SAMPLE EMISSION CALCULATIONS

FOR

DRY BULK FERTILIZER HANDLING OPERATIONS

The following emission calculations are provided only as an example. These calculations are based on typical equipment and bulk materials utilized at dry bulk fertilizer handling operations. Any emission calculations that are submitted to the TCEQ should include any assumptions and references for all emission factors used and samples of all emission calculations performed. The following steps should be taken when calculating emissions from a dry bulk fertilizer handling facility.

Step 1: The applicant should identify all emission points located at the bulk fertilizer handling facility. Normally, these emission points are limited to receiving areas, mixing and handling areas, and loadout areas.

Step 2: Once the emission points have been identified, the applicant should list all fertilizer material types received at the facility. In addition, all hourly and annual receiving throughput rates for these material types should be provided. Hourly receiving throughput rates for each receiving pit/area can be determined by the maximum number of truck and/or railcar loads that can be unloaded in one hour. Annual receiving throughput rates can be estimated on the annual usage of each material type. This estimation of receiving throughput rates should be conducted for all material types.

Step 3: The applicant should determine the maximum amount of dry fertilizer mixes that could be completed in a one hour period. The amount of each fertilizer material type should be identified as well as the maximum capacity of the mixer/blender. Any movement of fertilizer materials by front-end loaders and any drop points (i.e. drop of fertilizer materials into open storage bins, etc.) should also be quantified. The maximum amount of material that can be transferred in one hour from various points at the facility by front-end loader or by conveyor and drop spout (excluding the final loadout areas) should be determined.

Step 4: All hourly and annual loadout throughput rates for the fertilizer material types/blends should also be provided. Hourly loadout throughput rates for each loadout area can be determined by the maximum number of truck and/or railcar loads that can be loaded out in a one hour period. Annual loadout throughput rates are estimated on the annual usage of each material type.

Step 5: A fan chart should be created for all proposed abatement devices. The fan chart should include the emission point number, it's purpose (i.e. pneumatic receiving, truck loadout, etc.), type of control device (i.e. bagfilter, cyclone, etc.), and average and maximum air flow rates (dscfm).

Step 6: Estimate the hourly and annual emission rates for each emission point. All emission rates should be based on the maximum hourly and annual throughput capacity for that particular emission point. In addition, any control efficiencies used to reduce the emissions from an emission point should be justified and provided in the emission calculations.

EXAMPLE CALCULATIONS

Emission Points

Emission Point No. 1: Railcar Receiving Operations

Emission Point Nos. 2 & 3: Mixing/Handling Operations

Emission Point No. 4: Truck Loadout Operations

Fertilizer Materials Received at Railcar Receiving Area

Fertilizer Materials	Tons/ RRcar	RRcars/ Hr	Max. Hrly Rail Rec. (TPH)	Max. Ann. Rail Rec. (TPY)
Urea	200	1	75	4,000
Zinc Oxide	200	1	75	4,000
Ammonium Sulphate	200	1	75	4,000
Totals:				12,000

Fertilizer Materials Mixed and Handled in Storage/Handling Building

Emission Point No.	Purpose	Max. Hrly Handling (TPH)	Max. Ann. Handling (TPY)
2	Drop from overhead conveyor to open storage bins	25	6,000
3	Transfer of materials by front-end loader	25	6,000
Totals:		50	12,000

Fan Chart

Emission Point No.	Purpose	Control Device	Max. Flowrate	Avg. Flowrate
4	Loadout Area	Baghouse	2,500 (dscfm)	2,000 (dscfm)

EMISSION CALCULATIONS FOR RAILCAR RECEIVING

1. RAILCAR RECEIVING OPERATIONS:

- Assume that only one type of fertilizer material is received at a time.
- Assume that the auger which transfers material from the receiving pad has a maximum hourly capacity of 75 tons.
- Assume choke feeding will reduce emissions by 90%.
- Assume emissions from the receiving of fertilizer materials will be PM_{10} or smaller.

Hourly:

$$PM_{10} = 75 \frac{\text{tons}}{\text{hr}} \times 0.02 \frac{\text{lb}}{\text{ton}}^{(a)} \times (1\text{-}.90)^{(b)} = \mathbf{0.15\ \underline{lbs}}\ \mathbf{hr}$$

Annual:

Total all fertilizer materials that will be received through the railcar receiving area per year.

Total Material Received = 4,000 tons/yr + 4,000 tons/yr + 4,000 tons/yr

= 12,000 tons/yr

$$PM_{10} = 12{,}000 \frac{\text{tons}}{\text{yr}} \times 0.02 \frac{\text{lb}}{\text{ton}}^{(a)} \times (1\text{-}.90)^{(b)} \times \frac{1\ \text{ton}}{2000\ \text{lbs}} = \mathbf{0.01\ \underline{lbs}}\ \mathbf{yr}$$

2 & 3 MIXING/HANDLING OPERATIONS

- Assume the conveyor that transfers received materials into individual open storage bins can transfer a maximum of 25 tons in a one hour period.
- Assume front-end loaders can transfer a maximum of 25 tons in a one hour period from the storage bins to the mixer/blender.
- Assume materials can be dropped into the open storage bins and be transferred by front-end loader simultaneously; therefore, the maximum hourly throughputs from each of these operations should be combined when calculating emissions.
- Assume that since the storage/handling building is not totally enclosed, no control efficiency will be applied for the transfer operations conducted by conveyor or front-end loader.
- Assume that since the mixer/blender room is totally enclosed and the mixer is not open to the atmosphere during the blending process, there will be no emissions from the mixing process.

Hourly:

25 tons/hr + 25 tons/hr = 50 tons/hr

PM_{10} = 50 $\frac{\text{tons}}{\text{hr}}$ x 0.02 $\frac{\text{lbs}}{\text{ton}}$[(a)] = **1.00 $\frac{\textbf{lb}}{\textbf{hr}}$**

Annual:

Total all fertilizer materials that will be handled by conveyor or front-end loader in the storage/handling building.

Total Materials Handled = 6,000 tons/yr + 6,000 tons/yr

= 12,000 tons/yr

PM_{10} = 12,000 $\frac{\text{tons}}{\text{yr}}$ x 0.02 $\frac{\text{lbs}}{\text{ton}}$[(a)] x $\frac{1 \text{ ton}}{2000 \text{ lbs}}$ = **0.12 $\frac{\textbf{tons}}{\textbf{yr}}$**

4. TRUCK LOADOUT:

- Assume that no more than one truck will loadout at a time.
- Assume that the maximum hourly capacity of the loadout spout is 50 tons.
- Assume that since the truck loadout area is enclosed, with suction being pulled, and the doors are closed while receiving fertilizer materials that this emission point will not have any fugitive emissions. The only emissions from this point will be point source emissions from the truck loadout bagfilter system.
- Assume emissions from the bagfilter will be PM_{10} or smaller.

Hourly:

PM_{10} = 0.01 $\frac{\text{gr}}{\text{dscf}}$[(c)] x 2,000 $\frac{\text{dscf}}{\text{min}}$ x $\frac{\text{lb}}{7000 \text{ grains}}$ x 60 $\frac{\text{min}}{\text{hr}}$ = **0.17 $\frac{\textbf{lbs}}{\textbf{hr}}$**

Annual:

Total all materials that will be loaded out. The assumption can be made that all materials received will be loaded out.

Total Materials Loaded Out =4,000 tons/yr + 4,000 tons/yr + 4,000 tons/yr

= 12,000 tons/yr

PM_{10} = 0.17 $\frac{\text{lbs}}{\text{hr}}$ x 12,000 $\frac{\text{tons}}{\text{yr}}$ ÷ 50 $\frac{\text{tons}}{\text{hr}}$ x $\frac{1 \text{ ton}}{2000 \text{ lbs}}$ = **0.02 $\frac{\textbf{tons}}{\textbf{yr}}$**

References: (all assumptions should be justified and references should be provided where applicable)

(a) EPA Criteria Pollutant Emission Factors for the 1985 NAPAP Emissions Inventory, Bulk Loading of Urea, May 1987, pg. 46.

(b) Accepted efficiencies given for certain control devices/measures that minimize <u>fugitive emissions only</u> (Not to be utilized on point sources). Any other control efficiencies should be well justified and submitted with references if possible. These include:

Enclosed receiving or loadout area with doors and/or flexible strips (canvas or plastic) and suction being pulled = 100%.
Enclosed receiving or loadout area with no suction = 90%
Choke feeding on receiving operations = 90%
Mineral oil application = 90%

(c) AP-40, Air Pollution Engineering Manual, Air and Waste Management Association, 1991, pg 115. "Well designed and operated baghouses have been shown to be capable of reducing overall particulate emissions to less than 0.01 gr/dscf"...."in some cases as low as 0.01 - 0.005 gr/dscf".