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 **September 2014**. 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.

Carbon Adsorption System Calculations

Inlet concentration

The inlet concentration to the carbon adsorption system can be calculated based on the flow rate and emission rate for the source to be controlled. These rates should be calculated using the method appropriate to the source (i.e. storage tank, process vent, tank truck, etc.).

Outlet concentration

The outlet concentration should be based on the inlet concentration, flow rate, relative humidity and adsorption isotherm of the carbon, etc. It is dependent on a number of variables specific to the carbon system, type of carbon used and the compound(s) being controlled. The carbon vendor can supply the expected outlet concentration for a specific compound when supplied with the inlet concentration, flow rate, type of carbon to be used and temperature of the stream to be controlled. The expected outlet concentrations will be used to set a breakthrough concentration for the carbon adsorption system.

Emission rate

The short-term emission rate can be back calculated from the outlet concentration and the flow rate of the exit stream as follows:

$$lb/hr = (outlet\ concentration)(flow\ rate)\left(\frac{mole}{scf}\right)(MW)\left(\frac{\min}{hr}\right)$$

where: outlet concentration = parts per million
flow rate = standard cubic feet per minute
$\left(\frac{mole}{scf}\right) = 359\frac{ft^3}{lb\ mole}$ at 492°R, 1 atmMW = molecular weight

For a regenerative system controlling gasoline the emission rate would be:

$$lb/hr = \left(\frac{0.04 - 0.09\ lb}{1000\ gallons\ loaded}\right)\left(\frac{gallons\ loaded}{hr}\right)$$

Example 1

A CAS will remove methylene chloride from a 300 actual cubic feet per minute air stream at 90°F. The vendor represents an outlet concentration of 10 ppmv.

Breakthrough will be set at 10 ppmv. The short-term emission rate will be:

$$\left(\frac{10\ ppm}{10^6}\right)\left(\frac{300\ ft^3}{\min}\right)\left(\frac{1\ lb\ mole}{359\ ft^3}\right)\left(\frac{84.93\ lb}{lb\ mole}\right)\left(\frac{60\ \min}{hr}\right)\left(\frac{492^o\ R}{550^o\ R}\right) = 0.038\ lb/hr$$

Example 2

A fuel terminal loads 25,000 gallons per hour of gasoline through a loading rack controlled by a regenerative CAS.

The short-term emission rate will be:

$$\left(\frac{0.09\ lbs}{1000\ gals\ loaded}\right)\left(\frac{25000\ gals}{hr}\right) = 2.25\ lb/hr$$

The annual emission rate will be:

$$\left(\frac{lb}{hr}\right)\left(\frac{hours\ loaded}{year}\right)\left(\frac{1\ ton}{2000\ lb}\right) = ton/yr$$

Or

$$\left(\frac{0.04 - 0.09\ lb}{1000\ gals\ loaded}\right)\left(\frac{gals\ loaded}{year}\right)\left(\frac{1\ ton}{2000\ lb}\right) = ton/year$$

Information used in the emission calculation, such as flow rates, temperatures, compounds controlled, number of beds and regeneration time per time, should correspond to the information contained on the TCEQ Table 15 (Adsorbers).