

Note: This is a reference cited in AP 42, *Compilation of Air Pollutant Emission Factors, Volume I Stationary Point and Area Sources*. AP42 is located on the EPA web site at www.epa.gov/ttn/chief/ap42/

The file name refers to the reference number, the AP42 chapter and section. The file name "ref02_c01s02.pdf" would mean the reference is from AP42 chapter 1 section 2. The reference may be from a previous version of the section and no longer cited. The primary source should always be checked.

AP42 Section:	11.7
Background Chapter:	4
Reference:	30
Title:	<i>Evaluation of Estimated Particulate Emissions from Proposed Tunnel Kilns, Steward, Inc., Chattanooga, TN, Chattanooga-Hamilton County Air Pollution Control Bureau, Chattanooga, TN, October 1994.</i>

SCS

AP-42 Section	11.7
Reference	—
Report Sect.	4
Reference	30

CHATTANOOGA-HAMILTON COUNTY AIR POLLUTION CONTROL BUREAU

Steward, Inc.
P. O. Box 510
East 36th Street and Jerome Avenue
Chattanooga, Tennessee 37407
Contact: Wayne Bishop
Telephone: 867-4100

W. C. Markham, Jr. WCM
Engineer

September 12, 1994
Revised October 10, 1994

Applicable Permits:

- 0780-30500899-47I No. 36 Tunnel Kiln
- 0780-30500899-48I No. 37 Tunnel Kiln

COPY

Purpose

On July 8, 1994, Steward, Inc., applied for installation permits to construct two (2) tunnel kilns at the Jerome Avenue facility. These kilns will be identical in operation to the other tunnel kilns operated at the plant. The purpose of this report is to evaluate the estimated particulate emissions from these proposed kilns. The particulate emissions are composed of materials due to the combustion of cereal binders contained in the ferrite parts. No Title III Hazardous Air Pollutants or other air toxic emissions have been identified from these sources. Based on these evaluations, a recommendation was made to issue installation permits for each source, with certain conditions.

Process Description

The two (2) pieces of process equipment evaluated will be used in the production of ferrite ceramic parts. The No. 36 Tunnel Kiln will be gas-fired and the No. 37 Tunnel Kiln will be electrically heated. The kilns will be used to fire or sinter the ferrite ceramic parts produced by Steward. These parts are used primarily in the electronics industry for electromagnetic interference suppression. Process emissions from these kilns are estimated to be particulate (ash) resulting from the burn-off of the cereal binder used in the parts. The emission rates are low due to the low process weights. The small weight percentage of binder used in the ferrite parts also contributes to the low emission estimated from these sources.

Evaluation

Installation and operation of these production kilns are subject to Section 4-8 and Section 4-41, Rule 3 (visible emissions) and Rule 10 (process emissions) of the Chattanooga Air Pollution Control Ordinance (the Ordinance). In addition, the No. 36 Tunnel Kiln is subject to Rule 2 (nitrogen oxides), Rule 13 (sulfur oxides), and Rule 25 (volatile organic compounds), the Ordinance. Steward, Inc., is located in the non-attainment area and has been determined to be a major source for particulate emissions. New particulate emission sources at this facility are subject to Best

Available Control Technology (BACT) determination. The company has three (3) existing particulate emission points currently regulated by BACT limitations. These limitations define a combined allowable hourly emission rate of 0.70 lbs/hr or 3.066 tons/yr.

0780-30500899-47I No. 36 Tunnel Kiln

This natural gas-fired kiln will be used to fire or sinter the ceramic (ferrite) products manufactured at Steward. This kiln will be identical in operation to the MnZn Bisque Kiln (0780-30500899-44C) currently in operation at the plant. The kiln has a process weight of 19.2 lbs/hr. The process weight reflects the small size of the kiln and also the parts which will be processed. Emissions from the No. 36 Tunnel Kiln are expected to be particulate from combustion of the cereal binder and fuel burning emissions. There will be no emission controls on this kiln. The fuel burning rate for this kiln is 2,800 cubic feet per hour (CFH) or 2.8 MM BTU/hr. Fuel burning emissions from the No. 36 Tunnel Kiln are listed in Table One.

Particulate emissions expected from this unit are estimated based on material balance and fuel consumption. The process emission rate has been estimated by the company to be 0.07 lbs/lb. Particulate emissions from fuel burning are estimated to be 0.014 lbs/hr. Based on the combined emission rate of 0.084 lbs/hr and an expected 8,760 hours of annual operation, particulate emissions from this kiln would be 735.8 pounds or 0.37 tons.

Rule 10 (Schedule 2), the Ordinance, defines an allowable particulate emission limit for this kiln to be 0.45 lbs/hr. This emission limitation is based on the process weight and is too high to be considered BACT for this source. Therefore, a 0.09 lbs/hr BACT particulate emission limitation is recommended. Because the emission limitation is low, a five (5) percent opacity limitation is also recommended for this source. Based on the recommended BACT allowable emission limit, annual allowable emissions from the No. 36 Tunnel Kiln are 788.4 pounds or 0.39 tons. This recommended limitation raises annual BACT allowable particulate emissions for Steward to 4.07 tons.

Nitrogen oxide (NO_x) emissions from the tunnel kiln are limited by Rule 2, the Ordinance, to 300 ppm. At the physical operating parameters of the kiln, this is equivalent to 0.35 lbs/hr. At this limitation, annual allowable NO_x emissions are 3,121.5 pounds or 1.56 tons. Actual NO_x emissions, based on AP-42 fuel burning emission factors for natural gas, are estimated to be 0.28 lbs/hr. Annual NO_x emissions from the No. 36 Tunnel Kiln would be 2,452.8 pounds or 1.23 tons at 8,760 annual hours of operation.

Sulfur dioxide (SO₂) emissions from the tunnel kiln are limited by Rule 13, the Ordinance, to 500 ppm. At the physical operating parameters of the kiln, this is equivalent to 0.83 lbs/hr. At this limit, annual allowable SO₂ emissions are 7,243.6 pounds or 3.62 tons. Actual SO₂ emissions, based on AP-42 fuel burning emission factors for natural gas, are estimated to be 0.0017 lbs/hr. Annual SO₂ emissions from the No. 14 Tunnel Kiln would be 14.72 pounds or 0.0074 tons at 8,760 annual hours of operation.

Volatile organic compound (VOC) emissions from the tunnel kiln are subject to BACT determination as defined by Rule 25, the Ordinance. Actual VOC emissions, based on AP-42 fuel burning emission factors for natural gas, are estimated to be 0.0076 lbs/hr. Annual VOC emissions from the No. 36 Tunnel Kiln would be 66.23 pounds or 0.033 tons at 8,760 annual hours of operation. Based on the estimated emission rate, a BACT VOC emission limitation is recommended to be 0.01 lbs/hr. At this VOC limitation, annual BACT allowable emissions are 87.60 pounds or 0.04 tons.

There are currently no hourly carbon monoxide (CO) emission limitations set forth the Ordinance for the operation of this tunnel kiln. Actual CO emissions are estimated to be 0.056 lbs/hr, based on the AP-42 pollution emission factor for natural gas. At this rate, annual CO emissions would be 490.6 pounds or 0.25 tons.

Table One - Estimated Particulate and Fuel Burning Emissions from the No. 36 Tunnel Kiln

Fuel Burning Rate (MM BTU/hr)				2.8
Pollutant	Allowable Emissions lbs/hr	Estimated Emissions lbs/hr	Estimated Emissions tons/yr	Potential ² Emissions tons/yr
Particulate	0.09 ¹	0.084	0.36	0.39
NO _x	0.35	0.28	1.23	1.53
SO _x	0.83	0.0017	0.0074	3.64
VOC	0.01 ¹	0.007	0.03	0.04
CO	N/A	0.056	0.25	N/A
Total	1.28	0.429	1.88	5.60

1 Recommended Best Available Control Technology (BACT) Allowable
 2 Based on Allowable Emission Rate at 8,760 Annual Hours of Operation

0780-30500899-48I No. 37 Tunnel Kiln

The No. 37 Tunnel Kiln will also be used to sinter ferrite ceramic parts. This will be an electric kiln and particulate emissions from it will be uncontrolled. Emissions from this kiln are estimated by the company to be particulate only. The uncontrolled particulate emission estimate is based on material balance. This emission rate was determined to be 0.06 lbs/hr. Based on this emission estimate and 8,760 annual hours of operation, annual particulate emissions from this process are estimated to be 525.6 pounds or 0.26 tons.

Rule 10 (Schedule 2), the Ordinance, defines an allowable particulate emission limit for the No. 37 Tunnel Kiln to be 0.1544 lbs/hr. At this Rule 10 limit annual allowable emissions would be 0.68 tons. This emission limitation is too high to be considered BACT for this source. Therefore, a 0.075 lbs/hr BACT particulate emission limitation is recommended. Because the emission limitation is low, a five (5) percent opacity limitation is also recommended for this source. Based on the recommended BACT allowable emission limit, annual allowable emissions from the No. 37 Tunnel Kiln are 0.33 tons. This recommended limitation brings the total BACT allowable for Steward, Inc., to 4.40 tons annually.

Emission Status

Table Two - Summary of All Best Available Control Technology (BACT) Emissions from Process Equipment at Steward, Inc.

Source	Allowable Emissions lbs/hr	Actual Emissions lbs/hr	Actual Emissions tons/yr	Potential ² Emissions tons/yr
-16C	0.004 ¹	0.002	0.0054	0.0175
-20C	0.002 ¹	0.001	0.0002	0.0088
-26C	0.02 ¹	0.01	0.0003	0.0876
-27C	0.004 ¹	0.002	0.0021	0.0175
-30C	0.65	0.575	1.30	2.8470
-31C	0.05	0.002	0.0054	0.2190
-42C	0.07 ¹	0.066	0.29	0.3066
-43C	0.0001 ¹	0.00003	0.0001	0.0004
-44C	0.035 ¹	0.03	0.13	0.1533
-45C	0.035 ¹	0.03	0.13	0.1533
-46C	0.09 ¹	0.084	0.37	0.3942
-47I	0.09 ¹	0.084	0.37	0.3942
-48I	0.07 ¹	0.06	0.26	0.3066
Total	1.1101	0.6120	2.54	4.5556

1 Best Available Control Technology (BACT) Emission Limits.
 2 Based on Recommended BACT Emissions Limitation at 8760 Hours Per Year.

Conclusion

Based on the proposed operating parameters and the emission estimates supplied by Steward, the tunnel kilns evaluated should operate in compliance with the Chattanooga Air Pollution Control Ordinance during normal operation. Therefore an installation permit should be issued to Steward, Inc., for the installation of each of these proposed tunnel kilns.

Recommendations

I recommend issuance of installation permits to Steward, Inc., for the proposed process equipment evaluated in this report. In addition to these, I recommend the following special operating conditions as listed for each process. These include the Best Available Control Technology emissions and opacity limitations for each source. A testing condition has been added to the permit conditions, but no source testing is recommended at this time.

0780-30500899-47I No. 36 Tunnel Kiln

1. The maximum allowable particulate emission rate from this source shall be 0.09 lbs/hr.
2. The maximum allowable volatile organic compound emission rate from this source shall be 0.01 lbs/hr.
3. Visible emissions from the No. 47 Tunnel Kiln exhaust shall not exceed five (5) percent opacity.
4. These emission limitations and opacity requirement are Best Available Control Technology (BACT), as determined by the Director, the Chattanooga-Hamilton County Air Pollution Control Bureau.
5. Testing of this source to determine compliance with all applicable emission limitations shall be conducted, if so required by the Director, the Chattanooga-Hamilton County Air Pollution Control Bureau at owners expense, and a written report of the results shall be supplied to the Director. Such testing shall be conducted for particulate matter in accordance with Test Methods 5 and 9, Title 40 Code of Federal Regulations Part 60, Appendix A, (July 1, 1994) and in accordance with the provisions of Section 4-3 of the Chattanooga Air Pollution Control Ordinance.
6. No physical change in, or change in the method of operation of this source which increases the amount of any air contaminant

not previously emitted from this source shall be made until an installation permit application has been filed and an installation permit has been issued by the Director of the Chattanooga-Hamilton County Air Pollution Control Bureau.

0780-30500899-48I No. 37 Tunnel Kiln

1. The maximum allowable particulate emission rate from this source shall be 0.075 lbs/hr.
2. Visible emissions from the No. 37 Tunnel Kiln exhaust shall not exceed five (5) percent opacity.
3. This particulate emission limitation and opacity requirement are Best Available Control Technology (BACT), as determined by the Director, the Chattanooga-Hamilton County Air Pollution Control Bureau.
4. Testing of this source to determine compliance with all applicable emission limitations shall be conducted, if so required by the Director, the Chattanooga-Hamilton County Air Pollution Control Bureau at owners expense, and a written report of the results shall be supplied to the Director. Such testing shall be conducted for particulate matter in accordance with Test Methods 5 and 9, Title 40 Code of Federal Regulations Part 60, Appendix A, (July 1, 1994) and in accordance with the provisions of Section 4-3 of the Chattanooga Air Pollution Control Ordinance.
5. No physical change in, or change in the method of operation of this source which increases the amount of any air contaminant not previously emitted from this source shall be made until an installation permit application has been filed and an installation permit has been issued by the Director of the Chattanooga-Hamilton County Air Pollution Control Bureau.