr H_2O