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AP42 Section:	11.7
Background Chapter:	4
Reference:	16
Title:	<i>Inspection Report, Steward, Inc., Chattanooga, TN, May 19, 1994, Chattanooga-Hamilton County Air Pollution Control Bureau, Chattanooga, TN, August, 1994.</i>

CRC

AP-42 Section 11.7
Reference _____
Report Sect. 4
Reference 16

CHATTANOOGA-HAMILTON COUNTY AIR POLLUTION CONTROL BUREAU

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July 1, 1994
Revised August 10, 1994

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Applicable Permits:

- 0780-30500899-12C No. 2 Tunnel Kiln (DMS-3333)
- 0780-30500899-13C No. 4 Tunnel Kiln (DMS-3400)
- 0780-30500899-15C No. 6 Tunnel Kiln (DMS-100)
- 0780-30500899-16C C-6 Calciner (Harper 1985)
- 0780-30500899-17C C-5 Rotary Calciner
- 0780-30500899-18C No. 2 Bowen Spray Dryer
- 0780-30500899-19C No. 3 Bowen Spray Dryer
- 0780-30500899-20C Parts Hammer Mill (Jeffrey Mill)
- 0780-30500899-21C No. 5 Tunnel Kiln
- 0780-30500899-22C No. 8 Tunnel Kiln
- 0780-30500899-23C No. 1 Silo Vent
- 0780-30500899-24C No. 2 Silo Vent
- 0780-30500899-25C No. 3 Silo Vent
- 0780-30500899-26C Silo No. 4 Vent
- 0780-30500899-27C C-8 Calciner (Harper 1986)
- 0780-30500899-28C CB Fugitive Emissions Collector
- 0780-30500899-30C No. 4 Anhydro Spray Dryer
- 0780-30500899-33C C-7 Harper Rotary Calciner
- 0780-30500899-40C Grieves Furnace No. 1
- 0780-30500899-41C Grieves Furnace No. 2
- 0780-30500899-42C Blender - Chemical Processing
- 0780-30500899-43C Eirich Mixer - Chemical Processing
- 0780-30500899-44C MnZn Bisque Kiln
- 0780-30500899-45C No. 14 Tunnel Kiln
- 0780-30500899-46C No. 16 Tunnel Kiln

Purpose

On May 19, 1994, Steward, Inc., applied for renewal certificates of operation for the process equipment operated at its Jerome Avenue facility. An annual inspection was conducted on July 1, 1994, to determine the operational compliance of this process equipment. The purpose of this report is to summarize the observations made on the date of the inspection and evaluate the emissions from this source. Based on this evaluation, a recommendation was made to issue the renewal certificates of operation, with certain conditions.

Process Description

Steward, Inc., manufactures three (3) products at its Chattanooga plant. These products include electronic ceramics, toner carrier for copier machines, and cerium carbonate used in automotive air pollution control equipment. Ferrite powders are

used to manufacture the ceramic products and toner. The company uses spray dryers, ball milling, and calcining equipment to produce its products. The cerium materials are received in bulk containers, processed in electric ovens, and shipped from the company in drums.

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The electronic ceramic and toner carrier portion of the plant share the same initial processing equipment. This includes the permitted storage silos, C-5, C-6, and C-7 rotary furnaces, and spray dryers. The raw materials are received into three (3) storage silos. Raw materials are loaded pneumatically from the delivery trucks. The silos are controlled by separate baghouses and each has an individual certificate of operation. The material is transferred from the silos to the processing area by a separate pneumatic system. This system is serviced by a baghouse which exhausts into the interior of the production building.

The raw material is transported to an Eirich mixer and mixed into a pelletized form. The pelletizing process involves combination of the ferrite powders with an organic powder (similar in consistency to talc) and water. The pelletized raw material, referred to at this point as carrier beads, is fed through the C-5, C-6, and C-7 calciners. The calciners are rotary gas-fired kilns. The calciners operate at temperatures approaching the melting point of the ferrite powders. The purpose of the calciner treatment, which is also known as solid sintering, is to increase the strength, density, and conductivity of the ferrite powders. Because this process decreases the porosity of the material, there is shrinkage of the carrier bead. The calciners operate at low hourly process weights to allowing the beads sufficient retention times.

From the calciners, the carrier beads are slowly cooled. The cooled carrier beads are ball milled, or ground, into in a ferrite powder slurry. The slurry is pumped from the ball mill to the spray dryers. The spray dryers are large gas-fired vessels. The slurry is introduced into the upper section of the dryer. The material passes counter-current to the products of combustion as it falls to the bottom of the dryer. This process drives off the water in the slurry leaving the finely ground ferrite powders. At this point, the ferrite powder is diverted to either the toner carrier or electronic ceramic production areas.

If the powder is to become toner carrier, it is fire screened. This involves a second heat treatment in either the No. 2 or No. 8 tunnel kilns. The ferrite powder is exposed to 2,400° F temperatures in these natural gas-fired kilns. The heat treatment is similar to that in the calciner where the material is sintered. After the kiln treatment, the powder is refined to remove any clumps that may have formed in the kilns. The powder is also sized and passed under a large electromagnet to separate the product from

any non-metallic material. From here the powder is packaged and shipped to the customer. A baghouse system is incorporated into this process to collect any fugitive emissions from the refining process.

The electronic ceramics production combines several production lines. In this department the ferrite powders are pressed into ceramic parts to be used for electromagnetic interference (EMI) suppression and printed circuit (PC) board components. After being pressed, the parts are heat treated in one of several tunnel kilns. The heat treatment hardens the electronic component. From the kilns the ceramic parts are inspected, packaged, and shipped to the Steward warehouses.

Evaluation

Operation of the process equipment at Steward, Inc., is regulated by Section 4-41, Rule 2 (nitrogen oxides), Rule 3 (visible emissions), Rule 10 (process emissions), Rule 12 (odor), Rule 13 (sulfur dioxide), and Rule 25 (volatile organic compound emissions) of the Chattanooga Air Pollution Control Ordinance (the Ordinance). It has been determined that Rule 26.3, the Ordinance, would not apply to this company as the products manufactured at Steward, Inc., contain metallic powders. Rule 26.3, the Ordinance, applies to non-metallic ceramics. The company discontinued its production of non-metallic ceramic components in 1989 and was known at that time as D. M. Steward Manufacturing Company. Steward, Inc., is located in the non-attainment area and is a major source for particulate emissions. Particulate and volatile organic compound emissions from this facility are subject to Best Available Control Technology (BACT) determination.

The permitted process equipment at the company is configured so that the products of combustion pass through the processing portion of the equipment. Traditionally, direct fired machinery has been permitted as process equipment, which is the case at Steward. The company has provided the natural gas usages and emission estimates from each of the fuel burning process equipment. The fuel burning particulate emissions are included as part of the process equipment emissions.

Steward, Inc., has been determined to be a major source for particulate emissions and the location of the company is within the non-attainment area for the secondary particulate standard. Particulate standards for equipment installed prior to September 16, 1980, at the company are those dictated by Rule 10, the Ordinance. Process equipment installed after this date is subject to Best Available Control Technology (BACT) limitations.

On the date of the inspection, the Steward facility was in operation. Of the permitted process equipment the Grieves Furnaces, the MnZn Bisque Kiln, the C-5 Rotary Calciner, the No. 4 Silo, and the chemical blending section were not in operation on the date of the inspection. Visible emissions from the process equipment exhausts were zero (0) percent opacity. In addition, there were no observed physical indications of any excessive particulate emissions. Based on the visual inspection conducted the company was operating in compliance with Rule 3, the Ordinance, and those applied BACT visible emission limitations.

The company has removed the Jeffery Mill and the No. 8 Calciner from service at the facility. These certificates of operation will be discontinued with this annual renewal cycle. The No. 4 Silo is currently out of service but will again be used in the near future. The company has added a considerable amount of new space on the west side of the plant to accommodate its production growth. In addition, the company has applied for installation permits to install two (2) new tunnel kilns in a portion of this space.

It remains apparent that the company has continued its effort to organize the environmental aspects of its operation. The company prohibition of fork lift traffic on Jerome Avenue has helped clean up the street. Before, the material from the filter press area was being carried onto the street. The company has continued to installed new lights in the interior of the plant and uses several sweepers to collect dust from the plant floors. The company has also continued to open up the interior of the plant having removed more partitions between the tunnel kilns. The company has also reconfigured the pressing machinery within the plant in order to group each production line as physically close together as possible. The result is a more open and cleaner parts production process. The general housekeeping within the plant continues to improve as a direct result of the company's policy to discharge the minimum amount of material as possible from its facility. The cumulative effect of these changes continues to improve the company's ability to comply with the Chattanooga Air Pollution Control Ordinance.

0780-30500899-12C	No. 2 Tunnel Kiln	(DMS-3333)
0780-30500899-13C	No. 4 Tunnel Kiln	(DMS-3400)
0780-30500899-15C	No. 6 Tunnel Kiln	(DMS-100)

Operation of the tunnel kilns is regulated by Section 4-41, Rule 2, Rule 3, Rule 10, Rule 12, and Rule 13, the Ordinance. On the date of the inspection no visible emissions or odors were detected from these exhaust stacks. Based on these observations, the kilns should operate in compliance with Rule 3 and Rule 12, the Ordinance, under normal operating conditions.

These kilns each have stacks exhausting directly to the atmosphere. The emissions from these kilns are uncontrolled. The kilns were in good condition and were in normal operation on the date of the inspection. No visible emissions were observed from the area of the kilns or from each respective stack.

Allowable particulate emissions from the No. 2 kiln are defined by Rule 10 as 1.31 lbs/hr. This is based on the process weight of 365 lbs/hr. Annual allowable emissions from this source are 11,475.6 pounds or 5.74 tons. Actual particulate emissions from this source, based on fuel burning only, are estimated to be 0.005 lb/hr. At this emission rate annual particulate emissions from this source are estimated to be 43.8 pounds or 0.0219 tons. These totals are based on 8,760 hours of operation.

Allowable particulate emissions from the No. 4 kiln are defined by Rule 10 as 0.30 lbs/hr. This is based on the process weight of 40 lbs/hr. Allowable annual emissions from this source are 2,612 pounds or 1.31 tons. Actual particulate emissions from this source, based on fuel burning only, are estimated to be 0.003 lb/hr. At this emission rate annual particulate emissions from this source are estimated to be 26.28 pounds or 0.013 tons. These totals are based on 8,760 hours of operation.

Allowable particulate emissions from the No. 6 kiln are defined by Rule 10 as 0.88 lbs/hr. This is based on the process weight of 200 lbs/hr. Annual allowable emissions from this source are 7,678.7 pounds or 3.84 tons. Actual particulate emissions from this source, based on fuel burning only, are estimated to be 0.0038 lb/hr. At this emission rate annual particulate emissions from this source are estimated to be 33.29 pounds or 0.017 tons. These totals are based on 8,760 hours of operation.

Fuel burning emissions from each tunnel kiln are reported in the following three (3) tables. The actual emission estimates are based on the reported fuel burning rates and AP-42 pollution emission factors for natural gas. The natural gas fuel consumption rate for the No. 2 and No. 4 kilns is 1.05 MM Btu/hr and 0.63 MM Btu/hr, respectively. The fuel consumption rate for the No. 6 kiln is 0.7875 MM Btu/hr.

The allowable hourly emission rates are referenced from the applicable sections of the Ordinance. Volumetric limitations have been converted to mass emission rates based on the reported exhaust rates of the process equipment. Nitrogen oxide (NO_x) emissions from these tunnel kilns are limited by Rule 2, the Ordinance, to 300 ppm. Sulfur dioxide (SO₂) emissions from each tunnel kiln are limited by Rule 13, the Ordinance, to 500 ppm. There are currently no hourly carbon monoxide (CO) or volatile organic compound (VOC) emission limitations for the operation of these tunnel kilns.

Table One - Estimated Fuel Burning Emissions from the No. 2 Tunnel Kiln (DMS-3333)

Fuel Burning Rate (MM BTU/hr)				1.05
Pollutant	Allowable Emissions lbs/hr	Estimated Emissions lbs/hr	Estimated Emissions tons/yr	Potential ¹ Emissions tons/yr
Particulate	1.31 ²	0.005	0.022	5.74
NO _x	4.95 ³	0.10	0.44	21.7
SO _x	11.5 ⁴	0.0006	0.003	50.4
VOC	N/A	0.008	0.035	N/A
CO	N/A	0.02	0.088	N/A

- 1 Based on Allowable Emission Rate at 8,760 Annual Hours of Operation
- 2 Based on Rule 10.2 for the Process Weight of 365 lbs/hr
- 3 Based on Rule 2.4 Allowable Emission Rate of 300 ppm for Nitrogen Oxides
- 4 Based on Rule 13.1 Allowable Emission Rate of 500 ppm for Sulfur Oxides

Table Two - Estimated Fuel Burning Emissions from the No. 4 Tunnel Kiln (DMS-3400)

Fuel Burning Rate (MM BTU/hr)				0.63
Pollutant	Allowable Emissions lbs/hr	Estimated Emissions lbs/hr	Estimated Emissions tons/yr	Potential ¹ Emissions tons/yr
Particulate	0.30 ²	0.003	0.013	1.31
NO _x	1.95 ³	0.06	0.263	8.5
SO _x	4.53 ⁴	0.0004	0.002	19.8
VOC	N/A	0.048	0.210	N/A
CO	N/A	0.012	0.053	N/A

- 1 Based on Allowable Emission Rate at 8,760 Annual Hours of Operation
- 2 Based on Rule 10.2 for the Process Weight of 365 lbs/hr
- 3 Based on Rule 2.4 Allowable Emission Rate of 300 ppm for Nitrogen Oxides
- 4 Based on Rule 13.1 Allowable Emission Rate of 500 ppm for Sulfur Oxides

Table Three - Estimated Fuel Burning Emissions from the No. 6 Tunnel Kiln (DMS-100)

Fuel Burning Rate (MM BTU/hr)				0.79
Pollutant	Allowable Emissions lbs/hr	Estimated Emissions lbs/hr	Estimated Emissions tons/yr	Potential ¹ Emissions tons/yr
Particulate	0.88 ²	0.0038	0.011	3.84
NO _x	3.92 ³	0.05	0.22	17.2
SO _x	9.07 ⁴	0.0003	0.0013	56.5
VOC	N/A	0.0041	0.018	N/A
CO	N/A	0.01	0.044	N/A

1 Based on Allowable Emission Rate at 8,760 Annual Hours of Operation

2 Based on Rule 10.2 for the Process Weight of 365 lbs/hr

3 Based on Rule 2.4 Allowable Emission Rate of 300 ppm for Nitrogen Oxides

4 Based on Rule 13.1 Allowable Emission Rate of 500 ppm for Sulfur Oxides

0780-30500899-16C C-6 Calciner (Harper 1985)

Operation of this process is subject to Section 4-8 and Section 4-41, Rule 2, Rule 3, Rule 10, Rule 13, and Rule 25, the Ordinance. Recommended BACT limitations for this source include hourly particulate and volatile organic compound emission limits. A BACT opacity limit was also applied to this source.

On the date of the inspection the calciner was in operation. No visible emissions were observed from the control equipment exhaust. The baghouse equipment was observed to be in good condition. Based on the observations made during the inspection this equipment should operate in compliance with the BACT opacity limit during normal operation.

Uncontrolled emissions from this process are estimated to be 4.0 lbs/hr. This is based on the weight of the material recovered from the baghouse collector. At this rate potential emissions from this process are 35,040 pounds or 17.52 tons. These totals are based on 8,760 hours of operation.

Allowable particulate emissions from this source as set forth by Rule 10, the Ordinance, would be 1.79 lbs/hr based on a process weight of 650 lbs/hr. At this limit, annual allowable emissions from this source would be 15,680 pounds or 7.84 tons. This

limitation was too high to be considered BACT for this process and a more appropriate limitations was applied.

Actual emissions from this source have been estimated to be 0.002 lbs/hr. This rate is based on the uncontrolled emission rate and an estimated 99.95 percent baghouse control efficiency. At this rate actual emissions from this source, including fuel burning emissions, would be 10.80 pounds or 0.0054 tons annually. These totals are based on 5,400 hours of operation.

Based on the estimated emission rate of 0.002, a BACT limitation was recommended to be 0.004 lbs/hr. At this BACT emission limitation, allowable particulate emissions would be 0.0175 tons/yr. Because the BACT emission limitation is low, a visible emission limit of five (5) percent opacity was also recommended for this process. Visible emissions in excess of five (5) percent opacity would be a violation of this special operating condition.

Particulate emissions from this source are expected to be iron and zinc oxide. The Threshold Limit Value-Time Weighted Average (TLV-TWA) for these constituents are referenced from the American Conference of Government and Industrial Hygienists (ACGIH) TLV reference manual. The SCREEN model results at the recommended BACT allowable rate (0.004 lbs/hr) are shown in the following tables. These tables reflect a comparison of the predicted maximum concentration with the TLV and TLV/420. The concentrations are shown as worst case for that constituent representing the theoretical concentration as 100 percent of that compound.

Table Four - TLV and TLV/420 Evaluation for Iron Oxide Based on SCREEN Model Predictions at Recommended BACT Allowable Concentration Located 274.6 Meters from Emission Point

Iron Oxide	Predicted Impact at Recommended BACT Allowable
Maximum Concentration ($\mu\text{g}/\text{m}^3$)	0.766 ¹
TLV ($\mu\text{g}/\text{m}^3$)	5,000
Percent of TLV (%)	0.0153
TLV/420 ($\mu\text{g}/\text{m}^3$)	11.90
Percent of TLV/420 (%)	0.349 ²

1 8-hr Average
 2 Based on Maximum Predicted Annual Average

Table Five - TLV and TLV/420 Evaluation for Zinc Oxide Based on SCREEN Model Predictions at Recommended BACT Allowable Concentration Located 274.6 Meters from Emission Point

Zinc Oxide	Predicted Impact at Recommended BACT Allowable
Maximum Concentration ($\mu\text{g}/\text{m}^3$)	0.766 ¹
TLV ($\mu\text{g}/\text{m}^3$)	10,000
Percent of TLV (%)	0.0077
TLV/420 ($\mu\text{g}/\text{m}^3$)	23.81
Percent of TLV/420 (%)	0.175 ²

- 1 8-hr Average
 2 Based on Maximum Predicted Annual Average

As noted, the maximum predicted SCREEN model concentrations of iron oxide and zinc oxide are fractional amounts of the TLV and TLV/420 for that compound. As demonstrated by this dispersion modeling, the emission of these compounds should not create health problems or a nuisance beyond plant property. Based on this information, the C-6 calciner should operate in compliance with the Ordinance during normal operation.

Nitrogen oxide (NO_x) emissions from the calciner are limited by Rule 2, the Ordinance, to 300 ppm. At the physical operating parameters of the kiln, this is equivalent to 0.67 lbs/hr. Annual allowable NO_x emissions are 5,834.9 pounds or 2.92 tons. Actual NO_x emissions, based on AP-42 fuel burning emission factors, are estimated to be 0.025 lbs/hr. Annual NO_x emissions from the C-6 Calciner are estimated to be 135.0 pounds or 0.0675 tons at 5,400 annual hours of operation.

Sulfur Dioxide (SO_2) emissions from the calciner are limited by Rule 13, the Ordinance, to 500 ppm. At the physical operating parameters of the calciner, this is equivalent to 1.54 lbs/hr. Annual allowable SO_2 emissions are 13,540 pounds or 6.77 tons. Actual SO_2 emissions, based on AP-42 fuel burning emission factors, are estimated to be 0.0002 lbs/hr. Annual SO_2 emissions from this calciner are estimated to be 0.81 pounds or 0.0004 tons at 5,400 annual hours of operation.

Volatile organic compound (VOC) emissions from the calciner are subject to BACT determination as defined by Rule 25, the Ordinance. Actual VOC emissions, based on AP-42 fuel burning

emission factors, are estimated to be 0.002 lbs/hr. Annual VOC emissions are estimated to be 10.80 pounds or 0.0054 tons at 5,400 annual hours of operation. Based on the estimated emission rate, a BACT VOC emission limitation is recommended to be 0.004 lbs/hr. Annual allowable emissions at this recommended limitation are 35.04 pounds or 0.0175 tons.

There are currently no hourly carbon monoxide (CO) emission limitations for the operation of the calciner. Actual CO emissions are estimated to be 0.005 lbs/hr, based on the AP-42 pollution emission factor for natural gas. At this rate annual CO emissions would be 27 pounds or 0.0135 tons. These totals are based on 5,400 annual hours of operation.

Table Six - Estimated Particulate and Fuel Burning Emissions from the C-6 Calciner (Harper 1985)

Fuel Burning Rate (MM BTU/hr)				0.262
Pollutant	Allowable Emissions lbs/hr	Estimated Emissions lbs/hr	Estimated Emissions tons/yr	Potential ² Emissions tons/yr
Particulate	0.004 ¹	0.002	0.0054	0.0175
NO _x	0.67	0.025	0.0675	2.92
SO _x	1.47	0.0002	0.0004	6.77
VOC	0.004 ¹	0.002	0.0054	0.0175
CO	n.a.	0.005	0.0135	n.a.

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

0780-30500899-17C C-5 Rotary Calciner

Operation of this process is subject to Section 4-8 and Section 4-41, Rule 2, Rule 3, Rule 10, Rule 13, and Rule 25, the Ordinance. The C-5 Rotary Calciner is a gas fired furnace. This calciner is used to treat raw metallic materials for production of the carrier beads. The emissions from this source are controlled by an American Air Filter baghouse. The rotary furnace was in operation on the date of the inspection and was observed to be in good condition. The opacity of the baghouse exhaust was observed to be zero (0) percent.

Allowable particulate emissions from the No. 5 rotary kiln are defined by Rule 10 as 1.39 lbs/hr. This is based on the process weight of 400 lbs/hr. At this allowable hourly emission rate annual emissions from this source are 12,176.4 pounds or 6.09 tons. Actual particulate emissions from this source are estimated to be 0.102 lb/hr, including those from fuel burning. At this emission rate annual particulate emissions from this source would be 550 pounds or 0.21 tons. These totals are based on 5,400 hours of annual operation. The estimated fuel burning emissions from this process are listed in Table Seven.

Table Seven - Estimated Fuel Burning Emissions from the C-5 Rotary Calciner

Fuel Burning Rate (MM BTU/hr)				0.262
Pollutant	Allowable Emissions lbs/hr	Estimated Emissions lbs/hr	Estimated Emissions tons/yr	Potential ¹ Emissions tons/yr
Particulate	1.39 ²	0.102	0.21	6.09
NO _x	1.03 ³	0.025	0.07	4.51
SO _x	2.39 ⁴	0.0002	0.0005	10.5
VOC	N/A	0.002	0.005	N/A
CO	N/A	0.005	0.014	N/A

- 1 Based on Allowable Emission Rate at 8,760 Annual Hours of Operation
- 2 Based on Rule 10.2 for the Process Weight of 365 lbs/hr
- 3 Based on Rule 2.4 Allowable Emission Rate of 300 ppm for Nitrogen Oxides
- 4 Based on Rule 13.1 Allowable Emission Rate of 500 ppm for Sulfur Oxides

0780-30500899-18C No. 2 Bowen Spray Dryer
 0780-30500899-19C No. 3 Bowen Spray Dryer

The Bowen spray dryers are used to dry the ball-milled metallic slurry. The dryers are natural gas fired and the emissions from each are controlled by a common control device. These dryers are controlled by a FlexKleen pulse jet baghouse. The baghouse, which operates at an estimated 99.95 percent efficiency, replaces a scrubber with estimated efficiency of 98 percent.

Allowable particulate emissions from each spray dryer are set forth by Rule 10, the Ordinance, to be 1.79 lbs/hr. This is based on the dry process weight of 580 lbs/hr for each unit. Allowable particulate emissions at this hourly emission limit are 15,670.9 pounds or 7.84 tons.

Uncontrolled particulate emissions from these sources, based on fuel burning and process emissions, are estimated to be 2.505 lbs/hr. At this rate potential emissions from each source are 10.97 tons. Actual combined emissions from the process equipment, based on 99.95 percent baghouse control, are estimated to be 0.0026 lbs/hr. At this rate annual particulate emissions from this source would be 10.82 pounds or 0.0054 tons. These annual totals are based on 3,200 hours of operation for each dryer. The estimated fuel burning emissions from each of these processes are listed in Table Eight and Table Nine.

Table Eight - Estimated Fuel Burning Emissions from the No. 2 Bowen Spray Dryer

Fuel Burning Rate (MM BTU/hr)				1.05
Pollutant	Allowable Emissions lbs/hr	Estimated Emissions lbs/hr	Estimated Emissions tons/yr	Potential ¹ Emissions tons/yr
Particulate	1.79 ²	0.0013	0.0027	7.84
NO _x	3.72 ³	0.10	0.16	16.3
SO _x	8.63 ⁴	0.0006	0.001	37.8
VOC	N/A	0.008	0.035	N/A
CO	N/A	0.02	0.088	N/A

- 1 Based on Allowable Emission Rate at 8,760 Annual Hours of Operation
- 2 Based on Rule 10.2 for the Process Weight of 365 lbs/hr
- 3 Based on Rule 2.4 Allowable Emission Rate of 300 ppm for Nitrogen Oxides
- 4 Based on Rule 13.1 Allowable Emission Rate of 500 ppm for Sulfur Oxides

Table Nine - Estimated Fuel Burning Emissions from the No. 3 Bowen Spray Dryer

Fuel Burning Rate (MM BTU/hr)				1.05
Pollutant	Allowable Emissions lbs/hr	Estimated Emissions lbs/hr	Estimated Emissions tons/yr	Potential ¹ Emissions tons/yr
Particulate	1.79 ²	0.0013	0.0027	7.84
NO _x	3.72 ³	0.10	0.16	16.3
SO _x	8.63 ⁴	0.0006	0.001	37.8
VOC	N/A	0.008	0.035	N/A
CO	N/A	0.02	0.088	N/A

- 1 Based on Allowable Emission Rate at 8,760 Annual Hours of Operation
- 2 Based on Rule 10.2 for the Process Weight of 365 lbs/hr
- 3 Based on Rule 2.4 Allowable Emission Rate of 300 ppm for Nitrogen Oxides
- 4 Based on Rule 13.1 Allowable Emission Rate of 500 ppm for Sulfur Oxides

0780-30500899-21C No. 5 Tunnel Kiln
 0780-30500899-22C No. 8 Tunnel Kiln

The No. 5 and No. 8 kilns, like the No. 2, 4, & 6 kilns, operate continuously. These are used to harden the ceramic pieces produced at the company. This hardening is similar to the heat treatment of steel where the grain structure of the material is altered. The material changes physically and not chemically where by-product emissions would be expected. The parts are placed in trays and are carried through the kiln by conveyors. The natural gas fuel consumption rates are as follows: No. 5, 0.63 MM Btu/hr; and No. 8, 1.573 MM Btu/hr.

These kilns each have stacks exhausting directly to the atmosphere and each kiln has one (1) stack. The emissions from these kilns are uncontrolled. The kilns were in good condition and in normal operation on the date of the inspection. No visible emissions were observed from the area of the kilns or from each respective stack.

Allowable particulate emissions from the No. 5 kiln are 0.15 lb/hr (Rule 10), based on the 15 lbs/hr process weight. The annual allowable emission rate from this source is 1,353.9 pounds or 0.66 tons. Actual particulate emissions from this source, based on fuel burning only, are estimated to be 0.0025 lb/hr. At this emission rate annual particulate emissions from this source would be 21.9 pounds or 0.011 tons. These totals are based on 8,760 hours of annual operation.

Allowable particulate emissions from the No. 8 kiln are 1.73 lb/hr, as defined by Rule 10, the Ordinance. This emission limit is based on the 550 lbs/hr process weight. The allowable emission rate from this source is 15,123.1 pounds or 7.56 tons. Actual particulate emissions from this source, based on fuel burning emission estimates only, are 0.0075 lb/hr. At this emission rate annual particulate emissions from this source are estimated to be 65.7 pounds or 0.0328 tons. These totals are based on 8,760 hours of annual operation. The estimated fuel burning emissions from each of these processes are listed in Table Ten and Table Eleven.

Table Ten - Estimated Fuel Burning Emissions from the No. 5 Tunnel Kiln

Fuel Burning Rate (MM BTU/hr)				0.63
Pollutant	Allowable Emissions lbs/hr	Estimated Emissions lbs/hr	Estimated Emissions tons/yr	Potential ¹ Emissions tons/yr
Particulate	0.15 ²	0.003	0.011	0.66
NO _x	0.12 ³	0.05	0.22	0.53
SO _x	0.28 ⁴	0.0003	0.001	1.23
VOC	N/A	0.0041	0.018	N/A
CO	N/A	0.01	0.044	N/A

- 1 Based on Allowable Emission Rate at 8,760 Annual Hours of Operation
- 2 Based on Rule 10.2 for the Process Weight of 365 lbs/hr
- 3 Based on Rule 2.4 Allowable Emission Rate of 300 ppm for Nitrogen Oxides
- 4 Based on Rule 13.1 Allowable Emission Rate of 500 ppm for Sulfur Oxides

Table Eleven - Estimated Fuel Burning Emissions from the No. 8 Tunnel Kiln

Fuel Burning Rate (MM BTU/hr)				1.573
Pollutant	Allowable Emissions lbs/hr	Estimated Emissions lbs/hr	Estimated Emissions tons/yr	Potential ¹ Emissions tons/yr
Particulate	1.73 ²	0.0075	0.033	7.6
NO _x	0.47 ³	0.15	0.66	2.06
SO _x	1.08 ⁴	0.0009	0.004	4.73
VOC	N/A	0.0049	0.022	N/A
CO	N/A	0.03	0.13	N/A

- 1 Based on Allowable Emission Rate at 8,760 Annual Hours of Operation
- 2 Based on Rule 10.2 for the Process Weight of 365 lbs/hr
- 3 Based on Rule 2.4 Allowable Emission Rate of 300 ppm for Nitrogen Oxides
- 4 Based on Rule 13.1 Allowable Emission Rate of 500 ppm for Sulfur Oxides

0780-30500899-23C No. 1 Silo Vent
 0780-30500899-24C No. 2 Silo Vent
 0780-30500899-25C No. 3 Silo Vent
 0780-30500899-26C Silo No. 4 Vent

These storage silos are used to hold ferrous powder. The silos feed by pneumatic conveyer to the slurry production area. The silo vents are connected to a FlexKleen baghouse. This source generates emissions during the receiving of material from fleet trucks. Special operating conditions have been established to limit the operation (loading) of the No. 1 and No. 2 silos to less than 150 hours annually. The No. 3 silo loading is limited to less than 100 hours annually. These hourly loading limitations were requested by the company in a letter from John Woody on October 8, 1982.

Allowable particulate emissions for the No. 2 and No. 3 silos are 33.02 lbs/hr as defined by Rule 10, the Ordinance, for a process weight of 45,000 lbs/hr. Allowable emissions from these silos are (at 150 hours) 4,952.6 pounds or 2.48 tons.

Uncontrolled emissions from each of these silos are estimated to be 1.15 lbs/hr. This is based on an AP-42 (Table 8.23-1) pollution emission factor of 0.12 lbs/ton. Actual emissions are

estimated to be 0.0005 lbs/hr. At this emission rate, annual emissions from each of these silos would be 0.075 pounds.

Allowable particulate emissions for the No. 1 silo are 2.22 lbs/hr as defined by Rule 10, the Ordinance, for a process weight of 800 lbs/hr. Allowable emissions from the No. 3 silo are (at 100 hours) 222 pounds or 0.11 tons.

Uncontrolled emissions from this silo are estimated to be 0.58 lbs/hr. This is based on an AP-42 (Table 8.23-1) pollution emission factor of 0.12 lbs/ton. Actual emissions are estimated to be 0.0003 lbs/hr. At this emission rate, annual emissions from each of these silos would be 0.029 pounds.

Allowable particulate emissions from the No. 4 silo, as defined by Rule 10, the Ordinance, would be 9.43 lbs/hr for a process weight of 9,500 lbs/hr. This limitation was considered too high to be BACT for this process. Based on the estimated emission rate, a BACT limitation was recommended to be 0.02 lbs/hr for this source. At this BACT emission limitation, allowable particulate emissions from this source would be 0.088 tons/yr. Because the BACT emission limitation is small, a visible emission limit of five (5) percent opacity, as determined by EPA reference Method 9, was also recommended for this process. Visible emissions in excess of five (5) percent opacity would be a violation of this special operating condition.

At an estimated 99.95 percent baghouse control efficiency, the actual particulate emission rate are estimated to be 0.01 lbs/hr from the No. 4 silo when loading. Actual emissions from this source are estimated to be low, as emissions would only be expected when the silo is loaded. The company predicts that the silo would be loaded approximately fifty (50) hours per year. At this rate, annual emissions from this source would be 0.5 pounds per year.

0780-30500899-28C CB Fugitive Emissions Collector

The CB fugitive emissions collector is used to capture fugitive emissions from the toner processing area. The collector was in operation during the inspection. No emissions were observed from the baghouse exhaust and on material was present in the area of the exhaust.

Allowable particulate emissions, as defined by Rule 10, the Ordinance, are 0.074 lbs/hr based on the process weight of 5.0 lbs/hr. Annual allowable emissions from this source are 648.5 pounds or 0.32 tons.

Uncontrolled emissions from this source are estimated to be 5.0 lbs/hr based on material balance. Controlled emissions from

this process are estimated to be 0.005 lbs/hr. Actual emissions from this process would be 20.80 pounds or 0.0104 tons annually, based on 4,160 hours of normal operation.

0780-30500899-30C No. 4 Anhydro Spray Dryer

Operation of this equipment is subject to a Best Available Control Technology (BACT) emission limitation for particulate emissions emitted from the MikroPul baghouse collector. This BACT emission limitation has been established to be 0.10 lbs/hr.

Source testing of this exhaust point was conducted on March 30, 1993. Particulate emissions from this process were determined to average 0.075 lbs/hr (0.0024 gr/dscf) during the three (3) test runs. At this rate annual emissions from this source would be 300 pounds or 0.15 tons. These totals are based on 4,000 hours of annual operation. The estimated fuel burning emissions from this process are listed in Table Twelve.

Table Twelve - Estimated Fuel Burning Emissions from the No. 4 Anhydro Spray Dryer

Fuel Burning Rate (MM BTU/hr)				0.84
Pollutant	Allowable Emissions lbs/hr	Estimated Emissions lbs/hr	Estimated Emissions tons/yr	Potential ¹ Emissions tons/yr
Particulate	0.1 ²	0.075	0.15	0.44
NO _x	6.24 ³	0.08	0.16	27.33
SO _x	14.5 ⁴	0.0005	0.0010	63.5
VOC	N/A	0.0066	0.013	N/A
CO	N/A	0.016	0.032	N/A

- 1 Based on Allowable Emission Rate at 8,760 Annual Hours of Operation
- 2 Best Available Control Technology Emission Limitation
- 3 Based on Rule 2.4 Allowable Emission Rate of 300 ppm for Nitrogen Oxides
- 4 Based on Rule 13.1 Allowable Emission Rate of 500 ppm for Sulfur Oxides

0780-30500899-33C C-7 Harper Rotary Calciner

The No. 7 Rotary Calciner is electric but is otherwise similar to the C-5 Calciner as it is also used to calcine pelletized ferrite powder in the carrier bead department. The emissions are

collected by a Steel Craft baghouse. The baghouse is estimated to have an efficiency of 99.95 percent for this application.

Allowable particulate emissions from this source are limited to 0.05 lbs/hr. At this rate allowable emissions from this source are 438 pounds or 0.22 tons annually. This hourly limit is a BACT emission limitation established at the time of the equipment installation. The limit is based on the estimated controlled emission rate of 0.002 lbs/hr. At this estimated emission rate, annual emissions from this source would be 10.80 pounds or 0.0054 tons.

0780-30500899-40C Grievs Furnace No. 1
0780-30500899-41C Grievs Furnace No. 2

Operation of these furnaces is subject to Section 4-8 and Section 4-41, Rule 2 (nitrogen oxides) and Rule 12 (odors) of the Chattanooga Air Pollution Control Ordinance (the Ordinance). On the date of the inspection these furnaces were in operation. The exhaust were observed and no visible emissions were detected. No odors were detected in the area near the exhausts. The furnaces exhaust on the side of the plant fronting 38th Street.

As stated, these Grievs furnaces are used to fire the blends containing colloidal ceria, alumina, aluminum nitrate, and water. Nitrogen oxide (NO_x) is emitted from each furnace when the blend is fired. According to Hawley's Condensed Chemical Dictionary, Eleventh Edition, aluminum nitrate is a powerful oxidizer which decomposes in hot water. This would support the estimate that NO_x emissions are produced when the blend is exposed to the elevated temperatures of the furnace. Nitrogen oxides are the only emissions expected from these electric furnaces.

As with the other ovens, dryers, and kilns used in the chemical processing area, these units are designed to prohibit particulate (from the powders) from becoming entrained in the exhaust gases. The off-gasses from the ovens are taken from the top of the units. This draft is balanced using dampers located at the top of each furnace. Additionally, the electric furnace elements are separated from the oven chamber such that the units are indirectly heated. Based on these physical characteristics there should be no particulate emissions from these sources.

Rule 2, the Ordinance, defines an allowable NO_x emission limit of 300 ppm for these furnaces. Based on the draft system characteristics, this emission limitation is equal to 5.03 lbs/hr. Annual allowable NO_x emissions at this limit are 22.03 tons. Steward, Inc., estimates that the actual hourly NO_x emission rate is 2.31 lbs/hr. This emission estimate is based on a seven (7) percent conversion by weight of the 33 lbs/hr batch to NO_x . Annual

NO_x emissions at this estimated emission rate are 20,235.6 pounds or 10.12 tons. Based on these estimates, the Grieves furnaces should operate in compliance with the Ordinance during normal operation.

0780-30500899-42C Blender - Chemical Processing

Operation of this blender is subject to Section 4-8 and Section 4-41, Rule 3, Rule 10, Rule 11, and Rule 12, the Ordinance. Steward, Inc., is located in the non-attainment area and has been determined to be a major source for particulate emissions. This particulate emission source is subject to Best Available Control Technology (BACT) determination.

On the date of the inspection this equipment was in operation. The baghouse was observed and no visible emissions were detected. The area around the baghouse was clean and free of the powder materials. The draft system and the baghouse collector were noted to be in good condition. Material collected by this control system drops into an enclosed hopper and is disposed. There should be no fugitive dust or material handling problems during the normal recovery of this material.

This blending process is used to mix the cerium products after firing. Particulate emissions from this blender are controlled by an Estee baghouse. The uncontrolled particulate emission estimate is based on material balance and determined to be 1.32 lbs/hr. The process weight is 5,280 lbs/hr. Actual emissions are estimated by the company to be 0.066 lbs/hr based on 99.95 percent baghouse efficiency. At this estimated emission rate, annual particulate emissions from this source are 578.16 pounds or 0.29 tons, based on 8,760 annual hours of operation.

Rule 10 (Schedule 2), the Ordinance, defines an allowable particulate emission limit for this blender of 6.55 lbs/hr. Based on this limitation annual allowable emissions from this source would be 57,378 pounds or 28.69 tons. This Rule 10 limit was too high to be considered BACT for this process. Therefore, a BACT limit of 0.07 lbs/hr was recommended. Because the recommended particulate emission limit was low, a five (5) percent opacity limitation was also recommended for this source. At the recommended BACT limit, annual allowable emissions from the Blender (Chemical Processing) are 0.31 tons. This recommended limitation brings the total BACT allowable for Steward, Inc., to 6,752 pounds or 3.38 tons annually.

Particulate emissions from this source are expected to be cerium oxide and alumina (aluminum oxide). The threshold limit value-time weighted average (TLV-TWA) for cerium (IV) oxide is referenced from the material safety data (MSD) sheet supplied by

Steward, Inc., for these products. The reported TLV-TWA is 10,000 $\mu\text{g}/\text{m}^3$. There were no references for this compound in the American Conference of Government and Industrial Hygienists (ACGIH) TLV reference manual or the NIOSH Guide to Chemical Hazards. The MSD sheet indicates that acute overexposure would result in slight irritation to the eyes. There is no indication of the effect of long term overexposure suggesting that this compound would not be considered a chronic air toxic. Alumina or aluminum oxide is given a 10,000 $\mu\text{g}/\text{m}^3$ TLV by the ACGIH. The ACGIH discussion concerning alumina indicates that this substance would also not be a chronic air toxic.

The SCREEN dispersion model was used to estimate the ambient impact of each compound. For the purpose of this evaluation, each compound was considered separately at the recommended BACT allowable emission rate. The result of these evaluations are shown in Tables One and Two. These tables reflect the comparison of the predicted maximum concentration with the TLV and TLV/420. An odor problem is not expected from the emission of cerium oxide or alumina. There are no available odor threshold values for these compounds.

As indicted for each compound, the predicted ambient concentrations are less than one (1) percent of the TLV and TLV/420, at the recommended BACT allowable. Based on this evaluation, the emission of these compounds from this source is not expected to create an air toxic emission problem or public health hazard. Based on this review, this source should operate in compliance with the Ordinance during normal operation conditions.

Table Thirteen - TLV and TLV/420 Evaluation for Cerium Oxide Emissions from the Chemical Processing Blender Based on SCREEN Model Predictions at Recommended BACT Allowable Concentration Located 137 Meters from Emission Point

Cerium (IV) Oxide	Results of SCREEN Dispersion Modeling
Maximum Concentration ($\mu\text{g}/\text{m}^3$)	1.59 ¹
TLV ($\mu\text{g}/\text{m}^3$)	10,000
Percent of TLV (%)	0.016
TLV/420 ($\mu\text{g}/\text{m}^3$)	23.81
Percent of TLV/420 (%)	0.36 ²

1 8-hr Average
 2 Based on Maximum Predicted Annual Average

Table Fourteen - TLV and TLV/420 Evaluation for Alumina Emissions from the Chemical Processing Blender Based on SCREEN Model Predictions at Recommended BACT Allowable Concentration Located 137 Meters from Emission Point

Alumina (Aluminum Oxide)	Results of SCREEN Dispersion Modeling
Maximum Concentration ($\mu\text{g}/\text{m}^3$)	1.59 ¹
TLV ($\mu\text{g}/\text{m}^3$)	10,000
Percent of TLV (%)	0.016
TLV/420 ($\mu\text{g}/\text{m}^3$)	23.81
Percent of TLV/420 (%)	0.36 ²

1 8-hr Average

2 Based on Maximum Predicted Annual Average

0780-30500899-43C Eirich Mixer - Chemical Processing

Operation of this mixer is subject to Section 4-8 and Section 4-41, Rule 3, Rule 10, Rule 11, and Rule 12, the Ordinance. This source was subject to BACT determination for particulate emissions. On the date of the inspection this equipment was in operation. The baghouse was observed and no visible emissions were detected. The area around the baghouse was clean and free of the powder materials. The dust collection system and the baghouse were noted to be in good condition. Material collected by the system is stored in an enclosed hopper. The material is not recycled back into the process and is disposed.

The Eirich Mixer is used to mix all the cerium products before firing. Particulate emissions from the mixer are controlled by a Mikro-Pulsaire baghouse. The uncontrolled particulate emission estimate is based on material balance and determined to be 0.0625 lbs/hr. The mixer process weight is 250 lbs/hr. Actual emissions are estimated by the company to be 3.125E-05 lbs/hr based on 99.95 percent baghouse efficiency. At this estimated emission rate, annual particulate emissions from this source are 0.0625 pounds or 3.125E-05 tons, based on 2,000 annual hours of operation.

Rule 10 (Schedule 2), the Ordinance, defines an allowable particulate emission limit for the mixer to be 0.99 lbs/hr. Based on this limitation annual allowable emissions from this source would be 866.33 pounds or 4.33 tons. This Rule 10 limit was

considered too high to be BACT for this process. Therefore, a BACT limit of 0.0001 lbs/hr was recommended. Because the recommended particulate emission limit is low, a five (5) percent opacity limitation was also recommended for this source. Based on the recommended BACT allowable emission limit, annual allowable emissions from the Blender (Chemical Processing) are 0.0004 tons. This recommended limitation brings the total BACT allowable for Steward, Inc., to 6,752.8 pounds or 3.38 tons annually. Total hourly BACT allowable emissions are 0.7701 lbs/hr.

Particulate emissions from this source are also expected to be cerium oxide and alumina (aluminum oxide). The TLV-TWA for cerium (IV) oxide is referenced from the MSD Sheet supplied by Steward, Inc., and listed as 10,000 $\mu\text{g}/\text{m}^3$. The TLV-TWA for alumina is given as 10,000 $\mu\text{g}/\text{m}^3$ TLV by the ACGIH.

Again, the SCREEN dispersion model was used to estimate the ambient impact of each compound. For the purpose of this evaluation, each compound was also considered separately at the recommended BACT allowable emission rate. The result of these evaluations are shown in Table Fifteen and Table Sixteen.

As indicated for each compound, the predicted ambient concentrations are much less than one (1) percent of the TLV and TLV/420 at the recommended BACT allowable. Considering these same emissions from the blender process as the background concentration, the emissions would still remain less than one (1) percent of the comparative value. Based on this evaluation, the emission of these compounds from this source is not expected to create an air toxic emission problem or public health hazard.

Table Fifteen - TLV and TLV/420 Evaluation for Cerium Oxide Emissions from the Chemical Processing Eirich Mixer Based on SCREEN Model Predictions at Recommended BACT Allowable Concentration Located 158 Meters from Emission Point

Cerium (IV) Oxide	Results of SCREEN Dispersion Modeling
Maximum Concentration ($\mu\text{g}/\text{m}^3$)	0.011 ¹
TLV ($\mu\text{g}/\text{m}^3$)	10,000
Percent of TLV (%)	0.000011
TLV/420 ($\mu\text{g}/\text{m}^3$)	23.81
Percent of TLV/420 (%)	0.0025 ²

1 8-hr Average

2 Based on Maximum Predicted Annual Average

Table Sixteen - TLV and TLV/420 Evaluation for Alumina Emissions from the Chemical Processing Eirich Mixer Based on SCREEN Model Predictions at Recommended BACT Allowable Concentration Located 158 Meters from Emission Point

Alumina (Aluminum Oxide)	Results of SCREEN Dispersion Modeling
Maximum Concentration ($\mu\text{g}/\text{m}^3$)	0.011 ¹
TLV ($\mu\text{g}/\text{m}^3$)	10,000
Percent of TLV (%)	0.000011
TLV/420 ($\mu\text{g}/\text{m}^3$)	23.81
Percent of TLV/420 (%)	0.0025 ²

- 1 8-hr Average
- 2 Based on Maximum Predicted Annual Average

0780-30500899-44C MnZn Bisque Kiln

Operation of the MnZn Bisque Kiln is subject to Section 4-8 and Section 4-41, Rule 3, Rule 10, and Rule 12, the Ordinance. This source is also subject to BACT determination for particulate and volatile organic compound emissions. The current BACT limitations define a combined allowable hourly emission rate of 0.7701 lbs/hr. This corresponds to annual allowable emissions of 6,752 pounds or 3.38 tons.

The MnZn Bisque Kiln is used to sinter the smallest electronic ceramic parts produced at Steward, Inc.. This is a small electric kiln and it is equipped with no emission controls. Emissions are estimated by the company to be particulate only and result from the combustion of the cereal binder used in the ceramic parts. On the date of the inspection this equipment was in operation. The kiln exhausts were observed and no visible emissions were detected. The exhausts were clean and free of dust or ceramic materials.

Uncontrolled particulate emissions are based on material balance and were determined to be 0.03 lbs/hr. Based on this emission estimate and 8,760 annual hours of operation, particulate emissions from this process are estimated to be 262.8 pounds or 0.13 tons.

Rule 10 (Schedule 2), the Ordinance, defines an allowable particulate emission limit for the MnZn Bisque Kiln of 0.15 lbs/hr. Annual allowable emissions at this Rule 10 limit would be 0.66

tons. This emission limitation was too high to be considered BACT for this source. Therefore, a 0.035 lbs/hr BACT particulate emission limitation was recommended for the MnZn kiln. Because the emission limitation is low, a five (5) percent opacity limitation was also recommended for this source. Based on the recommended BACT allowable emission limit, annual allowable emissions from the MnZn Bisque Kiln are 0.15 tons. This recommended limitation brings the total BACT allowable for Steward, Inc., to 7,059.5 pounds or 3.53 tons annually. The hourly BACT allowable is 0.7736 lbs/hr.

0780-30500899-45C No. 14 Tunnel Kiln

Operation of the No. 14 Tunnel Kiln is subject to Section 4-8 and Section 4-41, Rule 2, Rule 3, Rule 10, Rule 12, Rule 13 (sulfur oxides), the Ordinance. This source is also subject to BACT determination for particulate and volatile organic compound emissions. The current BACT limitations define a combined allowable hourly emission rate of 0.7736 lbs/hr. This corresponds to annual allowable emissions of 7,059.5 pounds or 3.23 tons.

This natural gas-fired kiln is used to fire or sinter the ceramic (metallic) products manufactured at Steward, Inc.. The kiln has a process weight of 70 lbs/hr. Emissions from the No. 14 Tunnel Kiln are expected to be particulate plus fuel burning emissions. There are no emission controls on this kiln. The fuel burning rate for this kiln is 880 cubic feet per hour (CFH) or 0.924 MM BTU/hr. Fuel burning emissions from the No. 14 Tunnel Kiln are listed in Table Seventeen.

The uncontrolled particulate emission estimate is based on material balance and fuel consumption. Again, these emissions are based on the burn-off of the cereal binder and fuel burning pollution emission factors. This emission rate was reported by the company to be 0.03 lbs/lb. Particulate emissions from fuel burning are 0.0044 lbs/hr. Based on this emission estimate and 8,760 annual hours of operation, particulate emissions from this kiln are estimated to be 262.8 pounds or 0.13 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 was too high to be considered BACT for this process. Therefore, a 0.035 lbs/hr BACT particulate emission limitation was recommended. Because this emission limitation was low, a five (5) percent opacity limitation was also recommended for this source. Based on the recommended BACT allowable emission limit, annual allowable emissions from the No. 14 Tunnel Kiln are 0.15 tons. This recommended limitation brings the annual BACT allowable for Steward, Inc., to 7,366.6 pounds or 3.68 tons. The combined hourly BACT limit is 0.9236 lbs/hr.

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 0.28 lbs/hr. At this limitation, annual allowable NO_x emissions are 2,452.8 pounds or 1.23 tons. Actual NO_x emissions, based on AP-42 fuel burning emission factors for natural gas, are estimated to be 0.088 lbs/hr. Annual NO_x emissions from the No. 14 Tunnel Kiln are estimated to be 770.9 pounds or 0.39 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 0.65 lbs/hr. At this limit, annual allowable SO₂ emissions are 5,694 pounds or 5.25 tons. Actual SO₂ emissions, based on AP-42 fuel burning emission factors for natural gas, are estimated to be 0.0005 lbs/hr. Annual SO₂ emissions from the No. 14 Tunnel Kiln are estimated to be 4.38 pounds or 0.0022 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 0.007 lbs/hr. Annual VOC emissions from the No. 14 Tunnel Kiln are estimated to be 61.32 pounds or 0.03 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 for the operation of the tunnel kiln. Actual CO emissions are estimated to be 0.018 lbs/hr, based on the AP-42 pollution emission factor for natural gas. At this rate, annual CO emissions would be 157.7 pounds or 0.08 tons.

Table Seventeen - Estimated Particulate and Fuel Burning Emissions from the No. 14 Tunnel Kiln

Fuel Burning Rate (MM BTU/hr)				0.924
Pollutant	Allowable Emissions lbs/hr	Estimated Emissions lbs/hr	Estimated Emissions tons/yr	Potential ² Emissions tons/yr
Particulate	0.035 ¹	0.03	0.13	0.15
NO _x	0.28	0.088	0.39	1.23
SO _x	0.65	0.0005	0.0022	5.25
VOC	0.01 ¹	0.007	0.03	0.04
CO	N/A	0.018	0.08	N/A
Total	0.98	0.14	0.63	6.67

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

0780-30500899-46C No. 16 Tunnel Kiln

Operation of the No. 16 Tunnel Kiln is subject to Section 4-8 and Section 4-41, Rule 2, Rule 3, Rule 10, Rule 12, Rule 13, the Ordinance. This source is also subject to BACT determination for particulate emissions. The current BACT limitations define a combined allowable hourly emission rate of 0.8409 lbs/hr. This corresponds to annual allowable emissions of 7,366.6 pounds or 3.68 tons.

The No. 16 Tunnel Kiln is also used to sinter ferrite ceramic parts. This is an electric kiln and particulate emissions are 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 0.07 lbs/hr. Based on this emission estimate and 8,760 annual hours of operation, annual particulate emissions from this process are estimated to be 613.2 pounds or 0.3066 tons.

Rule 10 (Schedule 2), the Ordinance, defines an allowable particulate emission limit for the No. 16 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 0.08 lbs/hr BACT particulate

emission limitation is recommended. At the BACT limit, annual allowable particulate emissions from this source are 700.8 pounds or 0.35 tons. Because the emission limitation was low, a five (5) percent opacity limitation was also recommended. Based on the recommended BACT allowable emission limit, annual allowable emissions from the No. 16 Tunnel Kiln are 0.35 tons. This recommended limitation brings the total BACT allowable for Steward, Inc., to 8,066.6 pounds or 4.03 tons annually.

Emission Status

Table Eighteen - Summary of Steward, Inc., Particulate Emissions

Source	Estimated Allowable Emissions lbs/hr	Estimated Actual Emissions lbs/hr	Estimated Actual Emissions tons/yr	Potential* Allowable Emissions tons/yr
-12C	1.31	0.005	0.022	5.7378
-13C	0.30	0.003	0.013	1.3140
-15C	0.88	0.0025	0.011	3.8544
-16C	0.004 ^{BACT}	0.002	0.005	0.0175
-17C	1.39	0.102	0.21	6.0882
-18C	1.79	0.0013	0.0027	7.8402
-19C	1.79	0.0013	0.0027	7.8402
-21C	0.15	0.0025	0.011	0.6570
-22C	1.73	0.008	0.033	7.5774
-23C	2.22	0.001	0.00003	0.1665
-24C	33.02	0.001	0.00003	2.4765
-25C	33.02	0.003	0.00001	1.6510
-26C	0.02	0.01	0.001	0.0876
-28C	0.074	0.005	0.0104	0.3241
-30C	0.10 ^{BACT}	0.075	0.15	0.4380
-33C	0.05 ^{BACT}	0.002	0.0054	0.2190
-42C	0.07 ^{BACT}	0.066	0.29	0.3066
-43C	0.0001 ^{BACT}	0.00001	0.0001	0.0004
-44C	0.035 ^{BACT}	0.03	0.13	0.1533
-45C	0.035 ^{BACT}	0.03	0.13	0.1533
-46C	0.08 ^{BACT}	0.07	0.31	0.3504
Totals	78.0681	0.4206	1.3373	47.2534

1 Based on Allowable Emission Rate at 8,760 Hours per Year Unless Otherwise Limited by Annual Operating Hours Limitation as Specified by Special Operating Condition

Conclusions

In conclusion, based on the information provided by Steward, Inc., and the observations made on the date of the inspection, the process equipment evaluated should continue to operate in compliance with the Chattanooga Air Pollution Control Ordinance under normal conditions. Therefore, the renewal certificates of operation should be issued to the company.

Recommendations

I recommend issuance to Steward, Inc., the renewal certificates of operation for the process equipment evaluated in this report. I also recommend the continuation of the following special operating conditions.

0780-30500899-16C C-6 Calciner (Harper 1986)

1. The maximum allowable particulate emission rate from this source shall be 0.004 lbs/hr.
2. The maximum allowable volatile organic compound emission rate from this source shall be 0.004 lbs/hr.
3. Visible emissions from the C-6 Calciner 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, 1993) 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.

0780-30500899-20C Parts Hammer Crusher (Jeffry Mill)

1. The maximum allowable particulate emission rate from this source shall be 0.002 lbs/hr.
2. Visible emissions from the Parts Hammer Crusher (Jeffry Mill) 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, 1993) 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.

0780-30500899-23C No. 1 Silo Vent

0780-30500899-24C No. 2 Silo Vent

1. This equipment shall not be operated more than one-hundred fifty (150) hours in any consecutive 365-day period, as requested by the company.

0780-30500899-25C No. 3 Silo Vent

1. This equipment shall not be operated more than one-hundred (100) hours in any consecutive 365-day period, as requested by the company.

0780-30500899-30C No. 4 Anhydro Spray Dryer

1. The maximum allowable particulate emission rate from the MikroPul baghouse emission point shall be 0.1 lbs/hr.
2. These emission limitations are Best Available Control Technology (BACT), as determined by the Director, the Chattanooga-Hamilton County Air Pollution Control Bureau.
3. The owner or operator of this source shall be required, if so directed by the Director, the Chattanooga-Hamilton County Air Pollution Control Bureau, to conduct stack sampling for particulate matter. This stack sampling shall be conducted during maximum operating conditions and shall, at a minimum, consist of and be performed in accordance with EPA reference Method 5 (particulate), Title 40 Code of Federal Regulations Part 60, Appendix A, (July 1, 1993). Such testing shall be conducted using this reference method and procedures deemed acceptable by the Director, the Chattanooga-Hamilton County Air Pollution Control Bureau.
4. 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.

0780-30500899-33C C-7 Harper Rotary Calciner

1. The maximum allowable particulate emission rate for this source shall be 0.050 lbs/hr.
2. This emission limitation is Best Available Control Technology (BACT) as determined by the Director, the Chattanooga-Hamilton County Air Pollution Control Bureau.

0780-30500899-40C Grieves Furnace No. 1

1. The maximum allowable nitrogen oxide (NO_x) emission rate from this source shall be 300 ppm, as regulated by Section 4-41, Rule 2.4 of the Chattanooga Air Pollution Control Ordinance.
2. Testing of this source to determine compliance with this limitation 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 nitrogen oxide emissions in accordance with Test Method 7,

Title 40 Code of Federal Regulations Part 60, Appendix A, (July 1, 1991) and in accordance with the provisions of Section 4-3 of the Chattanooga Air Pollution Control Ordinance.

0780-30500899-41C Grievess Furnace No. 2

1. The maximum allowable nitrogen oxide (NO_x) emission rate from this source shall be 300 ppm, as regulated by Section 4-41, Rule 2.4 of the Chattanooga Air Pollution Control Ordinance.
2. Testing of this source to determine compliance with this limitation 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 nitrogen oxide emissions in accordance with Test Method 7, Title 40 Code of Federal Regulations Part 60, Appendix A, (July 1, 1991) and in accordance with the provisions of Section 4-3 of the Chattanooga Air Pollution Control Ordinance.

0780-30500899-42C Blender - Chemical Processing

1. The maximum allowable particulate emission rate from this source shall be 0.07 lbs/hr.
2. Visible emissions from the Estee baghouse exhaust serving the Chemical Processing Blender 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, 1991) 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.

0780-30500899-43C Eirich Mixer - Chemical Processing

1. The maximum allowable particulate emission rate from this source shall be 0.0001 lbs/hr.
2. Visible emissions from the Micro Pulsaire baghouse exhaust serving the Chemical Processing Eirich Mixer 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, 1991) 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.

0780-30500899-44C MnZn Bisque Kiln

1. The maximum allowable particulate emission rate from this source shall be 0.035 lbs/hr.
2. Visible emissions from the MnZn Bisque 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, 1991) 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.

0780-30500899-45C No. 14 Tunnel Kiln

1. The maximum allowable particulate emission rate from this source shall be 0.035 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. 14 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, 1991) 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.

0780-30500899-46C No. 16 Tunnel Kiln

1. The maximum allowable particulate emission rate from this source shall be 0.08 lbs/hr.
2. Visible emissions from the No. 16 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, 1991) 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.