Emission/Operational Limitations

The construction permit engineer is responsible for the approvable of all emission estimates that are used in ambient air quality impact analyses within the State of Missouri. All emission estimates should be based upon the use of maximum, ***hourly*** emissions or federally enforceable limits (for existing sources) contained within construction permits, operating permits or other enforceable mechanisms such as consent decrees, state requirements, or federal requirements. In the absence of limits, potential to emit calculations should be used to determine compliance with each applicable air quality standard and averaging time.

When determining hourly emission estimates, it is important to understand the processes that are occurring and what conditions result in the worst case ambient impact. A detailed discussion on the calculation of potential to emit is contained within the document entitled, "Discussion of Potential to Emit," located on the Air Construction Permits Guidance website. As noted in this document, hourly potential to emit calculations should be based upon the maximum design capacity of the equipment being modeled with consideration of reductions that occur due to the installation of control devices and/or other voluntary operational limits. When determining an allowable emission rate for inclusion into an ambient air quality impact analysis, the applicant must determine if any of the following conditions apply:

Fuel Type

When calculating pollutant emissions from a source that is capable of combusting multiple fuel types, the applicant must consider which fuel results in the worst case, hourly emission rate. Depending on the pollutant being considered, the primary fuel may not result in the maximum hourly design rate. For example, the emission estimates for a boiler that primarily combusts natural gas with a fuel oil backup may result in the worst case sulfur dioxide (SO_2) emissions while combusting fuel oil and the worst case oxide of nitrogen (NO_x) emissions while combusting natural gas. The model compliance determination for SO_2 should be conducted using the worst case fuel oil emission rate while the NO_x model compliance determination should be conducted using the worst case natural gas emission rate.

Operational Loads

A load analysis is required for each piece of equipment that operates at levels which are significantly less than the design capacity. When equipment is operated at a reduced capacity, differences in the emission rate and stack parameters can result and may lead to higher ground level concentrations. In order to determine the worst case operating scenario, the applicant should consider differing load scenarios. The operating loads will differ according to the equipment design. An example of a facility that may be required to evaluate varying loads is a coal fired boiler or a combustion turbine that is used for peaking purposes. In these instances, the applicant might consider the following boiler loads when modeling: 100%, 75% and 50%.

Bypass Stacks

In some instances, an emission unit may be equipped with a bypass stack that allows the emissions to be directly vented to the atmosphere rather than passing through a control device prior to exhausting through the primary stack. Bypass stacks allow facilities the opportunity to continue operations during maintenance periods on control equipment such as scrubbers,

thermal oxidizers, etc. The potential to emit must reflect bypass conditions in the air quality analysis. Limitations may be applied using scaling factors within the air quality model if bypass usage is a scheduled event that occurs during the same hourly window.

Hourly Variability/Emissions Spikes

Facilities that operate fluctuating emission sources must consider spikes in hourly concentrations when calculating the potential to emit for modeling purposes. For example, a facility that is combusting coal may experience spikes in the amount of SO_2 that is being emitted because the amount of sulfur in the fuel is variable. For a short-term standard, such as the 1-hour SO_2 standard, the maximum hourly rate must be modeled.

Start-up/Shutdown

The Clean Air Act does not provide any provisions that would allow state or local agencies to exempt emissions that occur during start-up or shutdown of a piece of equipment. Emission estimates should account for any spikes that may result during this time period. For questions on start-up and/or shutdown, please contact the department's Air Pollution Control Program at (573)751-4817.

In addition to the restriction of emissions due to the installation of control devices, a facility can apply other operational limits in the construction permit application. Any emission limit applied to the new source or modification must be clearly described and must include a detailed account of all assumptions used in the calculation of the emission estimates. ***Any limits that are noted will become a special condition within the construction permit.*** When applying emission limitations within the model input file, several methods can be used as described below:

AERMOD Scaling Factors

The AERMOD dispersion model allows the user to specify variable emission rate factors to account for restricted hours of operation for one or more sources at a facility. The scaling factors can be used under a variety of circumstances and can be applied to a single source, multiple sources or the entire facility. The scaling factors are characterized in the source pathway of the modeling system through the use of the EMISFACT keyword. Several options are available as summarized below:

- Season-Emission rates vary seasonally (n=4),
  - Winter-December, January and February,
  - Spring-March, April and May,
  - Summer-June, July and August,
  - Fall-September, October and November.
- Month-Emission rates vary monthly (n = 12),
  - January,
  - February,
  - March, etc.

- HROFDY-Emission rates vary by hour of day (n = 24),
    - Hour 1 (time period ending at 1:00 a.m.),
    - Hour 2 (time period ending at 2:00 a.m.),
    - . . .
    - Hour 24 (time period ending at midnight).
- WSPEED-Emission rates vary by wind speed (n = 6),
    - Wind speed categories can be defined using the WINDCATS keyword or through the selection of default wind speed categories,
        - Default Wind Speed Categories,
            - 1.54 meters per second,
            - 3.09 meters per second,
            - 5.14 meters per second,
            - 8.23 meters per second, and
            - 10.8 meters per second.
- SEASHR-Emission rates vary by season and hour of day (n = 96),
- SHRDOW-Emission rates vary by season, hour of day and day of week (n = 288),
    - Monday-Friday,
    - Saturday, and
    - Sunday.
- SHRDOW7-Emission rates vary by season, hour of day and the seven days of the week (n= 672).
    - Monday,
    - Tuesday,
    - Wednesday,
    - Thursday,
    - Friday,
    - Saturday, and
    - Sunday.

The syntax and the format are important when defining limits using the scaling factors within AERMOD through the use of the EMISFACT keyword. Each keyword is followed by a series of values that represent the first time block within the period being considered. The emission rate for each time step is adjusted by multiplying the scaling factor by the appropriate value. For example, if the facility does not operate during a particular hour of the day, the scaling factor would be set to zero. If the facility is operating, the scaling factor is equal to a value of one. A value between zero and one may be used to denote that a source will only operate for a portion of the hour being modeled. If a facility proposes a haul road limit that would allow the facility to

receive grain from 6:00 a.m. to 7:00 p.m. the syntax of the EMISFACT keyword would be as follows:

SO EMISFACT ROAD1 HROFDY 0 0 0 0 0 0 1 1 1 1 1 1
SO EMISFACT ROAD1 HROFDY 1 1 1 1 1 1 1 0 0 0 0 0

Emission Limits for Sort-term Averaging Periods

In certain instances, a facility may not want to restrict the operation of a source to a specific time period. If this occurs, the facility can ratio the emission rate input into the air quality analysis to account for a reduced operating rate. ***IMPORTANT: The applicant must consider the averaging time of the pollutant being considered!*** It is not appropriate to scale an hourly emission rate for a 1-hour averaging period. This method can only be applied to periods greater than one hour. For example, if a facility wants to limit a conveyor to twelve hours of operation within a 24-hour period, the applicant can ratio the hourly emission rate by a factor of 0.5. If a 1-hour standard applies, SO_2 for example, this method of restriction would not be allowed.

Emission Limits for Long-term Averaging Periods

If a facility proposes an annual emission limit or a restriction on the annual hours of operation, the emission rate input into the dispersion model can be adjusted accordingly. For example, emergency generators often limit their operating hours to 500 hours per year. This restriction can be accounted for in the compliance determination (for the annual averaging period only) as follows: Calculated emission rate X (500 Hours/8760 Hours).

It is important to note that a permit limit based upon existing stack data, BACT determinations, etc. may not demonstrate compliance. In these instances, the applicant should be aware that additional limitations within the construction permit may result in the event that modeled violations take place.