Texas Commission on Environmental Quality
Air Permits Division

New Source Review (NSR) Emission Calculations

This information is maintained by the Chemical NSR Section and is subject to change. Last update was made **October 2006**. These emission calculations represent current NSR guidelines and are provided for informational purposes only. The emission calculations are subject to change based on TCEQ case by case evaluation. Please contact the appropriate Chemical NSR Section management if there are questions related to the emission calculations.

Polyethylene and Polypropylene Manufacturing Sample Calculations

For control using combustion devices, the VOC emissions are determined using the control efficiency of the unit on the stream being controlled, with the uncombusted fuel source (VOC fraction) also included. Emissions of the other products of combustion (CO, NO_x, particulate, and SO_2 if the fuel source contains sulfur) are calculated using test or vendor data. If these sources are unavailable, AP-42 natural gas combustion factors (found in Chapter 1 of that document) or TCEQ flare factors (found in *Technical Guidance Package for Chemical Sources, Flares and Vapor Oxidizers*) may be used, as applicable. Calculations for VOC emissions from the control device, fugitive emissions, cooling water emissions, and tank emissions are not included here; these can be found in the technical guidance packages cited in Chapter 2.

Emissions from streams with low concentrations of VOC that do not allow for accurate continuous monitoring may be estimated by using the "VOC head-space" (or equivalent) test to determine the amount of residual VOC in the polymer at that point in the process. For example, if the product polymer has a residence time of 24 hours in the storage silos, the emissions from each pound of polymer may be determined using this test. The emissions then can be stated as the production rate times the VOCs emitted per pound of polymer as determined by the test. A similar method may be used for other emission points. It is likely that any permits issued will require periodic testing of this type to ensure that the differing product types do not violate the maximum allowable emission rate in the permit. An example is shown below:

Example 1 - Calculation of VOC Emissions Using Head-Space Test

VOC head-space sampling (annual average) from an existing polyethylene unit showed the following results (samples taken just before each emission point):

at extruder/dryer	72 ppmw VOC
at silo	51 ppmw VOC
before loading	8 ppmw VOC

The existing and proposed facility (500 MMlb./yr) are similar and only three emission points are venting to atmosphere (extruder, silo, loading). The annual VOC emissions are estimated to be:

extruder/dryer:

$$\left(\frac{500\,MMlb}{yr}\right)\left([72-51]\,ppm\right)\left(10^{-6}\right)\left(\frac{1ton}{2000lb}\right)=5.25TPY$$

silo:

$$\left(\frac{500\,MMlb}{yr}\right)\left([51-8]\,ppm\right)\left(10^{-6}\right)\left(\frac{1ton}{2000lb}\right)=10.75TPY$$

loading:

$$\left(\frac{500\,MMlb}{yr}\right)\left(8\,ppm\right)\left(10^{-6}\right)\left(\frac{1ton}{2000lb}\right)=2\ TPY$$

The loading estimate is very conservative because it assumes that the vessel being loaded vents to the atmosphere at the plant site for a prolonged period. The VOC emissions could also be speciated, if off-site impacts are a concern, with the diluent and monomer expected to be the major species. Sampling on the existing unit showed the maximums of VOC concentration measured throughout the year for each sample point were as much as 30 percent higher than the figures above. In addition, the maximum hourly production rate for the proposed unit could be up to 20 percent greater than the annualized average. The maximum hourly emissions are therefore:

extruder/dryer:

$$\left(\frac{5.25ton}{yr}\right)\left(\frac{2000lb}{ton}\right)\left(\frac{year}{8760hr}\right)\left(1.3\right)\left(1.2\right)=1.87\ lb/hr$$

The silo and loading emissions would be 3.83 and 0.71 lb./hr respectively.

Example 2 - Calculation of Particulate Emissions

The loading particulate emissions are controlled by fabric filters guaranteed to reduce the particulate emissions to less than 0.01 grain/scf. The vent gas to the control device during loading is expected to be a maximum of 6800 scfm. Hourly particulate emissions are determined to be:

$$\left(\frac{6800\,scf}{\min}\right)\left(\frac{60\min}{hr}\right)\left(\frac{0.01\,grain}{scf}\right)\left(\frac{lb}{7000\,grain}\right)=0.58lb/hr$$

Loading at this spot will occur no more than eight hours per day so the annual emissions are:

$$\left(\frac{0.58lb}{hr}\right)\left(\frac{ton}{2000lb}\right)\left(\frac{8760hr}{yr}\right)\left(\frac{8}{24}\right)=0.85TPY$$