Attachment B9a,b,c,d,e-1 Emissions Tests After 2013

COMPLIANCE TEST PROTOCOL

Version 1.0

As Defined By The
Code of Federal Regulations; Title 40 Parts 60, 63 & State Permit

RMCEINC Project #2015-12593

CENTURY PALTING COMPANY
CHICAGO, ILLINOIS

PLATE SHOP DECORATIVE CHROMIUM ELECTROPLATE LINE

TWO (2) THREE-STAGE CMP SCRUBBER EXHAUST SYSTEMS

PREPARED FOR:
Century Plating Company

BY:
RMC ENVIRONMENTAL, INC. – CHICAGO REGIONAL OFFICE

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1.0 INTRODUCTION

1.1 Company Information

Name & Mailing Address:	FACILITY **Century Plating Company, Inc.** 2939 N Oakley Aveune Chicago, Illinois 60618
Contact:	Mr. Vic LaPorta
Title:	Vice President
Telephone Number:	773-477-1620
Email:	Vic@centuryplatingco.com

Permit Number:	
Source to be tested:	**Two (2) Three-Stage Composite Mesh Pad Scrubbers**

1.2 Test Information

Test Requested By:	Century Plating Company, Inc.	
Source Contact:	Mr. Vic LaPorta	
Telephone Number:	773-477-1620	
Test Objective:	Demonstrate Compliance with the Total Chromium Emission Standards set forth in the Chrome NESHAP – 40 CFR 63.	
Test Methods:	1, 2, 3, 4 and 306	
Scheduled Test Dates:	March 19, 2015	
Source Test Coordinators:	Mr. Vic LaPorta	Century Plating
On-Site RMCEINC Supervisor:	Andrew McDermand,	RMC Environmental, Inc.

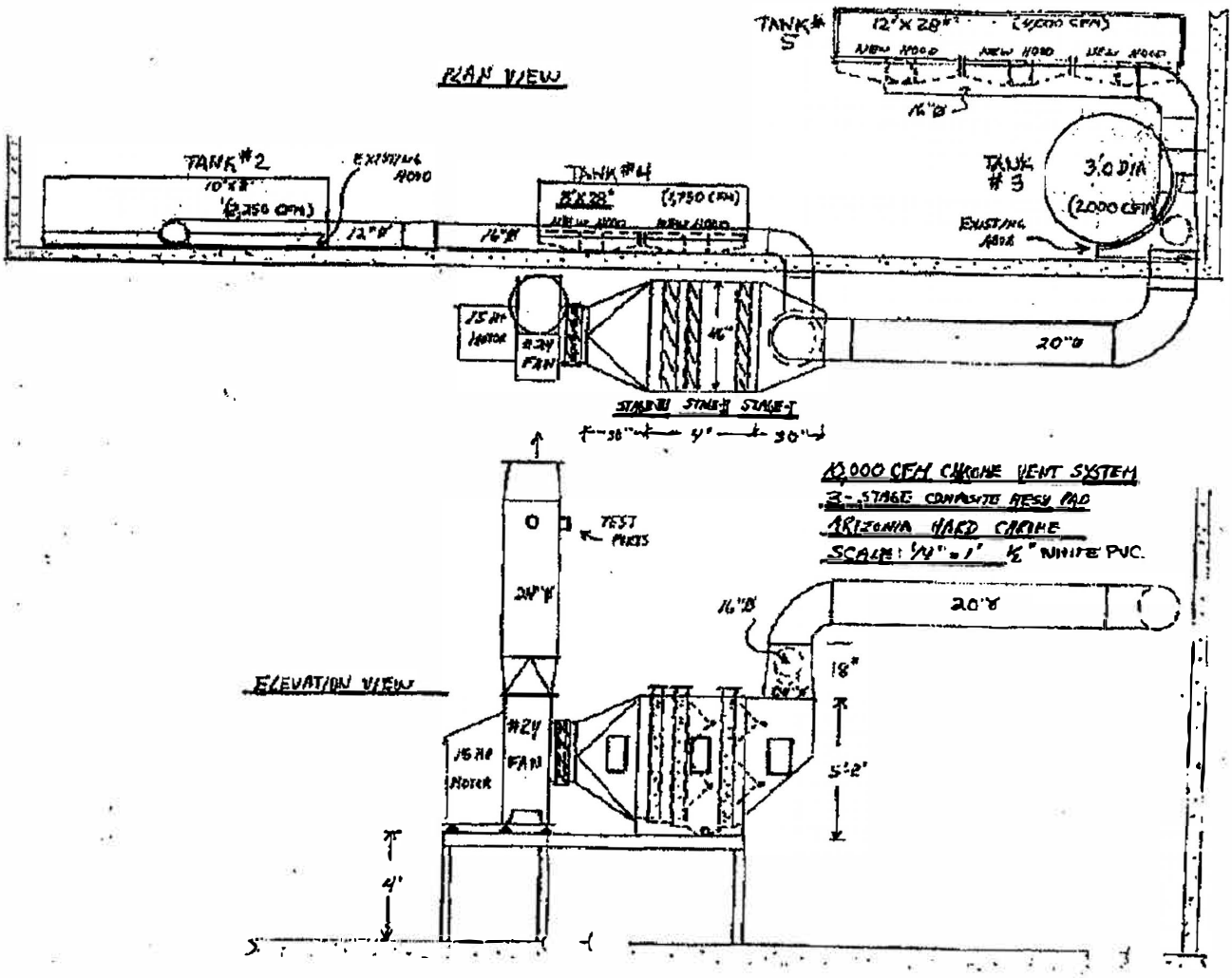
2.0 EMISSION SOURCE INFORMATION

2.1 Facility Description, Process Information, and Emission Source Description

Century Plating applies a microporous chrome plateon steel parts. The facility currently consists of two electroplating tanks. Each electroplating tank is constructed of steel and lined with a hard CPVC and a bladder of polyvinyl chloride (PVC). These tanks are filled with a conventional chromium or catalyzed chromium solution. Parts to be plated are lowered into the electroplating bath on racks. Once plating is complete, the racks are lifted out of the tanks and plated products are rinsed with water while they are suspended over the tanks. The bath temperatures are maintained at approximately 104 degrees F with a closed-loop water-cooled heat exchanger. The cooling coils circulate through a chiller.

As part of this pollution control project, each tank is equipped with suction hoods for capture of any gasses generated from the tanks. Each scrubber system is designed for three-stage mist eliminators. Each exhaust system is equipped with 9000 - 11000 CFM centrifugal fans. A process schematic diagram of the duct system and location of the exhaust stack is included as **Figure 2.1-1.**

FIGURE 2.1-1 Century Plating Co – Process Diagram



Stack Information

	Century Plating
Shape of the test plane	Round – Vertical
Source sampling system approximate height (AGL)	~ 30' above ground level
Reference Sampling Ports (Est. Offset from North = 0°)	0°, 90°

3.0 SOURCE TEST PROGRAM DESCRIPTION

3.1 Test Contractor

Name and Address:	RMC ENVIRONMENTAL, INC. (RMCEINC) 9226 North 2nd Street, Suite D Machesney Park, Illinois 61115
Contact:	Rachel Chleborowicz – Sr. Project Manager
Telephone Number:	815-378-6150 Mobile 815-425-1102 Fax RMCE@AirMonitoring.com

3.2 Test Program Organization

Test Team Participants:	Gregory Chleborowicz	RMCEINC, Project Manager
	Andrew McDermand	RMCEINC, Asst Project Manager
Site Coordinator:	Vic LaPorta	Century Plating Company
Test Dates:	March 19 & 20, 2015	
Project Number:	2015-12593	

- Senior Project Manager works directly with the site coordinator and the facility's operators during the testing to coordinate the testing. They are also responsible for operating and monitoring the instrumental test methods within the mobile test laboratory.
- Project Manager manages and supervises the wet test methods conducted at the sample location.
- Team Leader and the Environmental technicians conduct the wet test methods and provide assistance as required on the instrumental test methods.
- The Site Coordinator is the facility's representative for the test program.

The individuals listed within above account for nearly 75 years of accumulative experience in the stack testing industry. Their experience expands nearly every state in the United States. It also includes most source categories such as hazardous waste incinerators, trash incinerators, medical waste incinerators, cement kilns, paper mills, steel mills, combined cycle power plants, simple cycle power plants, coal fired power plants, natural gas compressor stations, diesel engines, ethanol plants, oil refineries, waste–to–energy facilities, aerospace facilities and plating facilities.

3.3 Test Program Objectives

Compliance testing will be conducted in accordance with the requirements of the Code of Federal Regulations; Title 40 Part 60 and 63 and the source air permit. RMCEINC will calculate the total Chromium in terms of the pollutant emission rate – lb/hr, and mg/dscm for all units. RMCEINC will conduct the testing while the source operates within its designed parameters and loadings. The facility operates 5 days a week and the test will be conducted at the Normal Maximum plating the facility. Amps, Voltages, solution temperatures, and the pressure drop across the scrubber wil be collected by Century Plating Personnel.

As this is an ongoing compliance test for the abatement equipment, the operating parameters of the abatement units (pressure drop) and the actual amperages consumed at each tank will be documented and the applicable pressure differential range will be re-established during the test. **Table 3.3-1** provides a tentative test schedule however these may be modified on-site during the test project due to potential facility issues, process problems, or other issues.

TABLE 3.3-1 Air Test Project Schedule

Day	Source Operating Condition	Air Test Methods	# of Runs	Run Duration
Day 1	**Travel, arrive on-site, and set-up test equipment**			
Day 2	**Compliance Testing CMP Exhaust Stacks**			
	Operations Load	**Compliance Testing**		
	Amp-hrs and tank loads will be tracked	EPA Method 1-4 (Flowrates)	3	2 Hours
		EPA Method 306 (Total Chromium)	3	2 Hours
	Collect Facility Data and De-Mobilize from Site			

Note: The schedule in above may be altered on-site depending on current test conditions.

4.0 SOURCE TESTING PROCEDURES

The compliance test program is to measure exhaust gas concentrations of Total Chromium and O_2/CO_2 utilizing wet methods, to demonstrate compliance with the applicable emission limits pursuant the applicable regulations and the facility's State issued permit to operate. RMCEINC uses procedures that conform to the requirements of CFR; Title 40 Part 51, 60, and 63 and EPA Test Methods 1, 2, 3, 4, and 306 (CFR; Title 40 Part 60, Appendix A). The equipment and procedures RMCEINC plans to use in meeting these requirements are described below. An example EPA Method 1 data sheet is included as **FIGURE 4.0-1** and examples of the computer generated data from our isokenetic spreadsheets are shown in **FIGURES 4.0-2 through 4.0-6.**

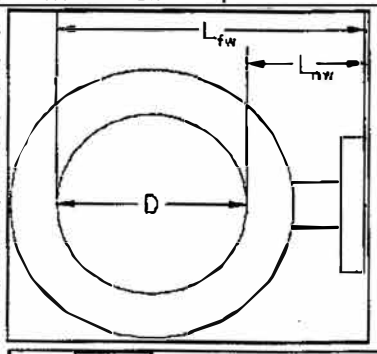
Cyclonic flow within the Stacks will be checked as defined by 40CFR60-Method 2.

FIGURE 4.0-1 EXAMPLE Chrome Scrubber - EPA Method 1 Data Sheet

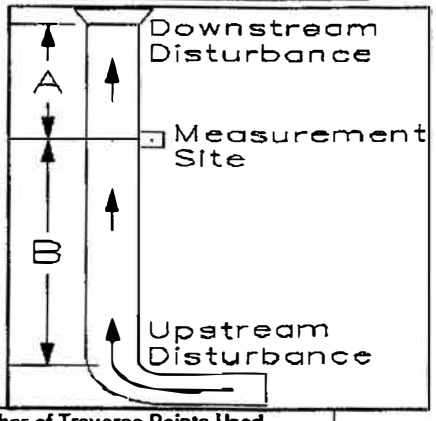
METHOD 1 - SAMPLE AND VELOCITY TRAVERSES FOR CIRCULAR SOURCES

Plant Name	Arizona Hard Chrome	Date	04/07/09
Sampling Location	Chrome Scrubber	Project #	2009-16992
Operator	RC	# of Ports Available	2
Stack Type	Circular	# of Ports Used	2
Stack Size	Small	Port Inside Diameter	3

Circular Stack or Duct Diameter			
Distance to Far Wall of Stack	(L_{fw})	28.50	in
Distance to Near Wall of Stack	(L_{nw})	4.50	in
(=Lfw - Lnw) Diameter of Stack	(D)	24.00	in
(=3.14(D/2/Cunits)2) Area of Stack	(A_s)	3.14	ft^2



Distance from Port to Disturbances			
Distance Upstream	(B)	48.00	in
(=B/D) Diameters Upstream	(B_D)	2.00	diameters
Distance Downstream	(A)	16.00	in
(=A/D) Diameters Downstream	(A_D)	0.67	diameters



Number of Traverse Points Required			
Diameters to Flow Disturbance		Minimum Number of[1] Traverse Points	
Up Stream	Down Stream	Particulate Points	Velocity Points
2.00-4.99	0.50-1.24	24	16
5.00-5.99	1.25-1.49	20	16
6.00-6.99	1.50-1.74	16	12
7.00-7.99	1.75-1.99	12	12
>= 8.00	>=2.00	8 or 12[2]	8 or 12[2]
Upstream Spec		24	16
Downstream Spec		24	16
Traverse Pts Required		24	16

[1] Check Minimum Number of Points for the Upstream and Downstream conditions, then use the largest.
[2] 8 for Circular Stacks 12 to 24 inches
12 for Circular Stacks over 24 inches

Number of Traverse Points Used			
2	Ports by	8	Across
16	Pts Used	16	Required
☑	Particulate	☐	Velocity

Location of Traverse Points in Circular Stacks						
Traverse Point Number	(Fraction of Stack Diameter from Inside Wall to Traverse Point) Number of Traverse Points on a Diameter					
	2	4	6	8	10	12
1	.146	.067	.044	.032	.026	.021
2	.854	.250	.146	.105	.082	.067
3		.750	.296	.194	.146	.118
4		.933	.704	.323	.236	.177
5			.854	.677	.342	.250
6			.956	.806	.658	.356
7				.895	.774	.644
8				.968	.854	.750
9					.918	.823
10					.974	.882
11						.933
12						.979

Traverse Point Locations			
Traverse Point Number	Fraction of Stack Diameter	Distance from Inside Wall	Distance Including Nipple Length
		in	in
1	0.032	6/8	5 2/8
2	0.105	2 4/8	7
3	0.194	4 5/8	9 1/8
4	0.323	7 6/8	12 2/8
5	0.677	16 2/8	20 6/8
6	0.806	19 3/8	23 7/8
7	0.895	21 4/8	26
8	0.968	23 2/8	27 6/8
9			
10			
11			
12			

FIGURE 4.0-2 Example Data Sheet – EPA Method 2

METHOD 2 - DETERMINATION OF STACK GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant Name	Rocky Mountain Power			Date	04/17/06
Sampling Location	Unit 1			Project #	2006-13099
Operator	GAC			# of Ports Used	4
Stack Type	Circular			Pitot Identification	
Pitot Leak Check	☐	PreTest	☐ PostTest	Pitot Coefficient (C_p)	

Stack Dimensions			
Diameter or Length of Stack	(D)	108.00	in
Width of Stack	(W)		in
Area of Stack	(A_s)	63.62	ft^2

Pressures			
Barometric Pressure	(P_b)		in Hg
Static Pressure	(P_{static})		in H_2O
Absolute Stack Pressure	(P_s)		in Hg

Stack Gas Composition			
Composition Data:	Actual ☐	Estimated ☐	
Carbon Dioxide Concentration	($\%CO_2$)		%
Oxygen Concentration	($\%O_2$)		%
Carbon Monoxide Concentration	(%CO)		%
Nitrogen Concentration	($\%N_2$)		%
Stack Moisture Content	(B_{ws})		
Stack Dry Molecular Weight	(M_d)		lb/lb-mole
Stack Wet Molecular Weight	(M_s)		lb/lb-mole

Results			
Avg Stack Gas Velocity	(v_s)		ft/sec
Avg Stack Dry Std Flow Rate	(Q_{std})		dscf/hr
Avg Stack Dry Std Flow Rate	(Q_{sd})		dscf/min
Avg Stack Wet Flow Rate	(Q_{aw})		ascf/min

Stack Cross Section Schematic

Velocity Traverse Data

Run Number	U1-M5/202-V1		
Run Time			
Traverse Point	Velocity Head (Δp)	Stack Temp (t_s)	Local Velocity (v_s)
	in H_2O	°F	ft/sec
Average[1]			

[1] Please report the average of the square roots of Δp, or, $(\Delta p)^{1/2}_{avg} = {}^1/_n \Sigma(\Delta p^{1/2})$

Formulas Used

$A_s = DW/K_u$ for Rectangular Stacks

$A_s = (\pi(D/2)^2)/K_u$ for Circular Stacks

where $K_u = 1$ for metric units

where $K_u = 144$ (in^2/ft^2) for English units

$P_s = P_{bar} + P_{static}/13.6$

$\%N_2 = 100 - \%CO_2 - \%O_2 - \%CO$

$M_d = .44(\%CO_2) + .32(\%O_2) + .28(\%N_2 + \%CO)$

$M_s = M_d(1 - B_{ws}) + 18B_{ws}$

$(\Delta p)^{1/2}_{avg} = {}^1/_n \Sigma(\Delta p^{1/2})$

$T_{s(avg)} = {}^1/_n \Sigma t_s + T_u$

where $T_u = 273$ °K for metric units

where $T_u = 460$ °R for English units

$v_s = K_p C_p (\Delta p)^{1/2}_{avg} (T_{s(avg)}/(P_s M_s))^{1/2}$

where $K_p = 34.97$ for metric units

where $K_p = 85.49$ for English units

$Q_{sd} = 3600(1 - B_{ws}) v_s A_s (T_{std}/T_{s(avg)})(P_s/P_{std})$

where $T_{std} = 293$ °K, $P_{std} = 760$ mm Hg, for metric units

where $T_{std} = 528$ °R, $P_{std} = 29.92$ in Hg, for English units

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FIGURE 4.0-3 Example Data Sheet – EPA Method 3

METHOD 3 - GAS ANALYSIS FOR THE DETERMINATION OF DRY MOLECULAR WEIGHT

Plant Name	Rocky Mountain Power			Date	04/17/06
Sampling Location	Unit 1			Project #	2006-13099
Operator	GAC			# of Ports Used	4
Fuel Type	N/A	Minimum Fuel Factor		Maximum Fuel Factor	
Orsat Leak Check	☐	PreTest	☐ PostTest	Orsat Identification	

Gas Analysis Data

Run Number	U1-M5/202-1			Run Start Time			Run Stop Time		
Sample Analysis Time	Carbon Dioxide Volume (V_{CO2})	Oxygen Volume (V_{O2})	Carbon Monoxide Volume (V_{CO})	Carbon Dioxide Conc. ($\%CO_2$)	Oxygen Conc. ($\%O_2$)	Carbon Monoxide Conc. (%CO)	Nitrogen Conc. ($\%N_2$)	Dry Molecular Weight (M_d)	Molecular Weight Deviation (ΔM_d)
hh:mm	ml	ml	ml	percent	percent	percent	percent	lb/lb-mole	lb/lb-mole
CEMS									
Results			Averages						
Average Calculated Fuel Factor			$(F_o)_{avg}$			Molecular Wt Deviation < 0.3?			☐
Average Excess Air			$(\%EA)_{avg}$		percent	Fuel Factor in Handbook Range?			☐

Gas Analysis Data

Run Number	U1-M5/202-2			Run Start Time			Run Stop Time		
Sample Analysis Time	Carbon Dioxide Volume (V_{CO2})	Oxygen Volume (V_{O2})	Carbon Monoxide Volume (V_{CO})	Carbon Dioxide Conc. ($\%CO_2$)	Oxygen Conc. ($\%O_2$)	Carbon Monoxide Conc. (%CO)	Nitrogen Conc. ($\%N_2$)	Dry Molecular Weight (M_d)	Molecular Weight Deviation (ΔM_d)
hh:mm	ml	ml	ml	percent	percent	percent	percent	lb/lb-mole	lb/lb-mole
CEMS									
Results			Averages						
Average Calculated Fuel Factor			$(F_o)_{avg}$			Molecular Wt Deviation < 0.3?			☐
Average Excess Air			$(\%EA)_{avg}$		percent	Fuel Factor in Handbook Range?			☐

Gas Analysis Data

Run Number	U1-M5/202-3			Run Start Time			Run Stop Time		
Sample Analysis Time	Carbon Dioxide Volume (V_{CO2})	Oxygen Volume (V_{O2})	Carbon Monoxide Volume (V_{CO})	Carbon Dioxide Conc. ($\%CO_2$)	Oxygen Conc. ($\%O_2$)	Carbon Monoxide Conc. (%CO)	Nitrogen Conc. ($\%N_2$)	Dry Molecular Weight (M_d)	Molecular Weight Deviation (ΔM_d)
hh:mm	ml	ml	ml	percent	percent	percent	percent	lb/lb-mole	lb/lb-mole
CEMS									
Results			Averages						
Average Calculated Fuel Factor			$(F_o)_{avg}$			Molecular Wt Deviation < 0.3?			☐
Average Excess Air			$(\%EA)_{avg}$		percent	Fuel Factor in Handbook Range?			☐

Fuel Factor Fo

Fuel Type	Minimum	Maximum
Coal, Anthracite	1.016	1.130
Coal, Lignite	1.016	1.130
Coal, Bituminous	1.083	1.230
Oil, Distillate	1.260	1.413
Oil, Residual	1.210	1.370
Gas, Natural	1.600	1.836
Gas, Propane	1.434	1.586
Gas, Butane	1.405	1.553
Wood	1.000	1.120
Wood Bark	1.003	1.130

Formulas Used

$\%CO_2 = V_{CO2}$

$\%O_2 = V_{O2} - V_{CO2}$

$\%CO = V_{CO} - V_{O2}$

$\%N_2 = 100 - \%CO_2 - \%O_2 - \%CO$

$M_d = .44(\%CO_2) + .32(\%O_2) + .28(\%N_2 + \%CO)$

$\Delta M_d = M_d - M_{d_{avg}}$

$F_o = (20.9 - \%O_2 - .5\%CO)/(\%CO_2 + \%CO)$

$\%EA = 100(\%O_2 - .5\%CO)/(.264\%N_2 - (\%O_2 - .5\%CO))$

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FIGURE 4.0-4 Example Data Sheet – EPA Method 4

METHOD 4 - DETERMINATION OF MOISTURE CONTENT IN STACK GASES

Plant Name	Rocky Mountain Power	Date	04/17/06
Sampling Location	Unit 1	Project #	2006-13099
Operator	GAC	# of Ports Used	4
Stack Type	Circular	Meter Box Number	
Train Leak Check	☐ PreTest ☐ PostTest	Meter Cal Factor (Y)	

Moisture Content Data								
Run Number	U1-M5/202-1		Run Start Time			Run Stop Time		
Total Meter Volume	(V_m)		dcf	Barometric Press.		(P_b)		in Hg
Avg Meter Temp	$(t_m)_{avg}$		°F	Stack Static Press.		(P_{static})		in H_2O
Avg Stack Temp	$(t_s)_{avg}$		°F	Avg Orifice Press.		$(\Delta H)_{avg}$		in H_2O
		Impinger 1	Impinger 2	Impinger 3	Impinger 4	Impinger 5	Impinger 6	Impinger 7
		ml	ml	ml	g	ml	ml	ml
Contents		DI	DI		Sil Gel			
Final Value	$(V_f),(W_f)$							
Initial Value	$(V_i),(W_i)$							
Net Value	$(V_n),(W_n)$							
Results								
Total Volume	(V_t)		ml	Water Vol Condensed		$(V_{wc(std)})$		scf
Total Weight	(W_t)		g	Water Vol Weighed		$(V_{wg(std)})$		scf
Std Meter Volume	$(V_{m(std)})$		dscf	Sat. Moisture Content		$(B_{ws(sat)})$		%
Calc Moisture Content	$(B_{ws(calc)})$		%	Final Moisture Content		(B_{ws})		%

Moisture Content Data								
Run Number	U1-M5/202-2		Run Start Time			Run Stop Time		
Total Meter Volume	(V_m)		dcf	Barometric Press.		(P_b)		in Hg
Avg Meter Temp	$(t_m)_{avg}$		°F	Stack Static Press.		(P_{static})		in H_2O
Avg Stack Temp	$(t_s)_{avg}$		°F	Avg Orifice Press.		$(\Delta H)_{avg}$		in H_2O
		Impinger 1	Impinger 2	Impinger 3	Impinger 4	Impinger 5	Impinger 6	Impinger 7
		ml	ml	ml	g	ml	ml	ml
Contents		DI	DI		Sil Gel			
Final Value	$(V_f),(W_f)$							
Initial Value	$(V_i),(W_i)$							
Net Value	$(V_n),(W_n)$							
Results								
Total Volume	(V_t)		ml	Water Vol Condensed		$(V_{wc(std)})$		scf
Total Weight	(W_t)		g	Water Vol Weighed		$(V_{wg(std)})$		scf
Std Meter Volume	$(V_{m(std)})$		dscf	Sat. Moisture Content		$(B_{ws(sat)})$		%
Calc Moisture Content	(B_{ws})		%	Final Moisture Content		(B_{ws})		%

Moisture Content Data								
Run Number	U1-M5/202-3		Run Start Time			Run Stop Time		
Total Meter Volume	(V_m)		dcf	Barometric Press.		(P_b)		in Hg
Avg Meter Temp	$(t_m)_{avg}$		°F	Stack Static Press.		(P_{static})		in H_2O
Avg Stack Temp	$(t_s)_{avg}$		°F	Avg Orifice Press.		$(\Delta H)_{avg}$		in H_2O
		Impinger 1	Impinger 2	Impinger 3	Impinger 4	Impinger 5	Impinger 6	Impinger 7
		ml	ml	ml	g	ml	ml	ml
Contents		DI	DI		Sil Gel			
Final Value	$(V_f),(W_f)$							
Initial Value	$(V_i),(W_i)$							
Net Value	$(V_n),(W_n)$							
Results								
Total Volume	(V_t)		ml	Water Vol Condensed		$(V_{wc(std)})$		scf
Total Weight	(W_t)		g	Water Vol Weighed		$(V_{wg(std)})$		scf
Std Meter Volume	$(V_{m(std)})$		dscf	Sat. Moisture Content		$(B_{ws(sat)})$		%
Calc Moisture Content	(B_{ws})		%	Final Moisture Content		(B_{ws})		%

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FIGURE 4.0-5 Example Data Sheet – Sample Recovery

METHOD 5 - SAMPLE RECOVERY AND INTEGRITY DATA SHEET

Plant Name	Rocky Mountain Power	Date	04/17/06
Sampling Location	Unit 1	Project #	2006-13099
Operator	GAC	Acetone Lot Number	

Run History Data				
Run Number	U1-M5/202-1	U1-M5/202-2	U1-M5/202-3	
Run Start Time				(hh:mm)
Run Stop Time				(hh:mm)
Train Prepared By				
Train Recovered By				
Recovery Date				(mm/dd/yy)
Relinquished By				
Received By				
Relinquished Date				(mm/dd/yy)
Relinquished Time				(hh:mm)

Equipment Identification Numbers			
Filter			
Acetone Wash			
Silica Gel			
Impinger Case			
Sample Box			
Oven			

Moisture Content Data					
Impingers 1, 2, and 3 - Water Volume					
Final Volume	(V_f)				ml
Initial Volume	(V_i)				ml
Net Volume	(V_n)				ml
Comments					
Impinger 4 - Silica Gel Weight					
Final Weight	(W_f)				g
Initial Weight	(W_i)				g
Net Weight	(W_n)				g
Comments					
Total Water Collected					
Total Volume	(V_{lc})				g

Formulas Used		
$V_n = V_f - V_i$	$W_n = W_f - W_i$	$V_{lc} = V_n + W_n/\rho_w$ where ρ_w = .9982 g/ml

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FIGURE 4.0-6 Example Data Sheet – Results Summary

METHOD 5 - DETERMINATION OF PARTICULATE EMISSIONS - RESULTS

Plant Name	Rocky Mountain Power	Date	04/17/06
Sampling Location	Unit 1	Project #	2006-13099
Operator	GAC	Stack Type	Circular

Historical Data						
Run Number		U1-M5/202-1	U1-M5/202-2	U1-M5/202-3	Average	
Run Start Time						hhmm
Run Stop Time						hhmm
Meter Calibration Factor	(Y)					
Pitot Tube Coefficient	(C_p)					
Actual Nozzle Diameter	(D_{ns})					in
Stack Test Data						
Initial Meter Volume	$(V_m)_i$					ft^3
Final Meter Volume	$(V_m)_f$					ft^3
Total Meter Volume	(V_m)					ft^3
Total Sampling Time	(Θ)	120.0	120.0	120.0	120.0	min
Average Meter Temperature	$(t_m)_{avg}$					°F
Average Stack Temperature	$(t_s)_{avg}$					°F
Barometric Pressure	(P_b)					in Hg
Stack Static Pressure	(P_{static})					in H_2O
Absolute Stack Pressure	(P_s)					in Hg
Average Orifice Pressure Drop	$(\Delta H)_{avg}$					in H_2O
Absolute Meter Pressure	(P_m)					in Hg
Avg Square Root Pitot Pressure	$(\Delta p^{1/2})_{avg}$					$(in\ H_2O)^{1/2}$
Moisture Content Data						
Impingers 1-3 Water Volume Gain	(V_h)					ml
Impinger 4 Silica Gel Weight Gain	(W_s)					g
Total Water Volume Collected	(V_c)					ml
Standard Water Vapor Volume	$(V_w)_{std}$					scf
Standard Meter Volume	$(V_m)_{std}$					dscf
Calculated Stack Moisture	($B_{ws(calc)}$)					%
Saturated Stack Moisture	($B_{ws(sat)}$)					%
Reported Stack Moisture Content	(B_{ws})					%
Gas Analysis Data						
Carbon Dioxide Percentage	(%CO_2)					%
Oxygen Percentage	(%O_2)					%
Carbon Monoxide Percentage	(%CO)					%
Nitrogen Percentage	(%N_2)					%
Dry Gas Molecular Weight	(M_d)					lb/lb-mole
Wet Stack Gas Molecular Weight	(M_s)					lb/lb-mole
Calculated Fuel Factor	(F_o)					
Fuel F-Factor	(F_d)	8760	8760	8760		dscf/mmBtu
Percent Excess Air	(%EA)					%
Volumetric Flow Rate Data						
Average Stack Gas Velocity	(v_s)					ft/sec
Stack Cross-Sectional Area	(A_s)	63.62	63.62	63.62		ft^2
Actual Stack Flow Rate	(Q_{sw})					acfm
Wet Standard Stack Flow Rate	(Q_{sw})					wkscfh
Dry Standard Stack Flow Rate	(Q_{sd})					dscfm
Percent of Isokinetic Rate	(I)					%
Emission Rate Data						
Mass of Particulate - Front Half	(m_n)					mg
Mass of Particulate - Back Half	(m_a')					mg
Mass due to Acetone Blank	(W_a)					mg
Total Mass of Particulates	(m_n)					mg
Stack Particulate Concentration	(c_s)					g/dscf
	(c_s)					gr/dscf
Particulate Emission Rate	(E)					kg/hr
	(E)					lbs/hr
	(E)					lbs/mmBtu
(Pt76 App F Sect 5.2.1) Heat Input	(HI)					mmBtu/hr

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