Background Report Reference

AP-42 Section Number: 9.9.1

Background Report Section: 4

Reference Number: 59

Title: Bay Area Area Quality Management District, Summary of Source Test Results

Willowbrook Feeds, Petaluma, CA.

October 1995

BAY AREA AIR QUALITY MANAGEMENT DISTRICT

AP-42 Section Reference Report Sect. Reference 9.9.1 4 59

December 19, 1995

Glenn Bach, Plant Manager
Willowbrook Feeds
40 N. Ely Road
P. O. Box 750818
Petaluma, California 94975-0818

Dear Mr. Bach:

Enclosed are the results of the source tests that this District conducted on your *Feed Pellet Cooler* on *October 26, 1995*.

These data are considered to be representative of the emissions from this source for the operating parameters described during the test times and are forwarded as a courtesy for your information.

Your cooperation with our Source Test personnel is appreciated. Please contact Ken Kunaniec, Air Quality Engineering Manager, if you have any questions regarding these data.

Sincerely,

Ellen J. Garvey
Director, Technical Services Division

EJG:KK:cm

Enclosure

DISTRIBUTION:
Firm
Permit Services
Enforcement
Technical Services Planning
Requester DAPCO

BAY AREA
AIR QUALITY MANAGEMENT DISTRICT
939 Ellis Street
San Francisco, California 94109
(415) 771-6000

SUMMARY OF SOURCE TEST RESULTS

Report No. 96069
Test Date: 10/26/95
Test Times:
Run A: 1948 - 2102 (27 min)
Run B: 2120 - 2213 (50 min)
Run C: 2221 - 2301 (37 min)

SOURCE INFORMATION

Firm Name and Address
WILLOWBROOK FEEDS
40 N. Ely Road
P. O. Box 750818
Petaluma, CA 94975-0818

Firm Representative and Title
Glenn Bach,
Plant Manager

Phone No. (707) 792-9585

Source:
Feed Pellet Cooler
Abated by 3 Parallel Cyclones

Plant No. 10292
Permit No. 14920

Operates On Demand between 7pm to 9am
Batch

Permit Conditions
To be determined. A grain loading limit of 0.01 gr/SDCF has been propsed.

BAAQMD REPRESENTATIVES

Source Test Engineers
T. Underwood/H. Doi

Permit Services Division / Enforcement Division

Test Requested by:
D. Singh, (Request)

Operating Parameters:
Plant produces chicken feed (pellets) between 22 to 27 tph. Different feed products were produced in batch sizes ranging from 4 to 27 tons. Products produced during these tests are identified in the supporting documentation to this report.

Applicable Regulations: Developmental Data
VN Recommended: NO

Source Test Results and Comments:

METHOD:	TEST	RUN A	RUN B	RUN C	AVERAGE	LIMIT
ST-17	Volume Flowrate, SDCFM	10,500	8,810	7,840	9,050	
	Stack Temperature, ^{O}F	108	128	134	124	
ST-23	Water Content, Volume %	8.2	13.4	17.0	12.8	
EPA-5	Particulate, gr/SDCF	0.004	0.004	0.005	0.004	0.010**
	Particulate, lb/hr	0.32	0.33	0.35	0.33	
	Isokinetic Ratio, act/theo	106%	52%*	103%		

Stack gas composition is the same as ambient air.
* Note: Plant operating conditions did not fully stabilize until Run C.
** Proposed grain loading emission limit.

NO COMMERCIAL USE OF THESE RESULTS IS AUTHORIZED

Air Quality Engineer II	Date	Supervising Air Quality Engineer	Date	Approved by Air Quality Engineering Manager	Date
T. Underwood	11/15/95	C. McClure	11/15/95	K. Kunaniec	11/15/95

Form: Summary of Source Test Results
FSSTS: ej: 16 July 88

BAY AREA AIR QUALITY MANAGEMENT DISTRICT
939 Ellis Stree' ·n Francisco, California 94109
(415) 77. J00

Test Number: assign
Test Date October 26, 1995

096069

DISTRIBUTION
Firm
Permit Services
Enforcement
Technical Services
Source Inventory
Requestor
D.A.P.C.O.

Test Times:

Run A:	1948	to	2102	27 min
Run B:	2120	to	2213	50 min
Run C:	2221	to	2301	37 min

SUMMARY OF SOURCE TEST RESULTS

SOURCE INFORMATION

BAAQMD Representatives

Firm Name and Address
Willowbrook Feeds
40 N. Ely Rd.: POB 750818
Petaluma, CA 94975-0818

Representative and Title
Glenn Bach
plt mgr
Phone No (707) 792-9585

Source Test Engineers
Tim Underwood
Hiroshi Doi

Plant No. 10292

Permit Services:

Permit Conditions
To be determined. A grainloading limit of 0.01 gr/SDCF has been proposed.

Feed pellet cooler abated by 3 parallel cyclones

Permit N 14920

Enforcement Division:

Operates: On demand between 7pm to 9am.

Operating Parameters:
Batch

Plant produces chicken feed (pellets) between 22 to 27 tph.
Different feed products were produced in batch sizes ranging from 4 to 27 tons.
~~We tried to sample only during periods when actual product was in the pellet cooler.~~
Products produced during these tests are identified in the supporting documentation to this report.
Applicable Regulations:Developmental Data

Test Requested By:
D. Singh, (Request)

VN Recommended? No

Test Results and Comments:

METHOD	TEST	RUN A	RUN B	RUN C	AVERAGE	LIMIT
ST-17	Volume Flowrate, SDCFM	10,500	8,810	7,840	9,050	
	Stack Temperature, F	108	128	134	124	
ST-23	Water Content, volume %	8.2	13.4	17.0	12.8	
EPA-5	Particulate, gr/SDCF	0.004	0.004	0.005	0.004	0.010**
	Particulate, lb/hr	0.32	0.33	0.35	0.33	
	Isokinetic Ratio, act/theo	106%	52% *	103%		

PLANT Stack gas composition is the same as ambient air.

* Note: Operating conditions did not fully stabalize until run C. ~~During the test there was much confusion which resulted in a 'sub-iso' sample for run B. The effect of sub-isokinetic sampling would be an apparent increase in mass rate emissions. The relative insensitivity to isokinetic conditions actually observed supports the view that the particulate is primarily submicron in size.~~

** Proposed grainloading emission limit.

NO COMMERCIAL USE OF THESE RESULTS IS AUTHORIZED

Source Test Team Leader
Tim Underwood
C McClure

Date 11/6/95

Approved-Chief of Source Test
Ken Kunaniec

CMB

Willowbrook Feeds
plt 10292
October 26, 1995
Source numbers not assigned yet

Fixed Gases Results	Traverse	Run A	Run B	Run C
Oxygen, %	21.0	21.0	21.0	21.0
CO2, %	0.1	0.1	0.1	0.1
CO, ppmv	41	41	41	41
N2, %	79.0	79.0	79.0	79.0

Run Data	Traverse	Run A	Run B	Run C	
Ym		1.002	1.002	1.002	
Cp, pitot constant	0.855	0.835	0.835	0.835	
Dn, mm:Nozzle		6.21667	6.21667	4.45	
An, ft^2:Nozzle		3.27E-04	3.27E-04	1.67E-04	
Dstack, inches		29.5	29.5	29.5	
Astack, ft^2	4.75	4.75	4.75	4.75	
Pstd, in Hg	29.92	29.92	29.92	29.92	
Pbar, in Hg	30.1	30.1	30.1	30.1	
Pstatic, in H2O	0.5	0.5	0.5	0.5	
Pstack, in Hg	30.14	30.14	30.14	30.14	**See sample calculation using Run A values, EQ1**
del H, in H2O, mtr press cor		1.97	1.47	0.30	
Pvacimp, in Hg		5.79	2.06	1.65	
(del p)^.5avg	0.65	0.73	0.65	0.61	
{(del p)^.5*cos(x)}avg	0.65	0.73	0.65	0.61	
Tstd, R		530	530	530	
Tstk, F	129.4	108.2	128.1	134.4	
Tstk, R	589.0	567.8	587.7	594.0	**See sample calculation using Run A values, EQ 2**
Tm, R		533.3	533.5	534.0	
Tsat, F: Impinger		43.6	41.1	40.1	
Vm, meter vol CF		20.6	15.7	10.5	
Vstd, SCF		20.731	15.758	10.496	**See sample calculation using Run A values, EQ 3**
Wsg, Saturated Imp H2O, gms		5.2	3.1	2.0	**See sample calculation using Run A values, EQ's 4,5,6,7**
Vw, CF H2O,condensed and on dessicant		1.93	2.44	2.15	**See sample calculation using Run A values, EQ 8**
Bws, [H2O], (trav uses run A)	0.082	0.082	0.134	0.170	**See sample calculation using Run A values, EQ 9**
1-Bws, [Dry gas]	0.918	0.918	0.866	0.830	
Mwdry, g/g-mol	28.846	28.85	28.85	28.85	**See sample calculation using Run A values, EQ 10**
Mwwet, g/g-mol	27.436	27.96	27.39	27.01	**See sample calculation using Run A values, EQ11**
Vs,wet, ft/sec actual	40.0	42.7	39.3	36.9	**See sample calculation using Run A values, EQ 12**
(Vs,wet*k), ft/sec actual ex vect	40.0	42.7	39.3	36.9	**See sample calculation using Run A values, EQ 13**
t, min:test time		27	50	37	Vs*k may differ from Vs if some points were traversed with a secondary pitot or there was cy
Qstd, SDCFM	8990.248	10491	8807	7840	**See sample calculation using Run A values, EQ 14**
Isokinetic Ratio, overall		106.3%	52.0%	102.6%	**See sample calculation using Run A values, EQ 15**

LAB RESULTS	Run A	Run B	Run C	
Basis, (sample vlm)	20.731	15.758	10.496	
Prorata del wt, gms	0			
Prorated wt, gms	0.0000	0.0000	0.0000	
P&N&F weight, gms	0.0048	0.0044	0.0035	
Total wt gain, gms	0.0048	0.0044	0.0035	
G, gr/SDCF	0.0036	0.0043	0.0051	**See sample calculation using Run A values, EQ 16**
M, lb/hr	0.32	0.33	0.35	**See sample calculation using Run A values, EQ 17**
Wc, Condenser Imp H2O, gms	35.5	48.3	43.3	

Sample Calculations Using Run A Data

Willowbrook Feeds
plt 10292
October 26, 1995
Source numbers not assigned yet

EQ 1 Absolute Stack Pressure Equation

Pstack=Pbar+Pstatic/13.6
Pstack=30.10+0.5/13.6
Pstack=30.14 in Hg

EQ 2 Fundamental physical law, Conversion to absolute temperature, R (Rankine)

T, deg R = T, deg F + 459.6
Tstk,R = Tstk,F + 459.6
Tstk,R=108.2+459.6
Tstk,R=567.8

EQ 3 EPA Method 5, Eqtn 5-1, Dry gas volume corrected to standard conditions:

Vstd=Vm*Y*(Tstd/Tm)*[(Pbar+(del H)/13.6)/Pstd]
Vstd=20.593*1.002*(530/533.3)*[(30.10+1.97/13.6)/29.92]
Vstd=20.731

Parametric Equation for Ppw calculates partial Pressure of H2O passing final knockout impinger at Tsat. Application of Henry's Law to determine Vwsg, water vapor volume, that is scrubbed out by silica gel just before meter quantifies dry gas volume Constant from BAAQMD ST-23, Eqtn 9.2 converts gaseous H2O to grams, Wsg, and vica versa. Full equation cited in Bws calculation.

EQ 4 Ppw=(Tsat/79.48)^3-(Tsat/115.34)^2+(Tsat/164.42)-(1/364) Parametric Eqtn
Ppw=(43.6/79.48)^3-(43.6/115.34)^2+(43.6/164.42)-(1/364)
Ppw= 0.2842 in Hg

EQ 5 Ppdry, partial pressure of dry gas in Tsat impinger is also calculated:

Ppdry=Pbar-Pvacimp-Ppw — One term from BAAQMD ST-23, Eqtn 9.2 and Henry's Law
Ppdry=30.10-5.79-0.28
Ppdry= 24.022 in Hg

EQ 6 Vwsg=Vstd*(Ppw/Ppdry) — One term from BAAQMD ST-23, Eqtn 9.2 and Henry's Law
Vwsg=20.731*(0.28/24.02)
Vwsg= 0.24527

EQ 7 Wsg=Vwsg/.0474 — Constant from BAAQMD ST-23, Eqtn 9.2
Wsg=0.25/.0474
Wsg= 5.17447 grams H2O

EQ 8 Vw=.0474*(Wc+Wsg) — Constant from BAAQMD ST-23, Eqtn 9.2
Vw=.0474*(35.5+5.2)
Vw=1.93 CF

EPA Method 4, Eqtn4-4 or BAAQMD ST-23, Eqtn 9.2: Stack gas Moisture Content

EQ 9 Bws=(Vwc+Vwsg)/(Vwc+Vwsg+Vstd)=Vw/(Vw+Vstd) **EPA 4-4**

$$\%H2O=100\%*Bws=\frac{\{.0474*Wc+Vstd*Ppw/(Pbar-Pvacimp-Ppw)\}}{\{.0474*Wc+Vstd*Ppw/(Pbar-Pvacimp-Ppw)\}+Vstd}=(Vwc+Vwsg)/(Vwc+Vwsg+Vstd)$$

BAAQMD S-23, Eqtn 9.2

Sample Calculations Using Run A Data--Page 2

Willowbrook Feeds
plt 10292
October 26, 1995
Source numbers not assigned yet

Both equations are presented here so that one can see their equivalence. Previously calculated intermediate values makes the use of EPA 4-4 more convenient and easier to follow.

Bws=Vw/(Vw+Vstd)
Bws=1.93/(1.93+20.73)
Bws= 0.08509 =8.2%

EQ 10 EPA Method 3, Eqtn 3-2, Dry Molecular weight
Mwdry=.44*%CO2+.32*%O2+.28*(%N2+%CO)
Mwdry=.44*0.1+.32*21.0+.28*(79.0+0.0)
Mwdry=28.85 g/g-mol

EQ 11 EPA Method 2 Eqtn 2-5, Wet molecular weight determination
Mwwet=(1-Bws)*Mwdry+18*Bws
Mwwet=0.918*28.85+18*0.082
Mwwet=27.96 g/g-mol

EQ 12 BAAQMD ST-17, Eqtn 8.2 and EPA Method 2, Eqtn 2-9: Stack gas velocity
Vs,wet=85.49*Cp*[(del p)^.5 avg]*(Tstk/(Pstk*Mww))^.5
Vs,wet=85.49*0.84*0.729*(567.8/(30.14*27.96))^.5
Vs,wet=42.7 ft/sec

EQ 13 For Cyclonic flow exhaust calculations, del p root avg must be corrected by cosine of exhaust angle
Vs,wet*k=85.49*Cp*[{(del p)^.5*cos(x)} avg]*(Tstk/(Pstk*Mww))^.5
Vs,wet*k=85.49*0.84*0.729*(567.8/(30.14*27.96))^.5
Vs,wet*k=42.7 ft/sec

EQ 14 EPA Method 2, Eqtn 2-10 and BAAQMD ST-17 Eqtn 8.3: Stack Volume Flowrate, SDCFM
Qstd=60*(1-Bws)*(Vs,wet*k)*Astack*(Tstd/Tstk)*(Pstack/Pstd)
Qstd=60*0.918*42.7*4.75*(530/568*(30.14/29.92)
Qstd=10491 SDCFM

EQ 15 EPA Equation 5-8 for overall Isokinetic rate determination:
I=(Tstack*Vstd*Pstd*100)/(TstdVs,wet*sample time*An*Pstack*60*(1-Bws))
Example from run A:
I=(567.8*20.731*29.92*100)/(530*42.7*27*3.27E-4*30.14*60*0.92)
I=106.3%

EQ 16 BAAQMD ST-15, Eqtn 10.6, Grain Loading, gr/SDCF
G=15.43*(Weight Gain, gms)/(Vstd)
G=15.43*0.0048/20.731
G=0.004 gr/SDCF

Miscellaneous Emissions:
Mx=.156E-6*Mwx*Q*[X]
x [=] species x
Mwx [=] molecular weight of x, amu
[X] = concentration of X, dry ppmv

EQ 17 BAAQMD ST-15, Eqtn 10.7, Particulate Mass Emission Rate, lb/hr
M=G*Qstd/116.67
M=0.004*10491/116.67
M=0.32 lb/hr

Table of Nomenclature

Variable or constant		Units	Description
An	[=]	ft^2	Nozzle Area
As or Astack	[=]	ft^2	Stack Area
Bws	[=]	CF H2O/CF Gas	Water vapor fraction
Cp	[=]	unitless	Pitot tube constant
Dn	[=]	mm	Nozzle diameter
Ds or Dstack	[=]	in	Stack diameter
G	[=]	grain/SDCF	grain loading (per cubic foot)
del H or ΔH	[=]	inches H_2O	Back pressure on the meter
I	[=]	dimensionless or %	Ratio of actual to theoretical sample volumes
M	[=]	lb/hr	Mass rate emissions
Mwdry	[=]	amu	Molecular weight of dry stack gas
Mwwet	[=]	amu	Molecular weight of wet stack gas
Pbar	[=]	inches Hg	Barometric pressure
Ppdry	[=]	inches Hg	Partial pressure of dry gas in final impinger
Ppw	[=]	inches Hg	Partial pressure of water gas in final impinger
Ps or Pstack	[=]	inches Hg	Absolute stack pressure
Pstd	[=]	inches Hg	Average Ambient Air Pressure, defined at 29.92
Pstatic	[=]	inches H2O	Static guage pressure of stack
Pvacimp	[=]	inches Hg	Guage vacuum at the saturated gas impinger, knockout before dessicant
del p or Δp	[=]	inches H_2O	Velocity head as measured by pitot tube
Qstd	[=]	SDCFM	Volumetric flow rate corrected to Pstd and Tstd
Tsat	[=]	F or R	Temperature of gas saturated with water vapor
Tm	[=]	F or R	Meter temperature
Tstk	[=]	F or R	Stack Temperature
Tstd	[=]	F or R	Standard temperature defined at 70 F or 530 R
t or Δt	[=]	minutes	time between sample points or time of entire sample
Vm	[=]	CF	meter reading or cumulative sample volume according to dry gas meter
Vstd	[=]	SCF	sample volume corrected to standard temperature and pressure
Vw	[=]	SCF	Water condensed and dessicated at Tstd and Pstd in the gaseous state
Vwc	[=]	SCF	Water condensed at Tstd and Pstd in the gaseous state
Vwsg	[=]	SCF	Water dessicated at standard temperature and pressure in the gaseous state
Vswet	[=]	ft/sec	actual stack velocity
Vswet*k	[=]	ft/sec	k vector component of actual stack velocity
Wc	[=]	grams H_2O	Condensed water weight in the first two knockout impingers
Wsg	[=]	grams H_2O	Scrubbed water weight on the silica gel or other dessicant
Ym	[=]	dimensionless	meter calibration coefficient
13.6	[=]	dimensionless	Ratio of liquid densities, Hg to H_2O: EQ's 1 and 3
.0474	[=]	CF-H_2O/g-H_2O	Conversion factor at Tstd and Pstd: EQ's 7, 8 and 9
.44	[=]	amu/%-CO_2	Molecular Weight: EQ 10
.32	[=]	amu/%-O_2	Molecular Weight: EQ 10
.28	[=]	amu/%-N_2	Molecular Weight: EQ 10
.28	[=]	amu/%-CO	Molecular Weight: EQ 10
18	[=]	amu/H_2O	Molecular Weight: EQ 11
85.49	[=]	ft/s[in Hg*amu]^.5 [in H_2O* R]^.5	Pitot tube constant: EQ 12 and 13
60	[=]	sec/min	Conversion factor: EQ 14 and 15
15.43	[=]	gr/g	Conversion factor: EQ 16
116.67	[=]	gr-hr/lb-min	Conversion factors 7000 gr/lb * 1hr/60-min: EQ 17

Notes for the particulate Spread sheet

Note 1: The initial estimate of water content is the one parameter that most affects the final isokinetic ratio. The upper bound on stack $[H_2O]$ is the vapor pressure at T_{stk}. Additionally, the water in a stack is often a result of fuel combustion. $[H_2O]$ at T_{sat} is calculated according to the following parametric equation:

$[H_2O]=(\exp(18.3036-3816.44/(T_{sat}-46.13))/7.6$; T[=]°R; atm

Stoichiometry of methane and air combustion was used to develop $[H_2O]$ based on $[CO_2]$:

$[H_2O]=2/(.02+1/[CO_2])$

Other methods for estimating water content may be available. An on-site evaluation is made to select the best guess. Final water content is calculated from the equation in BAAQMD ST-23-9.2:

$B_{ws}=.0474*W/(V_{std}+.0474*W)*100\%$

B_{ws} is the water vapor percentage, wet basis. W is the weight in grams of water condensed during sampling and that which is adsorbed in the desiccant after passing through the final knockout impinger.

Note 2: These pre-test calculations of gas velocity at the nozzle help ensure that the selected nozzle will cover the entire range of stack gas velocities. EPA equations 2-9 and 2-10 calculate stack gas velocity and volumetric flow rate. For stacks with cyclonic flow, it is necessary to include the factor cos(angle of egress) for the exhaust vector component. Calculation of the nozzle velocity can not include this cosine factor. Instead, the sample time at each traverse point is adjusted by this cosine factor in order to maintain representative sampling criteria at each traverse point.

$v_{s,wet}=85.49c_p(\Delta p)^{.5}(T_s/(P_sM_{wwet}))^{.5}*\cos(x)$; ft/sec

$Q_{std}=60A_sV_s(1-B_{ws})(P_s/P_{std})(T_{std}/T_s)$; SDCFM; referenced to P_{std} and T_{std}

Additionally, the relationship between wet and dry gas velocity or volumetric flow is given by:

$v_{s,dry}=(1-B_{ws})v_{s,wet}$: $Q_{s,dry}=(1-B_{ws})Q_{s,wet}$

$\Delta t_i=\cos(x_i)$*basic time interval

Note 3: Method ST-18-3.2 specifies the number of traverse points and their location. Stacks less than 12 inches in diameter require 4 traverse points per diameter; up to 20 Inch D=>6 pts <30 in D=>8 pts;<48 in D=>10 pts;>48 in D=>12 pts

The radial location of traverse point "i" in duct of radius "R" with a total of "2a" points per diameter is:

$r_i=R((i-.5)/a)^{.5}$

PLANT DATA	Willowbrook Feeds	Contact:	Glenn Bach	Willowbrook Feeds
Address	40 N. Ely Rd.: POB 750818	Title	plt mgr	plt 10292
City, Zip	Petaluma, CA 94975-0818	Phone	(707) 792-9585	October 26, 1995
Date:	October 26, 1995	Plant no.	10292	Source numbers not assigned yet
Permit No	14920	Test No.	assign	
Request by?	*D. Singh*	Source:	Source numbers not assigned yet	
CDS,NSR,NESHAPS?	Request	(source de	Feed pellet cooler abated by 3 parallel cyclones	
Test Engineer	Tim Underwood			
Technician	Hiroshi Doi	Operates:	On demand between 7pm to 9am. Batch	

Applicable Regulations

	ton/hr	cap	Reg 6 cap, lb/hr	Developmental Data
Process weight	27.000	40	37.31	=4.1*(ton processed/hr)^0.67=4.1*27.0^.67

Permit Conditions: To be determined xxxxxxxx 80 min range3 finisher male # M645
xxxxxxxx 35minutes of broiler grower # M7 xxxxxxxxx
xxxxxxxx 1.5 hr of range starter # M 6430N xxxxxxxxx
xxxxxxxx 1 hr of range grower # M6442DC xxxxxxxxx

Operating Parameter xxxxxxxxx xxxxxxxxx xxxxxxxxx

Plant produces chicken feed (pellets) between 22 to 27 tph.
Different feed products were produced in batch sizes ranging from
We tried to sample only during periods when actual product was in
Products produced during these tests are identified in the supporting documentation to this rep

Common Regulation references:
Reg 2-1-307 Failure to Meet Permit Con
Reg 2-2-x NSR permit conditions
Reg 6-310 Particulate grainloading
Reg 6-311 Particulate mass rate
Reg 10-I Asphalt plants
Reg 10-L Secondary Lead Smelters
Reg 10-M Bronze and Brass
Reg 10-N, Na Iron and Steel
Reg 10-O Sewage Treatment Plants
Reg 10-AA Steel Plants w/Elec Arc Fur
Reg 10-CC Glass Mfg
Reg 11-1-301 Lead, mass cap
Reg 11-3-301 Be, mass cap
Reg 11-5-302 Hg, mass cap
Reg 11-8-301 Hex Chrome

Used:T=traverse, S=sample

Pitot coefficients:	ID	CpA		Calibration Date		
	I 60	0.855	T	6/27/95	0.86	0.00
	I 120	0.841		6/27/95	0.00	0.00
	P 48	0.835	S	6/27/95	0.00	0.84
	p 66	0.834		6/27/95	0.00	0.00
	p 88	0.837		6/27/95	0.00	0.00
	m17-35	0.845		1/30/95	0.00	0.00
	m17-204	0.843		1/30/95	0.00	0.00
	gp 35	0.839		10/21/94	0.00	0.00
	gp 44	0.840		10/21/94	0.00	0.00
	qp-56	0.840		10/21/94	0.00	0.00

Meter Y value 1.00200 Calibrated: February 1, 1995 Have @.5 CFM 1.867
Imp Code: S
Initial Filter 368

	Traverse	Sample		
PITOT COEFFICIENT	0.855	0.835	Stack id [in]	29.50
	Run A	Run B	Run C	Stack Area [ft2] 4.75
Pbar, in Hg	30.1	30.1	30.1	
Pstatic, In H2O	0.5	0.5	0.5	
Pstack, in Hg	30.14	30.14	30.14	

Willowbrook Feeds
plt 10292
October 26, 1995
Source numbers not assigned yet

INITIAL TRAVERSE FORM

		Span	Span Strip Chart Response	Stack trip Chart Response	Initial Levels	
Cal gases	Oxygen,	20.95	84	84	20.95	
cyl#BLM002313	CO2, %	15	59.5	0.2	0.05	
lab#08-21704	CO, ppmv	1190	58	2	41	
(oxy @ 6.03%			H2O from Comb Eq		0.1	**(note 1)**
or amb air @20.95%)			Max vap press of H2O		14.8	**(note 1)**
Number of Traverse points				Initial Oxy	21.0	
on a diameter: 8				Initial CO2	0.1	
				Initial N2	79.0	
Cp= 0.855				Guess Initial H2O	13.0	**(note 1)**
Ds= 29.5				Mwdry	28.8	
As= 4.75				Mwwet	27.4	

(Note 3) **This is a true traver** from run A after blockage was fixed

Distance on diameter	Tr Pt	Degrees Cyclonic	Tstk	del p	Tr Pt	Degrees Cyclonic	Tstk	del p	cos(x)		del p^.5		T*p*cos root	
1.0	1	0	128	0.42	1	0	128	0.40	1	1	0.648	0.632	15.71	15.33
3.1	2	0	128	0.44	2	0	128	0.43	1	1	0.663	0.656	16.08	15.90
5.7	3	0	128	0.43	3	0	128	0.43	1	1	0.656	0.656	15.90	15.90
9.5	4	0	129	0.46	4	0	129	0.43	1	1	0.678	0.656	16.45	15.91
20.0	5	0	129	0.41	5	0	129	0.41	1	1	0.640	0.640	15.53	15.53
23.8	6	0	131	0.42	6	0	131	0.41	1	1	0.648	0.640	15.75	15.56
26.4	7	0	131	0.4	7	0	131	0.41	1	1	0.632	0.640	15.37	15.56
28.5	8	0	131	0.43	8	0	131	0.41	1	1	*0.656*	*0.640*	*15.94*	*15.56*
0.0	9	0			9	0			0	0	0.000	0.000	0.00	0.00
0.0	10	0			10	0			0	0	0.000	0.000	0.00	0.00
0.0	11	0			11	0			0	0	0.000	0.000	0.00	0.00
0.0	12	0			12	0			0	0	0.000	0.000	0.00	0.00
			1035	8			1035	8	16		5.222	5.161	15.75	

Avg delP	0.421		0.64893		
Avg Ts*delP^.	15.749				
Avg T,*Farenheit--Rankine*	129	------	589	(dot product with k vector)	
calc Vsswet*k	36.29	std ft/sec=	2177	ft/min	(includes cosine for) These velocities have been
clc Vssdry*k=	31.57	std ft/sec=	1894	ft/min	(cyclonic correction) corrected to standard Temperature at Pbar.
Stack flow rate, SDCFM			8990		**(note 2)** Vssdry and Vssdry*k are fictitious quantites generated as intermediate values for nozzle selection

Nozzle selection

Vsswet @nozzle=		36.2		
Vssdry @nozzle, ft/s=		31.5	=	1892 ft/min
Standard	30CFH=.5CFM	**(note 2)**		

Referenced to Pbar and Tstd

		Sample Rate vs.		An ref:		wet	dry **(note 2)**
Sugg Noz Dm	5.591	An(ft2)		0.000327	wet f/s	CFM	CFM (
Dmm sel, Run	6.217	3.27E-4		delP	Stk vel:	Rate:	Rate: (
Dmm sel, Run	6.217	3.27E-4	Min	0.40	35.2	0.689	0.600 (
Dmm sel, Run	4.450	1.67E-4	Avg	0.42	36.1	0.707	0.615 (
			Max	0.46	37.7	0.739	0.643 (

Sample Form -- Run A

Willowbrook Feeds
plt 10292
October 26, 1995
Source numbers not assigned yet

Filter ID 368
Impingers S1 and S2
Temperat Digitemp No 1
Pressure Digital Manometer
Train=Probe>Filter>Imp S1>Imp S2>pump box #80631

		Span	Span Strip Chart Response	Stack Strip Char Response	Test A Levels
Cal gases	Oxygen, %	20.95	84	84	20.95
	CO2, %	15	59.5	0.2	0.05
	CO, ppmv	1190	58	2	41
	Nitrogen, %				79.0
Initial H2O guess	**13.0**				
H2O from KO imps	35.5		Run A max H2O vap pres		8.2
H2O from Tsat imp	5.2				
H2O vapor volume	1.9		**H2O--run A, %**		8.2
EPA method 4 H2O	8.5		**(note 3)**	Mwdry	28.8
Run A Initl Lk Chk at 28.5"Hg 330.847-.854=.007 CFM				Mwwet	28.0
Run A Final Lk Chk at 28.5"Hg 351.752-.760/2=.004 CFM					

Order and Direction of Traverse:
W then S ports -------- in to out

W then S ports start ti 1948 W then S ports end time
in to out start time in to out end time 2102

Basic time interval, minut 1.50

Cp= 0.835 (Note 2)

Tpt	Cyclo Ang	Time	del p	Tstk	M Temp	E Rate	T E Vlm	R delH	Imp Temp	Van 12 Vac	Imp Vac	not smpld but trav del p	EQ 3 sdcf	EQ 5 & H2O imp grams	EQ 4 sat imp pH2O "Hg	EQ 15 iso	Probe Temp	Filt Temp
Initialization		0.00					330.957											
1	0	2.00	0.74	74	74	0.880	332.615	2.50	33	20.0	6.0		1.669	0.3	0.19	94.92%	242	242
2	0	4.00	0.77	74	74	0.898	334.273	2.50	40	20.0	6.2		1.669	0.4	0.25	93.06%	254	240
3	0	6.00	0.75	74	74	0.886	335.931	2.50	42	20.0	6.3		1.669	0.4	0.27	94.29%	256	254
4	0	8.00	0.74	74	74	0.880	337.589	2.50	42	20.0	6.3		1.669	0.4	0.27	94.92%		
5	0	10.00	0.70	74	73	0.855	339.247	2.50	42	20.0	6.0		1.672	0.4	0.27	97.78%	250	241
6	0	12.00	0.63	74	73	0.811	340.905	2.50	43	20.0	6.0		1.672	0.4	0.28	103.07%	251	244
7	0	13.50	0.50	127	72	0.688	342.149	1.93	40	20.0	6.9		1.255	0.3	0.25	121.41%	248	232
8	0	15.00	0.49	125	73	0.683	343.807	1.89	42	20.0	7.2		1.670	0.4	0.27	162.86%	254	246
0	0	15.00				0.000	343.807	0.00			0.0		0.000	0.0	0.00	0.00%		
0	0	15.00				0.000	343.807	0.00			0.0		0.000	0.0	0.00	0.00%		
0	0	15.00				0.000	343.807	0.00			0.0		0.000	0.0	0.00	0.00%		
0	0	15.00				0.000	343.807	0.00			0.0		0.000	0.0	0.00	0.00%		
1	0	16.50	0.40	128	72	0.614	345.000	1.54	44	16.0	5.3		1.203	0.3	0.29	130.16%		
2	0	18.00	0.43	128	73	0.638	345.900	1.65	44	15.0	6.3		0.906	0.2	0.29	94.56%	255	252
3	0	19.50	0.43	128	73	0.638	346.800	1.65	45	14.0	6.0		0.906	0.2	0.30	94.56%	241	246
4	0	21.00	0.43	129	74	0.639	347.750	1.65	45	12.0	5.5		0.954	0.2	0.30	99.71%		
5	0	22.50	0.41	129	73	0.623	348.800	1.57	47	11.0	5.0		1.057	0.3	0.32	113.05%	246	244
6	0	24.00	0.41	131	73	0.622	349.670	1.57	48	12.0	5.0		0.875	0.3	0.34	93.83%	254	246
7	0	25.50	0.41	131	74	0.623	350.600	1.57	50	11.0	5.0		0.934	0.3	0.36	100.11%	251	246
8	0	27.00	0.41	131	73	0.622	351.550	1.57	50	11.0	3.7		0.956	0.3	0.36	102.45%	250	244
0	0	27.00				0.000	351.550	0.00			0.0		0.000	0.0	0.00	0.00%		
0	0	27.00				0.000	351.550	0.00			0.0		0.000	0.0	0.00	0.00%		
0	0	27.00				0.000	351.550	0.00			0.0		0.000	0.0	0.00	0.00%		
0	0	27.00				0.000	351.550	0.00			0.0		0.000	0.0	0.00	0.00%		
Averages		27	0.531	108	73		20.593	1.97	44		5.79		20.731	5.2	0.28	106.33%		

Sample Form -- Run B

Willowbrook Feeds
plt 10292
October 26, 1995
Source numbers not assigned yet

Filter ID 369
Impingers S3 and S4
Temperat Digitemp No 1
Pressure Digital Manometer
Train=Probe>Filter>Imp S3>Imp S4>pump box #80631

		Span	Span Strip Response	Stack Chart Response	Test B Levels
Cal gases	Oxygen, %	20.95	84	84	20.95
	CO2, %	15	59.5	0.2	0.05
	CO, ppmv	1190	58	2	41
	Nitrogen, %				79.0
Inital H2O guess	**12.8**				
H2O from KO imps	48.3		Run B max H2O vap pres		14.3
H2O from Tsat imp	3.1				
H2O vapor volume	2.4		**H2O--run B, %**		13.4
EPA method 4 H2O	13.4			Mwdry	28.8
Run B Intl Lk Chk at 28.5"Hg 352.035-.052=.017 CFM				Mwwet	27.4
Run B Final L Chk at 28.5"Hg 367.978-.990/.5					

Order and Direction of Traverse:
S then W ports -------- in to out

S then W ports start ti 2120 S then W ports end time
in to out start time in to out end time 2213
Basic time interval, minut 3.13
Cp= 0.835

Tpt	Cyclo Ang	Time	del p	Tstk	M Temp	E Rate	T E Vlm	R delH	Imp Temp	Van 12 Vac	Imp Vac	not smpld but trav del p	EQ 3 sdcf	H2O imp grams	sat imp pH2O "Hg	iso	Probe Temp	Filt Temp
Initialization		0.00					352.100											
1	0	3.13	0.57	109	73	0.705	353.249	2.02	40	5.0	2.6		1.158	0.2	0.25	52.01%	248	246
2	0	6.25	0.55	111	73	0.691	354.377	1.94	41	5.0	2.5		1.135	0.2	0.26	52.00%	241	249
3	0	9.38	0.54	110	73	0.685	355.494	1.91	41	5.5	2.4		1.126	0.2	0.26	52.00%	249	249
4	0	12.50	0.45	125	73	0.618	356.502	1.55	41	4.0	2.3		1.013	0.2	0.26	51.95%	248	248
5	0	15.63	0.40	129	73	0.580	357.448	1.37	41	4.0	2.0		0.952	0.2	0.26	51.93%	253	247
6	0	18.75	0.39	134	74	0.572	358.380	1.32	41	4.0	2.0		0.936	0.2	0.26	51.92%	245	247
7	0	21.88	0.40	130	73	0.580	359.326	1.36	41	4.0	2.0		0.951	0.2	0.26	51.93%	242	244
8	0	25.00	0.38	132	74	0.565	360.248	1.29	41	4.0	2.0		0.925	0.2	0.26	51.92%	254	243
0	0	25.00				0.000	360.248	0.00			0.0		0.000	0.0	0.00	0.00%		
0	0	25.00				0.000	360.248	0.00			0.0		0.000	0.0	0.00	0.00%		
0	0	25.00				0.000	360.248	0.00			0.0		0.000	0.0	0.00	0.00%		
0	0	25.00				0.000	360.248	0.00			0.0		0.000	0.0	0.00	0.00%		
1	0	28.13	0.38	135	73	0.563	361.166	1.28	40	3.0	1.5		0.923	0.2	0.25	51.92%	258	245
2	0	31.25	0.43	133	74	0.601	362.146	1.46	41	4.0	2.0		0.984	0.2	0.26	51.94%	240	243
3	0	34.38	0.38	132	74	0.565	363.067	1.29	41	3.5	2.0		0.925	0.2	0.26	51.92%	257	245
4	0	37.50	0.41	134	73	0.585	364.022	1.39	42	3.5	2.0		0.960	0.2	0.27	51.93%	251	242
5	0	40.63	0.40	133	74	0.579	364.967	1.36	41	3.5	1.8		0.949	0.2	0.26	51.93%	257	245
6	0	43.75	0.40	134	74	0.579	365.911	1.35	41	3.5	1.8		0.948	0.2	0.26	51.93%	242	244
7	0	46.88	0.38	133	74	0.565	366.832	1.29	42	3.5	2.0		0.924	0.2	0.27	51.92%	248	250
8	0	50.00	0.40	135	74	0.578	367.779	1.35	42	3.5	2.0		0.951	0.2	0.27	52.14%	242	243
0	0	50.00				0.000	367.779	0.00			0.0		0.000	0.0	0.00	0.00%		
0	0	50.00				0.000	367.779	0.00			0.0		0.000	0.0	0.00	0.00%		
0	0	50.00				0.000	367.779	0.00			0.0		0.000	0.0	0.00	0.00%		
0	0	50.00				0.000	367.779	0.00			0.0		0.000	0.0	0.00	0.00%		
Averages		50	0.427	128	74		15.679	1.47	41		2.06		15.758	3.1	0.26	51.98%		

Sample Form -- Run C

		Span	Span Strip Response	Stack Chart Response	Test C Levels
Cal gases	Oxygen, %	20.95	84	84	20.95
	CO2, %	15	59.5	0.2	0.05
	CO, ppmv	1190	58	2	41
	Nitrogen, %				79.0

Inital H2O guess **15.0**
H2O from KO imps 43.3 Run C max H2O vap pres 17.0
H2O from Tsat imp 2.0
H2O vapor volume 2.1 **H2O--run C, %** 17.0
EPA method 4 H2O 17.0 Mwdry 28.8
Run C Intl Lk Chk at 28.5"Hg 368.315-.322/.5=.014 CFM Mwwet 27.0
Run C Final L Chk at 28.5"Hg 379.105-.115=.010 CFM

Willowbrook Feeds
plt 10292
October 26, 1995
Source numbers not assigned yet

Filter ID 370
Impingers S5 and S6
Temperat Digitemp No 1
Pressure Digital Manometer
Train=Probe>Filter>Imp S5>Imp S6>pump box #80631

Order and Direction of Traverse:
W then S ports -------- in to out
W then S ports start ti 2221 W then S ports end time
in to out start time in to out end time 2301
Basic time interval, minut 2.50
Cp= 0.835

Tpt	Cyclo Ang	Time	del p	Tstk	M Temp	E Rate	T E Vlm	R delH	Imp Temp	Van 12 Vac	Imp Vac	not smpld but trav del p	**EQ 3** sdcf	H2O imp grams	sat imp pH2O "Hg	iso	Probe Temp	Filt Temp
Initialization		0.00					368.432											
1	0	2.50	0.38	118	74	0.281	369.160	0.32	39	3.5	1.8		0.729	0.1	0.24	102.07%	249	227
2	0	5.00	0.40	125	74	0.287	369.902	0.33	39	3.5	1.8		0.743	0.1	0.24	102.08%	252	242
3	0	7.50	0.37	134	74	0.274	370.610	0.30	40	3.5	1.8		0.709	0.1	0.25	102.07%	243	245
4	0	10.00	0.39	134	74	0.281	371.338	0.32	40	3.5	1.8		0.728	0.1	0.25	102.07%	247	246
5	0	12.50	0.40	135	74	0.284	372.074	0.33	40	3.5	1.8		0.737	0.1	0.25	102.07%	253	245
6	0	15.00	0.39	136	74	0.280	372.800	0.32	39	3.5	1.8		0.727	0.1	0.24	102.07%	246	245
7	0	17.50	0.35	136	74	0.266	373.488	0.29	39	3.0	1.5		0.689	0.1	0.24	102.06%	253	242
8	0	20.00	0.35	137	74	0.265	374.175	0.28	40	3.0	1.5		0.688	0.1	0.25	102.06%	255	246
0	0	20.00				0.000	374.175	0.00			0.0		0.000	0.0	0.00	0.00%		
0	0	20.00				0.000	374.175	0.00			0.0		0.000	0.0	0.00	0.00%		
0	0	20.00				0.000	374.175	0.00			0.0		0.000	0.0	0.00	0.00%		
0	0	20.00				0.000	374.175	0.00			0.0		0.000	0.0	0.00	0.00%		
1	0	22.50	0.38	136	74	0.277	374.892	0.31	40	3.5	1.8		0.718	0.1	0.25	102.07%	247	[illegible]
2	0	25.00	0.38	137	74	0.277	375.608	0.31	40	3.5	1.8		0.717	0.1	0.25	102.07%	242	246
3	0	27.50	0.40	136	74	0.284	376.343	0.33	41	3.5	1.8		0.736	0.1	0.26	102.07%	254	244
4	0	30.00	0.36	135	74	0.270	377.041	0.29	41	3.5	1.8		0.699	0.1	0.26	102.07%	247	245
5	0	32.50	0.33	135	74	0.258	377.710	0.27	41	3.5	1.8		0.669	0.1	0.26	102.06%	255	244
6	0	35.00	0.33	136	74	0.258	378.378	0.27	41	3.5	1.8		0.669	0.1	0.26	102.06%	250	243
7	0	37.00	0.33	140	74	0.257	378.910	0.27	41	3.5	1.8		0.533	0.1	0.26	102.06%	250	243
8	0	37.00	0.33	140	74	0.257	378.915	0.27	41		0.0		0.005	0.0	0.26	#DIV/0!		
0	0	37.00				0.000	378.915	0.00			0.0		0.000	0.0	0.00	0.00%		
0	0	37.00				0.000	378.915	0.00			0.0		0.000	0.0	0.00	0.00%		
0	0	37.00				0.000	378.915	0.00			0.0		0.000	0.0	0.00	0.00%		
0	0	37.00				0.000	378.915	0.00			0.0		0.000	0.0	0.00	0.00%		
Averages		37	0.366	134	74		10.483	0.30	40		1.65		10.496	2.0	0.25	102.59%		

SOURCE TEST LAB DATA SHEET

PLANT: WILLOWBROOK FEED COMPANY

PAGE: 1 OF 1

SOURCE OPERATION: CYCLONE

INITIAL: CM

SOURCE TEST NO.:

TEST DATE: 10/26/95

FILTER MEDIA: GLASS FIBER, 90 MM

FILTER DATA

RUN #	FILTER #	TARE WEIGHT(g)			FINAL WEIGHT(g)			TOTAL(g)
A	368	0.4795	0.4795	0.4795	0.4807	0.4809	0.4809	0.0013
B	369	0.4912	0.4911	0.4912	0.4918	0.4918	0.4919	0.0007
C	370	0.4896	0.4895	0.4896	0.4900	0.4901	0.4901	0.0005
DATE/TIME		9/21/95P	9/22/95A	9/22/95P	10/31/95P	11/1/95A	11/1/95P	
Room Relative Humidity, %		73	70	71	62	67	69	
Room Temperature		65	68	66	70	67	65	
Dessicator Relative Humidity, %		20-38	20-39	24-50	29-32	23-27	30-36	

PROBE & NOZZLE RINSE DATA

RUN =	JAR #	TARE WEIGHT(g)			FINAL WEIGHT(g)			TOTAL(g)
A	17	54.5168	54.5169	54.5171	54.5204	54.5202	54.5205	0.0034
B	18	58.0725	58.0727	58.0728	58.0766	58.0762	58.0764	0.0037
C	19	55.6723	55.6725	55.6725	55.6755	55.6753	55.6755	0.0030
DATE/TIME		9/28/95P	9/29/95P	10/2/95A	10/31/95P	11/1/95A	11/1/95P	
Room Relative Humidity,%		73	71	71	62	67	69	
Room Temperature		62	64	68	70	67	65	
Dessicator Relative Humidity, %		29-40	15-27	11-25	29-32	23-27	30-36	

TOTAL WEIGHTS

RUN =	FILTER FINAL WT(g)	P & N FINAL WT(g)	TOTAL(g)
A	0.0013	0.0034	0.0048
B	0.0007	0.0037	0.0044
C	0.0005	0.0030	0.0035

P+N+C

Source Test Lab Data Sheet

Impinger Data

Plant:	WILLOWBROOK FEED COMPANY		
Source operation:	CYCLONE	Page:	1of 1
Source test no.:		Initial:	CM
Impinger solution:	Distilled H2O	Test date:	10/26/95

DATA

Impinger #	A Tare weight(g)	B Filled weight(g)	C Final weight(g)
S-1	533.5	633.8	666.4
S-2	514.3	614.8	617.7
S-3	485.3	585.8	633.3
S-4	514.3	614.7	615.5
S-5	512.5	612.9	655.5
S-6	501.6	602.1	602.8

Impinger #	C - A Sample weight (g)	C - B Condensate wt.(g)	Total weight (g)
S-1	132.9	32.6	Run A
S-2	103.4	2.9	35.5
S-3	148.0	47.5	Run B
S-4	101.2	0.8	48.3
S-5	143.0	42.6	Run C
S-6	101.2	0.7	43.3

H.DOI 4/95

SOURCE TEST LAB DATA SHEET

PLANT: BLANKS

PAGE: 1 OF 1

SOURCE OPERATION: 100ML ACETONE & H2O

INITIAL: CM

SOURCE TEST NO.:

TEST DATE: 8/14/95

FILTER MEDIA:

FILTER DATA

RUN #	FILTER #	TARE WEIGHT(g)			FINAL WEIGHT(g)			TOTAL(g)
DATE/TIME								
Room Relative Humidity, %								
Room Temperature								
Dessicator Relative Humidity, %								

PROBE & NOZZLE RINSE DATA

RUN #	JAR #	TARE WEIGHT(g)			FINAL WEIGHT(g)			TOTAL(g)
A	12H2O	64.9946	64.9943	64.9943	64.9944	64.9947	64.9949	0.0003
B	23ACETONE	70.3122	70.3118	70.3118	70.3122	70.3123	70.3127	0.0005
DATE/TIME		8/14/95A	8/14/95P	8/15/95A	8/21/95A	8/21/95P	8/24/95A	
Room Relative Humidity,%		75	73	74	77	76	73	
Room Temperature		61	60	62	63	64	64	
Dessicator Relative Humidity, %		30-40	27-37	15-30	23-25	31-32	25-27	

TOTAL WEIGHTS

RUN #	FILTER FINAL WT(g)	P & N FINAL WT(g)	TOTAL(g)
A		0.0003	0.0003
B		0.0005	0.0005

JACK HILLIKER
JBH EQUIPMENT SALES
TEL 209-521-2191 FAX 209-521-5032
CPM ROSKAM CHAMPION SILVER-WEIBULL ABEL MICRO-SYSTEMS MAC EQUIPMENT WEM AUTOMATION

TO: GLENN BACH **DATE: 02/16/93** **PAGES: 4**

REF: MAC EQUIPMENT

Just to confirm our conversation of Tuesday, MAC has agreed to sell to you the four 96AVS16 Style II Filters as quoted on 12-30-92, at $2,465 each, plus the fans as specified at $648 each, all assembled, and shipped FOB Sabetha Kansas. **THANKS!**

We need more information to properly size the bin vent filters. I have enclosed the information I am working from, which may be more than you ever wanted to know about sizing filters, but on the other hand, will help you in your justification of the sizing to the Air Quality folks when they ask.

I need your best guess as to the following:

1. effective length of the spout in feet

   Here we mean how far from the last "break" i.e. the spout from the turn-head, the transition from the screw or super-flo, or the spout from the elevator discharge.

2. spout area in feet

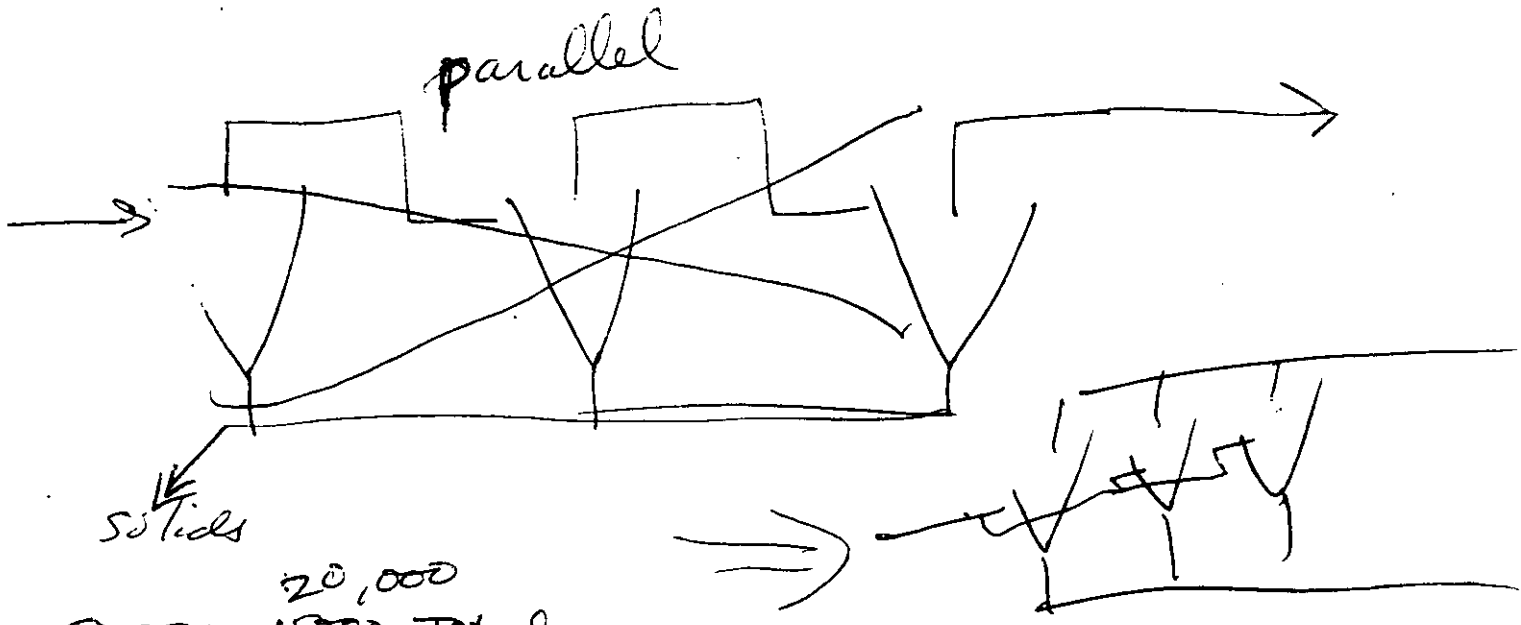
   width times width, or area of the circle

3. particle size of the product in inches - a range of the smallest (like soyabean meal), to the largest,(like corn).

As I will be traveling on Wednesday and Thursday, you are welcome to call Curt Strahn at 800-442-0622 (MAC) to get quick answers to any questions you have in generating this information. Curt is up to speed on this project, and can be of immeasurable help. He may be on the road also, but you can imagine how long it will take if you call me, I call him, he calls me back, I call you back, etc.

You also need to be thinking how you could inter-connect the bins with ducts of 6" to 8" diamter. Cross-contamination needs to be a consideration. For example, connecting the bins in series of three, meaning three filters instead of nine, cuts the cost by 50%. I can't remember how your bins are arranged so I can't make that decision for you.

MAC innovated with cartridge filters some time ago and the industry quickly followed suit. The cartridge filter is close in capital cost to the bag filter, but is **ten times more efficient!** For example, the cartridge emits .002 grains per scfm, while the bag emits .02 grains per scfm. On a 600 cfm system, the bags would emit 12 grains/minute while the cartridges emit 1.2 grains. Your next question is "what the Hell is a grain?" There are 7000 grains in a pound.



20,000

SDCFM 15000 Total

Cyclone 1 ID	8 inches	Cut pt	____	Recov rate	____
Cyc 2 ID	____	Cut pt	____	Recov rate	____
Cyc 3 ID	____	Cut pt	____	Recov rate	____

Ambient?
Feed Wt?
PSD or Data

Temp? Sat @ ~~95~~ -176
130°

90% cut @ 10 μ

Baghouse data

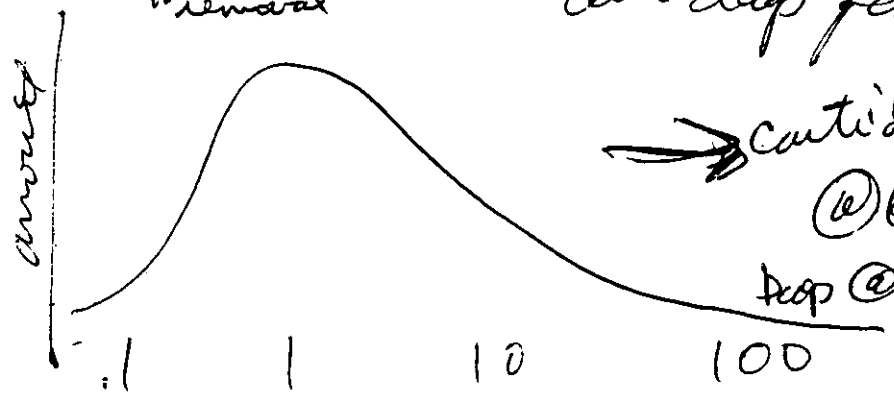
16 oz bags (cuff)

	1	2	3	4	5
Number	4x4 = 16/unit (4)				
SDCFM	52 (1)				
No. of bags					
Bag type					

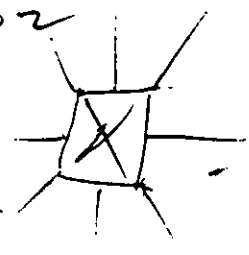
Rated eff @ size removal

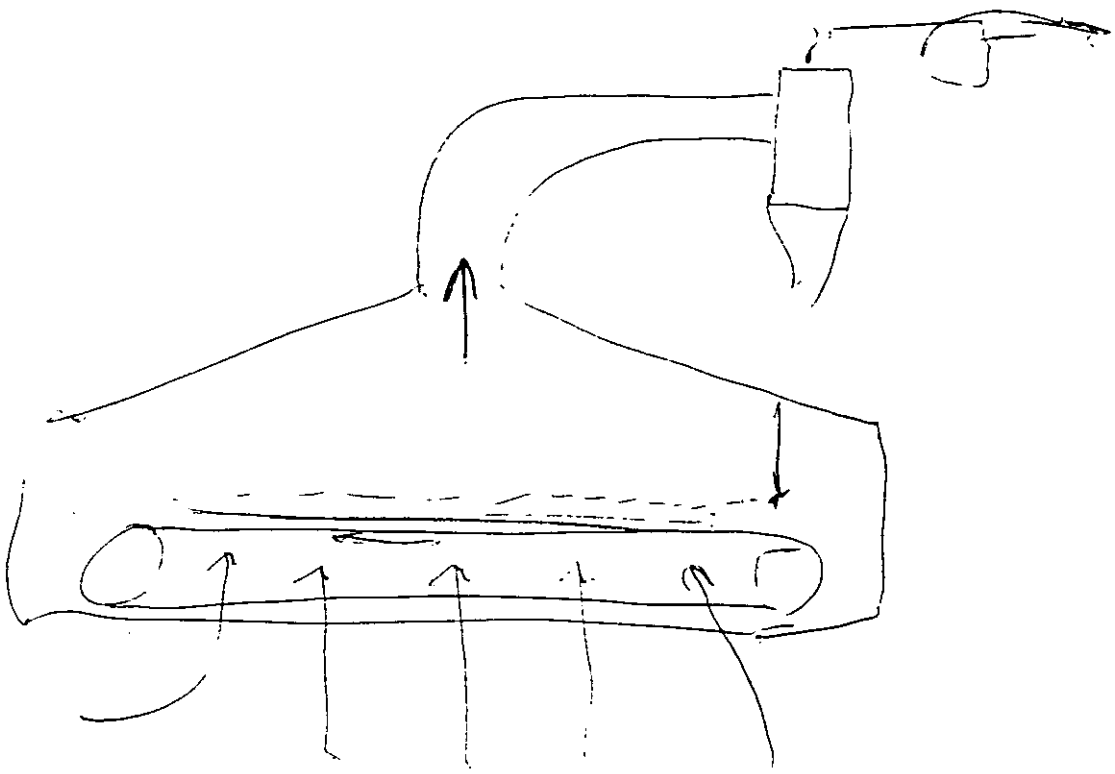
mini Variable speed

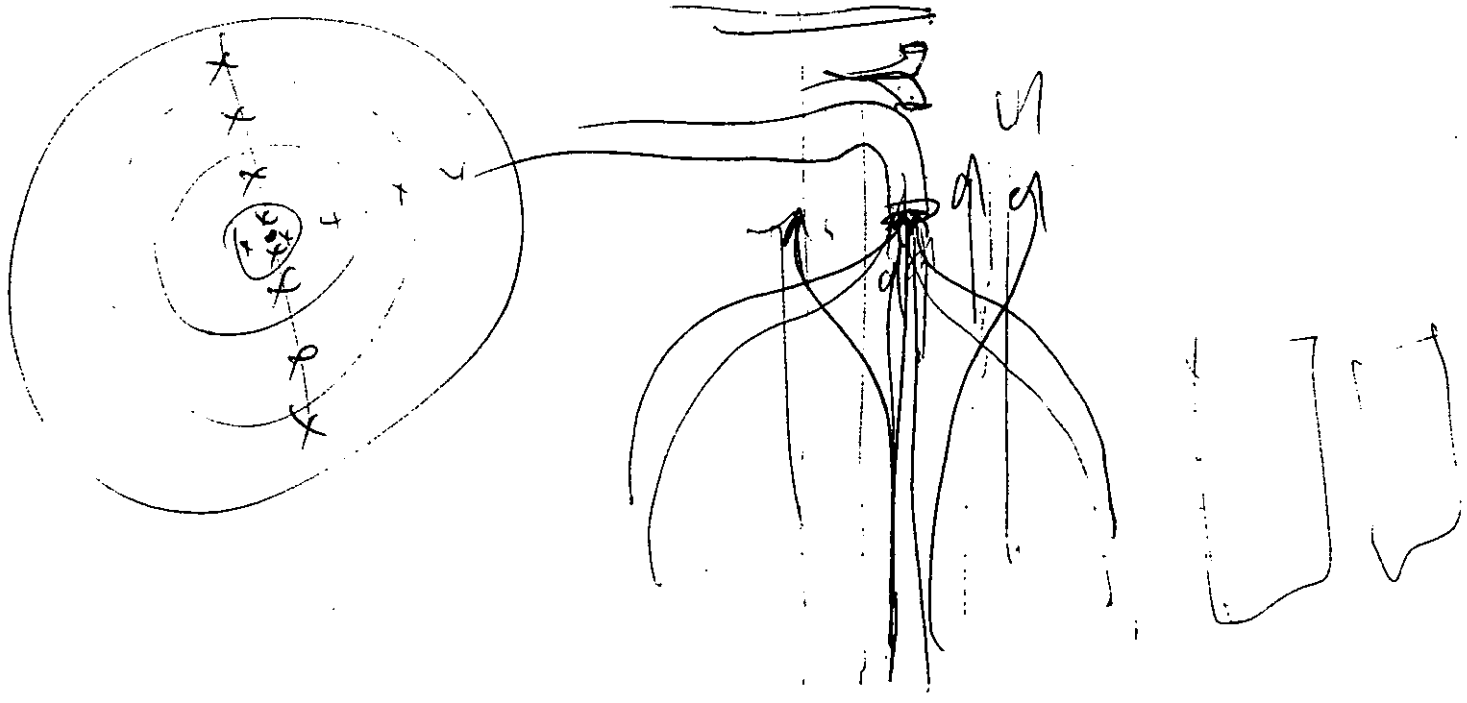
other days fan on low speed?



→ cut is 8.002 gr/SDCFM
@ 600 CFM = 1.2 gr/min







list condition COMMANDS >> c

list condition NUMBER >> 12948

COND# 12948 ----------

PERMIT CONDITIONS
S-1 through S-18:

1. The animal feed raw material throughput shall not exceed the following limits per consecutive 12 month period.

   S-1 : 88,000 tons
   S-2 : 88,000 tons
   S-3 : 14,000 tons
   S-4 : 14,000 tons
   S-5 : 14,000 tons
   S-6 : 14,000 tons
   S-7 : 54,000 tons
   S-8 : 18,000 tons
   S-9 : 18,000 tons
   S-10: 18,000 tons
   S-11: 42,000 tons
   S-12: 42,000 tons
   S-13: 54,000 tons
   S-14: 7,000 tons
   S-15: 54,000 tons
   S-16: 36,000 tons
   S-17: 54,000 tons
   S-18: 61,000 tons

2. The grain loading of the exhaust from A-1, A-2, A-3, A-4, A-5, and A-8 shall not exceed 0.01 gr/dscf.
3. In order to demonstrate compliance with condition #1, the owner/operator of the sources, S-1 through S-18, shall keep dated records of material throughput in a District approved logbook. The records shall be kept for at least two years from the date of data entry, and shall be made available to the District staff for inspection.
4. Visible dust emissions from any source/operation at this facility shall not exceed Ringelmann 0.5 or result in fallout on adjacent property in such quantities as to cause a public nuisance per Regulation 1-301.
5. All roadways associated with the facility shall be maintained in a clean or wetted condition, as necessary, to minimize visible emissions.

list condition NUMBER >>

SOURCE TEST ACTION

BAY AREA
AIR QUALITY MANAGEMENT DISTRICT
939 Ellis Street
San Francisco, California 94109
(415) 771-6000

SOURCE TEST REQUEST

Date Rec'd: 10-2-95
Sr. Engineer Assigned: CM
Test Number: 96069
Date Tested: 10/26/95
Date Completed:

SOURCE DATA

Firm Name: Willowbrook Feeds Telephone No.: (707)-792-9585
Address: 40 N. Ely Road PCB 750818 Pet. CA 94975-0818 City: Petaluma Zip: 94975
Representative to Contact: Ms Glenn Bach Title: Plant Manager
Source Operation: S-1 thru S-12 Permit No.: P/A # 14920 Plant No.: 10292
Permit Conditions: None COMM 12948

Condition No.:

SAMPLE DATA

Points to be Tested: Exhaust of all abatement devices (5 baghouses, 3 cyclones)
(List each Source No.:)
Type of Tests: PM grain loading (gr/dscf) and emission rates (lbs/hr)

1-CYCLONE
1-BAGHOUSE
1-CYLOS
} DO 1 OF EACH REPRESENTATIVE TYPE PRIOR TO R CHECK 10/4/95

Special Instructions:

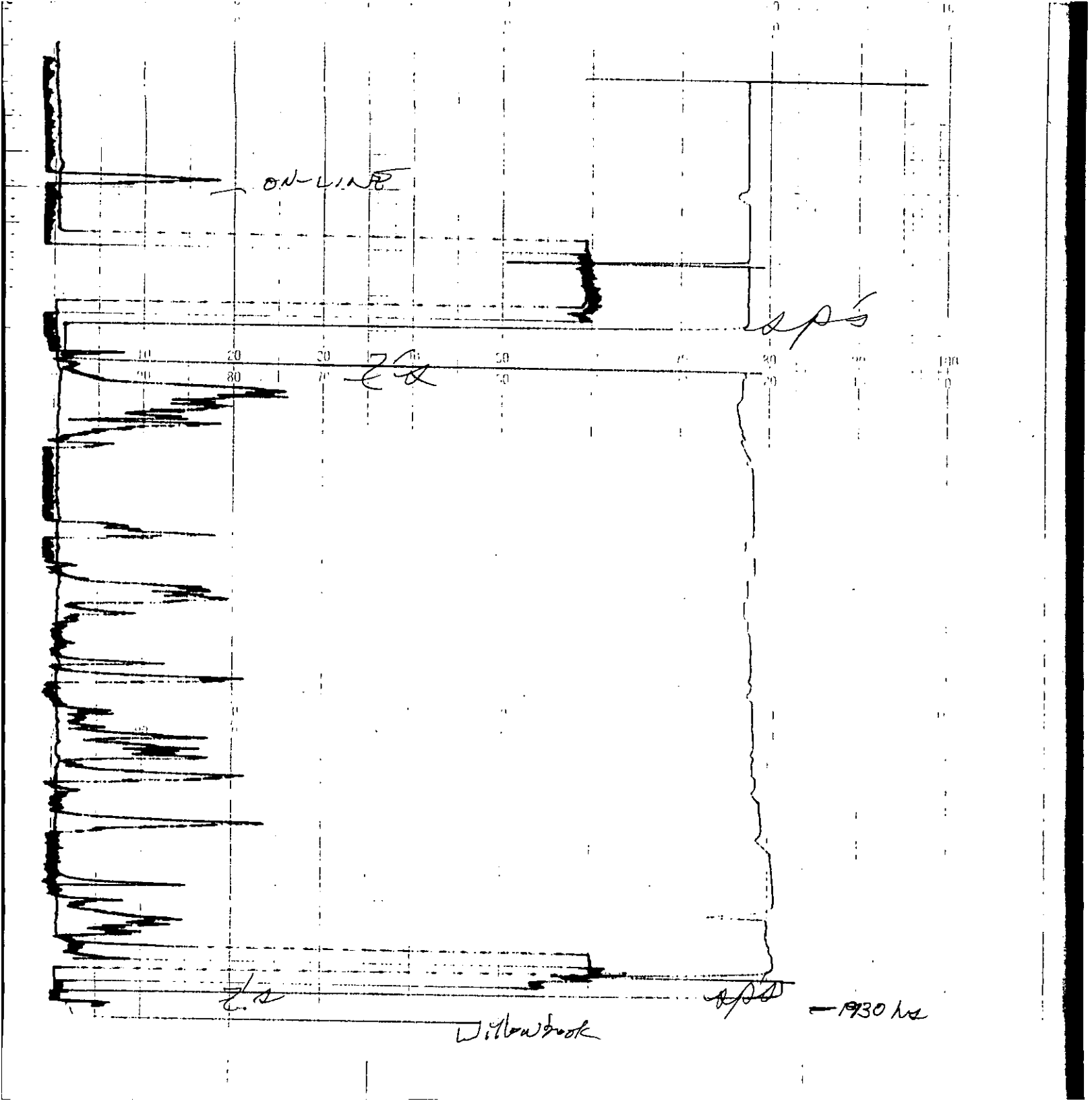
REQUEST DATA

Reason for Request: To estimate emissions and compliance with Reg 6, Rule 1 & Reg
[X] Compliance with Regulation 6 Rule Section(s)
[ ] Developmental Data [ ] Hearing Board [X] Permit
[ ] Other

Date Results Requested by: ASAP (10/6/95) Type of Request: [X] Announced [X] Unannounced
Request Initiated by: Section: NSR
Requester to be Present During Test? Yes Approved by 9/29/95 (Date)

Form: Source Test Request

FREQUEST: e|: 1 November 1994


ON-LINE
Willowbrook
1930 hrs

MRI
401 Harrison Oaks Blvd #350
Cary, NC 27513-2412

Thomas Lapp