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MEMORANDUM

DATE: August 9, 1990

TO: Jim McDonald THRU J. Harry Kerns, P.E.

FROM: Carlos Gonzalez CG THRU Jerry Campbell, P.E. JC

RE: New Air Operating Permit (AO29-181935) for CF Industries' Y-Train: DAP, MAP or GTSP

The associated construction permit (AC29-165420) has been reviewed and the appropriate and pertinent specific conditions have been incorporated in this new air operating permit. As discussed with you on July 3, 1990, the following items have been addressed as follows:

- The heat value has been mentioned in the permit but no limitation has been set.
- The sulfur content (1.6% S) of the fuel oil has been placed as a restriction.
- The May 5, 1990 test showing production of DAP at 89.3 TPH was considered acceptable of the minimum requirement in the AC permit. A specific condition has been incorporated to require amendment if the production rate drops below 90% of a 100 TPH in the next compliance test.
- Pursuant to Specific Condition No. 12 of the construction permit, the DAP production mode triggered NSPS applicability as a result of emission increase for fluorides. As a result, the emission limitations and monitoring requirements under Subpart V, 40 CFR 60 apply. I have enclosed the appropriate page in the General Conditions to indicate the NSPS applicability.

The emission increase determination was based on historical emissions based on compliance tests prior to the cooler installation (10/87-10/89) versus the recent compliance test (5/90) after installation of the cooler. The formulae used is contained in 40 CFR 60, Appendix C, which was the same criteria used by CFI and submitted with the COCOC. As it can be noted, my calculations show the emission increase based on more test runs used in the formulae. I discussed this with Mr. Willard Hanks in CAPS and he concurred that my calculations and determination had a sound foundation for issuing an NSPS permit.

The 5/90 test can be considered the initial start-up test. My inspection of 8/14/90 determined that phos acid mass flow meter and pressure drop across the venturi scrubbers are in place and in operation. However, our Chief Compliance Engineer has suggested that we require CFI to place a pressure drop meter downstream from the cyclonic scrubbers since these are most effective on fluoride emissions and will also establish the pressure drop across the entire scrubber system. (Note inspection report diagram).

Enclosed are the inspection report and other pertinent data, which found the source in compliance.

I recommend approval to issue an operating permit for this source. Enclosed for your signature is the draft of the proposed operating permit and diskette.

cc: Mr. Willard Hanks, DER, Tallahassee

CCG:A0181935

Testrun (#/DAY, F⁻), t-test Fluorides by EPC

Date	(a)	(b)
10/27/87	1.8	22.0
↓	1.3	41.3
	1.4	21.2
4/13/88	4.1	20.2
↓	3.9	12.3
	5.0	23.4 = $\bar{x}_b$
10/25/88	5.7	
↓	6.1	
	9.6	
4/11/89	24.1	
↓	21.7	
	19.4	
10/17/89	2.4	
	2.8	
	3.5	
	7.52 = $\bar{x}_a$	

$$S_a^2 = (1.8-7.52)^2+(1.3-7.52)^2+(1.4-7.52)^2+(4.1-7.52)^2+(3.9-7.52)^2+(5.0-7.52)^2$$
$$+(5.7-7.52)^2+(6.1-7.52)^2+(9.6-7.52)^2+(24.1-7.52)^2+(21.7-7.52)^2+$$
$$(19.4-7.52)^2+(2.4-7.52)^2+(2.8-7.52)^2+(3.5-7.52)^2 / 15-1 = 59.38$$

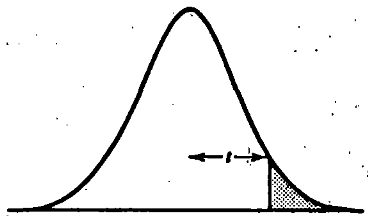
$$S_b^2 = 5.52$$

$$S_p = \left[\frac{(15-1)(59.38)+(5-1)(5.52)}{15+5-2}\right]^{1/2} = 6.88$$

$$t = \frac{23.4-7.52}{6.88\left[\frac{1}{15}+\frac{1}{5}\right]^{1/2}} = \frac{15.88}{6.88\times(.267)^{1/2}} = \frac{15.88}{3.55} = \underline{4.47}$$

$15+5-2 = 18 \Rightarrow t' = \underline{1.73}$ (Note t' table on reverse)

TABLE B1. Probability points of the *t* distribution with ν degrees of freedom



ν	tail area probability									
	0.4	0.25	0.1	0.05	0.025	0.01	0.005	0.0025	0.001	0.0005
1	0.325	1.000	3.078	6.314	12.706	31.821	63.657	127.32	318.31	636.62
2	0.289	0.816	1.886	2.920	4.303	6.965	9.925	14.089	22.326	31.598
3	0.277	0.765	1.638	2.353	3.182	4.541	5.841	7.453	10.213	12.924
4	0.271	0.741	1.533	2.132	2.776	3.747	4.604	5.598	7.173	8.610
5	0.267	0.727	1.476	2.015	2.571	3.365	4.032	4.773	5.893	6.869
6	0.265	0.718	1.440	1.943	2.447	3.143	3.707	4.317	5.208	5.959
7	0.263	0.711	1.415	1.895	2.365	2.998	3.499	4.029	4.785	5.408
8	0.262	0.706	1.397	1.860	2.306	2.896	3.355	3.833	4.501	5.041
9	0.261	0.703	1.383	1.833	2.262	2.821	3.250	3.690	4.297	4.781
10	0.260	0.700	1.372	1.812	2.228	2.764	3.169	3.581	4.144	4.587
11	0.260	0.697	1.363	1.796	2.201	2.718	3.106	3.497	4.025	4.437
12	0.259	0.695	1.356	1.782	2.179	2.681	3.055	3.428	3.930	4.318
13	0.259	0.694	1.350	1.771	2.160	2.650	3.012	3.372	3.852	4.221
14	0.258	0.692	1.345	1.761	2.145	2.624	2.977	3.326	3.787	4.140
15	0.258	0.691	1.341	1.753	2.131	2.602	2.947	3.286	3.733	4.073
16	0.258	0.690	1.337	1.746	2.120	2.583	2.921	3.252	3.686	4.015
17	0.257	0.689	1.333	1.740	2.110	2.567	2.898	3.222	3.646	3.965
18	0.257	0.688	1.330	1.734	2.101	2.552	2.878	3.197	3.610	3.922
19	0.257	0.688	1.328	1.729	2.093	2.539	2.861	3.174	3.579	3.883
20	0.257	0.687	1.325	1.725	2.086	2.528	2.845	3.153	3.552	3.850
21	0.257	0.686	1.323	1.721	2.080	2.518	2.831	3.135	3.527	3.819
22	0.256	0.686	1.321	1.717	2.074	2.508	2.819	3.119	3.505	3.792
23	0.256	0.685	1.319	1.714	2.069	2.500	2.807	3.104	3.485	3.767
24	0.256	0.685	1.318	1.711	2.064	2.492	2.797	3.091	3.467	3.745
25	0.256	0.684	1.316	1.708	2.060	2.485	2.787	3.078	3.450	3.725
26	0.256	0.684	1.315	1.706	2.056	2.479	2.779	3.067	3.435	3.707
27	0.256	0.684	1.314	1.703	2.052	2.473	2.771	3.057	3.421	3.690
28	0.256	0.683	1.313	1.701	2.048	2.467	2.763	3.047	3.408	3.674
29	0.256	0.683	1.311	1.699	2.045	2.462	2.756	3.038	3.396	3.659
30	0.256	0.683	1.310	1.697	2.042	2.457	2.750	3.030	3.385	3.646
40	0.255	0.681	1.303	1.684	2.021	2.423	2.704	2.971	3.307	3.551
60	0.254	0.679	1.296	1.671	2.000	2.390	2.660	2.915	3.232	3.460
120	0.254	0.677	1.289	1.658	1.980	2.358	2.617	2.860	3.160	3.373
∞	0.253	0.674	1.282	1.645	1.960	2.326	2.576	2.807	3.090	3.291

Source: Taken with permission from E. S. Pearson and H. O. Hartley (Eds.) (1958), *Biometrika Tables for Statisticians*, Vol. 1, Cambridge University Press.

Parts of the table are also taken from Table III of Fisher and Yates: *Statistical Tables for Biological, Agricultural and Medical Research*, published by Longman Group Ltd., London (previously published by Oliver and Boyd, Edinburgh), by permission of the authors and publishers.

t TEST FLUORIDES by CFI

(A)	(b)	
4/89	5/90	Results are lbs./day
24.1	22.0	
19.4	41.3	
21.7	21.2	
	20.2	
	12.3	

(1) $\frac{24.1 + 19.4 + 21.7}{3} = 21.73 = E_a$

(1) $\frac{22.0 + 41.3 + 21.2 + 20.2 + 12.3}{5} = 23.4 = E_b$

(2) $s_a^2 = \frac{(24.1 - 21.73)^2 + (19.4 - 21.73)^2 + (21.7 - 21.73)^2}{3 - 1} = 3.68$

$s_b^2 = \frac{(22.0 - 23.4)^2 + (41.3 - 23.4)^2 + (21.2 - 23.4)^2 + (20.2 - 23.4)^2 + (12.3 - 23.4)^2}{5 - 1}$

a $\frac{5.62 + 5.43 + .0009}{2} = 5.52$

b $\frac{1.96 + 320.41 + 4.84 + 10.24 + 123.21}{4} = 115.16$

(3) $s_p = \left[\frac{(3 - 1)(5.52) + (5 - 1)(115.16)}{3 + 5 - 2}\right]^{1/2} = 8.866$

(4) $t = \frac{23.4 - 21.73}{8.866\left[1/3 + 1/5\right]^{1/2}} = \frac{1.67}{6.475} = 0.258 = t$

$N_a + N_b - 2 = 3 + 5 - 2 = 6$

Degree of Freedom = 6 $\quad t' = 1.943$

Since $t < t'$, the difference between Ea and Eb is not significant and there is no increase in emissions.

40 CFR 60 Appendix C ∴ a) prechange
b) postchange

CFI HISTORY OF COMPLIANCE TESTS ON Y-TRAIN

Test Date	INPUT Rate (P_2O_5)	EMISSIONS #F/Ton P_2O_5	EMISSIONS #F/HR
10/27/87	36 TPH	0.0020	0.07
4/13/88	38	0.0047	0.18
10/25/88	40	0.0075	0.30
4/11/89 *	40	0.022	0.90
10/17/89	41	0.0029	0.12
AVG		0.0078	0.31
5/5/90 *	42	0.023	0.97

Note: Compliance with NSPS Standard (0.06 # F^-/Ton P_2O_5 input) is shown above.