AP42 Section: 13.2.6

Background Chapter 4

Reference: 5

Title: **Summary of Source Test Results, Hunter Schlesser Sandblasting, San Leanardo, CA, Bay Area Air Quality Management District, San Francisco, CA, March 3, 1993.**

SECTION 4
REF 5

DISTRIBUTION:

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

SUMMARY OF SOURCE TEST RESULTS

Report No. 93142
Test Date: 02/10/93
Test Times:
Run A: 0916-1006
Run B: 1023-1113
Run C: 1126-1216

SOURCE INFORMATION

Firm Name and Address
HUNTER SCHLESSER SANDBLASTING
1620 Doolittle Drive
San Leandro, CA 94577

Firm Representative and Title
Mr. Hunter Schlesser,
Owner
Phone No. (510) 614-8244

Source:
(S-2) Blasting Room
Abated by (A-1) Baghouse
Plant No. 7601
Operates 8 hr/day & 260 days/yr

Permit Conditions
Number 7605: Limits visible emissions and amount of abrasive consumed.

BAAQMD REPRESENTATIVES

Source Test Engineers
C. McClure/H. Doi

Permit Services Division / Enforcement Division
T. Bui

Test Requested by:
N. Lew

Operating Parameters:
Normal parts blasting operations were conducted during sampling. The Glass Bead blast room was utilized to surface finish two large motor shields and several handrails.

Applicable Regulations: Developmental Data

VN Recommended: NO

Source Test Results and Comments:

METHOD:	TEST	RUN A	RUN B	RUN C	AVERAGE	LIMIT
ST-17	Stack Volume Flowrate, SDCFM				1,800	
	Stack Gas Temperature, ^{O}F	60	63	64	62	
ST-23	Water Content, Volume %	1.4	1.2	1.1	1.2	
C.A.R.B. 5	Particulate, gr/SDCF	.001	.001	.001	.001	
	Particulate, lb/hr	.01	.01	.02	.01	
	Isokinetic Ratio, Act./Theo.	1.01	.99	.99		

Air Quality Engineer II	Date	Supervising Air Quality Engineer	Date	Approved by Source Test Manager	Date
C. McClure II	2/24/93	K. Kunaniec	2/24/93	G. Karels	3/1/93
C. McClure		K. Kunaniec			

GRAIN LOADING:

$$G_{(gr/SDCF)} = 15.43 \frac{W_p(g)}{V_o(SDCF)}$$

PLANT: #7601 S-1, 2
SOURCE: H/S SANDBLASTING
DATE: 2/10/93

$G_A = 15.43 \frac{(.0018)}{(32.438)} = 0.00086 = 0.001 \text{ gr/SDCF}$ $W_{PA} = .0018$ g

$G_B = 15.43 \frac{(.0016)}{(31.445)} = 0.00078 = 0.001 \text{ gr/SDCF}$ $W_{PB} = .0016$ g

$G_C = 15.43 \frac{(.0018)}{(26.804)} = 0.0010 = 0.001 \text{ gr/SDCF}$ $W_{PC} = .0018$ g

$V_{OA} = 32.438$ SDCF

$V_{OB} = 31.445$ SDCF

$G_{AVG} = 0.001$ gr/SDCF $V_{OC} = 26.804$ SDCF

MASS EMISSIONS: $M = \frac{G \cdot Q}{116.67}$ $Q_o = 1820$ SDCFM

$M_A = \frac{(0.00086 \times 1820)}{116.67} = 0.01$ LB/HR

$M_B = \frac{(0.00078)(1820)}{116.67} = 0.01$ LB/HR

$M_C = \frac{(0.0010)(1820)}{116.67} = 0.02$ LB/HR

$M_{AVG} = 0.01$ LB/HR

SOURCE TEST LAB DATA SHEET

PLANT: HUNTER'S SANDBLASTING

PAGE: 1 OF 1

SOURCE OPERATION: BAGHOUSE

INITIAL: CM

SOURCE TEST NO.:

TEST DATE: 2/10/93

FILTER MEDIA: GLASS FIBER, 90 MM

FILTER DATA

RUN #	FILTER #	TARE WEIGHT(g)		FINAL WEIGHT(g)		TOTAL(g)
A	3010	.3953	.3953	.3952	.3952	0.0000
B	3011	.3935	.3936	.3932	.3932	0.0000
C	3012	.3957	.3955	.3950	.3950	0.0000
DATE/TIME		12/22/92P	12/23/92A	2/16/93AM	2/17/93AM	

PROBE & NOZZLE RINSE DATA

RUN #	JAR #	TARE WEIGHT(g)		FINAL WEIGHT(g)		TOTAL(g)
A	18	58.0711	58.0710	58.0729	58.0730	.0018
B	19	55.6713	55.6712	55.6729	55.6729	.0016
C	20	54.5710	54.5709	54.5728	54.5729	.0018
DATE/TIME		1/29/93PM	2/1/93AM	2/16/93AM	2/17/93AM	

TOTAL WEIGHTS (FILTER AND PROBE & NOZZLE)

RUN #	FILTER FINAL WT(g)	P & N FINAL WT(g)	TOTAL(g)
A	0.0000	.0018	.0018
B	0.0000	.0016	.0016
C	0.0000	.0018	.0018

ISOKINETIC RATIOS

E.P.A. EQUASION 5-8

$$R_I = \frac{(T_s\ ^\circ R)(V_{o\ SDCF})(K_I)}{(V_s\ FPS)(100-\%H_2O)(A_n\ ft^2)(t\ MINUTES)(P_s\ "Hg)}$$

$K_I = 9.414 \times 10^{-2}$ AT STANDARD CONDITIONS OF 29.92"Hg & 70°F

$$P_s = P_{BAR} + \left(\frac{P_{STATIC}\ "H_2O}{13.6\ "H_2O/"Hg}\right) = 30.30 + \left(\frac{-4.0}{13.6}\right)$$

#7601
PLANT: A.S. STABBLASTING
SOURCE: S-2, 1
DATE: 12/10/93

$P_s = 30.006$ "Hg t = TIME = 50 MINUTES

$A_n = 8.454 \times 10^{-6} (D_n\ mm)^2\ FT^2$ $D_n = 3.3$ mm

$A_n = 8.454 \times 10^{-6} (3.3\ mm)^2\ FT^2$

$A_n = 9.206 \times 10^{-5}\ FT^2$

GROUP TERMS:

$$R_I = \frac{(T_s)(V_o)(9.414 \times 10^{-2})}{(V_s)(100-\%H_2O)(9.206 \times 10^{-5})(50)(30.006)} = \frac{(T_s)(V_o)(0.6816)}{V_s(100-\%H_2O)}$$

RUN A) $T_s = 520^\circ R$ $V_o = 32.438$ SDCF $V_s = 114.85$ FPS $\%H_2O = 1.4$ $(100-\%H_2O) = 98.6$

$$R_{I_A} = \frac{(520)(32.438)(0.6816)}{(114.85)(98.6)} = \underline{1.01}$$

RUN B) $T_s = 523^\circ R$ $V_o = 31.445$ SDCF $V_s = 114.48$ FPS $\%H_2O = 1.2$ $(100-\%H_2O) = 98.8$

$$R_{I_B} = \frac{(523)(31.445)(0.6816)}{(114.48)(98.8)} = 0.991 = \underline{0.99}$$

RUN C) $T_s = 524^\circ R$ $V_o = 26.804$ SDCF $V_s = 97.39$ FPS $\%H_2O = 1.1$ $(100-\%H_2O) = 98.9$

$$R_{I_C} = \frac{(524)(26.804)(0.6816)}{(97.39)(98.9)} = \underline{0.99}$$

RUN # 1
VO= ~~33.0126~~
% H20= 1.37918 > A
1.4%

RUN # 2
VO= ~~31.0331~~
% H20= 1.20329 > B
1.2%

RUN # 3
VO= ~~26.4521~~
% H20= 1.10341 > C
1.1%

>

$\%\ H_2O_{AVG} = 1.2\%$

#7601
2/10/93
S-2,1

```
>run htwoo
HTWOO
HOW MANY RUNS?  3


RUN #            1
WHAT IS THE WEIGHT ,GM OF CONDENSATE?  1.7

ENTER INITIAL,FINAL METER READING !  0,31.318

ENTER METER TEMPS FOR AVERAGING
?58.5
?-10

ENTER METER VACUUMS FOR AVERAGING
?14.1
?-10

ENTER SATURATED GAS TEMPS FOR AVERAGING
?32
?-10


RUN #            2
WHAT IS THE WEIGHT ,GM OF CONDENSATE?  1.4

ENTER INITIAL,FINAL METER READING !  0,30.793

ENTER METER TEMPS FOR AVERAGING
?65.9
?-10

ENTER METER VACUUMS FOR AVERAGING
?11.2
?-10

ENTER SATURATED GAS TEMPS FOR AVERAGING
?32.9
?-10


RUN #            3
WHAT IS THE WEIGHT ,GM OF CONDENSATE?  1.7

ENTER INITIAL,FINAL METER READING !  0,26.532

ENTER METER TEMPS FOR AVERAGING
?71.6
?-10

ENTER METER VACUUMS FOR AVERAGING
?7.7
?-10

ENTER SATURATED GAS TEMPS FOR AVERAGING
?32
?-10
```

SOURCE TEST LAB DATA SHEET

IMPINGER DATA

PLANT: HUNTER'S SANDBLASTING PAGE: 1 OF 1

SOURCE OPERATION: BAGHOUSE INITIAL: CM

SOURCE TEST NO.: TEST DATE: 2/10/93

IMPINGER SOLUTION: DI H2O

DATA

IMPINGER#	A TARE WEIGHT(g)	B FILLED WEIGHT(g)	C FINAL WEIGHT(g)
P-1	510.8	611.0	612.4
P-2	496.8	597.1	597.4
P-3	508.7	609.0	610.4
P-4	538.3	638.4	638.4
P-5	471.2	571.7	573.1
P-6	515.7	616.0	616.3

IMPINGER#	C-A SAMPLE WEIGHT(g)	C-B CONDENSATE WT(g)	TOTAL WEIGHT(g)
P-1	101.6	1.4	RUN A
P-2	100.6	.3	1.7
P-3	101.7	1.4	RUN B
P-4	100.1	.0	1.4
P-5	101.9	1.4	RUN C
P-6	100.6	.3	1.7

STAND CLOSES HEADS
5-1 5-2

NORMAL ~~START~~ BLASTING OPERATIONS WERE CONDUCTED DURING SAMPLING

BAY AREA AIR QUALITY MANAGEMENT DISTRICT
939 Ellis Street, San Francisco, Calif. 94109 · 771-6000

Source Test Data Sheet

Source Operation 5-2 AREA BLASTING
Plant #760 Hamilton Stockpiles
Sample Type PARTICULATE
Process Cycle D/H 6 Deck
Duct Size RECT 5 5/8 X 5 5/8 — 5.625 X 5.125
Duct Pressure −4.0"
ASSUMED H_2O 1.5%

Run No. T&A
Date: 2/10/93

DIGI-TEMP # 437663
MAG GAGE RACK # VI2-III

BOX $\Delta H@$ = 1.8487
METER (Y) = 1.0096

G.P.-12
3.3 mm Nozzle Diameter
.84 Pitot Tube
N/A Gas Collector No.
30.30 Barometric Pressure
0.005 cfm Leak Rate
5 TIME EACH POINT
1 # OF POINTS
5 TIME EACH RUN

Sampling Train: PROBE ⇒ FILTER # 3010 ⇒ IMP # P-1 IMP # P-2 ⇒ PUMP/BOX # 80631

Traverse Point	Dist. From inches	INITIAL TRAVERSE Duct Temp °F	INITIAL TRAVERSE ΔP H_2O	Traverse Point	SAMPLING ΔP H_2O	V_s PPS	Time (0916 / 0)	METER Rate ΔH ORFICE	METER Temp °F	METER Volume Ft^3 330.71	Vac "Hg	Sat'd Gas Temp °F	T_s Duct Temp °F	REMARKS
A-1 7.2				A-1	4.3	115.5	5	1.32	55	33.85 / 333.80	13	32	58	
2 6.8				A-1	4.3	115.5	10	1.33	56	36.94 / 336.85	14	32	58	
3 (9.0)				A-1	4.3	115.5	15	1.33	56	39.99 / 339.98	14.5	32	58	
4 8.4				A-1	4.3	115.8	20	1.33	57	43.12 / 343.12	14.5	32	57	
B-1 4.7				A-1	4.3	115.8	25	1.33	58	46.25 / 346.23	14.5	32	60	
2 7.4				A-1	4.3	116.0	30	1.32	59	49.36 / 349.35	14.5	32	62	
3 (8.0)				A-1	4.3	116.0	35	1.32	60	52.48 / 352.46	14.5	32	62	
4 7.0				A-1	4.3	116.0	40	1.32	61	55.59 / 355.60	14.5	32	62	
				A-1	4.1	113.2	45	1.26	61	58.65 / 358.66	13.5	32	62	
T_s = 56 °F				A-1	4.1	113.2	(1000) 50	1.26	62	61.71 / 361.73	13.5	32	62	
$\Delta P_{FOR\ POINT}$ = 8.0 H_2O									58.5	31.02	(14.1)	32	(60.1)	
T_s = 516 °R									518.2	×1.0096			520	
										31.318				

B-STATION

$$V_o = \frac{530 \cdot V_m \cdot P_{BAR}}{29.92 \cdot T_m} \text{ SDCF}$$

$$V_o = \frac{17.714 (31.318)(30.30)}{(518.2)}$$

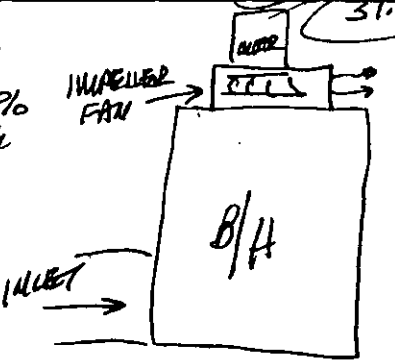
V_o = 32.438 SDCF

WATER CATCH = _____ ml

FIELD % H_2O = _____ %

	A	B
1	X	X
2	X	X
3	X	X
4	X	X

SAMPLE POINT



Source Test Team
CHUCK McCLURE
Source Test Engineer II
HIROSHI DOI
Air Quality Instrument Specialist II

AMBIENT AIR

Source Operation S-2 ✓
Plant #7601
Sample Type PARTICULATE
Process Cycle B/H EXHAUST
Duct Size RECT 52"X54"
Duct Pressure -4.0"
ASSUMED H_2O 1.5%

BAY AREA AIR QUALITY MANAGEMENT DISTRICT
939 Ellis Street, San Francisco, Calif. 94109 • 771-6000

Source Test Data Sheet

Run No. B
Date: 2/10/93

DIGI-TEMP# 4376163
MAG GAGE RACK# V12-111

BOX ΔH@ = 1.8487
METER(Y) = 1.0096

CP-12 → 3.3 Nozzle Diameter
.84 Pitot Tube
N/A Gas Collector No.
30.30 Barometric Pressure
0.016 at 18 Leak Rate
5 TIME EACH POINT
4 # OF POINTS
50 TIME EACH RUN

Sampling Train: PROBE ⇒ FILTER # 3011 ⇒ IMP# P-1 IMP# P-2 ⇒ PUMP/BOX# 80631

Traverse Point	Dist. From inches	INITIAL TRAVERSE Duct Temp °F	INITIAL TRAVERSE ΔP H_2O	Traverse Point	SAMPLING ΔP H_2O	V_s FPS	Time (1023 − 0)	METER Rate ΔH ORIFICE	METER Temp °F	METER Volume Ft³	Vac "Hg	Sat'd Gas Temp °F	T_s Duct Temp °F	REMARKS
										36.192				
				B-1	4.3	1160	5	1.32	63	365.05 / 365.05	12	32	62	
				1	4.3	1160	10	1.32	63	368.18 / 368.28	12	33	62	
				1	4.3	1160	15	1.32	64	371.41 / 371.32	11	33	62	
				1	4.2	114.7	20	1.29	65	374.41 / 374.44	11	33	63	
				1	4.2	114.7	25	1.29	65	377.53 / 377.40	11	33	63	
				1	4.2	114.7	30	1.29	66	380.49 / 380.40	11	33	63	
				1	4.2	114.7	35	1.29	67	383.49 / 383.40	11	33	63	
				1	4.2	114.7	40	1.29	68	386.49 / 386.41	11	33	63	
				1	4.1	113.5	45	1.26	69	389.46 / 389.42	11	33	64	
				1	4.1	113.5	(1113) 50	1.26	69	392.47 / 392.42	11	33	64	
									(65.9)	30.50	(11.2)	(32.9)	62.9	
									(525.6)	X 1.0096			(523)	
										30.793 ✓				

B-STATION

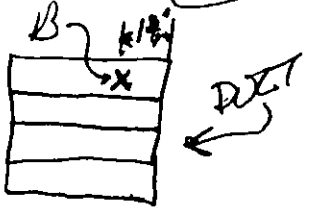
$$V_o = \frac{530 \cdot V_m \cdot P_{BAR}}{29.92 \cdot T_m} \text{ SDCF}$$

$$V_o = \frac{17.714(30.793)(30.30)}{(525.6)}$$

V_o = 31.445 SDCF

WATER CATCH = _____ ML

FIELD % H_2O = _____ %



Source Test Team
CHUCK McCLURE
Source Test Engineer II

HIROSHI DOI
Air Quality Instrument Specialist II

GLASS BEAD BLASTING
SANDBLASTING (GLASS BEADS)

BAY AREA AIR QUALITY MANAGEMENT DISTRICT
939 Ellis Street, San Francisco, Calif. 94109 • 771-6000

Source Test Data Sheet

Run No. C
Date: 2/10/93

Source Operation S-2
Plant #7601
Sample Type PARTICULATE
Process Cycle B/H EXHAUST
Duct Size R- 5 3/8 X 5 1/8
Duct Pressure -4.0" H2O
ASSUMED H_2O 1.5" H2O

DIGI-TEMP# 437663
MAG GAGE RACK# V12-111

BOX ΔH@ = 1.8487
METER(Y) = 1.0096

GP-12
3.3mm Nozzle Diameter
.84 Pitot Tube
N/A Gas Collector No.
30.30 Barometric Pressure
0.00248 Leak Rate
5 TIME EACH POINT
1 # OF POINTS
50 TIME EACH RUN

Sampling Train: PROBE ⇒ FILTER # 3012 ⇒ IMP# P-5 IMP# A-6 ⇒ PUMP/BOX# 80631

Traverse Point	Dist. From inches	INITIAL TRAVERSE Duct Temp °F	INITIAL TRAVERSE ΔP H_2O	Traverse Point	ΔP H_2O	V_s FPS	Time (1126)	METER Rate ΔH ORIFICE	METER Temp °F	METER Volume Ft^3	Vac "Hg	Sat'd Gas Temp °F	T_s Duct Temp °F	REMARKS
							0			392.57				
				C-1	3.0	97.6	5	.92	70	45.18 395.19	7.5	32	64	
				1	3.0	97.1	10	.92	70	47.80 397.79	7.5	32	64	
				1	3.0	97.1	15	.92	70	00.40 399.89	7.5	32	64	
				1	3.0	97.1	20	.92	71	02.60 403.00	7.5	32	64	
				1	3.0	97.1	25	.92	71	5.61 405.62	7.5	32	64	
				1	3.0	97.1	30	.92	72	8.23 408.16	7.5	32	64	
				1	3.1	98.7	35	.95	72	10.81 410.80	8.0	32	64	
				1	3.1	98.7	40	.95	73	13.45 413.60	8.0	32	64	
				1	3.1	98.7	45	.95	73	16.30 416.15	8.0	32	64	
				1	3.1	98.7	(1216) 50	.95	73	18.88 418.85	8.0	32	64	
									(71.6)	26.28 X1.0096	(7.7)	(32)	(64)	
									531.3	26.532 CF			524	

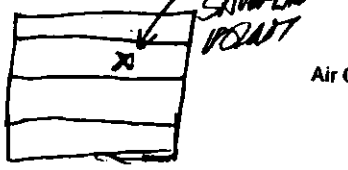
$$V_o = \frac{530 \cdot V_m \cdot P_{BAR}}{29.92 \cdot T_m} \text{ SDCF}$$

$$V_o = \frac{17.714(26.532)(30.30)}{(531.3)}$$

V_o = 26.804 SDCF

WATER CATCH = _____ ML

FIELD % H_2O = _____ %



Source Test Team
CHUCK McCLURE
Source Test Engineer II

HIROSHI DOI
Air Quality Instrument Specialist II

2- MOTOR FANS W/FILTERS
2- MOTORCYCLE FOOTLOCKERS
SECTIONAL MISC. HANDRAILS

ISOKINETIC RATE SHEET

C. McCLURE
1/93 VERSION

$MW_{DRY} = .44(\ \%CO_2\ ) + .32(\ \%O_2\ ) + .28(\ \%N_2 + \%CO\ ) =$ _____ DRY

$MW_{WET} = (\ MW_{DRY}\ )\left(1 - \frac{(\ \%H_2O\ )}{100}\right) + 18(\ \%H_2O\ ) =$ _____ WET

$AVS = \frac{85.49(\ T_{RAVERSE}\ C_{P\ RUN}\ /\ )}{\left[(\ P_s\ )(\ MW_{WET}\ )\right]^{1/2}} =$ _____ / _____ AVF TRAVERSE / AVF RUN

$V_S = [\ AVF\ ]\left(\sqrt{\ \Delta P\ \times\ T_{S\,°R}\ }\right) =$ _____ FT/SEC

$D_{n_{mm}\ ESTIMATED} = 314\left[\frac{(\ P_m\ \times\ T_{S\,°R}\ )}{(\ V_S\ \times\ (100 - \%H_2O)_{H2F}\ \times\ P_S\ \times\ T_{m\,°R}\ )}\right]^{1/2} =$ _____ mm ESTIMATED

NOTE: NOW RE-ENTER CP_{RUN} & $D_{n_{mm\ ACTUAL}}$, EVALUATE FOR AVF RUN

$QMF = 5.072X10^{-6}\left(\frac{(\ D_{mm}\ 2\ )(\ P_s\ )(\ 100 - \%H_2O\ )(\ T_{m\,°R}\ )}{(\ P_m\ )}\right)$

$QMF =$ _____ REMEMBER TO ÷ BY (γ)

$XF = \left[2.034X10^{-7}(\ D_{mm}\ )^4\ \Delta H@(\ CP\ )^2(\ 100 - \%H_2O\ )^2\right]\left[\frac{(\ MW_{DRY}\ )(\ P_s\ \times\ T_m\ )}{(\ MW_{WET}\ )(\ P_m\ )}\right] =$ _____

$\%H_2O\ (H2O)$ _____ %

$(100 - \%H_2O)\ (H2F)$ _____

$\%O_2\ (O2)$ _____ %

$\%CO_2\ (CO2)$ _____ %

$\Delta H@\ (HAT)$ _____

Y_{METER} _____

$C_{P\,TRAVERSE}$ _____

$C_{P\,RUN}\ (CP)$ _____

$\Delta P_{AVG}\ (DP)$ _____ "H_2O

$D_{n_{mm\ ACTUAL}}\ (DN)$ _____ MM

$P_{BAROMETRIC}$ _____ "Hg

P_{STATIC} _____ "Hg

$P_{STACK} = P_B \pm \frac{(\ P_{STACK}\ )}{13.6} =$ _____ "Hg

$P_{METER} = P_B + \frac{(\ P_{\Delta H@}\ )}{13.6} =$ _____ "Hg

$T_{STACK\ AVG} =$ _____ °F/(TSR) _____ °R

$T_{METER\ AVG} =$ _____ °F/(TMR) _____ °R

$\frac{QMF}{\gamma} = \frac{(\ \ )}{(\ \ )} =$ _____ STO(0)

AVF = _____ STO(3)

XF = _____ STO(4)

ISOKINETIC RATE SHEET

C. McCLURE
1/93 VERSION

$MW_{DRY} = .44(\ \%CO_2\ ) + .32(\ \%O_2\ ) + .28(\ \%N_2+\%CO\ ) =$ _____ DRY

$MW_{WET} = (\ MW_{DRY}\ )(1 - \frac{(\ \%H_2O\ )}{100}) + 18(\ \%H_2O\ ) =$ _____ WET

$AVS = \frac{85.49(\ \text{TRAVERSE } C_{P\ RUN}\ /\ )}{[(\ P_s\ )(\ MW_{WET}\ )]^{1/2}} =$ _____ AVF TRAVERSE / _____ AVF RUN

$V_s = [\ AVF\ ](\ \Delta P\ X\ T_{s°R}\ )^{1/2} =$ _____ FT/SEC

$D_{n_{min}} = 314\left[\frac{(\ P_m\ X\ T_{s°R}\ )}{(\ V_s\ X\ (100-\%H_2O)_{H2F}\ X\ P_s\ X\ T_{m°R}\ )}\right]^{1/2} =$ _____ min ESTIMATED

NOTE: NOW RE-ENTER CP_{RUN} & $D_{n_{min}}$ ACTUAL, EVALUATE FOR AVF RUN

$QMF = 5.0T2X10^{-6}\frac{(\ D_{nmm}\ 2\ )(\ P_s\ )(\ 100-\%H_2O\ )(\ T_{m°R}\ )}{(\ P_m\ )}$

$QMF =$ _____ REMEMBER TO ÷ BY (Y)

$XF = \left[2.034X10^{-7}(\ D_{mm}\ )^4\ \Delta H@(\ CP\ )^2(\ (100-\%H_2O)_{H2F}\ )^2\right] \left[\frac{(\ MW_{DRY}\ )(\ P_s\ X\ T_m\ )}{(\ MW_{WET}\ )(\ P_m\ )}\right] =$ _____

%H_2O (H_2O) _____ %

$(100-\%H_2O)$ (H_2F) _____

%O_2 (O_2) _____ %

%CO_2 (CO_2) _____ %

$\Delta H@$ (HAT) _____

Y_{METER} _____

$C_{P\ TRAVERSE}$ _____

$C_{P\ RUN}$ (CP) _____

ΔP_{AVG} (DP) _____ "H_2O

$D_{n_{mm}}$ ACTUAL (DN) _____ MM

$P_{BAROMETRIC}$ _____ "Hg

P_{STATIC} _____ "Hg

$P_{STACK} = P_B \pm \frac{(\ P_{mm}\ )}{13.6} =$ _____ "Hg

$P_{METER} = P_B + \frac{(\ P\Delta H_@\ )}{13.6} =$ _____ "Hg

$T_{STACK\ AVG} =$ _____ °F/(TSR) _____ °R

$T_{METER\ AVG} =$ _____ °F/(TMR) _____ °R

$\frac{QMF}{Y} = \frac{(\ \ )}{(\ \ )} =$ _____ STO(0)

AVF = _____ STO(3)

XF = _____ STO(4)

ISOKINETIC RATE SHEET

C. McCLURE
1/93 VERSION

$MW_{DRY} = .44(\%CO_2) + .32(\%O_2) + .28(\%N_2 + \%CO) = 28.844$ DRY

$MW_{WET} = (MW_{DRY})(1 - \frac{\%H_2O}{100}) + 18(\%H_2O) = 28.682$ WET

$AVS = \frac{85.49(C_{P\ RUN})}{[(P_s)(MW_{WET})]^{1/2}} = 2.4479$ / 2.448 (AVF TRAVERSE / AVF RUN)

$V_S = [AVF](\Delta P \times T_{s\,°R})^{1/2} = 157.6$ FT/SEC

$D_{n\,mm\ ESTIMATED} = 314\left[\frac{(P_m)(T_{s\,°R})}{(V_s)(100 - \%H_2O)(H2F)(P_s)(T_{m\,°R})}\right]^{1/2} = 2.5$ MM ESTIMATED

NOTE: NOW RE-ENTER $C_{P\,RUN}$ ✓ & $D_{n\,mm\ ACTUAL}$ ✓, EVALUATE FOR AVF RUN

$QMF = 5.0724 \times 10^{-6}\left[\frac{(D_{n\,mm}^2)(P_s)(100 - \%H_2O)(T_{m\,°R})}{(P_m)}\right]$

$QMF = 2.8428$ REMEMBER TO ÷ BY (γ) ✓

$XF = \left[2.034 \times 10^{-7}(D_{n\,mm})^4 \Delta H@ (C_P)^2 (100 - \%H_2O)^2\right]\left[\frac{(MW_{DRY})(P_s)(T_m)}{(MW_{WET})(P_m)}\right] = 160.42$

$\%H_2O$ (H2O) 1.5 %

$(100 - \%H_2O)$ (H2F) 98.5

$\%O_2$ (O2) 20.95 %

$\%CO_2$ (CO2) 0.04 %

$\Delta H@$ (HAT) 1.8487

γ_{METER} 1.0096

$C_{P\,TRAVERSE}$ .84

$C_{P\,RUN}$ (CP) .84

ΔP_{AVG} (DP) 8.0 "H_2O

$D_{n\,mm\ ACTUAL}$ (DN) 3.3 MM

$P_{BAROMETRIC}$ 30.30 "Hg

P_{STATIC} −4.0 "Hg

$P_{STACK} = P_B + \frac{P_{STATIC}(-4.0)}{13.6} = 30.006$ "Hg

$P_{METER} = P_B + \frac{P_{\Delta H@}(1.8487)}{13.6} = 30.436$ "Hg

$T_{STACK\ AVG} = 58$ °F (TSR) 518 °R

$T_{METER\ AVG} = 70$ °F (TMR) 530 °R

$\frac{QMF}{\gamma} = \frac{(2.8428)}{(1.0096)} = 2.8158$ STO(0)

AVF = 2.448 STO(3)

XF = 160.42 STO(4)