ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
BUREAU OF AIR
PERMIT SECTION

April 17, 2013

RESPONSES TO COMMENTS ON THE DRAFT CAAPP OPERATING PERMIT FOR THREE Z PRINTING, PRINTING FACILITY, OPERATED IN TEUTOPOLIS, ILLINOIS

SOURCE IDENTIFICATION NO.: 049811AAA
APPLICATION NO.: 95120108

I. BACKGROUND

On October 24, 2005, the Illinois EPA, Bureau of Air received a CAAPP operating permit renewal application from Three Z Printing for their printing facility in Teutopolis, Illinois.

The public comment period on the renewal to the CAAPP operating permit closed on October 20, 2012. Comments were received from USEPA, Region 5, on September 19, 2012. The Illinois EPA has prepared this document, which addresses these comments to accompany the submittal of the Proposed CAAPP Permit.

II. COMMENTS WITH RESPONSES

USEPA Comments #1:

1. The permit is not clear on how the facility will demonstrate compliance with some applicable requirements. The requirements within the sections for the "Compliance Method" do not appear to include a monitoring scheme that links compliance with the actual limits for each respective pollutant. To address, additional discussion of a correlation developed in the Statement of Basis may resolve this, or else revision of the monitoring may be necessary. Please address this comment for the following:

    a. Particulate Matter (PM) limitations for the printing lines and dryers in conditions 4.1.2.b. and 4.2.2.b., respectively. It is not clear how the source will comply with the 0.55 lb/hr PM limits.

    b. Condition 4.1.2.c.i.A., 8 lb/hr of VOM emissions. The permit contains recordkeeping requirements under condition 4.1.2.c.ii.B which would include appropriate data gathering to determine emissions on a monthly and yearly basis.

    However, it is not clear how this recordkeeping, will also serve to demonstrate compliance with the hourly limit.

    c. Nitrogen Oxide (NOx) Title 1 limits in condition 4.2.2.C. The corresponding monitoring requirements references conditions 4.2.2.(g) and (h) that includes operational and production requirements as well as work practice requirements, however, it is not clear how these conditions result in a monitoring scheme that will result in adequate demonstration of compliance with the 1.5 tons/month and 17.6 tons/year limits.

    d. Carbon Monoxide (CO) Title 1 limits in condition 4.2.2.d. Similar to the discussion above for NOx, the corresponding monitoring requirements reference conditions 4.2.2.(g) and (h), but it is not clear how the monitoring scheme will result in adequate demonstration of compliance with the 1.3 tons/month and 14.8 tons/year limits.

    e. VOM hourly and Title 1 limits in condition 4.2.2.f. Similar to the comments above for NOx and CO, the corresponding monitoring requirements reference conditions 4.2.2.(g) and (h), but it is

not clear how the monitoring scheme will result in adequate demonstration of compliance with the 8 lb/hr, the 1.3 tons/month and 14.8 tons/year limits.

IEPA Response:

According to 35 IAC 211.2850, Heatset web offset lithographic printing line means a lithographic printing line in which a blanket cylinder is used to transfer ink from a plate cylinder to a substrate continuously fed from a roll or an extension process and an oven is used to solidify the printing inks. Based on this definition and to provide clarity, section 4.1 and section 4.2 of Three Z Printing Title V Operating Permit have been consolidated into a single 4.1 section.

The requirements for the all printing presses and dryers are now addressed as follows: Opacity Requirements 4.1.2(a), Particulate Matter Requirements (PM) 4.1.2(b), Nitrogen Oxide Requirements (NOx) 4.1.2(c), Carbon Monoxide Requirements (CO) 4.1.2(d), Sulfur Dioxide Requirements (SO2) 4.1.2(e), Volatile Organic Material Requirements (VOM) 4.1.2(f), Operational and Production Requirements 4.1.2(g), and Work Practice Requirements 4.1.2(h).

1. The following responses address comments #1(a) – 1(e):

   a. 35 IAC Part 266 is not SIP approved and therefore cannot be used in the Federal Side of a CAAPP Permit. Therefore, Conditions 4.1.2.b. and 4.2.2.b. have been removed from the permit.

      Increased PM emissions may result from poor air/fuel mixing or maintenance problems. PM emissions may also result from carryover of noncombustible trace constituents in the fuel and any sulfur present in the natural gas if that source of natural gas is sour. Natural gas processing consists of separating all of the various hydrocarbons and fluids from the pure natural gas, to produce what is known as 'pipeline quality' dry natural gas. Major transportation pipelines usually impose restrictions on the make-up of the natural gas that is allowed into the pipeline. That means that before the natural gas can be transported it must be purified. Sulfur exists in natural gas as hydrogen sulfide (H_2S), and the gas is usually considered sour if the hydrogen sulfide content exceeds 5.7 milligrams of H_2S per cubic meter of natural gas. The process for removing hydrogen sulfide from sour gas is commonly referred to as 'sweetening' the gas. The primary process for sweetening sour natural gas is quite similar to the processes of glycol dehydration. Gas processing is an instrumental piece of the natural gas value chain. It is instrumental in ensuring that the natural gas intended for use is as clean and pure as possible, making it the clean burning and environmentally sound energy choice. Once the natural gas has been fully processed, and is ready to be consumed, it must be transported from those areas that produce natural gas, to those areas that require it.

      Opacity is used as a surrogate for PM emissions and provides qualitative information on the operation and maintenance of the combustion equipment. In other words, data on the relationship between opacity and PM emissions suggests an indirect increase in opacity with an increase in PM.

      Pipeline quality natural gas has a very low ash content given the low carbon to hydrogen ratio and requirement on solids. In general,

natural gas fired emission units do not produce significant amounts of PM. Emissions of PM are minimized by combustion controls and the use of clean fuels (inherent quality of natural gas).

Annual observations of opacity, including records of these observations, are sufficient to verify compliance with the 30% opacity limit for emission units that combust pipeline quality natural gas given its inherent nature (i.e.: low to no ash content and de minimus levels of trace metals) . Opacity can also be used as a sufficient means of demonstrating compliance for PM emissions. Since PM emissions are likely in the PM2.5 or less range (the range at which particulates are likely to form visible emissions), the proposed periodic monitoring is sufficient for these emission units because opacity is a simple and cost effective means to demonstrate compliance given there is a small likelihood of an exceedance, the margin of compliance routinely observed from emission tests on similar units, and the monitoring is consistent with other sources in this source category.

Records of monthly and annual hours of operation and PM emissions of all printing line dryers, including records of the supporting calculations, are sufficient to verify compliance with the Title 1 emission limits. Because the printing line press dryers use pipeline quality natural gas with low PM content and coupled with the monthly inspections, efficiency is maintained reducing PM emissions. Furthermore, particulate matter prior to drying is not likely because of the inherent nature of the solids to be imparted onto the paper as ink rather than emitted. (see Statement of Bases)

b. Pursuant to 35 IAC 215.403, Applicability of 35 IAC 215 Subpart K, upon achieving compliance with 35 IAC 215 Subpart P, the emission source is not required to meet 35 IAC 215 Subpart K. Therefore, the source is not subject to 35 IAC 215.301 and a Non-Applicability Determination has been added to Three Z Printing Title V Operation Permit in section 4.1.3 (k).

The source is also subject to Construction Permit #99080027, combined VOM emission from all units not to exceed 25.0 tons per month and 248.9 tons per year. Compliance with annual limits shall be determined on a monthly basis from the sum of the data for the current month plus the preceding 11 months (running 12 month total). Records of the monthly and annual aggregate VOM emissions from the printing lines and press dryers shall be maintained based on recordkeeping requirements with supporting calculations. Additional required recordkeeping from Condition 4.1.2(f)(ii)(B) for aggregate monthly and annual VOM emissions, including records of the calculations, also verify compliance with the Title I emission limits for all printing lines as required by Condition 3.3(a)(ii).

The source is also subject to 35 IAC 215.409 which requires volatile organic material content testing for fountain solution, coatings, and inks. Supplier provided information of VOM content, e.g., supplier data sheet or laboratory analysis report, is sufficient periodic monitoring to demonstrate compliance with VOM content testing of fountain solution, coatings, and inks required by Condition 4.1.2 (f)(ii)(A)(I).

c. The corresponding monitoring requirements to Condition 4.2.2 (c) (i), now Condition 4.1.2 (c)(i), are addressed in 4.1.2 (c)(ii). The Permittee shall maintain records of the Nitrogen Oxide (NO_x) emissions based on fuel consumption of the dryers with supporting calculations. Additionally, pipeline quality natural gas shall be the only fuel fired in the dryers pursuant to Condition 4.1.2 (g)(i).

Nitrogen oxides formation occurs by three fundamentally different mechanisms. The principal mechanism of NOx formation in natural gas combustion is thermal NOx. The thermal NOx mechanism occurs through the thermal dissociation and subsequent reaction of nitrogen (N2) and oxygen (O2) molecules in the combustion air. Most NOx formed through the thermal NOx mechanism occurs in the high temperature flame zone near the burners. The formation of thermal NOx is affected by three factors: (1) oxygen concentration, (2) peak temperature, and (3) time of exposure at peak temperature. As these three factors increase, NOx emission levels increase. The emission trends due to changes in these factors are fairly consistent for all types of natural gas-fired combustion emission units. Emission levels vary considerably with the type and size of combustor and with operating conditions (e.g., combustion air temperature, volumetric heat release rate, load, and excess oxygen level).

The second mechanism of NOx formation, called prompt NOx, occurs through early reactions of nitrogen molecules in the combustion air and hydrocarbon radicals from the fuel. Prompt NOx reactions occur within the flame and are usually negligible when compared to the amount of NOx formed through the thermal NOx mechanism.

The third mechanism of NOx formation, called fuel NOx, stems from the evolution and reaction of fuel-bound nitrogen compounds with oxygen. Due to the characteristically low fuel nitrogen content of natural gas, NOx formation through the fuel NOx mechanism is insignificant. Natural gas has negligible chemically-bound fuel nitrogen (although some molecular nitrogen is present).

Essentially all NOX formed from natural gas combustion is thermal NOX. The control of stoichiometry is critical in achieving reductions in thermal NOX. Thermal NOX formation also decreases rapidly as the temperature drops below the adiabatic flame temperature, for a given stoichiometry. Maximum reduction of thermal NOX can be achieved by control of both the combustion temperature and the stoichiometry. Since these emissions are dependent on the operability of the equipment to perform, an additional inspection requirement is included to maintain and demonstrate equipment performance. The proposed periodic monitoring is sufficient for the dryers because there is a small likelihood of an exceedance based on the inherent nature (discussed above) of natural gas, the margin of compliance routinely observed from emission tests on similar units, and the monitoring is consistent with other similar emission units in these source categories.

d/e. Condition 4.2.2(d) (i), now addressed in Condition 4.1.2(d)(i), has corresponding monitoring requirements for CO in conditions 4.1.2.(d) (ii). Limits for VOM emissions from the natural gas combustion in the dryer are addressed now in Condition 4.1.2 (f)(i)(C). The only fuel fired in the dryers shall be pipeline quality natural gas pursuant to Condition 4.1.2 (g)(i).

CO and VOC emissions both result from incomplete combustion. CO results when there is insufficient residence time at high temperature or incomplete mixing to complete the final step in fuel carbon oxidation. The pollutants commonly classified as VOC can encompass a wide spectrum of volatile organic compounds that are photo-reactive in the atmosphere. VOC occur when some of the gas remains unburned or is only partially burned during the combustion process. With natural gas, some organics are carryover, un-reacted, trace constituents of the gas. Partially burned hydrocarbons result from poor air-to-fuel mixing prior to, or during combustion or incorrect air-to-fuel ratios during combustion due to maladjustment of controls as well as quenching by dilution air. The rate of VOC emissions from natural gas combustion also depends on combustion efficiency. VOC emissions are minimized by combustion practices that promote high combustion temperatures, long residence times at those temperatures, and turbulent mixing of fuel and combustion air.

Improperly tuned equipment operating at off-design— levels decrease combustion efficiency resulting in increased CO and VOC emissions. Therefore, the likelihood of natural gas combustion violating CO or VOC standards/limits is unlikely given that pipeline quality natural gas has a reliable carbon to hydrogen composition (> 75% methane), stable distribution and firing system and since the standards/limits are typically based on worst-case operating conditions. The periodic monitoring chosen is one in which combustion practices that promote time, temperature and turbulence (3T's of combustion) have been incorporated so as to ensure the equipment performs at near design levels. Since these emissions are dependent on the operability of the equipment to perform, an additional inspection requirement is included to maintain and demonstrate equipment performance. The proposed periodic monitoring is sufficient for these emission units because there is a small likelihood of an exceedance based on the inherent nature (discussed above) of natural gas, the margin of compliance routinely observed from emission tests on similar units, and the monitoring is consistent with other similar emission units in these source categories.

USEPA Comments #2:

2. Conditions 4.2.2.b and 4.2.2.c reference condition 4.1.2.(h) within the discussions on the "Compliance Method" for NO_x and CO. However, it appears that the more appropriate citation is 4.2.2.(h).

IEPA Response:

The Conditions 4.2.2.b, and 4.2.2.c of the CAAPP permit have been consolidated into section 4.1.

USEPA Comments #3:

3. Section 3 of the permit identifies facility wide Title 1 limits of 248.9 tons/year and a 25 tons/month. The 248.9 tons/year limit also serves a purpose of restricting emissions from the facility to levels that would consider them to be minor for purposes of the Prevention of Significant Deterioration permit program. As per our discussion, please revise Section 4

of the permit to include the 248.9 tons/year limit as a synthetic minor limit.

IEPA Response:

Section 3.4 of the current CAAPP permit model strictly refers to source-wide synthetic minor limits. The reasons for a synthetic minor limit are major source of HAPs avoidance and rule applicability avoidance. Prevention of Significant Deterioration (PSD) is not addressed in section 3.4. In this instance the 248.9 ton/year VOM limit is not considered a synthetic minor, but a PSD avoidance limit which is addressed in the construction permit and incorporated into condition 3.3 of the CAAPP operating permit as a T1 limit.

III. ADDITIONAL INFORMATION

Questions about the public comment period and permit decision should be directed to:

Bradley Frost, Community Relations Coordinator
Illinois Environmental Protection Agency
Office of Community Relations
1021 North Grand Avenue, East
P.O. Box 19506
Springfield, Illinois 62794-9506
217-782-7027 Desk line
217-782-9143 TDD
217-524-5023 Facsimile
brad.frost@illinois.gov