PERMITTING STARTUP, SHUTDOWN, AND MAINTENANCE EMISSIONS:

IT'S COMING...BE PREPARED! Joe Ibanez and Katie Wiley, TRICORD Consulting



1. WHY?

On May 22, 2015, the U.S. Environmental Protection Agency (EPA) issued a final action to ensure full observance of the Clean Air Act (CAA) by addressing outdated provisions in 36 state implementation plans (SIPs), particularly the use of an affirmative defense for emissions from startup, shutdown and malfunction (SSM) events.

By November 22, 2016, these states are required to correct their SIPs, which will likely require catch-up permitting to authorize emissions from planned maintenance, startup, and shutdown (MSS) activities and minimize unplanned upsets/malfunctions to the extent practicable.

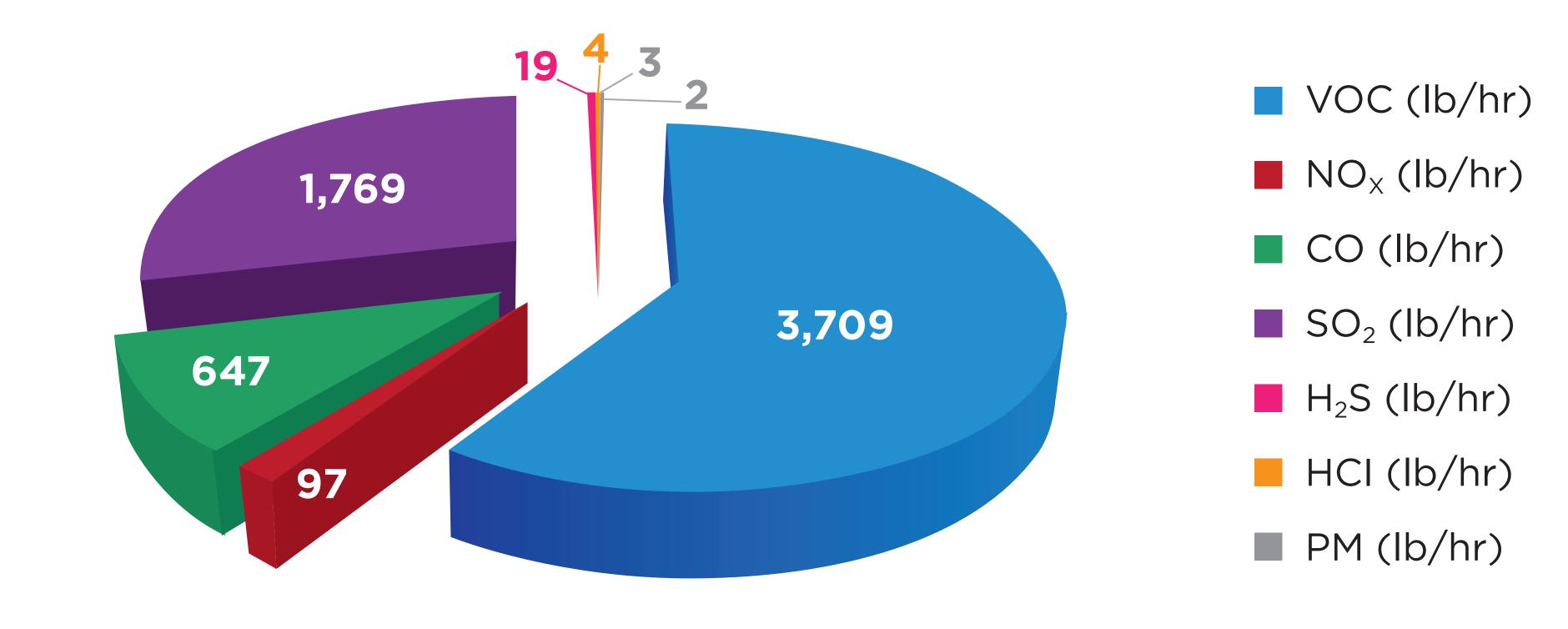
3. New Source Review Permitting

Emissions should be calculated for each step of the MSS process, mirroring activities in the field. All potential pollutants should be taken into account, including, but not limited to, VOC, CO, NO_x, SO₂, $PM/PM_{10}/PM_{25}$, benzene, ammonia (NH_3), and hydrogen sulfide (H_2S).

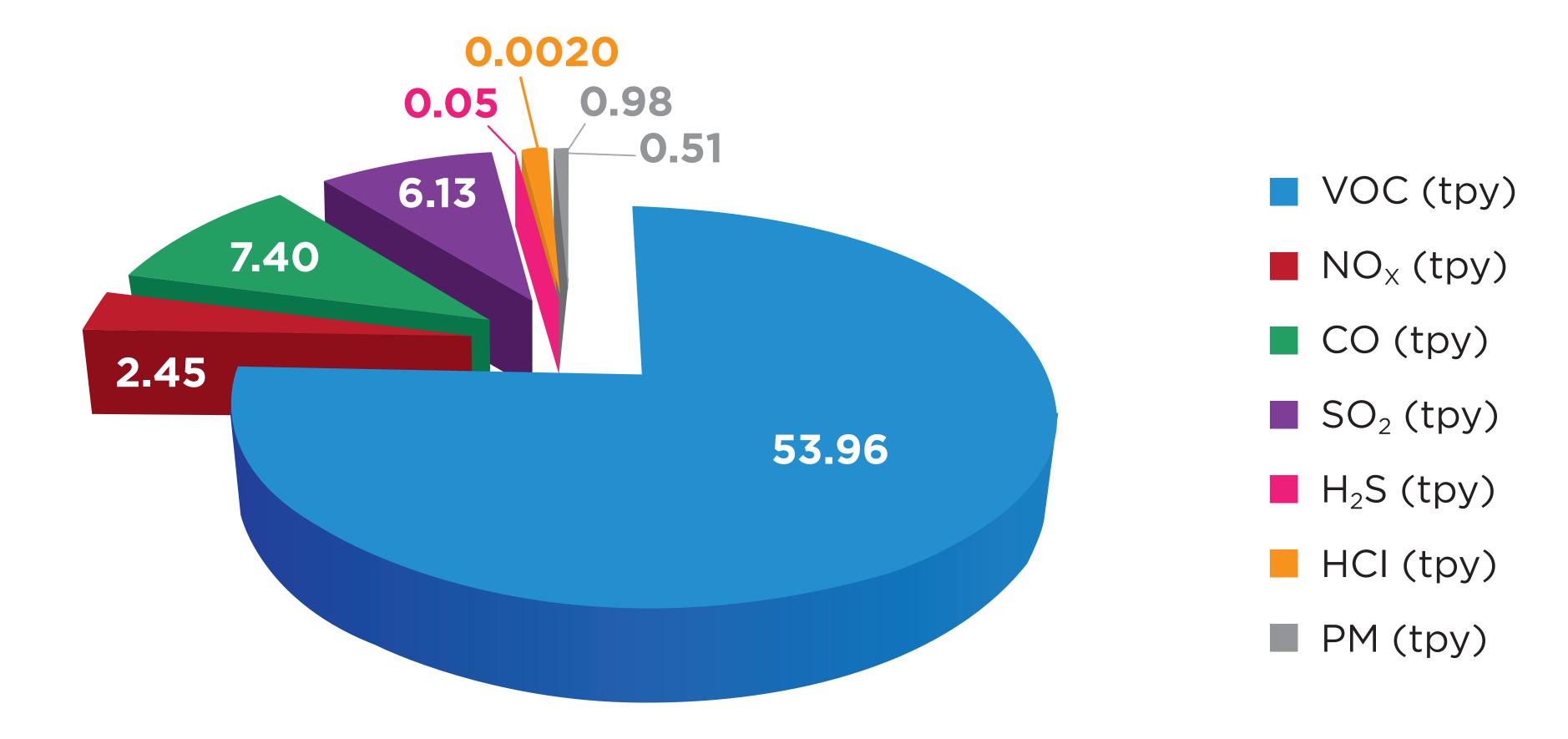
MAGNITUDE OF EMISSIONS AND FEDERAL NEW SOURCE REVIEW

Depending on operational procedures, controls, and facility size, the magnitude of emissions due to planned activities can be greater than prevention of significant deterioration (PSD) and/ or nonattainment new source review (NNSR) significance levels. The charts below provide a summary of the total MSS emissions associated with a 200,000 barrel per day refinery, by category.

MSS EMISSIONS SUMMARY - HOURLY (LB/HR)



MSS EMISSIONS SUMMARY - ANNUAL (TPY)



2. Planned MSS Activities with Emission Sources

Insignificant Maintenance Activities

Insignificant maintenance activities are small, low-emitting activities that occur on a routine basis and do not require a process unit shutdown. Examples of insignificant activities evaluated and included as part of previous permit authorizations in Texas include, but are not limited to, the following:

Examples:

- a) Process and analyzer filters/screens replacement;
- b) CEMS analyzers calibration;
- c) Process instrumentation calibration/maintenance;
- d) Carbon canister replacement (valve disconnect);
- e) Pipeline pigging;
- f) Catalyst replacement;
- g) Seal inspections and other tank inspection activities that do not require tank entry;
- h) Water washing of empty drums, totes, and other miscellaneous small equipment;
- i) Spare pump purging during startup; and
- j) Aerosol can usage.



When pigging a gas pipeline, opening the pig launcher or the pig receiver portion of the line will often emit a portion of trapped gas.

Routine Maintenance Activities

These are similar to insignificant activities because they are not usually associated with a process unit shutdown, but may be associated with higher emission rates and more rigorous calculations requirements.

PROCESS UNIT EQUIPMENT: Ancillary equipment often requires routine repair and maintenance during normal operation and does not require a process unit or plant-wide shutdown.

Examples:

- a) Pump maintenance/repair;
- b) Compressor maintenance/repair;
- c) Vessel maintenance/repair;
- d) Heat exchanger maintenance/repair;
- e) Combustion source (heater/boiler) maintenance/repair;
- f) Valve and piping replacement/repair; and
- g) Active flare line breaks.

STORAGE TANKS: Planned MSS storage tank activities are one of the larger-emitting events on a short-term basis.

Typical emission-generating steps associated with tank turnaround include the following:

- a) Standing idle (i.e., when the floating roof has landed on its legs and there is a saturated vapor space between the roof and liquid level);
- b) Cleaning (using a low-vapor pressure cleaning solution to reduce the volatile organic compound [VOC] vapor pressure in the tank);
- c) Degassing (purging tank to acceptable VOC concentration);
- d) Forced ventilation (blowing air through the tank to further reduce the VOC vapor pressure); and
- e) Refilling (filling the tank with material up to the point where the roof is refloated).



Although planned tank turnarounds are not a high-frequency activity, one tank event may generate more than 5 tons of VOC emissions.

FRAC TANKS: Emissions occur during the temporary loading and storage of materials generated from other on-site MSS activities.

VACUUM TRUCKS: Emissions are generated from the loading of material and cleaning of vacuum trucks used in support of other MSS activities (e.g., equipment cleaning, tank sludge removal).

PAINTING, BLASTING, AND DEGREASING: VOC emissions are generated during painting of equipment such as storage tanks and the opening of degreasers, and particulates are generated during sand-blasting of ancillary equipment such as piping.

TURNAROUND ACTIVITIES (STARTUP AND SHUTDOWN OF PROCESS UNITS): Routine startup and shutdown of process units can generate emissions from the emptying and degassing of large process unit vessels. After the equipment is purged and degassed to a vapor recovery or flare gas system, emissions to the atmosphere may occur from any residual liquid or vapor that remain inside the equipment when it is opened.



Flaring emissions during planned startups and shutdowns will typically be higher than emissions during normal operations. Flare emissions from unplanned events should not

BACT AND LAER EVALUATIONS

BACT and LAER evaluations for MSS activity emissions focus on best management practices (BMPs). Examples of BMPs required for MSS activities in Texas include the use of portable thermal oxidizers or other combustion devices to control storage tank degassing and positive displacement pumps or carbon canisters on vacuum trucks. These best management practice requirements come with additional costs and are considered federally enforceable.

AIR DISPERSION MODELING

If permitting MSS activity emissions trigger a full PSD permitting review, the applicant must conduct an air quality impacts analysis to ensure the emission increases associated with the project do not contribute to a violation of any applicable national ambient air quality standards (NAAQS) or PSD increment levels for criteria pollutants according to 40 CFR §52.21(k). In some states, a separate air quality impacts analysis may be required even if a federal PSD review is not triggered.

Further, if there are any environmental concerns identified by the permitting authority, an air dispersion modeling demonstration may be required to determine if ambient air monitoring is necessary. Key factors making it difficult to demonstrate compliance with the new NAAQS may include the conservatism of the EPA's guidance, high ambient background levels, lack of adequate source inventories, and air dispersion model limitations.

4. Implementation and Compliance

Similar to normal emission permits, sites with authorized planned MSS emissions will be required to demonstrate compliance with emission limits and certain permit condition requirements. The permit requirements associated with new authorized planned MSS activities may require sites to develop new procedures and change old ways of conducting planned MSS activities.

In Texas, compliance with annual emission limits is based on a rolling 12-month period. Emissions from small and routine maintenance activities can be tracked using the number of occurrences as recorded by a maintenance work orders system (e.g., SAP) and a representative emission factor consistent with the permit basis. Emissions from larger MSS activities can be calculated using more rigorous methods on an event-by-event basis and generally use engineering data from the actual event. New procedures may be developed to implement new best management practices and other means of reducing emissions during MSS activities.



At one major Texas facility, new procedures and recordkeeping forms have been developed for MSS activities that occurred onsite. Occasionally, new procedures were initially met with resistance due to additional demands in time and cost. Environmental staff conducted multiple training sessions, visited control rooms, and frequently attended planned maintenance events to provide support and maximize compliance.