

# **Georgia Department of Natural Resources**

**Environmental Protection Division • Air Protection Branch**

**4244 International Parkway • Suite 120 • Atlanta • Georgia 30354**

404/363-7000 • Fax: 404/363-7100

Judson H. Turner, Director

## **MEMORANDUM**

**DATE:** 1-29-2013

**TO:** Eric Cornwell- Stationary Source Permitting Manager

**FROM:** Manny Patel- VOC unit Manager

**SUBJECT:** Emission factors for Wood Pellet Manufacturing

### **BACKGROUND:**

We are seeing a lot of wood pellet manufacturing application being submitted to GAEPD. These applications are all using different emission factors. It is GAEPD's desire to provide standardized emission factors for applicant's to use in wood pellet manufacturing application. This will make the applications consistent and aide in faster review of these applications.

GAEPD has done extensive testing at Georgia Biomass and have come to conclusion that in addition to dryers there a significant amount of VOC emissions from Hammermill, Pellet Coolers and storage and handling from wood pellet manufacturing operations.

### **BASIS OF RECOMMENDATION:**

#### **1. VOC Emissions:**

##### **a. Dryers:**

It is our understanding that from the applications submitted to us that the operating temperatures of the dryer's used in pellet mill are very similar to that of particle board dryers. Additionally, the moisture content of the chips entering and exiting the pellet mill dryer and green particle board dryers are very similar. Hence, VOC emissions from the pellet mill dryers are same in amount and characteristics of particle board dryers.

This approach was further validated when we took VOC emissions test from Georgia Biomass (May 2012, Agri Products Thomasville, GA (March 22, 2010), Agri products Fitzgerald, GA(March 19 2009), Telfair Products, Lumber City GA(August 27,2009) and compared to that of particle board dryer emissions factors from AP-42 for green wood as shown in the attached Table. Based on the comparison of different VOC emission factors we concluded that the particleboard dryers VOC emission factors from AP-42 Chapter 10, Table 10.6.2-3(SCC 3-07-006-25) are a good representation for the wood pellet dryers.

##### **b. Hammermill, Pellet Cooler and Storage and Handling**

The VOC emission factors for Hammermill, Pellet Cooler and storage were taken from May 16, 2012 testing for Georgia Biomass. This is the only current data we have so we suggest using these until more test becomes available.

**2. HAP and HCl Emissions:**

**a. Dryers:**

The emission of Formaldehyde, Acetaldehyde and Methanol from Georgia Biomass test (May 16,2012) were compared to emissions from Particle board dryers from AP-42 Chapter 10, Table 10.6.2-3(SCC 3-07-006-25) and OSB dryes from AP-42 Chapter 10, Table 10.6.1-3(SCC3-07-010-09). All of these emission factors are almost identical to each other. Hence it is suggested that HAP emission factors for Particle board dryer from AP-42 Chapter 10, Table 10.6.2-3(SCC 3-07-006-25) be used for Formaldehdye, acetaldehyde and methanol and adjusted where deemed necessary for worst case emissions.

HCl emissions from AP-42 Chapter 1, Table 1.6-3 for wood residue combustion should be used for estimating HCl emissions from wood pellet dryers.

**b. Hammermill, Pellet Cooler and Storage and Handling**

Georgia Biomass has performed HAP testing on the pellet cooler exhaust. We estimated the HAP emissions from the Hammermill and storage areas by taking the ratio of the VOC emissions from pellet cooler to hammer mill and storage areas and applied the same ratio to estimate HAP emissions.

**3. NOX and CO and PM emissions:**

**a. Dryers:**

Both NO<sub>x</sub> and CO are temperature dependent. OSB dryer operate at lower temperature and hence generate more CO and less NO<sub>x</sub>. While particle board dryers operate at higher temperature and hence generate less CO and more NO<sub>x</sub>. Hence, a worst case emission from both data sources is recommended for CO and NO<sub>x</sub>.

NO<sub>x</sub> emission factor from AP-42 Chapter 10 Table 10.6.2-2 for particleboard dryer (SCC3-07-007-08) should be used.

CO emission factor from AP-42 Chapter 10 Table 10.6.1-2 for OSB dryer (SCC3-07-0010-09) should be used.

**b. PM Total and Condensibile:**

PM total and condensibile should be calculated by using AP-42 Chapter 6, Table 10.6.2-1 for Particle board dryer (SCC 3-07-006-25).

GAEPD RECOMMENDED EMISSION FACTORS FOR WOOD PELLET MANUFACTURING

Emission Source	Uncontrolled Emission Factor	Basis of Emission factor	Control Device
Rotary Dryer Direct wood fired processing green softwood	6.0 lb/ODT for VOC	AP-42 Table 10.6.2-3 SCC 3-07-006-25 (Adjusted)	If emissions are routed to the dryer with WESP/RTO controls use 95% DRE for VOC and HAP
	5.3 lb/ODT for CO	AP-42 Table 10.6.1-2 SCC3-07-010-09	
	2.7 lb/ODT for NOx	AP-42 Table 10.6.2-2 SCC 3-07-006-25	
	2.2 lb/ODT for PM total	AP-42 Table 10.6.2-1 SCC 3-07-006-25	
	1.1 lb/ODT for PM Condensable	AP-42 Table 10.6.2-1 SCC 3-07-006-25	
	0.11 lb/ODT for Acetaldehyde	AP-42 Table 10.6.2-3 SCC 3-07-006-25 (Adjusted)	
	0.14 lb/ODT for Formaldehyde	AP-42 Table 10.6.2-3 SCC 3-07-006-25	
	0.11 lb/ODT ton for Methanol	AP-42 Table 10.6.2-3 SCC 3-07-006-25	If WESP is used for PM control use 70% removal efficiency for HCl (pH of the water needs to be monitored and maintained)
	1.9 E-02 lb/MM Btu for HCl	AP-42 Table 1.6-3	
Hammermill	2.5 lb VOC/ton product	Georgia Biomass Testing	If emissions are routed to dryer 90 % DRE for VOC and HAP
	0.004 lb/ton of product for Acetaldehyde	Georgia Biomass- prorated from Pellet Cooler testing	
	0.008 lb/ton of product for Formaldehyde	Georgia Biomass-prorated from Pellet Cooler testing	If emissions are routed to RTO use 95 % DRE for VOC and HAP.
	0.004 lb/ton for Methanol	Georgia Biomass-prorated from Pellet Cooler testing	

Emission Source	Uncontrolled Emission Factor	Basis of Emission factor	Control Device
Pelletizer/Pellet Cooler (without Steam injection or extraction)	0.5 lb VOC/ton of Product	Georgia Biomass Testing	If emissions are routed to dryer 90 % DRE for VOC and HAP
	0.001 lb/ton of product for Acetaldehyde	Georgia Biomass Testing	
	0.002 lb/ton of product for Formaldehyde	Georgia Biomass Testing	If emissions are routed to RTO use 95 % DRE for VOC and HAP.
	0.001 lb/ton of product for Methanol	Georgia Biomass Testing	
Pelletizer/Pellet Cooler (with Steam injection)	1.3 lb VOC/ton of product	Georgia Biomass Testing	If emissions are routed to dryer 90 % DRE for VOC and HAP
	0.002 lb/ton of product for Acetaldehyde	Georgia Biomass- prorated from Pellet Cooler testing	
	0.004 lb/ton of product for Formaldehyde	Georgia Biomass- prorated from Pellet Cooler testing	If emissions are routed to RTO use 95 % DRE for VOC and HAP.
	0.002 lb/ton of product for Methanol	Georgia Biomass- prorated from Pellet Cooler testing	
Storage/Handling	0.4 lb VOC/ton of product	Georgia Biomass Testing	If emissions are routed to dryer 90 % DRE for VOC and HAP
	0.001 lb/ton of product for Acetaldehyde	Georgia Biomass- prorated from Pellet Cooler testing	
	0.002 lb/ton of product for Formaldehyde	Georgia Biomass- prorated from Pellet Cooler testing	If emissions are routed to RTO use 95 % DRE for VOC and HAP
	0.001 lb/ton of product for Methanol	Georgia Biomass- prorated from Pellet Cooler testing	

Note: These are GAEPD recommended emission factors. Use of these emission factors does not guarantee compliance with all state and federal regulations