CHATTANOOGA-HAMILTON COUNTY AIR POLLUTION CONTROL BUREAU

Statement of Basis
Part 70 Permit No. 47-065-3455

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Emission Unit No.	Description
001	Babcock & Wilcox Boilers #1 and #2
002	Paperboard Manufacturing Process
003	Paperboard Trim Conveying System

Purpose

Sonoco Products Company (*formerly WestRock Converting, LLC*) has applied for the renewal of their Part 70 (Title V) Permit. This company name is registered as an active entity with the Tennessee Secretary of State. This statement of basis includes discussions of the operation of the permitted equipment, the air pollutant emissions, and the applicable regulations. It has been adapted from the Bureau inspection report for WestRock dated July 21, 2023.

Process Description

Sonoco manufactures recycled paperboard from various types of post-consumer waste paper. The paperboard that is made normally consists of nine plies. The top and bottom plies are referred to as liner plies, and the seven inner plies are known as filler plies. The liner plies are typically made from higher-quality waste paper than what is used to produce the filler plies. Uses for the paperboard product include cartons, partitions, tubes, and laminated items. No coatings are applied to the paperboard at this mill, and no corrugated cardboard is made.

The waste paper raw material is initially made into pulp by slurrying it with water in any of four batch or two continuous pulpers that are all heated by steam. The batch pulpers supply pulp for making liner plies, and pulp for the filler plies is made in the continuous pulpers. After being screened, the pulp fibers are cut and aligned in any of nine refiners. One additional refiner is not normally used and serves as a backup unit. The pulp is then sent to either of two paper machines from stock chests. Five refiners and four stock chests serve Paper Machine No. 1, and Paper Machine No. 2 is served by four refiners and four stock chests. Machine No. 2 can make thicker paperboard than Machine No. 1.

Each of the two nearly identical paper machines consists of a wet end and a dry end. The pulp is formed into a continuous multi-ply sheet of paperboard at the wet end of each machine, which includes nine consecutive pulp vats, nine screen-covered cylinders, and a continuous sheet of synthetic felt. The first and last vats contain pulp for the liner plies, and pulp for the filler plies is contained in the other seven vats. Each individual ply is formed as pulp fibers are picked up from a vat by a cylinder screen and then transferred to the felt sheet. The multi-ply paperboard sheet is built up on the moving felt sheet as each of the nine plies is added.

After the wet paperboard sheet separates from the felt sheet, rollers are used to press excess water out of it. The paperboard sheet is then dried as it traverses an extensive series of drums (dryer cans) that are internally heated by steam. These rollers and heated drums are located at the dry end of each paper machine. An additional pulper for filler plies is also located at the dry end of each paper machine. These two pulpers are known as "broke" pulpers because they use any paperboard that may have torn off of the rollers or drums. The finished product is shipped out in the form of either rolls or cut sheets.

A water treatment system is used to treat process water so that it can be reused in the paperboard making process. This system includes an initial screen and a clarifier for removing suspended solids.

Fugitive VOC emissions of methanol (methyl alcohol, CH_3OH), acetaldehyde (ethanal, CH_3CHO), formaldehyde (methanal, H_2CO), and propionaldehyde (propanal, CH_3CH_2CHO), which are all HAPs, result directly from the paperboard manufacturing process **(Emission Unit 002)**. These emissions are evolved from the manufacture of recycled paperboard both at equipment for pulp stock preparation and at the two paper machines.

Furthermore, five VOC-containing chemicals are currently used in the paperboard manufacturing process. Nalco® 7593 is a retention aid that helps the pulp fibers to stay on the felt sheet of each paper machine. Nalsize™ 7543 is a water-repellent "sizing" agent. Axstrength® AS 8215 is a polymer that is used to increase the tear strength of paperboard. The retention aid, sizing agent, and strength aid are all added to the pulp as it enters the paper machine vats. Nalstrip™ 1702 is a cleaner that is continuously sprayed onto the felt sheets. In addition, Nalcon® 10WB is a biocide that is added to water that has been clarified in the water treatment system. Fugitive VOC emissions result from the use of these five process chemicals. The VOCs in Axstrength® AS 8215 include acrylamide [acrylic amide, $H_2C{=}CH(C{=}O)NH_2$] and the VOCs in Nalstrip™ 1702 include naphthalene ($C_{10}H_8$), both of which are HAPs. No emissions result from the use of powdered dyes, which may be added to the pulp, and no pulp bleaching is performed.

Paperboard is trimmed from the edges of the paperboard sheet at the dry end of each of the two paper machines, and the trim is pneumatically conveyed to the pulpers. The paperboard trim conveying system **(Emission Unit 003)** utilizes two large cyclones, in parallel, to separate the trim from the air stream. One cyclone is normally used per paper machine, and uncontrolled particulate emissions occur from each cyclone.

Finished paperboard is rolled onto cores made of paperboard layers. A saw is used to cut these purchased cores to the proper length. The saw blade is primarily vented to a small cyclone followed by eight bag filters in parallel for the control of particulate matter, and the filters exhaust to the inside of the building so that no particulate matter is emitted from them to the outside. To assure that adequate suction is being provided to the saw blade, material collected from the small cyclone can be vented to the two large cyclones of the paperboard trim conveying system. Additional particulate emissions from the large cyclones that result solely from the core saw are negligible in comparison to the particulate emissions resulting from the trim conveying system. The core saw is therefore not required to be separately permitted.

The rubber coating on the surface of certain rollers of the two paper machines may wear unevenly with use. A grinder is available, as needed, for smoothing the surface of a roller while the roller is turned on a spindle. Rubber dust is vented from the grinder to a hopper by way of a cyclone, and the majority of it is too large to be considered to be particulate matter. The grinder results in potential particulate emissions, before being controlled by the cyclone, of no more than 0.50 lb/hr. It is therefore classified as an insignificant activity in accordance with §4-56(c)(12)(ii). This operation, however, is currently outsourced and performed offsite.

Steam for the paperboard manufacturing process and for space heating is provided by Babcock & Wilcox Boilers #1 and #2 **(Emission Unit 001)**. These two identical boilers are fueled by natural gas primarily and use No. 6 fuel oil as a backup fuel. No. 2 fuel oil can also be burned in them as a backup fuel, but this is not currently done. Emissions that result from fuel combustion in the two boilers are uncontrolled. Boiler #1 is exhausted to a 70-foot tall stack, and a 175-foot tall stack serves Boiler #2.

Evaluation

Emission Unit 001 Babcock & Wilcox Boilers #1 and #2

Each of the Babcock & Wilcox Boilers #1 and #2 has a rated capacity of 104.7 MMBtu/hr for the combustion of both natural gas and No. 6 fuel oil, while No. 2 fuel oil can be burned in each boiler at a maximum rate of 698.0 gal/hr (97.72 MMBtu/hr). 750,627,000 cubic feet of natural gas, 89,300 gallons of No. 6 fuel oil, and no amount of No. 2 fuel oil were burned in the two boilers combined during calendar year 2022. The maximum allowable sulfur contents of the No. 6 fuel oil and No. 2 fuel oil that can be burned are 2.0% by weight and 15 ppm (0.0015%) by weight, respectively. The average sulfur content of the No. 6 fuel oil that was burned in 2022 is estimated to be 1.517% by weight.

The estimated emissions of particulate ($PM_{2.5}$, PM_{10}, and total), SO_X, NO_X, CO, VOCs, hydrogen chloride (HCl), hydrogen fluoride (HF), and GHGs (actual and CO_2e) that result from fuel combustion in Boilers #1 and #2 combined are given in Table I, which follows. The filterable particulate emissions that result from No. 6 fuel oil combustion were determined to be 0.09698 lb/MMBtu by an emissions test of Boiler #1 that was performed on May 24, 1979. The GHG

emissions were calculated by using the Tier 1 calculation methodology that is found in §98.33 of 40 CFR Part 98, Subpart C. All of the other emissions were calculated by using AP-42 (1998) emission factors. The particulate emissions that result from No. 6 fuel oil combustion were determined by adding the tested emissions of filterable particulate to the AP-42 factor for condensable particulate emissions.

The potential emissions are based on continuous operation of both boilers at their rated capacities. The hourly potential emissions are based on burning the fuel that results in the highest emissions. The hourly potential emissions of particulate, SO_X, NO_X, hydrogen chloride, hydrogen fluoride, and GHGs are based on burning No. 6 fuel oil that has the maximum allowable sulfur content. The annual potential emissions of these seven pollutants are based on burning 3,500,000 gallons of No. 6 fuel oil that has the maximum allowable sulfur content and on combustion of the maximum amount of natural gas that can be burned after this much No. 6 fuel oil has been burned. The potential emissions of CO and VOCs are based on natural gas combustion.

Table I. Emissions from Babcock & Wilcox Boilers #1 and #2

Pollutant	Actual Emissions *tons/yr*	Potential Emissions *lb/hr*	Potential Emissions *tons/yr*	Allowable Emissions *lb/hr*
Particulate Matter ≤ 2.5 μm ($PM_{2.5}$)	3.283	13.466	21.759	23.10
Particulate Matter ≤ 10 μm (PM_{10})	3.478	19.559	29.396	
Total Particulate Matter	3.569	22.402	32.960	
Sulfur Oxides (SO_X)	10.984	443.928	556.866	443.93
Nitrogen Oxides (NO_X)	41.488	76.780	163.001	n/a
Carbon Monoxide (CO)	31.750	17.245	75.532	n/a
Volatile Organic Compounds (VOCs)	2.077	1.129	4.946	n/a
Hydrogen Chloride	0.015	0.484	0.607	n/a
Hydrogen Fluoride	0.0017	0.052	0.065	n/a
Actual Greenhouse Gases (GHGs)	46,154.5	34,671.4	120,046.8	n/a
GHGs as Carbon Dioxide Equivalents (CO_2e)	46,203.8	34,786.9	120,269.1	n/a

All of the particulate emissions that result from burning natural gas are both $PM_{2.5}$ and PM_{10}. 47.0% and 69.7% of the particulate emissions that result from No. 2 fuel oil combustion are $PM_{2.5}$ and PM_{10}, respectively. In addition, 60.1% and 87.3% of the particulate emissions that result from No. 6 fuel oil combustion are $PM_{2.5}$ and PM_{10}, respectively. The VOC emissions that result from natural gas combustion consist of 32.7% hexane [$CH_3(CH_2)_4CH_3$] and 1.5% formaldehyde. VOC emissions that result from burning No. 2 fuel oil include up to 28.4% formaldehyde. In

addition, VOC emissions that result from burning No. 6 fuel oil include up to 21.7% formaldehyde and 2.21% toluene (methylbenzene, $C_6H_5CH_3$). All of these percentages were determined by using AP-42 (1998) emission factors. GHG emissions that result from fuel combustion consist mostly of CO_2 and include lesser amounts of methane (CH_4) and nitrous oxide (N_2O).

Hydrogen chloride, hydrogen fluoride, hexane, formaldehyde, and toluene are all HAPs. The potential emissions of total HAPs from the two boilers combined are 2.192 tons/yr, based on continuous operation of both boilers at their rated capacities, on burning 3,500,000 gal/yr of No. 6 fuel oil that has the maximum sulfur content, and on combustion of the maximum amount of natural gas that can be burned after this much No. 6 fuel oil has been burned. Each individual HAP that has quantifiable emissions, with the exception of hydrogen chloride and hydrogen fluoride, can be classified either as a VOC or as particulate matter.

Babcock & Wilcox Boilers #1 and #2 were installed in 1968. An appropriate limitation for the usage of No. 2 fuel oil and No. 6 fuel oil combined in Boilers #1 and #2 combined has been previously determined to be 3,500,000 gal/yr. Sonoco requested this limitation in order to reduce their annual Part 70 permit fee, which is based on their allowable emissions. The potential emissions that are given in Table I are based upon this limitation.

The two boilers are subject to "National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers Area Sources" [40 CFR Part 63, Subpart JJJJJJ (§63.11193–11237)], as adopted at Rule 16.5(c). The reporting and recordkeeping requirements are given in §63.11223(b)(6) and §63.11225(b), (c), and (d) of Subpart JJJJJJ. §63.11201(b) and §63.11223(a) and (b) of this subpart require a performance tune-up of each boiler every two years.

Potential particulate emissions from each of Boilers #1 and #2 are estimated to be 11.201 lb/hr. The particulate emissions from each of these boilers are limited by Rule 26.6 (RACT) to 0.1103 lb/MMBtu because the Sonoco paperboard mill is located within the former particulate non-attainment area. This limitation is equivalent to 11.55 lb/hr for each of the two boilers while they are operating at their rated capacities. This limitation is more stringent than the Rule 8.1 (Schedule 1) particulate emission limit of 34.15 lb/hr for each of the two boilers.

An appropriate sulfur content limitation for the No. 6 fuel oil that is burned in Boilers #1 and #2 has been previously determined to be 2.0% by weight. Sonoco requested this limitation in order to reduce their annual Part 70 permit fee. Combustion of No. 6 fuel oil with the maximum allowable sulfur content in either boiler at its rated capacity results in potential SO_X emissions of 221.964 lb/hr. This SO_X emission rate is the effective SO_X emission limitation for each boiler. This limitation is more stringent than the Rule 13.2 SO_2 emission limit of 4 lb/MMBtu, which is equivalent to 418.8 lb/hr for each of the two boilers while they are operating at their rated capacities. No limitations are applicable for the emissions of NO_X, CO, VOCs, hydrogen chloride, hydrogen fluoride, and GHGs from either of the two boilers.

Emission Unit 002 Paperboard Manufacturing Process

Paperboard can be manufactured in Paper Machines #1 and #2 combined at a maximum sustainable rate of 425 tons/day. Annual raw materials usage and paperboard production during calendar year 2022 were 141,007 tons and 128,637 tons, respectively. The estimated VOC emissions that result directly from paperboard manufacturing are given below in Table II. These emissions were calculated by using National Council for Air and Stream Improvement (NCASI) *Technical Bulletin No. 1050* (2018) emission factors. These factors are for raw materials and paperboard on an "air-dried" basis, which is defined as containing 10% moisture by weight. While the raw materials are considered to be air-dried, the lowest annual-average moisture content of the paperboard that is produced is 5.09% by weight. The methanol emission factor for paperboard was calculated by using a methanol concentration in process "whitewater" of 2 ppm that was determined from analyses of samples that were collected on December 1, 2020. The potential emissions are based both on continuous production, at the maximum rate, of paperboard with a minimum moisture content of 5.0% by weight and on the amount of air-dried paperboard produced being 87.7%, by weight, of the maximum required amount of raw materials.

Table II. VOC Emissions from the Paperboard Manufacturing Process (Except from Process Chemical Usage)

Pollutant	Actual Emissions *tons/yr*	Potential Emissions *lb/hr*	Potential Emissions *tons/yr*	Allowable Emissions *tons/yr*
Methanol	2.383	0.661	2.897	50.0*
Acetaldehyde	0.984	0.273	1.197	
Formaldehyde	0.061	0.017	0.075	
Propionaldehyde	0.040	0.011	0.049	
Total VOCs	**3.468**	**0.963**	**4.219**	**50.0***

*Includes allowable VOC emissions from process chemical usage

The annual emissions resulting from process chemical usage within the paperboard manufacturing process during calendar year 2022 were 11.203 tons of VOCs, including 0.459 ton of naphthalene and 0.0078 ton of acrylamide. These emissions were determined by multiplying the annual usages of the various chemicals by their respective VOC and HAP contents, as obtained from their safety data sheets or environmental data memoranda.

Because the chemicals that are used in the paperboard manufacturing process at this mill have continued to change over time, the VOC emissions and process gaseous emissions that result from this process are subject to BACT (Rule 25.3) and Rule 23, respectively. Appropriate BACT limitations for the fugitive emissions that result from the paperboard manufacturing process have

been previously determined to be 50.0 tons/yr for VOCs, 8.20 tons/yr for each individual HAP, and 22.70 tons/yr for combined HAPs. The HAP emission limitations are also reasonable and proper, in accordance with Rule 23.

The HAP emission limitations were determined in order to keep plant-wide allowable emissions below 9.90 tons/yr for each individual HAP and 24.90 tons/yr for combined HAPs. The only other source of HAP emissions at the paperboard mill are Boilers #1 and #2 (Emission Unit 001). The highest potential emissions of any individual HAP (hexane) from these two boilers are 1.619 tons/yr. (8.20 tons/yr + 1.619 tons/yr = 9.819 tons/yr < 9.90 tons/yr.) The potential emissions of combined HAPs from the two boilers are 2.190 tons/yr. (22.70 tons/yr + 2.190 tons/yr = 24.890 tons/yr < 24.90 tons/yr.) These emissions were calculated by using AP-42 (1998) emission factors.

Emission Unit 003 Paperboard Trim Conveying System

Paperboard can be manufactured in both paper machines combined at a maximum sustainable rate of 425 tons/day, and annual paperboard production during calendar year 2022 was 128,637 tons. The estimated particulate emissions from the trim conveying system are given below in Table III. These emissions were calculated by using an emission factor of 1.7823 pounds per ton of trim that was determined by an emissions test of a cyclone for a corrugated sheet trim conveying system that was performed at a Boise Cascade Corporation facility in Nampa, Idaho, on May 11, 1995. Any additional particulate emissions from the core saw are negligible in comparison. Paperboard trim that is removed from each side of a sheet has an average width of about 3 inches and an approximate maximum width of 4 inches. The nominal width of a paperboard sheet that is produced on either paper machine is 120 inches. The potential emissions are based on continuous operation at the maximum rate generating paperboard trim with the maximum width.

Table III. Particulate Matter Emissions from the Paperboard Trim Conveying System

Actual Emissions *tons/yr*	Potential Emissions *lb/hr*	Potential Emissions *tons/yr*	Allowable Emissions *lb/hr*
5.732	2.104	9.216	3.98

The paperboard trim conveying system was installed in 1977. The particulate emissions from the conveying system are limited by Rule 10.3 (Schedule 2) to 3.98 lb/hr, based on a process weight of 2,361.1 lb/hr (2 × 4 inches/120 inches × 425 tons/day × 1 day/24 hr × 2,000 lb/ton). This limitation is more stringent than the Rule 10.7 particulate emission limit of 0.25 gr/scf (54.69 lb/hr for the two cyclones combined).

Conclusions

Babcock & Wilcox Boilers #1 and #2 (Emission Unit 001) is subject to and in compliance with §4-41, Rule 3 (visible emissions), Rule 12 (odor), Rule 13 (SO_2 emissions), Rule 16.5(c) ("National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers Area Sources," Title 40 *Code of Federal Regulations* Part 63, Subpart JJJJJJ), and Rule 26.6 (RACT particulate emissions from fuel-burning equipment) of the Chattanooga Air Pollution Control Ordinance (the Ordinance).

The paperboard manufacturing process (Emission Unit 002) is subject to and in compliance with §4-41, Rule 12 (odor), Rule 23 (reasonable and proper gaseous emissions), and Rule 25.3 (BACT VOC emissions) of the Ordinance.

The paperboard trim conveying system (Emission Unit 003) is subject to and in compliance with §4-41, Rule 3 (visible emissions), Rule 10 (particulate emissions), and Rule 26.11 (RACT visible emissions from material handling sources) of the Ordinance.

None of the emission sources at this facility are subject to §4-68(d) ("Compliance Assurance Monitoring," Title 40 *Code of Federal Regulations* Part 64) of the Ordinance.