

Purpose

The Missouri Department of Natural Resources' Air Pollution Control Program (air program) evaluated the potential emissions for BASF to determine what requirements are applicable under the federal Data Requirements Rule (DRR) for the 2010 SO₂ standard. The U.S. Environmental Protection Agency (EPA) published the DRR in August 2015 to establish evaluation requirements and a timetable for area designations under the 2010 standard. The criterion for source evaluation is having emitted 2,000 or more tons of SO₂ in the most recent emission year [2014]. BASF emitted 2,560 tons of SO₂ in 2014 therefore the air program included BASF for evaluation under the DRR.

Introduction

BASF is an international chemical production company based in Germany. BASF Corporation operates a plant near Palmyra, Missouri (Hannibal site) in Marion County (FID #: 127-0001). The plant manufactures pesticides and agricultural chemicals mostly by batch process. The site is separated into seven separate sections. The SO₂ emission sources currently located at the facility include four natural gas fired boilers, seventeen emergency diesel powered generators and one nonemergency diesel powered generator, four incinerators, and two natural gas fired flares. These emission sources are discussed in the following paragraphs in more detail including explanation of their potential emissions calculations.

Emissions Calculations

Boilers

In May 2015, the BASF-Hannibal site dismantled two coal fired boilers (units 4 and 5) and began operation of two natural gas fired boilers (units 6 and 7)¹. BASF-Hannibal dismantled the coal fired boilers to comply with the Major Source Boiler MACT which had a compliance date of January 31, 2016. All four boilers that BASF currently operates (unit 1, 2, 6, and 7) are fired by natural gas. The combined maximum hourly heat input for boilers 1 and 2 is 0.23 million cubic feet (MCF) per hour as reported in their annual Emissions Inventory Questionnaire (EIQ). The combined maximum hourly heat input for boilers 6 and 7 is 0.27 MCF/hour as set in construction permit #072013-001. The potential emissions were determined by multiplying the hourly heat input for the boilers by the emission factor (EF) given in the EPA document AP-42, 5th edition, "Compilation of Air Pollutant Emission Factors," Section 1.4, "Natural Gas Combustion." This was converted to tons per year assuming 8760 hours of operation per year. The cumulative potential SO₂ emissions for all four boilers combined were calculated as 1.33 tons/year.

Generators

BASF-Hannibal site has seventeen emergency diesel powered generators and one nonemergency diesel powered generator. EPA established requirements for ultra-low sulfur diesel to not exceed 15 parts per million (ppm) in 2012 for nonroad diesel fuel. The density of diesel fuel (876 kg/m³) was converted to pounds per gallon and multiplied by 0.000015 (diesel fuel sulfur content of 15 ppm) to get an emission factor of 0.0001095 lb/gallon. The heating value of the fuel is 138,000 BTU (British thermal unit)/gallon. The maximum hours of operation was considered to be 500 hours/year for the seventeen emergency generators (as is suggested by EPA in a memorandum titled "Calculating Potential to Emit (PTE) for Emergency Generators," dated September 6, 1995). For the nonemergency generator, the air program assumed operational hours of 8760 hours/year. Each generator has a listed maximum horsepower (hp). These values were multiplied and a conversion of 7000 BTU/hp*hour (given in AP-42, section 3.3) was used to convert the PTE to tons/year. The total calculated PTE for all eighteen generators equals 0.015 tons/year.

Incinerators

BASF-Hannibal site operates four incinerators; incinerators A, B, C, and D. All of the incinerators are limited to 500 parts per million by volume (ppmv) SO₂ under the federal MACT (Maximum Achievable

¹ As required in Construction Permit #072013-001.

Appendix I – BASF Potential Emission Calculation and Documentation

Control Technology) standard in 40 CFR Part 63, Subpart EEE. The maximum stack flow rates for incinerators A, B, C, and D are 21,881 dry standard cubic feet per minute (dscfm), 21,881 dscfm, 18,304 dscfm, and 15,520 dscfm, respectively. These were multiplied by 500 ppmv and the molecular weight of sulfur and converted to tons/year assuming 8760 hours of operation per year. The calculated PTE for incinerators A, B, C, and D are 477.7, 477.7, 399.6, and 338.8 tons/year, respectively.

Flares

BASF-Hannibal site has two natural gas fired backup flares. The heat input capacity of TC-03 and TC-03a are 5.3 and 17 mmBTU/hour, respectively. These numbers were then divided by the heating value of the fuel (1020 mmBTU/MCF) to calculate the maximum hourly throughput of the flares. The calculated maximum throughputs of the flares are 0.005196 MCF/hr and 0.01667 MCF/hr. The flares only operate when Incinerator D is running. When the flares are operating, they do so in pilot mode which assumes the gas consumption rate is 20% of the maximum rate. It can also be assumed that the combustion emissions of the flares are similar to that of natural gas boilers, so an emission factor of 0.6 lb/MCF (from AP-42) was used. To calculate the PTE of each flare, 20% of the throughput was multiplied by the EF and 8760 operational hours/year. Using this method, the PTE for the flares were determined to be 0.00272 and 0.00871 tons/year. However to be conservative, the air program also examined the PTE for the flares at 100% of the maximum rate. Following the same method as above, the air program has calculated the PTE for flares TC-03 and TC-03a as 0.01 and 0.04 tons/year, respectively.

Other Emission Units

There are three other units with SO₂ emissions, but no changes have been made to them in recent years so the PTE calculations have remained the same. According to construction permit #0997-003, the potential to emit for emission point PR-51 is 268 tons per year. Permits #092009-005 and #122000-003 calculated potential emissions for the remaining processes at 0.1 tons/year.

Summary

The total facility-wide potential to emit for the BASF-Hannibal site was determined to be 1963.3 tons/year. Since this is below the established threshold of 2,000 tons, the BASF-Hannibal site is no longer subject to the requirements of the DRR for area designation purposes. The area surrounding the BASF-Hannibal site will be designated by EPA with the rest of the country in December 2020.

Table 1 – Summary of Calculated Potential Emissions for BASF-Hannibal plant

| Emission Source | PTE (tons/year) |
|------------------------|------------------------|
| Boiler 1 & 2 | 0.61 |
| Boilers 6 & 7 | 0.72 |
| Incinerator A | 477.7 |
| Incinerator B | 477.7 |
| Incinerator C | 399.6 |
| Incinerator D | 338.8 |
| Diesel Generators | 0.015 |
| Flares (at 100%) | 0.057 |
| PR-51 | 268 |
| Remaining Processes | 0.1 |
| Plant Total | 1963.3 |