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December 3, 2008

Ms. Purva Prabhu
Georgia Department of Natural Resources
Environmental Protection Division
Air Protection Branch
4244 International Parkway, Suite 120
Atlanta, GA 30354

RE: Application No. 17924, dated January 17, 2008
Plant Washington
Sandersville, Georgia
Project No. 6122-07-0007

Dear Ms. Prabhu:

On behalf of our client Power4Georgians, LLC (P4G) we are providing supplemental information to the above referenced air permit application. Rather than providing replacement pages to be inserted into the application, in order to avoid confusion we are providing three additional copies of the application with the information already inserted.

I have also attached a DVD which contains an electronic copy of the application and modeling, and a copy of information which you had requested previously including.

1. Vendor data referencing a cooling tower drift rate of 0.0005%.

2. A copy of the reference used to estimate the percentage of PM_{10} and $PM_{2.5}$ emitted from the facility cooling tower.

3. A copy of several references indicating a 90% control efficiency used for the material handling and storage piles, including a copy of AP-42, Chapter 13.2.4, and a Wisconsin DNR publication *Review of Particulate Matter Reporting for Coal Burning Facilities*.

In regards to your question regarding a vendor guarantee for an emission rate of 0.005 gr/dscf for a dust collector, the following excerpt is given from a recent correspondence with an equipment vendor (Airtrol Inc.).

In order to meet the .005 gr/dscf outlet emissions rate guarantee, Airtrol would only need to make a slight change in the type of bag fabric for dust collectors that utilize bag type filters. We would provide a dual density Polyester in lieu of the standard Polyester felt. This change in fabric adds less than 1% to the overall system price....

MACTEC Engineering and Consulting, Inc.
3200 Town Point Drive NW, Suite 100 • Kennesaw, GA 30144 • Phone: 770.421.3400 • Fax: 770.421.3486 www.mactec.com

Please note that if we provide insertable dust collectors, they utilize a spun bonded Polyester pleated filter. These filters can only be guaranteed to .007 gr/dscf and are not available in a dual density Polyester. Thus in order to meet .005 gr/dscf outlet emissions rate, the insertable dust collectors that utilize pleated filters would require a Teflon coating applied to the pleated filter. The Teflon membrane adds approximately 10-15% to the price of the insertable dust collector

If you have any questions, please contact me at (770) 421-3335 or Ken Hiltgen at (770) 421-3334.

Sincerely,
MACTEC ENGINEERING AND CONSULTING, INC.

Justin Fickas
Senior Engineer

Ken Hiltgen
Project Manager/Principal

GEA Energy Technology Division

GEA Power Cooling, Inc.

TECHNICAL DATA

COUNTERFLOW FRP TOWER - SCOPE OF SUPPLY

Job Name:	[redacted]				
Proposal Number:	[redacted]		Revision:		0
Model Number:	[redacted]		Date:	5/2/2006	11:40 AM

DESIGN SUMMARY

THERMAL PERFORMANCE

Water Flow:	(gpm)	300,000	Fan Power:	(bhp/cell)	192
Hot Water Temp:	(F)	114.8	Pump Head:	(ft)	37
Cold Water Temp:	(F)	92	Evaporation:	(gpm)	6072
Wet Bulb Temp:	(F)	78	Relative Humidity:	(%)	[illegible]
Range:	(F)	22.8	Drift:	(% Flow)	0.0005
Approach:	(F)	14	Elevation:	(ft)	500
			Total Dissolved Solids:	(g/kg)	1.0

STRUCTURAL DESIGN

Governing Code:		UBC			
Wind:	(mph)	90	Exposure:		C
Seismic Zone:		2	Snow Load:	(lb/ft2)	0
Fan Deck Live Load	(lb/ft2)	60	Fill Live Load:	(lb/ft2)	25
Other:			Drift Eliminator Live Load:	(lb/ft2)	25

PHYSICAL DETAILS

No. of Cells:			[redacted]	Fans per Cell:			1
Tower Site:			Ground	Arrangement:			[redacted]
Nominal Cell Size:				Overall Tower Size:			
	Length:	(ft)	54		Length:	(ft)	432
	Width:	(ft)	48		Width:	(ft)	96
	Height:	(ft)	44		Height:	(ft)	54
Nominal Bay Size:							
	Length:	(ft)	6	Air Inlet Height:		(ft)	22
	Width:	(ft)	6	No. Inlet Sides:			2
	Height:	(ft)	6	Plenum Height		(ft)	9
				Distribution Inlet Height:		(ft)	31
Shipping Weight		(lb)	1,567,603	Operating Weight		(lb)	4,312,119

Midwest TOWERS, INC.

Project: [redacted]
Location: [redacted]

Midwest Towers Proposal [redacted]
Rev. No: 0
Date: March 28, 2008

COOLING TOWER DATA SHEET

Cooling Tower	
Type:	Induced draft
Air Flow:	Counterflow
Model No.:	[redacted]
No. Cells:	[redacted]
Arrangement:	[redacted]
Operating Conditions	
Water Flow (gpm):	436,700
Inlet Water Temp. (°F):	105.36
Exit Water Temp. (°F):	89
Wet Bulb Temp. (°F):	78
Relative Humidity (%):	60
Heat Load (MMBtu/hr.)	3,572.21
Evaporation Loss (%):	1.41
Elevation (ft.):	0
Dimensions	
Each Cell (LxW):	48' x 48'
Overall Dims (LxW):	672' x 96'
Fanstack Height (ft.):	14'
Ht. BWall to Fandk (ft.)	40.22
Air Inlet Orientation:	2 Sides
Air Inlet Height (ft.):	20
Distribution System	
Type:	Low pressure
Material:	FRP & PVC
Inlet Water Flange:	30" FRP w 125# Drill
Inlet Water Height (ft.):	29.96
Tower Pump Head (ft.):	33.36
Fill	
Type:	Cellular
Material:	PVC
Fill Volume:	887,072 (ft3)
Water Loading:	7.29 (gpm/[illegible] Cells
Drift Eliminators	
Type:	Cellular
Material:	PVC
Drift Loss (%):	0.0005
Structure Materials	
Casing:	FR FRP
Fanstack:	FR FRP
Structure:	FR FRP
Fandeck:	FR FRP
Stairway:	FR FRP
Access Ladder:	FR FRP

Fans	
Quantity:	28
Manufacturer:	Hudson Products Co.
Type:	Axial Flow
Model No.:	APT-36H7-9 w/ W-2 Bushing
Diameter:	36 ft.
Number of Blades:	9
Blade Material:	FRP
Hub Material:	Galvanized Steel
Rotation (rpm):	106.1
Tip Spd (fpm)/ Pitch °:	12000 / 9.3
Motor BHP Req'd.:	203.01
Static Efficiency (%):	78.5
Air Flow (cfm):	1,109,879
Static Pressure (w.c.)	.720
Motors	
Quantity:	28
Manufacturer:	Siemens / TWMC or equal
Type:	TEFC Severe Duty
Frame Size:	449T
Rated Horsepower:	200
Service Factor:	1.15
Rotation (rpm):	1800/900
Voltage (volts):	460
Frequency (Hz):	60
Phase:	3
Space Heater:	Yes, 120V
Gear Reducers	
Quantity:	28
Manufacturer:	Amarillo Gear Co.
Type:	Right angle w/ LOLS
Model No.	1712.5W
Reduction Ratio:	17.0 : 1
Service Factor:	2.0
Gear Type:	Spiral Bevel
Lubrication:	Oil / Splash
Driveshafts	
Quantity:	28
Manufacturer:	Rexnord/Addax
Model No.:	LRR650.825SS
Service Factor:	2.0
Driveshaft Material:	Carbon Fiber
Flexible Element:	Composite
Accessories Per Cell	
Vibration Switch:	PMC Beta or Equal
Oil Fill / Drain Line:	HDG

Calculating Realistic PM_{10} Emissions from Cooling Towers

Abstract No. 216 Session No. AM-1b

Joel Reisman and Gordon Frisbie
Greystone Environmental Consultants, Inc., 650 University Avenue, Suite 100, Sacramento, California 95825

ABSTRACT

Particulate matter less than 10 micrometers in diameter (PM_{10}) emissions from wet cooling towers may be calculated using the methodology presented in EPA's AP-42[1] , which assumes that all total dissolved solids (TDS) emitted in "drift" particles (liquid water entrained in the air stream and carried out of the tower through the induced draft fan stack.) are PM_{10}. However, for wet cooling towers with medium to high TDS levels, this method is overly conservative, and predicts significantly higher PM_{10} emissions than would actually occur, even for towers equipped with very high efficiency drift eliminators (e.g., 0.0006% drift rate). Such over-prediction may result in unrealistically high PM_{10} modeled concentrations and/or the need to purchase expensive Emission Reduction Credits (ERCs) in PM_{10} non-attainment areas. Since these towers have fairly low emission points (10 to 15 m above ground), over-predicting PM_{10} emission rates can easily result in exceeding federal Prevention of Significant Deterioration (PSD) significance levels at a project's fenceline. This paper presents a method for computing realistic PM_{10} emissions from cooling towers with medium to high TDS levels.

INTRODUCTION

Cooling towers are heat exchangers that are used to dissipate large heat loads to the atmosphere. Wet, or evaporative, cooling towers rely on the latent heat of water evaporation to exchange heat between the process and the air passing through the cooling tower. The cooling water may be an integral part of the process or may provide cooling via heat exchangers, for example, steam condensers. Wet cooling towers provide direct contact between the cooling water and air passing through the tower, and as part of normal operation, a very small amount of the circulating water may be entrained in the air stream and be carried out of the tower as "drift" droplets. Because the drift droplets contain the same chemical impurities as the water circulating through the tower, the particulate matter constituent of the drift droplets may be classified as an emission. The magnitude of the drift loss is influenced by the number and size of droplets produced within the tower, which are determined by the tower fill design, tower design, the air and water patterns, and design of the drift eliminators.

AP-42 METHOD OF CALCULATING DRIFT PARTICULATE

EPA's AP-42[1] provides available particulate emission factors for wet cooling towers, however, these values only have an emission factor rating of "E" (the lowest level of confidence acceptable). They are also rather high, compared to typical present-day manufacturers' guaranteed drift rates, which are on the order of 0.0006%. (Drift emissions are typically expressed as a percentage of the cooling tower water circulation rate). AP-42 states that "a *conservatively high* PM_{10} emission factor can be obtained by (a) multiplying the total liquid drift factor by the TDS fraction in the circulating water, and (b) assuming that once the water evaporates, all remaining solid particles are within the PM_{10} range." (Italics per EPA).

If TDS data for the cooling tower are not available, a source-specific TDS content can be estimated by obtaining the TDS for the make-up water and multiplying it by the cooling tower cycles of concentration. [The cycles of concentration is the ratio of a measured parameter for the cooling tower water (such as conductivity, calcium, chlorides, or phosphate) to that parameter for the make-up water.]

Using AP-42 guidance, the total particulate emissions (PM) (after the pure water has evaporated) can be expressed as:

$$PM = \text{Water Circulation Rate} \times \text{Drift Rate} \times \text{TDS} \qquad [1]$$

For example, for a typical power plant wet cooling tower with a water circulation rate of 146,000 gallons per minute (gpm), drift rate of 0.0006%, and TDS of 7,700 parts per million by weight (ppmw):

$$PM = 146{,}000 \text{ gpm} \times 8.34 \text{ lb water/gal} \times 0.0006/100 \times 7{,}700 \text{ lb solids}/10^6 \text{ lb water} \times 60 \text{ min/hr} = \underline{3.38 \text{ lb/hr}}$$

On an annual basis, this is equivalent to almost 15 tons per year (tpy). Even for a state-of-the-art drift eliminator system, this is not a small number, especially if assumed to all be equal to PM_{10}, a regulated criteria pollutant. However, as the following analysis demonstrates, only a very small fraction is actually PM_{10}.

COMPUTING THE PM_{10} FRACTION

Based on a representative drift droplet size distribution and TDS in the water, the amount of solid mass in each drop size can be calculated. That is, for a given initial droplet size, assuming that the mass of dissolved solids condenses to a spherical particle after all the water evaporates, and assuming the density of the TDS is equivalent to a representative salt (e.g., sodium chloride), the diameter of the final solid particle can be calculated. Thus, using the drift droplet size distribution, the percentage of drift mass containing particles small enough to produce PM_{10} can be calculated. This method is conservative as the final particle is assumed to be perfectly spherical; hence as small a particle as can exist.

The droplet size distribution of the drift emitted from the tower is critical to performing the analysis. Brentwood Industries, a drift eliminator manufacturer, was contacted and agreed to provide drift eliminator test data from a test conducted by Environmental Systems Corporation (ESC) at the Electric Power Research Institute (EPRI) test facility in Houston, Texas in 1988 (Aull[2], 1999). The data consist of water droplet size distributions for a drift eliminator that achieved a tested drift rate of 0.0003 percent. As we are using a 0.0006 percent drift rate, it is reasonable to expect that the 0.0003 percent drift rate would produce smaller droplets, therefore, this size distribution data can be assumed to be <u>conservative</u> for predicting the fraction of PM_{10} in the total cooling tower PM emissions.

In calculating PM_{10} emissions the following assumptions were made:

- Each water droplet was assumed to evaporate shortly after being emitted into ambient air, into a single, solid, spherical particle.
- Drift water droplets have a density (ρ_w) of water; 1.0 g/cm^3 or $1.0 * 10^{-6}\ \mu g/\mu m^3$.
- The solid particles were assumed to have the same density (ρ_{TDS}) as sodium chloride, (i.e., 2.2 g/cm^3).

Using the formula for the volume of a sphere, $V = 4\pi r^3/3$, and the density of pure water, $\rho_w = 1.0$ g/cm^3, the following equations can be used to derive the solid particulate diameter, D_p, as a function of the TDS, the density of the solids, and the initial drift droplet diameter, D_d :

$$\text{Volume of drift droplet} = (4/3)\pi(D_d/2)^3 \quad [2]$$

$$\text{Mass of solids in drift droplet} = (TDS)(\rho_w)(\text{Volume of drift droplet}) \quad [3]$$

substituting,

$$\text{Mass of solids in drift} = (TDS)(\rho_w)(4/3)\pi(D_d/2)^3 \quad [4]$$

Assuming the solids remain and coalesce after the water evaporates, the mass of solids can also be expressed as:

$$\text{Mass of solids} = (\rho_{TDS})\ (\text{solid particle volume}) = (\rho_{TDS})(4/3)\pi(D_p/2)^3 \quad [5]$$

Equations [4] and [5] are equivalent:

$$(\rho_{TDS})(4/3)\pi(D_p/2)^3 = (TDS)(\rho_w)(4/3)\pi(D_d/2)^3 \quad [6]$$

Solving for D_p:

$$D_p = D_d\ [(TDS)(\rho_w/\rho_{TDS})]^{1/3} \quad [7]$$

Where,

TDS is in units of ppmw
D_p = diameter of solid particle, micrometers (μm)
D_d = diameter of drift droplet, μm

Using formulas [2] – [7] and the particle size distribution test data, Table 1 can be constructed for drift from a wet cooling tower having the same characteristics as our example; 7,700 ppmw TDS and a 0.0006% drift rate. The first and last columns of this table are the particle size distribution derived from test results provided by Brentwood Industries. Using straight-line interpolation for a solid particle size 10 μm in diameter, we conclude that approximately <u>14.9 percent</u> of the mass emissions are equal to or smaller than PM_{10}. The balance of the solid particulate are particulate greater than 10 μm. Hence, PM_{10} emissions from this tower would be equal to PM emissions x 0.149, or 3.38 lb/hr x 0.149 = 0.50 lb/hr. The process is repeated in Table 2, with all parameters equal except that the TDS is 11,000 ppmw. The result is that approximately 5.11 percent are smaller at 11,000 ppm. Thus, while total PM emissions are larger by virtue of a higher TDS, overall PM_{10} emissions are actually lower, because more of the solid particles are larger than 10 μm.

Table 1. Resultant Solid Particulate Size Distribution (TDS = 7700 ppmw)

EPRI Droplet Diameter (μm)	Droplet Volume (μm^3) [2][1]	Droplet Mass (μg) [3]	Particle Mass (Solids) (μg) [4]	Solid Particle Volume (μm^3)	Solid Particle Diameter (μm) [7]	EPRI % Mass Smaller
10	524	5.24E-04	4.03E-06	1.83	1.518	0.000
20	4189	4.19E-03	3.23E-05	14.66	3.037	0.196
30	14137	1.41E-02	1.09E-04	49.48	4.555	0.226
40	33510	3.35E-02	2.58E-04	117.29	6.073	0.514
50	65450	6.54E-02	5.04E-04	229.07	7.591	1.816
60	113097	1.13E-01	8.71E-04	395.84	9.110	5.702
70	179594	1.80E-01	1.38E-03	628.58	10.628	21.348
90	381704	3.82E-01	2.94E-03	1335.96	13.665	49.812
110	696910	6.97E-01	5.37E-03	2439.18	16.701	70.509
130	1150347	1.15E+00	8.86E-03	4026.21	19.738	82.023
150	1767146	1.77E+00	1.36E-02	6185.01	22.774	88.012
180	3053628	3.05E+00	2.35E-02	10687.70	27.329	91.032
210	4849048	4.85E+00	3.73E-02	16971.67	31.884	92.468
240	7238229	7.24E+00	5.57E-02	25333.80	36.439	94.091
270	10305995	1.03E+01	7.94E-02	36070.98	40.994	94.689
300	14137167	1.41E+01	1.09E-01	49480.08	45.549	96.288
350	22449298	2.24E+01	1.73E-01	78572.54	53.140	97.011
400	33510322	3.35E+01	2.58E-01	117286.13	60.732	98.340
450	47712938	4.77E+01	3.67E-01	166995.28	68.323	99.071
500	65449847	6.54E+01	5.04E-01	229074.46	75.915	99.071
600	113097336	1.13E+02	8.71E-01	395840.67	91.098	100.000

[1] Bracketed numbers refer to equation number in text.

The percentage of PM_{10}/PM was calculated for cooling tower TDS values from 1000 to 12000 ppmw and the results are plotted in Figure 1. Using these data, Figure 2 presents predicted PM_{10} emission rates for the 146,000 gpm example tower. As shown in this figure, the PM emission rate increases in a straight line as TDS increases, however, the PM_{10} emission rate increases to a maximum at around a TDS of 4000 ppmw, and then begins to decline. The reason is that at higher TDS, the drift droplets contain more solids and therefore, upon evaporation, result in larger solid particles for any given initial droplet size.

CONCLUSION

The emission factors and methodology given in EPA's AP-42[1] Chapter 13.4 *Wet Cooling Towers*, do not account for the droplet size distribution of the drift exiting the tower. This is a critical factor, as more than 85% of the mass of particulate in the drift from most cooling towers will result in solid particles larger than PM_{10} once the water has evaporated. Particles larger than PM_{10} are no longer a regulated air pollutant, because their impact on human health has been shown to be insignificant. Using reasonable, conservative assumptions and a realistic drift droplet size distribution, a method is now available for calculating realistic PM_{10} emission rates from wet mechanical draft cooling towers equipped with modern, high-efficiency drift eliminators and operating at medium to high levels of TDS in the circulating water.

Table 2. Resultant Solid Particulate Size Distribution (TDS = 11000 ppmw)

EPRI Droplet Diameter (μm)	Droplet Volume (μm^3) [2][1]	Droplet Mass (μg) [3]	Particle Mass (Solids) (μg) [4]	Solid Particle Volume (μm^3)	Solid Particle Diameter (μm) [7]	EPRI % Mass Smaller
10	524	5.24E-04	5.76E-06	2.62	1.710	0.000
20	4189	4.19E-03	4.61E-05	20.94	3.420	0.196
30	14137	1.41E-02	1.56E-04	70.69	5.130	0.226
40	33510	3.35E-02	3.69E-04	167.55	6.840	0.514
50	65450	6.54E-02	7.20E-04	327.25	8.550	1.816
60	113097	1.13E-01	1.24E-03	565.49	10.260	5.702
70	179594	1.80E-01	1.98E-03	897.97	11.970	21.348
90	381704	3.82E-01	4.20E-03	1908.52	15.390	49.812
110	696910	6.97E-01	7.67E-03	3484.55	18.810	70.509
130	1150347	1.15E+00	1.27E-02	5751.73	22.230	82.023
150	1767146	1.77E+00	1.94E-02	8835.73	25.650	88.012
180	3053628	3.05E+00	3.36E-02	15268.14	30.780	91.032
210	4849048	4.85E+00	5.33E-02	24245.24	35.909	92.468
240	7238229	7.24E+00	7.96E-02	36191.15	41.039	94.091
270	10305995	1.03E+01	1.13E-01	51529.97	46.169	94.689
300	14137167	1.41E+01	1.56E-01	70685.83	51.299	96.288
350	22449298	2.24E+01	2.47E-01	112246.49	59.849	97.011
400	33510322	3.35E+01	3.69E-01	167551.61	68.399	98.340
450	47712938	4.77E+01	5.25E-01	238564.69	76.949	99.071
500	65449847	6.54E+01	7.20E-01	327249.23	85.499	99.071
600	113097336	1.13E+02	1.24E+00	565486.68	102.599	100.000

Figure 1: Percentage of Drift PM that Evaporates to PM10

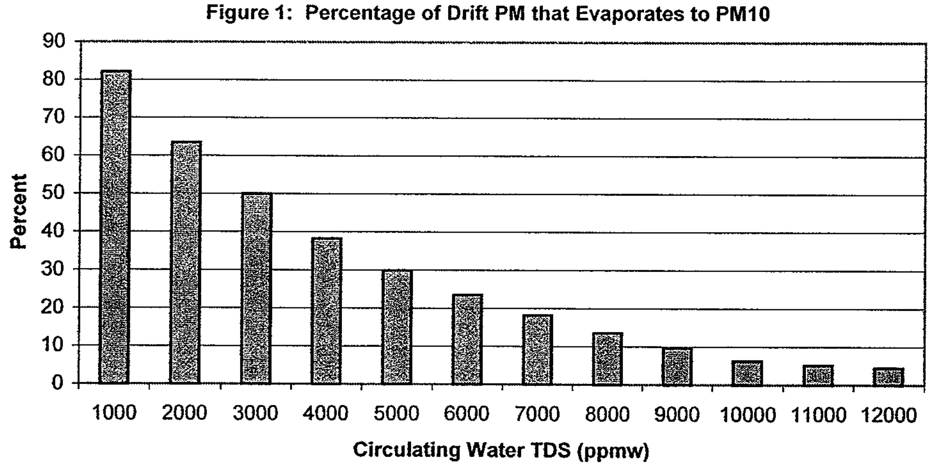
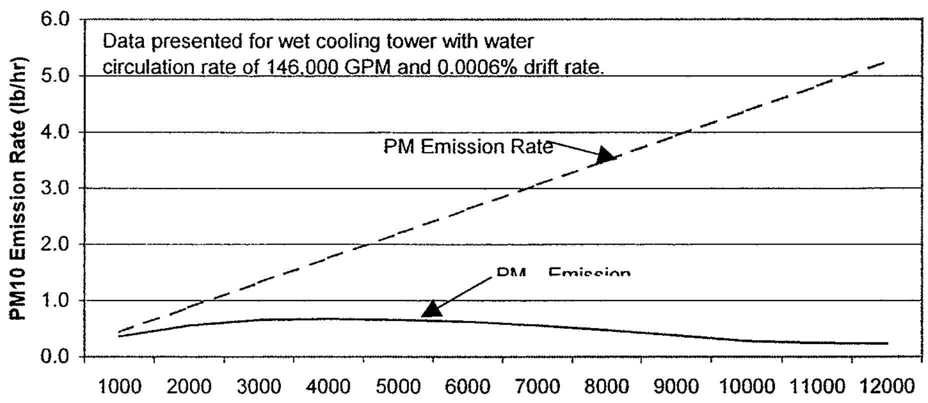


Figure 2: PM_{10} Emission Rate vs. TDS



REFERENCES

1. EPA, 1995. Compilation of Air pollutant Emission Factors, AP-42 Fifth edition, Volume I: *Stationary Point and Area Sources*, Chapter 13.4 Wet Cooling Towers, http://www.epa.gov/ttn/chief/ap42/, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, January.

2. Aull, 1999. Memorandum from R. Aull, Brentwood Industries to J. Reisman, Greystone, December 7, 1999.

KEY WORDS

Drift
Drift eliminators
Cooling tower
PM_{10} emissions
TDS

13.2.4 Aggregate Handling And Storage Piles

13.2.4.1 General

Inherent in operations that use minerals in aggregate form is the maintenance of outdoor storage piles. Storage piles are usually left uncovered, partially because of the need for frequent material transfer into or out of storage.

Dust emissions occur at several points in the storage cycle, such as material loading onto the pile, disturbances by strong wind currents, and loadout from the pile. The movement of trucks and loading equipment in the storage pile area is also a substantial source of dust.

13.2.4.2 Emissions And Correction Parameters

The quantity of dust emissions from aggregate storage operations varies with the volume of aggregate passing through the storage cycle. Emissions also depend on 3 parameters of the condition of a particular storage pile: age of the pile, moisture content, and proportion of aggregate fines.

When freshly processed aggregate is loaded onto a storage pile, the potential for dust emissions is at a maximum. Fines are easily disaggregated and released to the atmosphere upon exposure to air currents, either from aggregate transfer itself or from high winds. As the aggregate pile weathers, however, potential for dust emissions is greatly reduced. Moisture causes aggregation and cementation of fines to the surfaces of larger particles. Any significant rainfall soaks the interior of the pile, and then the drying process is very slow.

Silt (particles equal to or less than 75 micrometers [µm] in diameter) content is determined by measuring the portion of dry aggregate material that passes through a 200-mesh screen, using ASTM-C-136 method.[1] Table 13.2.4-1 summarizes measured silt and moisture values for industrial aggregate materials.

Table 13.2.4-1. TYPICAL SILT AND MOISTURE CONTENTS OF MATERIALS AT VARIOUS INDUSTRIES[a]

Industry	No. Of Facilities	Material	Silt Content (%)			Moisture Content (%)		
			No. Of Samples	Range	Mean	No. Of Samples	Range	Mean
Iron and steel production	9	Pellet ore	13	1.3 - 13	4.3	11	0.64 - 4.0	2.2
		Lump ore	9	2.8 - 19	9.5	6	1.6 - 8.0	5.4
		Coal	12	2.0 - 7.7	4.6	11	2.8 - 11	4.8
		Slag	3	3.0 - 7.3	5.3	3	0.25 - 2.0	0.92
		Flue dust	3	2.7 - 23	13	1	—	7
		Coke breeze	2	4.4 - 5.4	4.9	2	6.4 - 9.2	7.8
		Blended ore	1	—	15	1	—	6.6
		Sinter	1	—	0.7	0	—	—
		Limestone	3	0.4 - 2.3	1.0	2	ND	0.2
Stone quarrying and processing	2	Crushed limestone	2	1.3 - 1.9	1.6	2	0.3 - 1.1	0.7
		Various limestone products	8	0.8 - 14	3.9	8	0.46 - 5.0	2.1
Taconite mining and processing	1	Pellets	9	2.2 - 5.4	3.4	7	0.05 - 2.0	0.9
		Tailings	2	ND	11	1	—	0.4
Western surface coal mining	4	Coal	15	3.4 - 16	6.2	7	2.8 - 20	6.9
		Overburden	15	3.8 - 15	7.5	0	—	—
		Exposed ground	3	5.1 - 21	15	3	0.8 - 6.4	3.4
Coal-fired power plant	1	Coal (as received)	60	0.6 - 4.8	2.2	59	2.7 - 7.4	4.5
Municipal solid waste landfills	4	Sand	1	—	2.6	1	—	7.4
		Slag	2	3.0 - 4.7	3.8	2	2.3 - 4.9	3.6
		Cover	5	5.0 - 16	9.0	5	8.9 - 16	12
		Clay/dirt mix	1	—	9.2	1	—	14
		Clay	2	4.5 - 7.4	6.0	2	8.9 - 11	10
		Fly ash	4	78 - 81	80	4	26 - 29	27
		Misc. fill materials	1	—	12	1	—	11

[a] References 1-10. ND = no data.

13.2.4.3 Predictive Emission Factor Equations

Total dust emissions from aggregate storage piles result from several distinct source activities within the storage cycle:

1. Loading of aggregate onto storage piles (batch or continuous drop operations).
2. Equipment traffic in storage area.
3. Wind erosion of pile surfaces and ground areas around piles.
4. Loadout of aggregate for shipment or for return to the process stream (batch or continuous drop operations).

Either adding aggregate material to a storage pile or removing it usually involves dropping the material onto a receiving surface. Truck dumping on the pile or loading out from the pile to a truck with a front-end loader are examples of batch drop operations. Adding material to the pile by a conveyor stacker is an example of a continuous drop operation.

The quantity of particulate emissions generated by either type of drop operation, per kilogram (kg) (ton) of material transferred, may be estimated, with a rating of A, using the following empirical expression:[11]

$$E = k(0.0016) \frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}} \text{ (kg/megagram [Mg])}$$

(1)

$$E = k(0.0032) \frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}} \text{ (pound [lb]/ton)}$$

where:

E = emission factor
k = particle size multiplier (dimensionless)
U = mean wind speed, meters per second (m/s) (miles per hour [mph])
M = material moisture content (%)

The particle size multiplier in the equation, k, varies with aerodynamic particle size range, as follows:

Aerodynamic Particle Size Multiplier (k) For Equation 1				
< 30 µm	< 15 µm	< 10 µm	< 5 µm	< 2.5 µm
0.74	0.48	0.35	0.20	0.053[a]

[a] Multiplier for < 2.5 µm taken from Reference 14.

The equation retains the assigned quality rating if applied within the ranges of source conditions that were tested in developing the equation, as follows. Note that silt content is included, even though silt content does not appear as a correction parameter in the equation. While it is reasonable to expect that silt content and emission factors are interrelated, no significant correlation between the 2 was found during the derivation of the equation, probably because most tests with high silt contents were conducted under lower winds, and vice versa. It is recommended that estimates from the equation be reduced 1 quality rating level if the silt content used in a particular application falls outside the range given:

Ranges Of Source Conditions For Equation 1			
Silt Content (%)	Moisture Content (%)	Wind Speed	
		m/s	mph
0.44 - 19	0.25 - 4.8	0.6 - 6.7	1.3 - 15

To retain the quality rating of the equation when it is applied to a specific facility, reliable correction parameters must be determined for specific sources of interest. The field and laboratory procedures for aggregate sampling are given in Reference 3. In the event that site-specific values for correction parameters cannot be obtained, the appropriate mean from Table 13.2.4-1 may be used, but the quality rating of the equation is reduced by 1 letter.

For emissions from equipment traffic (trucks, front-end loaders, dozers, etc.) traveling between or on piles, it is recommended that the equations for vehicle traffic on unpaved surfaces be used (see Section 13.2.2). For vehicle travel between storage piles, the silt value(s) for the areas among the piles (which may differ from the silt values for the stored materials) should be used.

Worst-case emissions from storage pile areas occur under dry, windy conditions. Worst-case emissions from materials-handling operations may be calculated by substituting into the equation appropriate values for aggregate material moisture content and for anticipated wind speeds during the worst case averaging period, usually 24 hours. The treatment of dry conditions for Section 13.2.2, vehicle traffic, "Unpaved Roads", follows the methodology described in that section centering on parameter p. A separate set of nonclimatic correction parameters and source extent values corresponding to higher than normal storage pile activity also may be justified for the worst-case averaging period.

13.2.4.4 Controls[12-13]

Watering and the use of chemical wetting agents are the principal means for control of aggregate storage pile emissions. Enclosure or covering of inactive piles to reduce wind erosion can also reduce emissions. Watering is useful mainly to reduce emissions from vehicle traffic in the storage pile area. Watering of the storage piles themselves typically has only a very temporary slight effect on total emissions. A much more effective technique is to apply chemical agents (such as surfactants) that permit more extensive wetting. Continuous chemical treating of material loaded onto piles, coupled with watering or treatment of roadways, can reduce total particulate emissions from aggregate storage operations by up to 90 percent.[12]

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Review of Particulate Matter Reporting for Coal Burning Facilities

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Authors

Ralph Patterson
Dan Rosenthal

Reviewers

Andy Seeber
Bill Baumann
Pat Kirsop
John Meier
Phillip Spranger
Mike Griffin

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Executive Summary

In May 2004, a DNR Southeast Region (SER) air inspector completed a compliance inspection of the We Energies Valley Power Plant. During that inspection, he identified: 1) We Energies had understated its coal fired particulate emissions because it had not reported back-half emissions for these boilers these boilers and 2) We Energies failed to report fugitive dust emissions from its coal piles.

On July 1, 2004, the amended chapter NR 445, Wis. Adm. Code, became effective. In this chapter, section NR 445.10 addressed the control and compliance requirements for the handling and storage of coal. Companies stockpiling coal must address requirements for outdoor fugitive coal dust emissions, non-fugitive coal dust, and compliance certification by June 30, 2007. This requirement also highlighted the importance of accurate emissions reporting for coal fired facilities.

Although the SER compliance report focused on We Energies, it was not readily apparent whether the particulate matter under-calculation problem was specific to We Energies or consistent across all companies burning coal in Wisconsin. DNR completed a two-phase analysis to determine whether the reporting problem was statewide:

- For the back-half particulate matter emission analysis, company stack tests were reviewed from information available in the Wisconsin Air Compliance Database (WACD) and compared to what the company used for 2003 air emission reporting for a particular boiler.

- For the fugitive dust coal pile emission analysis, 2003 air emission reports were reviewed to determine how coal-burning power plants were reporting fugitive dust emissions from coal piles. Also a literature search was conducted which identified fugitive sources of particulate emissions associated with coal burning. This literature search identified coal piles, ash handling systems, and cooling towers as potential particulate matter emission sources.

The two completed analyses showed:

- There is no uniformity regarding the reporting of total particulate matter emissions from coal burning facilities in Wisconsin. It would appear that coal-burning installations may or may not factor back-half emission reporting in particulate matter calculations.

- Similarly, there also appears to be no uniformity regarding the reporting of fugitive dust emissions from coal piles. Many of the coal burning facilities did not report coal pile, ash handling systems, or cooling tower emissions and this lack of reporting may impeded the meeting NR 445.10 compliance certification requirements by June 30, 2007 for these companies

This document was written for the purpose of having consistent reporting particulate matter statewide from coal burning facilities.

Background

Definition of Particulate Matter

Federal and state regulations are clear in the definition of particulate matter. USEPA defines particulate matter in 40 CFR 51.100:

> "Particulate matter emissions means all finely divided solid or liquid material, other than uncombined water, emitted to the ambient air as measured by applicable reference methods, or an equivalent or alternative method, specified in this chapter, or by a test method specified in an approved State implementation plan."

Wisconsin defines the term "particulate matter emissions" in NR 400.02(119), Wis. Adm. Code, as follows:

> "Particulate matter emissions means all finely divided solid or liquid material, other than uncombined water, emitted to the ambient are as measured by an applicable reference method or an equivalent or alternative method specified by the department."

Based on the federal and state definitions of particulate matter, the measurement of particulate matter should include not only the solids (the front-half from the stack test results) but also the condensable (the back-half from the stack test results) particulate.

Quantification of Particulate Matter

Particulate matter is emitted with from a smokestack (which may or may not have a control device) or from fugitive sources that have no stack associated with the particulate generating activity.

The correct and consistent reporting of particulate matter air emissions in the annual air emission inventory has been a continual challenge. Emissions testing for the quantification of fugitive particulate matter emissions can be difficult and expensive to set-up and complete. Generally both the DNR and the regulated community have to rely on formulas contained in the USEPA document, Compilation of Air Pollutant Emission Factors, AP-42, Fifth Edition, Volume I: *Stationary Point and Area Sources* in Chapter 13 Miscellaneous Sources. This chapter contains sections supplying information on the calculation of fugitive emissions from Section 13.2.1 Paved Roads; Section 13.2.2 Unpaved Roads; Section 13.2.3 Heavy Construction Operations, Section 13.2.4 Aggregate Handling and Storage piles; Section 13.2.5 Industrial Wind Erosion and Section 13.2.6 Abrasive Blasting.

For non-fugitive sources (i.e. smokestack emissions), particulate matter emissions can be determined through stack testing. The filterable fraction, the front-half, of the particulate is determined by using USEPA Stack Test Methods 5 or 17. The condensable fraction, the back-half, of the particulate matter is measured using USEPA Stack Test Method 202. Adding the results from the front-half and the back-half supplies the total particulate matter amount for that air pollutant source. From this stack testing information air emission factors can be developed and then annual particulate emissions from the facility can then be calculated.

Particulate Matter Reporting Concerns for Stack Tested Sources Burning Coal

In May 2004, a DNR Southeast Region (SER) air inspector completed a compliance inspection of the We Energies Valley Power Plant. During that inspection, he identified: 1) We Energies had understated its coal fired particulate emissions because it had not reported back-half emissions for on these boilers and 2) We Energies failed to report fugitive dust emissions from the fugitive emissions from its coal piles.

An analysis of stack testing information for We Energies from the Wisconsin Air Compliance Database (WACD) showed that We Energies had completed the proper stack testing using USEPA Method 5, for filterable particulate matter, and USEPA Method 202, for condensable particulate matter. However, We Energies only used the Method 5 results when calculating combustion particulate matter emissions for its air emission inventory report for its main plants at Oak Creek, Pleasant Prairie, and Valley. The following table shows the back-half emissions were significant.

We Energies					
FID	Facility Name	Boiler Number	Original Reported PM Number Without Back Half (Tons)	Adjusted PM Number (with back half) With Back Half (Tons)	Difference (Tons)
230006260	Pleasant Prairie	B20	270	1038.9	768.9
		B21	84	1128.2	1044.2
241007800	Valley	B21	10.9	32.4	21.5
		B22	57.5	163	105.5
		B23	16.9	62.6	45.7
		B24	18.1	59	40.9
241007690	Oak Creek	B25	18.1	268.2	250.1
		B26	18.6	141.8	123.2
		B27	15.2	73.5	58.3
		B28	58.3	138.6	80.3

After the discrepancy in the We Energy emissions were found, DNR completed a second analysis looking at the other major coal burning facilities in Wisconsin to determine whether the concern identified with the We Energy air emission reporting was limited to one company.

For the second analysis, DNR reviewed stack test information in the Wisconsin Air Compliance Database (WACD) and then compared it to information reported in the 2003 air emissions inventory The findings are summarized in the next table.

Comparison of Emissions: Compliance Stack Test vs. DNR Oracle Database

			Compliance PM Stack Test		DNR Oracle Database			Calc. PM Emis. Stack Test	
FID	Facility	Device/ Process	(lb/mmBTU)	Date	T-put (Tons)	Heat Cont. (mmBTU/T)	2003 Emis. (Tons)	(Tons)	Diff.
111003090	Alliant Energy- Columbia	B21-01	0.0400	09/04/2003	2,327,122.0	17.064	724.7	794.2	69.5
		B22-01	0.0300	09/11/2001	2,176,225.0	16.846	554.9	549.9	-5.0
737009020	Wisconsin Public Service Corporation-Weston	B01	0.0870	07/25/2001	303,618.3	17.310	232	228.6	-3.4
		B02	0.0860	07/25/2001	414,537.0	17.330	314	308.9	-5.1
		B03	0.0040	07/25/2001	1,329,794.0	17.330	25.6	46.1	20.5
606034110	Dairyland Power-Alma	B25	0.0260	1998	1,476,292.0	17.400	356.3	333.9	-22.4
		B20-B24 No stack tests results in WACD							
802033320	Xcel Energy-Bay Front	B20	0.0900	03/18/2002	30,048.5	18.500	13.5	25.0	11.5
		B21	0.0600	03/18/2002	31,868.0	18.490	14.3	17.7	3.4
		B24	0.3300	03/18/2002	68,404.4	26.000	59.1	293.5	234.4
405032870	Fort James Operating Company	B24 - B28 no stack test results in WACD, though AEMS indicates Efs based on stack tests							
		B29-01	0.0395	08/27/2002	100,333.0	28.000	55.4	55.5	0.1
772009480	Stora Enso North America-Biron Mill	B23	0.1140	05/14/2002	86,992.0	23.560	116.5	116.8	0.3
		B24	0.0430	05/14/2002	123,631.0	17.600	6.3	46.8	40.5

The particulate matter stack test information used in this table included the front-half and back-half catch results as shown in the columns labeled "Compliance PM Stack Test" The reported 2003 air emissions for the facility is listed under the three columns labeled "DNR Oracle Database". The calculated emissions based on the throughput and heat content reported by the company using the stack test information is listed in the column titled "Calc. PM Emis. Stack Test (Tons)". The difference between the column labeled "2003 Emis (tons)" and the column labeled "Calc. PM Emis. Stack Test (Tons)" is shown in the column labeled "Diff." This table shows the discrepancy from the calculated 2003 emissions versus emissions calculated by stack test information in the last column of the table. The table shows a large discrepancy between the calculated particulate matter emissions from coal fired boiler to coal fired boiler. The results of the tables show that stack test emission factors, which include the front-half and back-half catches contributions, should be used for calculating annual air emissions because the general AP-42 emission factors used for the emission calculations both over-report and under-report air emissions from these boilers.

Particulate Matter Reporting Concerns for Fugitive Dust Emissions for Sources Burning Coal

On July 1, 2004, the amended chapter NR 445, Wis. Adm. Code, became effective. In this chapter, section NR 445.10 addresses the control and compliance requirements for the handling and storage of coal. Companies stockpiling coal must address requirements for outdoor fugitive coal dust emissions, non-fugitive coal dust, and compliance certification by June 30, 2007.

DNR completed an inventory of fugitive dust emitting sources for large coal burning facilities in September 2004. This analysis was also used as a starting point for determining how coal burning facilities would meet compliance requirements listed in NR 445.10, Wis. Adm. Code, by June 30, 2007.

The table presented below summarizes the amount of fugitive particulate matter reported by facility for 2003 air emissions.

Fugitive Emission Summary Table

Company	Reported Fugitive Emissions (tons)	Generating Capacity (MW)	Tons of Emission/MW x 10^2
Alliant			
Columbia	87.5	1050	8.3
Nelson Dewey	0 (no coal combusted in 2003	226	0
Rock River	0 (coal combustion?)	150	0
Edgewater	0	818	0
Wisc. Pub. Service			
JP Pulliam	94.2	407	23
Weston	66.1	477.6	13.8
Mid- America Power			
E.J. Stoneman	0	No data found	0
WE Energy			
Pleasant Praire	11.2	1200	0.9
Oak Creek	31.1	1135	2.7
Valley	8.3	281	2.9
Port Washington	0	322	0
Milwaukee Cty	0	11	0
Dairyland			
Alma	0	207	0
Genoa	0	377	0
Manitowoc Pub. Utility			
701 Columbus St.	0.23	71	0.3
M G & E			
Blount St	14.51	122	11.9

Menasha Elec & Water			
River St	0	23	0
Xcel Energy			
Bayfront	0	74	0
UW			
Charter St	0	3.7	0

This table shows a large inconsistency regarding the reporting of fugitive emissions from these facilities.

In an effort to make this reporting consistent and to assist coal burning facilities to meet coal burning compliance requirements under NR 445.10, Wis. Adm. Code, DNR completed a review of existing literature for calculation of coal pile particulate matter and ash handling emissions. Based on this review, DNR believes fugitive particulate emissions from coal burning facilities can be generated by up to seven different processes. If applicable, these emission sources should be included in the facility's annual air emission inventory report:

- Any coal material transfer operation that is totally enclosed and vents to a bag house
- Any coal unloading operation that is not enclosed
- Coal pile wind erosion
- Coal pile maintenance
- Ash loading to enclosed trucks
- Ash loading to open trucks
- Cooling Towers. Cooling towers emit particulate matter through the evaporation of solids in the water and these solids are then blown out of the cooling tower into the atmosphere.

DNR also realizes that companies owning coal piles can initiate control of these emissions by watering, addition of surfactants, etc. Based on this information, DNR also noted activities that would be reduce by 50%, 75%, or 90% the particulate matter emissions. The specific emission calculation information by fugitive emission source for the seven identified fugitive emission sources is presented in the next four pages of this report.

Source / Description	Uncontrolled Emission equation /variable definition/source of Emission Factor	Variable values to be entered one time[1]	Annual input	50% Control efficiency requirements	75 % Control efficiency requirements	90 % Control efficiency requirements
<u>Any material transfer operation that is totally enclosed and vents to a baghouse</u>: Example: 1. Railcar unloading in a totally enclosed car shed 2. Crusher houses 3. Transfer stations	E = gr/dscf x ft^3 / hr x 7.14286 x 10^{-8} gr/ton x hours operated / year **variable definition**: E= emissions in tons ft^3/hr = flow rate into the baghouse gr/dscf = output of baghouse in grains per dry standard cubic feet (from stack test or vendor guarantee) **source:** Engineering calculation. Facilities may run a stack test and show lower emissions than vendor guarantee	gr/dscf = 0.010[2]. ft^3/hr =1620[3].	hours of operation	Control efficiency is already included in baghouse information		
<u>Any unloading operation that is not enclosed</u>:	$E= k(0.0032)x \frac{(U/5)^{1.3}}{(M/2)^{1.4}}$	k = 1.0 for	tons of material	Watering spray bars	N/A	N/A

[1]There are 3 class of values for the variables listed here. Values followed by a **!** have values that must be used, values followed by a **?** must have site specific values entered by the facility, values followed by a **.** are suggested default values from literature but site specific values may be entered at the discretion of the facility.

[2] Air Pollution Engineering Manual , Buomicore and Davis, Air and Waste Management Association, 1992, page 115

[3] Air Pollution Engineering Manual , Buomicore and Davis, Air and Waste Management Association, 1992, page 117. Based on Figure 3 assumed a face velocityof 3 ft/min. Assumed an opening 3 feet high and 3 feet deep. Based on this assumption the flow rate was 27 cubic feet/minute or 1620 cubic feet/hour

Example: 1. Car train car unloading in a shed that is not enclosed. 2. Coal stacking conveyor unloading to a pile 3. Ash dumping to a pile (for ash unloading to trucks see below)	x 1 ton/2000 lb. x tons of coal unloaded /year **variable definition**: E= emissions in tons k= particle size multiplier U= mean wind speed (mph) M= material moisture content (%) **source:** AP 42 section 13.2.4 equation #1	TSP ! 0.35 for PM_{10} ! U = 10.3[4]. M= 6.9 %[5].	(coal, ash) unloade d			

[4] Average wind speed derived from data from the Wis. Climatology office
[5] Moisture value of 6.9% is from Table13.2.4-1 AP-42

<u>Coal pile wind erosion</u>: These are the emission from wind blowing across the coal pile	E= A x D x 1.7 x (s/1.5)x ((365-p)/235) x (f/15) x 1 ton/2000 lb. x k **variable definition**: E= emissions in tons/year A = acres of storage pile D = days in storage pile s = silt content of the coal p = days per year with greater than 0.01 inches of precipitation f= percent of time that wind is greater than 12 mph at mean pile height k= particle size multiplier **Source:** EPA-450/3-88-008equation # 4-9	D = 365. s = 6.2%[6]. p= 115[7]. f = 34%[8]. k= 1.0 for tsp.! = 0.5 for PM_{10}!	Area in acres of the storage pile for the year	NR 445 Dust Control Plan Submitted Water applied as required during windy conditions	NR 445 Dust Control Plan Submitted Water applied during all non freezing weather so that daily application from rain is 0.01 inches or from watering at a rate of 275 gallons per acres	NR 445 Dust Control Plan Submitted Water applied during all non freezing weather so that daily application from rain is 0.01 inches or from watering at a rate of 275 gallons per acres Surfactant or other chemical binder added for all coal that will be in storage during freezing weather or 4 sided enclosure with wall heights equal to or greater than height of the pile

[6] Silt value of 6.2% is from Table13.2.4-1 AP-42
[7] Derived from AP-42 figure 13.2.2-1
[8] Derived from data from Wisconsin Climatology Office

<u>Coal pile maintenance:</u> Vehicle travel on the pile	$E = k \times (s/12)^a \times (W/3)^{0.45} \times V \times 1ton/2000lbs$ **variable definition**: E= emissions in tons/year k= particle size multiplier s = silt content % W = vehicle weight (tons) a = particle size correction factor V = vehicle mile traveled in the year **Source:** AP-42 –13.2.2 equation # 1a	k= 4.9 for tsp.! = 1.5 for PM_{10}! s = 6.2 %. W= 45 tons(loader weight. a= 0.7 for tsp.! = 0.9 for PM_{10}!	Vehicle mile traveled for the year	Same controls as for wind erosion	Same controls as for wind erosion	Same controls as for wind erosion
<u>Ash loading to enclosed trucks</u>: This is ash loading directly into an enclosed tanker truck	E= 0.61 lb. / ton of ash unloaded x 1ton/ 2000 lb. E= emissions in tons /year **Source:** Adapted from Fire SCC 30501626 – lime loading to an enclosed truck		Tons of ash loaded	Control is built in the emission factor since this is loading to an enclosed truck		
<u>Ash loading to open trucks</u>: This is ash loading directly into open trucks.	E= 1.5 lb. / ton of ash unloaded x 1ton/ 2000 lb. E= emissions in tons /year **Source:** Adapted from Fire SCC 30501627 – lime loading to an open truck		Tons of ash loaded yearly		If ash is wet to form a snowball then 75% control can be claimed	

Cooling Tower:	**E = g x wt x p x c x d x MWh/year x 1ton/ 2000 lb.** **variable definition**: E = emission in tons per year g= tower design flow rate (gals/MWh) wt = weight of water (lb.) p = solids in water in ppm c = number of cycles of concentration in the cooling tower (#) d = drift loss (%) **Source:** **Engineering Equation**	g = ? wt = 8.345 lb./gal ! p = ? c = ? d = ?	MWh produce d annually			

Changes to 2005 and future Air Emission Inventories

Based on information presented in tables in the last section, DNR reviewed each facility reporting coal burning emissions in 2004 and added fugitive coal sources to these facilities if they were not part of the facility's 2004 air emission inventory. The information added to those facilities is shown in the table below:

Fugitive Dust Emission Sources From Coal Handling and Storage							
Emission Source	SCC	Pollutant	EMF	EMF Unit	Fugitive Control Efficiency	Throughpu Unit	Mandatory or Optional
Transfer Operation that is not totally enclosed	30501011	PM	1.45E-03	lb/ton coal	50	Ton Coal	Mandatory
		PM10	5.06E-04	lb/ton coal	50	Ton Coal	Mandatory
Any material transfer operation that is totally enclosed and vents to a baghouse	30501008	PM	2.31E-03	lb/hours of operation	0	Hours of operation	Optional
		PM10	1.39E-03	lb/hours of operation	0	Hours of operation	Optional
Coal pile wind erosion	30501043	PM	6184.463	lb/acre	50	Acre Coal	Added
		PM10	3092.232	lb/acre	50	Acre Coal	Added
Coal pile maintenance	30501031	PM	10.43961	lb/Vehicle Mile Traveled	50	Vehicle Mile Traveled	Added
		PM10	2.800411	lb/Vehicle Mile Traveled	50	Vehicle Mile Traveled	Added
Ash loading to enclosed trucks:	30700123	PM	6.10E-01	lb/ton ash	0	ton ash	Optional
		PM10	3.66E-01	lb/ton ash	0	ton ash	Optional
Ash loading to open trucks:	30700124	PM	1.5	lb/ton ash	0	ton ash	Added
		PM10	0.9	lb/ton ash	0	ton ash	Added
Cooling Tower:	30600701	PM	formula	lb/million gallons cooling water	0	million gallons cooling water	Optional
		PM10	formula	lb/million gallons cooling water	0	million gallons cooling water	Optional

DNR added information from the table with yellow highlighting and the word "added" in the furthest right column of this table for facilities that had not reported this information for 2005 and future emission inventories.

Summary

DNR completed two analyses of data from coal burning facilities. The first analysis compared reporting of particulate matter emissions from facilities in which stack test information was used to calculate air emissions versus USEPA emission factors. The second analysis reviewed the reporting of fugitive particulate matter emission sources. For both the stationary point sources and the fugitive particulate matter sources, large inconsistencies in reported emissions occurred were identified. In order to resolve these reporting inconsistencies statewide DNR proposes:

- Substitute stack test information for USEPA AP42 emission factors when the data has been quality assured and approved by DNR. The emission factors developed from the stack test should include the front-half and back-half catches of particulate matter.

- For companies not reporting fugitive particulate matter emitting sources, add up to seven sources to the facility's emission inventory that account for coal pile, ash handling, and cooling tower emissions. Assign 50%, 75%, or 90% control efficiency for some of these fugitive particulate matter emission sources depending on practices used by the company to reduce fugitive particulate matter emissions at the facility.