SOUTHERN ENVIRONMENTAL LAW CENTER

Telephone 404-521-9900 | TEN 10TH STREET NW, SUITE 1050 ATLANTA, GA 30309-3848 | Facsimile 404-521-9909

September 12, 2019

VIA E-MAIL

Mr. Eric Cornwell
Program Manager
Stationary Source Permitting
Georgia Environmental Protection Division – Air Protection Branch
4244 International Parkway, Suite 120
Atlanta, Georgia 30354-3906
askepd@gaepd.org

Re: **SIP Permit Application for Sterigenics, Atlanta Facility**
Permit No. 7389-067—0093-S-05-0

Dear Mr. Cornwell:

Please accept the following comments on the above-referenced permit application, which was filed with the Georgia Environmental Protection Division on July 30, 2019. We take the unusual step of commenting on a permit application because EPD does not plan to issue a draft permit for public comment. Instead, EPD has invited interested members of the public to comment on the permit application. These comments are submitted on behalf of Stop Sterigenics GA, Inc., Environment Georgia, and the Georgia Chapter of the Sierra Club.

Stop Sterigenics GA is a non-profit grassroots organization of concerned citizens, businesses, and community stakeholders aligned with the mission to smartly, swiftly, and strategically remove the source of human carcinogens such as ethylene oxide (EtO) emitted into their community. Environment Georgia works statewide to ensure all Georgians can enjoy clean air, clean water, and greenspaces. The Sierra Club is America's largest and most influential grassroots environmental organization, with more than 3.5 million members and supporters working in part to safeguard the health of our communities.

While we are pleased that EPD has agreed to accept comment on the permit application, we note EPD has already claimed to have approved the plans therein – indeed, to have done so a

mere three days after the application was submitted.[1] We sincerely hope that is not the case, as the permit application contains numerous unsupported assumptions and other flaws that make EPD's hasty grant of approval inappropriate. Given the gravity of the situation, no one questions the need for immediate action. However, EPD's procedures for expedited permitting expressly require a "high-quality application." [2] EPD retains discretion to refuse expedited permitting where applications turn out to be of "poor overall quality" and/or "very controversial." This application is both.[3]

For the reasons discussed herein, the pending application fails to provide a basis for EPD to verify the claimed efficacy of the additional controls that Sterigenics seeks approval to implement. Moreover, one of the application's core claims – that "[w]ith these improvements, the facility will have technology that provides the greatest reduction in ethylene oxide emissions that is now available" (p. 3) – is demonstrably false. Identical language appears in the permit application Sterigenics filed in Illinois for its Willowbrook facility, and yet the suite of controls approved there go well beyond what is proposed here. The residents of Smyrna surrounding Sterigenics' Atlanta facility deserve no less protection from harmful EtO emissions than the residents of Willowbrook, Illinois.

In addition, it is extremely important that EPD "get it right" with this proposal because, as we understand it, other EtO sterilization facilities in Georgia, such as the Bard Medical Division plant in Covington, may soon seek similar approvals.

In preparing these comments, we were assisted by Ranajit Sahu, Ph.D. Dr. Sahu has over twenty-nine years of experience in the fields of environmental, mechanical, and chemical engineering, including: program and project management services; design and specification of pollution control equipment for a wide range of emissions sources including stationary and mobile sources; multimedia environmental regulatory compliance (involving federal statutes and regulations such as the CAA and its Amendments, CWA, TSCA, RCRA, CERCLA, SARA, OSHA, NEPA, as well as various related state statutes and regulations); transportation air quality impact analysis; multimedia compliance audits; multimedia permitting (including air quality NSR/PSD permitting, Title V permitting, NPDES permitting for industrial and storm water discharges, RCRA permitting, etc.); multimedia/multi- pathway human health risk assessments for toxics; air dispersion modeling; and regulatory strategy development and support including negotiation of consent agreements and orders. A copy of Dr. Sahu's curriculum vitae is attached as Exhibit 1.

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[1] Press Release, Ga. Envtl. Prot. Div., State officials approve plan to reduce ethylene oxide emissions at Smyrna plant (Aug. 2, 2019), https://epd.georgia.gov/press-releases/2019-08-19/state-officials-approve-plan-reduce-ethylene-oxide-emissions-smyrna-plant.

[2] Standard Operating Procedures, Expedited Permitting Program, Georgia EPD – Air Protection Branch at 1 (April 9, 2013), https://epd.georgia.gov/sites/epd.georgia.gov/files/2013expeditedpermittingprocedures.pdf.

[3] *Id.* at 5.

These comments are divided into two parts. The first section addresses flaws in the pending permit application. As a result of those deficiencies, EPD should rescind any prior grant of approval and require Sterigenics to provide additional information substantiating the supposed effectiveness of its proposed new controls.

The second section offers recommendations to improve the permit. Guided principally by the new permit issued to the Willowbrook facility by the Illinois Environmental Protection Agency, we suggest language to include in any final permit to allow EPD and the public to verify that the claimed emission reductions will in fact occur.

I. Comments on Permit Application

Comment 1. The usage assumptions underlying the emissions calculations for EtO and Propylene Oxide (PO) set forth in Attachment D of the Sterigenics application are unsupported and unverified.

All of the application's emissions calculations rely on the four usage assumptions shown on Attachment D, which we have outlined below in red for emphasis.

Attachment D Emission Calculations

	Existing Emission Controls			Proposed Emission Controls		
	Control Devices	Required Existing Efficiency	Actual Existing Efficiency	Control Devices	Required Proposed Efficiency	Actual Expected Efficiency
Sterilizer Vacuum Pump	Ceilcote Scrubber	99.0%	99.999%	Ceilcote Scrubber and AAT	99.99%	99.999998%
Aeration Rooms	AAT System	99.0%	99.833%	AAT System	99.0%	99.833%
Backvent	AAT System	99.0%	99.833%	AAT System	99.0%	99.833%
Fugitives	None	0.0%	0.00%	Dry Bed system (new)	99.0%	99.000%

	Existing				Proposed			
	Ethylene Oxide Potential (lbs)	Ethylene Oxide 2018 (lbs)	Propylene Oxide Potential (lbs)	Propylene Oxide 2018 (lbs)	Ethylene Oxide Potential (lbs)	Ethylene Oxide Expected (lbs) (2018)	Propylene Oxide Potential (lbs)	Propylene Oxide Expected (lbs) (2018)
Usage (pounds)	625,000	425,000	25000	1569	625,000	425000	25000	1569
Sterilizer Emissions	5,937.5	4.04	237.5	0.0149	59.4	0.007	2.4	0.00002
Aeration Emissions	250.00	28.39	10.00	0.10	250.0	28.4	10.0	0.105
Backvent Emissions	62.50	7.10	2.50	0.03	62.5	7.1	2.5	0.026
Fugitive Emissions	312.5	212.5	12.5	0.8	3.1	2.1	0.1	0.008
TOTAL Emissions	**6,563**	**252**	**263**	**0.93**	**375.0**	**37.62**	**15.00**	**0.14**
TOTAL Emissions (tons)	**3.28**	**0.13**	**0.13**	**0.00047**	**0.187**	**0.019**	**0.0075**	**0.00007**

Assumptions
95% Usage through Chamber Vacuum Pumps
4% Usage through Aeration
1% Usage through Back Vents
0.05% Usage Assumed as fugitives

The application provides no engineering support for these assumptions. We note that similar assumptions have been used at least since 1999 to estimate emissions, even though the facility has undergone several design changes since then. The excerpt below is taken from the 1999 permit application:

Section IV. Assumptions

A. 95% by weight of all emissions are drawn off in the sterilization chamber. 4% by weight of all emissions are drawn off in the aeration room. 1% by weight of all emissions are drawn off in the sterilizer backvents.

B. All EtO and PO charged into the sterilizer are emitted.

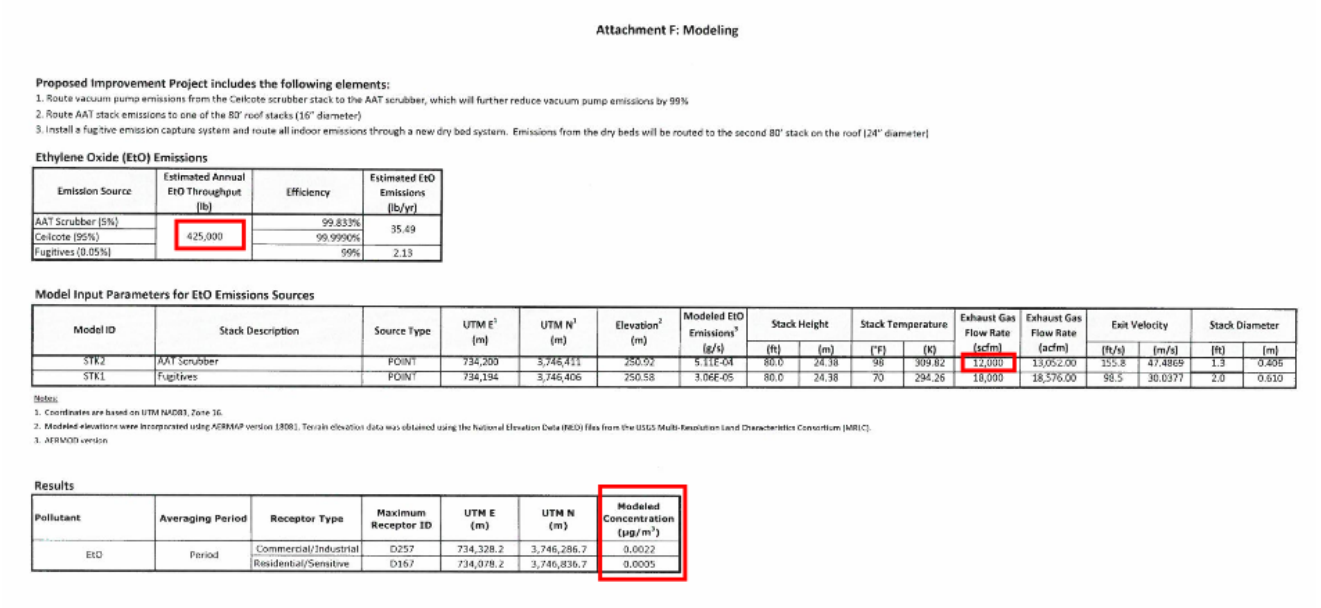
C. The control efficiency of the acid scrubber and the combined acid scrubber and dry bed absorption system is 99%.

We note also that a similar facility in south Fulton (Sterilization Services of Georgia) reports different usage assumptions. In an application for facility expansion received by EPD on April 29, 2014, Sterilization Services of Georgia reported that 97% of usage was evacuated to the chamber vacuum pumps, with 2.97% going to the aeration chambers, and 20% of that (0.6%) assumed as fugitive emissions [4] (an order of magnitude higher than the assumed fugitive emissions reported by Sterigenics, i.e. 0.05%). Our point is not that the two facilities should have identical usage assumptions; rather, our point is simply that usage can vary significantly even under similar processes. Hence, it's critical that Sterigenics' usage assumptions have clear and verifiable empirical support, especially because those assumptions underpin the entire proposal.

Comment 2. The modeling provided with the application uses actual instead of potential emissions. This is incorrect and inappropriate.

As shown in the modeling summary contained in Attachment F of the application (excerpted on the next page), the EtO throughput used in the modeling is 425,000 lb/year. This is the actual usage in 2018, as shown in Attachment D of the application.

[4] SIP Air Permit Application, Sterilization Servs. of Ga., Attachment A (Apr. 29, 2014) (attached as Exhibit 2).



Attachment F: Modeling

Proposed Improvement Project includes the following elements:

1. Route vacuum pump emissions from the Ceilcote scrubber stack to the AAT scrubber, which will further reduce vacuum pump emissions by 99%
2. Route AAT stack emissions to one of the 80' roof stacks (16" diameter)
3. Install a fugitive emission capture system and route all indoor emissions through a new dry bed system. Emissions from the dry beds will be routed to the second 80' stack on the roof (24" diameter)

Ethylene Oxide (EtO) Emissions

Emission Source	Estimated Annual EtO Throughput (lb)	Efficiency	Estimated EtO Emissions (lb/yr)
AAT Scrubber (5%)	625,000	99.833%	35.49
Ceilcote (95%)		99.9990%	
Fugitives (0.05%)		99%	2.13

Model Input Parameters for EtO Emissions Sources

Model ID	Stack Description	Source Type	UTM E[1] (m)	UTM N[1] (m)	Elevation[2] (m)	Modeled EtO Emissions[3] (g/s)	Stack Height (ft)	Stack Height (m)	Stack Temperature (°F)	Stack Temperature (K)	Exhaust Gas Flow Rate (scfm)	Exhaust Gas Flow Rate (acfm)	Exit Velocity (ft/s)	Exit Velocity (m/s)	Stack Diameter (ft)	Stack Diameter (m)
STK2	AAT Scrubber	POINT	734,200	3,746,411	250.92	5.11E-04	80.0	24.38	98	309.82	12,000	13,052.00	155.8	47.4869	1.3	0.406
STK1	Fugitives	POINT	734,194	3,746,406	250.58	3.06E-05	80.0	24.38	70	294.26	18,000	18,576.00	98.5	30.0377	2.0	0.610

Notes:
1. Coordinates are based on UTM NAD83, Zone 16.
2. Modeled elevations were incorporated using AERMAP version 18081. Terrain elevation data was obtained using the National Elevation Data (NED) files from the USGS Multi-Resolution Land Characteristics Consortium (MRLC).
3. AERMOD version

Results

Pollutant	Averaging Period	Receptor Type	Maximum Receptor ID	UTM E (m)	UTM N (m)	Modeled Concentration (µg/m³)
EtO	Period	Commercial/Industrial	D257	734,328.2	3,746,286.7	0.0022
		Residential/Sensitive	D167	734,078.2	3,746,836.7	0.0005

The facility's potential to emit (PTE) or potential throughput is 625,000 lb/year, as shown in Attachment D. This value (and the corresponding PTE value for PO) should have been used in the modeling. Because of this alone, the modeling underestimates the impacts from the facility.

Comment 3. The application does not discuss nor provide the source of the surface meteorological data used in the modeling.

Representative surface meteorological data is a critical input to any modeling analysis. Any meteorological data used should be representative of the site and its surroundings. Generally, the preference is to use site-specific data – i.e., data collected at the site. It does not appear that any such data were collected at this site.

We note that EPD's own modeling analysis of the facility dated June 7, 2019 identified the following, without any determination that it was representative of conditions at and around the site:

> **Meteorological Data** – Hourly meteorological data (2014 to 2018) used in this review were generated by GA EPD (http://epd.georgia.gov/air/georgia-aermet-meteorological-data). Surface measurements were obtained from the Cartersville Airport, Cartersville, GA. Upper air observations were obtained from the Atlanta Regional Airport – Falcon Field, Peachtree City, GA. These measurements were processed using the AERSURFACE (v13016), AERMINUTE (v15272), and AERMET (v18081) with the adjusted surface friction velocity option (ADJ_U*). [5]

[5] EPD memorandum, Modeling Analysis for Ethylene Oxide, Sterigenics, Smyrna, Cobb County, GA (June 7, 2019),

It is unclear whether Sterigenics relied on the same data set for its analysis. If so, the data would not appear to be representative of site conditions at the Smyrna facility. The Cartersville Airport is more than 40 miles away, and the Atlanta Regional Airport is located at a similar remove. Both areas feature different topography. It's imperative that Sterigenics identify the source of the meteorological data used in its analysis and for EPD to verify that the data are representative of site conditions.

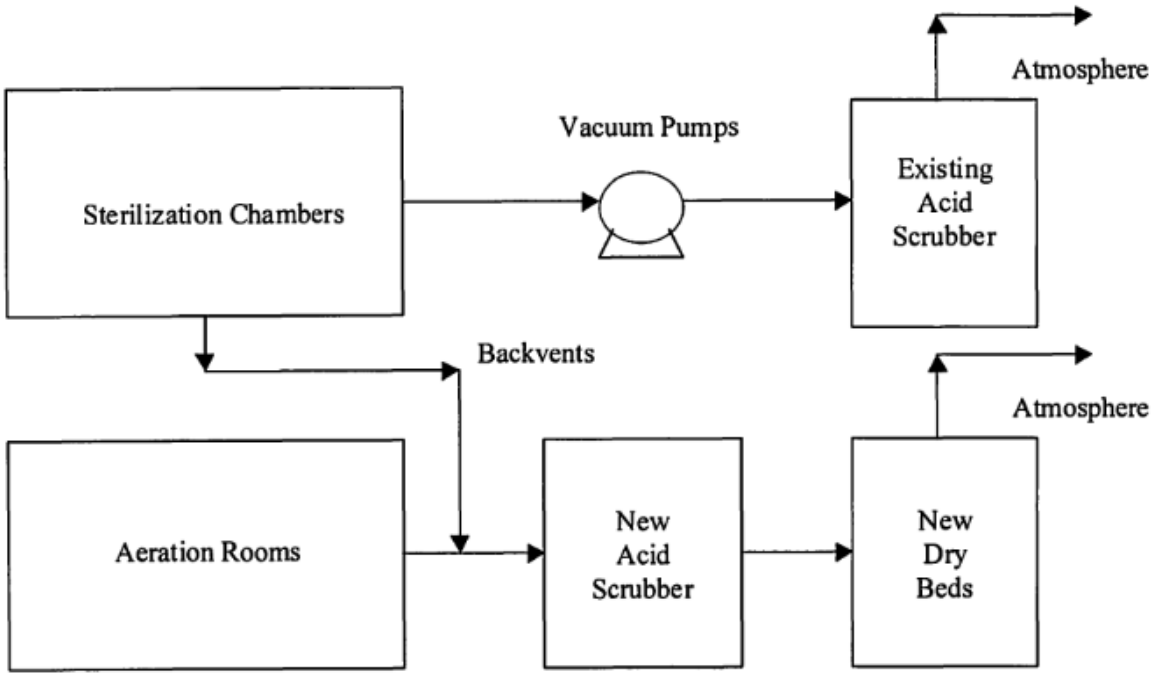
Comment 4. The application provides no engineering discussion regarding whether the existing AAT scrubber/dry beds (EC2) can actually accommodate the existing Ceilcote scrubber (EC3) exhaust gases. [6]

Currently, the existing Ceilcote scrubber exhausts to the atmosphere via a dedicated stack. Sterigenics proposes to duct the outlet of this scrubber to the existing AAT scrubber with dry bed (EC2) in an effort to further reduce vacuum pump emissions. This proposed improvement assumes the AAT scrubber has sufficient capacity to accommodate the added influx from the Ceilcote scrubber, but no such showing has been made. In fact, the record indicates the opposite.

The existing AAT control system was installed in 1999. The figure on the next page is taken from the 1999 application by Griffith Micro Science, Inc. (Sterigenic's predecessor) for permission to install this system:

https://epd.georgia.gov/sites/epd.georgia.gov/files/Sterigenics_Modeling_Memo%20%2806_07_2019%29.pdf. We note that the webpage cited in the memorandum is no longer valid.

[6] Advanced Air Technologies (AAT) and Ceilcote are manufacturers of air pollution control equipment such as wet and dry scrubbers. EC2 and EC3 are designations of the AAT and Ceilcote scrubber systems, respectively. EC4 is another proposed AAT control system that is planned to be installed.



The "Existing Acid Scrubber" shown above was likely EC1, which was replaced in 2004 by the Ceilcote system (EC3). In any case, the 1999 application shows the inlet gas flow rate to EC2 as 12,000 actual cubic feet per minute (acfm) per the excerpt below.

Source Code of Control Equip.	Source Code for Boiler or Process	Type Air Pollution Equip. eg. baghouse, ESP, scrubber	Date Installed	Make & Model Number (attach Mfg. Spec. & Literature)	Unit Modified from Mfg. spec.? (explain on separate sheet)	% Control Efficiency		Inlet Gas Flow Rate acfm
						Design	Actual	
EC2	ARV1-9 and AR10-13; CEV1-CEV8	Scrubber / Dry Cell Absorption System	Proposed	Advanced Air Technologies[a]	No	> 99[b]	NYD[c]	12,000

The inlet flow rate to EC2 is still shown as 12,000 acfm in the 2019 application under review, as excerpted below.

Form 3.00 – AIR POLLUTION CONTROL DEVICES - PART A: GENERAL EQUIPMENT INFORMATION

APCD Unit ID	Emission Unit ID	APCD Type (Baghouse, ESP, Scrubber etc)	Date Installed	Make & Model Number (Attach Mfg. Specifications & Literature)	Unit Modified from Mfg Specifications?	Gas Temp. °F		Inlet Gas Flow Rate (acfm)
						Inlet	Outlet	
EC3/EC2	SEV 1-11	Scrubber		Ceilcote Acid Scrubber and AAT Scrubber System with Dry Bed	No	98	98	
EC2	CEV1-11, AR1, SR1	Scrubber with dry beds		AAT Scrubber System with Dry Bed Adsorber	No	98	98	12,000
EC4	IA-1	Dry Beds	new	Advance Air Technology Dry beds	No	70	70	18,000

The AAT proposal (dated March 22, 1999), which was attached to the 1999 application as an appendix labeled "Manufacturer Design Specifications," describes the design assumption as follows:

PROCESS DESCRIPTION:
Smyrna, Ga.
12,000 cfm total flow rate comprised of continuous aeration flows @ 6,000 cfm plus additional 6,000 cfm from combination of back vents or from warehouse area. Customer will arrange flow rates from all processes such that 12,000 cfm from all sources will not be exceeded. NOTE: With proper ducting and control logic, you can use the scrubber system to process an emergency EtO leak without damage to the system. Guaranteed to meet NESHAP compliance.

As an initial matter, we question whether the EC2 12,000 acfm capacity is appropriate given the changes to the facility since 1999. As shown in the table excerpt above, at the time EC2 was installed, it vented the back vents from just eight chambers (CEV1 – CEV8), estimated to be 6,000 acfm in addition to the aeration vents ARV1-13 (also estimated at a continuous 6,000 acfm).

As the 2019 application (Form 2.00 excerpted below) shows, there are now ten chambers, and the two most recent ones – 10 and 11 – are the largest with a capacity of 30 pallets each. The largest previous chambers (numbers 5–8) were just 13 pallets. It's logical to presume that back vent emissions from the two newer 30-pallet chambers are significantly larger than those from the smaller chambers. And we note that nothing in the current permit or the 2019 application restricts chamber operation – i.e, all of them can operate simultaneously.

Even considering that some of the aeration flows have decreased due to decommissioning of AR-11 through AR-13 in 2014, it's not at all clear that the EC2 design can handle the addition of the back flows from chambers 10 and 11 – and that's before any consideration of ducting the Ceilcote scrubber emissions to that same device, as the application now proposes.

FORM 2.00 – EMISSION UNIT LIST

Emission Unit ID	Name	Manufacturer and Model Number	Description
SEV-1	Chamber 1 vacuum pump	Existing	Six-pallet Sterilization Chamber 1 vacuum pump
SEV-2	Chamber 2 vacuum pump	Existing	Six-pallet Sterilization Chamber 2 vacuum pump
SEV-3	Chamber 3 vacuum pump	Existing	Nine-pallet Sterilization Chamber vacuum pump
SEV-4	Chamber 4 vacuum pump	Existing	Five-pallet Sterilization Chamber vacuum pump
SEV-5	Chamber 5 vacuum pump	Existing	Thirteen-pallet Sterilization Chamber vacuum pump
SEV-6	Chamber 6 vacuum pump	Existing	Thirteen-pallet Sterilization Chamber vacuum pump
SEV-7	Chamber 7 vacuum pump	Existing	Thirteen-pallet Sterilization Chamber vacuum pump
SEV-8	Chamber 8 vacuum pump	Existing	Thirteen-pallet Sterilization Chamber vacuum pump
SEV-10	Chamber 10 vacuum pump	Existing	Thirty-pallet Sterilization Chamber vacuum pump
SEV-11	Chamber 11 vacuum pump	Existing	Thirty-pallet Sterilization Chamber vacuum pump

The Ceilcote flow is 1,200 acfm, as shown in the following excerpt taken from the 2004 application when the Ceilcote system was installed:

Facility Name: IBA S&I, Inc. **Date of Application:** 4/8/04

SECTION 11A – AIR POLLUTION CONTROL DEVICES (APCD)

APCD Source Code	Process Equipment Source Code	APCD Type (Baghouse, ESP, Scrubber etc)	Date Installed	Make & Model Number (Attach Mfg. Specifications & Literature)	Unit Modified from Mfg Specifications?	Percent Control Efficiency		Inlet Gas Flow Rate (acfm)
						Design	Actual	
EC 3	EC 3	Scrubber	5/1/04	Model SPT -42-240	Pressure drop changed from 2.5-3.0 to 2.5 to 4.0" WC.	99.9%	TBD	1200

The design summary shown below from the 2004 Ceilcote proposal also confirms the 1,200 acfm flow:

DESIGN SUMMARY

	Smyrna, GA
Design Volume	1200 SCFM
ETO per Chamber Cycle (lbs)	(4x35) + (4x75) +150
Cycles per Day per Chamber	2
Total Chambers	9
Total Chamber Cycles per Day	18
Total ETO Processed (lbs./Day)	590
Guaranteed Removal Efficiency	99.9 wt%
Scrubber Diameter	42"
Tank Capacity	30,000 Gallons
Heat of Reaction (BTU / Day)	438,370
Scrubber Recycle Rate	115 GPM

Note that this 1,200 flow rate to the Ceilcote system may itself be inadequate because it is based on nine chambers as shown above (i.e., chambers 1–8 from 1999 and chamber 9 which was added subsequently). Although chamber 9 has since been removed from service, the much larger chambers 10 and 11 have been added, as noted previously. Thus, the Ceilcote system itself was not designed to handle flows from the ten current chambers.

In summary, the permit application provides no documentation to show the existing EC3 (Ceilcote) and EC2 AAT systems can handle the expected continuous and periodic flows from the current chambers. An engineering analysis, with appropriate support, should be provided in order to prove the proposed changes will function as intended.

Comment 5. The EtO and PO control efficiencies shown in the application are not reliable.

As discussed in the previous comment, flow rates from the sterilization operations are significantly different now than when EC2 and EC3 were designed and installed. Thus, any pollution control guarantees provided by AAT in 1999 and Ceilcote in 2004 are no longer valid. The facility should have the Ceilcote and ATT scrubber vendors review the current facility configuration, flows, and other operating parameters and confirm their control efficiency guarantees under all operating conditions. This should be done before any consideration of whether the same control efficiencies will apply under the proposed reconfiguration.

We are aware of periodic testing that purports to establish control efficiencies used in the emission calculations and in the modeling, as shown in the following excerpt from the 2019 application:

Form 3.00 – AIR POLLUTION CONTROL DEVICES – PART B: EMISSION INFORMATION

APCD Unit ID	Pollutants Controlled	Percent Control Efficiency		Inlet Stream To APCD		Exit Stream From APCD		Pressure Drop Across Unit (Inches of water)
		Design	Actual	lb/hr	Method of Determination	lb/hr	Method of Determination	
EC2	Ethylene Oxide Propylene Oxide	99	99.833	4.3 0.17	Mass balance	0.04 0.002	Mass balance and performance test	NA
EC4	Ethylene Oxide Propylene Oxide	99	NEW	0.04 0.001	Mass balance	0.0004 0.00001	Mass balance and performance test	TBD

However, these snapshot tests cannot substitute for control equipment performance under all operating conditions – especially since the permit does not restrict all chambers from operating simultaneously. The 2016 performance test, for example, shows that each test run used just one chamber (a different one for each run) and that stack flows ranged from 235 to 332 dry standard cubic feet per minute (dscfm), significantly less than the 1,200 acfm flow rate shown in the application – even if it's converted to dscfm. As EPD personnel noted from review of the performance test data, "the outlet values during a specific run may not be directly scalable or relatable to 24 hour operation. The values I'm seeing on the test report for the Ceilcote scrubber, for example, are extremely low compared to what they presented with the modeling." [7] The same reviewer went on to note: "The performance testing also doesn't tell us anything about the fugitive emissions." [8]

In short, because the emissions calculations rely on data from performance tests, they fail to represent worst-case emissions. It appears EPD attempted to address this issue by requesting additional documentation supporting Sterigenics' modeling calculations. Sterigenics, in turn, supplied the emission rates used in its calculations by email dated February 13, 2019:

[7] E-mail from Heather Brown, Chemical Permitting Unit, EPD, to James Boylan, Manager, Planning & Support Program, EPD (Jan. 30, 2019, 2:40 PM) (attached as Exhibit 3).

[8] *Id*.

Ethylene Oxide Usage and Emissions

Plant	Atlanta	
Emission Controls:		
Sterilizer	Ceilcote	
Aerations Rooms	AAT System	
Back Vents	AAT System	
2017 Usage and Emissions:		
2017 EtO Usage (#)	418,653	
2017 Sterilizer Control Effic.	99.999	
2017 Aer. Room Control Effic	99.960	
2017 Backvent Effic.	99.833	
2017 EO Fugitive Emissions (#)	209	Note 4
2017 EO Sterilizer Emissions (#	4	Note 1
2017 EO Aeration Emissions (#)	7	Note 2
2017 EO Backvent Emissions (#	7	Note 3
2017 Accidental Releases (#):	0	
EO:	0	
TOTAL 2017 EO Emissions (#	**227**	

Notes:
1. We assume 95% of EO Used is routed as Sterilizer Emissions
2. We assume 4% of EO Used is routed as Aeration Emissions
3. We assume 1% of EO Used is routed as BackVent Emissions
4. We assume a Fugitive Emission Factor of 0.05% of EO Used

This submission appears to have satisfied EPD's concerns, but it should not have. It contains both the same unsupported control efficiencies (from unrepresentative performance testing) and usage assumptions (see Comment 1). In any case, the analysis should have used potential to emit values instead of actuals, such as from 2017 shown above or from 2018 as contained in the June 2019 application.

Comment 6. The level of precision reported in the 2016 performance test report, which is the basis for the assumed control efficiency of the Ceilcote scrubber, is not defensible. And similar flaws affect the 2014 performance test report, which is the basis for the assumed control efficiency of the AAT scrubber.

The reported average outlet concentrations range from 0.01 to 0.03 parts per million (ppm) EtO. However, in the calibration runs in Appendix A in Sterigenics' application, the lowest standard used to test accuracy is 1 ppm. For a reading at 0.01 ppm, the measurement would be 100 times smaller than the 1 ppm standard, which is not discernible from baseline drifting.

Incidentally, the detection device used (a photoionization detector, or PID) was calibrated for "low-range ppmv level analyses," ranging from 100 ppmv down to 1 ppmv.[9] In other words,

[9] Ppmv is parts per million by volume.

even at the low end, the device was not calibrated within the range of the resulting readings, which casts doubt on the validity of those low readings.

In Appendix B, the sample chromatograms have baselines that wander all over the place, sometimes in the elution window of EtO, and have areas as large as hundreds of area units.

Despite the above deficiencies, the analyst somehow interpreted the results to measure the presence of 0.01 to 0.03 ppm EtO. Further qualification is required, because the interpretations do not withstand scrutiny. In short, based on a review of the chromatographic measurements in the 2016 performance report, there is simply no way to justify an assumed 99.999 percent control efficiency.

Similar problems are evident from the October 2014 performance test, which Sterigenics has relied upon for the control efficiency of the AAT Scrubber, and which was performed by the same independent testing firm (ECSI) as the above report.

We cannot overstate the significance of these flaws contained in reports that are now three and five years old, respectively. The purported pollution control efficiencies drawn from these reports form the basis for the emissions estimates in the application. EPD should require that the control efficiencies be established through current testing, followed by reporting that is analytically sound.

Comment 7. The application should discuss current facility impacts (i.e. prior to the proposed reconfiguration).

As shown below, the 2019 application proposes to route emissions to two existing 80-foot stacks in order to increase dispersion of emissions from the facility (i.e., more dilution), resulting in lower EtO and PO maximum concentrations.

2) Currently, the existing AAT scrubber with dry beds (EC2) exhausts to atmosphere via a dedicated stack. Sterigenics proposes to duct the outlet of the AAT scrubber with dry beds to a different existing stack measuring 80 feet tall and 16 inches in diameter. This stack exists but is currently not being used.
3) An additional negative pressure system is proposed to capture air internally from chamber rooms, work aisles, processed product storage, and shipping areas. With this negative pressure system, the facility will route the indoor air to a new dry bed control system consisting of 18 dry beds. These dry beds will exhaust to atmosphere via an existing stack measuring 80 feet tall and 2 feet in diameter.

However, releasing emissions from two taller stacks that were previously not in use will increase the area impacted by the emissions. The application does not discuss that at all.

The excerpt below taken from the March 2014 application confirms that none of the stacks in current use are 80 feet tall.

D12 - Stack and Process Vent Summary

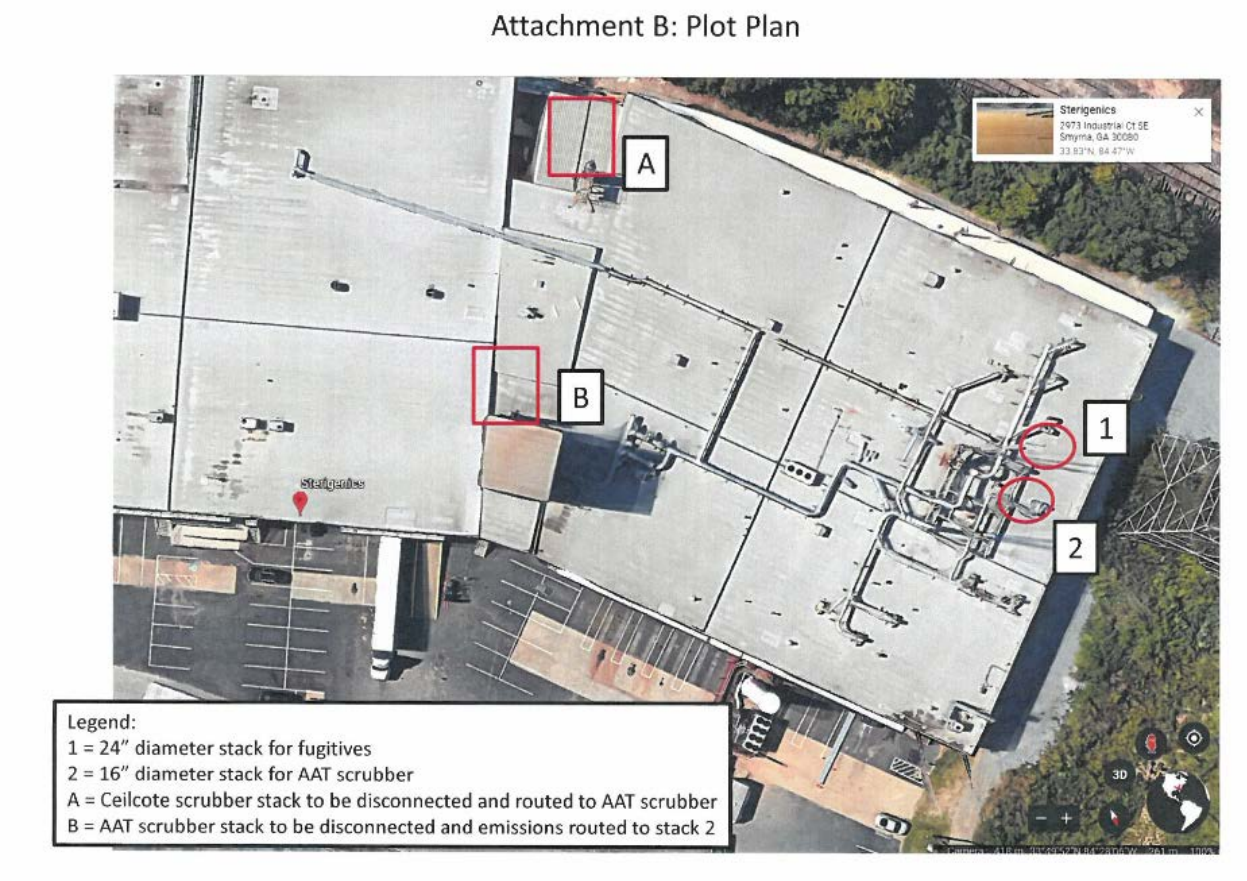
Facility: Sterigenics U.S., LLC — Application: 2014 Application for Synthetic Minor Permit - Smyrna, Georgia

Stack ID	**STK1**
Stack Name	Back Vent Emissions
Stack Height	10 feet
All Emission Units Exhausting throught this Stack	Back vent emissions of EO and PO are exhausted from this combined emissions stack.
All Pollution Control Devices Exhuasting through this Stack	None
Stack ID	**STK2**
Stack Name	AAT Scrubber Stack
Stack Height	33 feet
All Emission Units Exhausting throught this Stack	Aeration Room 11, 12 and 13 are exhausting through this stack. SEV1-9 and SV 10 is authorized to release to EC2 as an alternative. The exhaust from EC3 can be sent to EC2.
All Pollution Control Devices Exhuasting through this Stack	EC2 and EC3. EC3 is authrouzed to be released to the EC2 system.
Stack ID	**STK3**
Stack Name	Ceilcote Scrubber Stack
Stack Height	8 feet
All Emission Units Exhausting throught this Stack	SEV 1-9 and SV10; then through CE3.
All Pollution Control Devices Exhuasting through this Stack	EC3 is exhausted thrugh this stack or STK2.

It should be noted that none of the above stack heights or the purported two new 80-foot-tall stack heights match the figures provided in the modeling files supplied to EPD on January 25, 2019. That document shows figures of 51 feet for the AAT Scrubber Stack (which, to add to the confusion, is labeled STK2 above but STK1 in the modeling files). The same stack height (51 feet) is also used for the Ceilcote Scrubber Stack (labeled STK3 above but STK1 in the modeling files).

The new stack configuration, from the permit application, is shown below:

Attachment B: Plot Plan



However, the justification for the sizing of the new stacks labeled 1 and 2 above (i.e., their heights and diameters) is not provided in the application. The extent to which the choice of the height and diameter are driven solely by considerations of increased dispersion/dilution should be fully discussed in the application. Moreover, the stack heights shown here do not match those supplied to EPD with the modeling files – those files list the height of Stacks A and B as 105 feet, and the diameter as 1.5 feet.

Further, it is imperative that the 2019 application provide the "before" and "after" analysis associated with the proposed changes, including impacts to the surrounding neighborhood. This should be done after addressing the earlier shortcomings noted in these comments.

Comment 8. The application fails to provide documentation or analysis supporting the supposed efficacy of the new "capture and dry bed control system for indoor air" – i.e. the new system for capturing and controlling fugitive emissions.

The application proposes the addition of a new 18,000 acfm control system, EC4, also to be supplied by AAT. However, the application does not contain any design information for this system – i.e., how the 18,000 acfm capacity was determined based on the areas of the facility to be evacuated. This information is critical to judging the proposed system's effectiveness.

Moreover, the application does not discuss anything relating to the capture efficiency for this new system. Instead, the application implicitly assumes 100% capture of all usage resulting in fugitive emissions (0.05% of total usage). But it is unlikely, unless supported by design and engineering analyses which appear not to have been provided, that the new system will actually capture all of the fugitive emissions of EtO and PO that occur outside of the chambers – including from dispensing stations. Without further support, it is simply unrealistic to assume 100% capture of fugitive emissions in a sprawling facility, with many opportunities for ingress/egress by personnel and materials.

The application should provide details as to the design basis of the new EC4 system.

Comment 9. The narrative accompanying the 2019 permit application is not clear on whether pre-conditioning of pallets before sterilization can emit volatile organic compounds and if so, if they will be controlled.

EPD should seek clarification on VOC emissions and controls during the pre-conditioning step(s) before issuing a final permit.

Comment 10. The application fails to define the term "acceptable parameters" in its discussion of the sterilization process.

In its description of the facility's sterilization cycle in Attachment A, the application states that "the cycle is monitored to ensure that vacuum is maintained within acceptable parameters." The application does not describe how such monitoring is accomplished nor does it define what parameters are considered acceptable. This is not a sufficient description to ensure that EtO is not leaking from sterilization chambers. The term "acceptable parameters" should be quantifiably defined, including the monitoring source (with measure of precision), as well as the recordkeeping necessary to detect trends that may indicate leaks or other malfunctions.

Comment 11. The application lacks sufficient detail describing the location of the ducting that is proposed to connect the control systems to the two 80-foot stacks.

Based on the plot plan submitted as Attachment B of the application, it appears that much of the existing ducting for the stacks is mounted on the rooftop. The application does not describe how the new ducting will be constructed (connecting EC3 to EC2 or the new negative pressure system), but if it will also be located on the rooftop, any defects leading to leaks will not be controlled by the negative pressure system. All ducting before the final exhaust to the stacks should be contained within the building and subject to the negative pressure system.

II. Recommendations for the Final Permit.

Despite the urgency of the matter, EPD should not issue a permit for construction of the proposed modifications until the above deficiencies are fully addressed through a supplemental application. Further delays need not harm nor endanger members of the community. Georgia could follow Illinois' lead and order the facility to suspend operations unless and until it has installed the new controls, following an application process that is suitably complete and transparent. Alternatively, the facility could voluntarily suspend operations as a good neighbor to the citizens and businesses being harmed by the status quo.

The following recommendations are directed toward the final permit but should not be interpreted as encouraging EPD to take final action on the inadequate application currently pending.

The narrative portion of the application (Attachment A) has, in many places, language identical to the application Sterigenics submitted for its Willowbrook facility in Illinois. The two applications contain nearly verbatim language providing overviews of the respective facilities, as well as describing the sterilization process and the project purpose/detail. Site diagrams reveal that the two facilities' have similar layouts. But the similarities end there. There is no question that the suite of improvements now approved for the Willowbrook facility exceed what Sterigencis proposes here. And the permit just issued by Illinois EPA is substantially more stringent than the current permit for the Smyrna location.

As a result, while it may well be true that with these improvements, the *Willowbrook* "facility will have technology that provides the greatest reduction in ethylene oxide emissions that is now available," the same cannot be said of the improvements Sterigenics proposes to implement at its Smyrna facility. Accordingly, EPD should direct Sterigenics either to strike this language from its application or to submit a revised application that makes it true. (Sterigenics is required under Georgia's Air Quality Control Rules to attest to the completeness and correctness

of its application, and has done so here, despite an application that is neither complete nor correct, including in this fundamentally important regard. (2019 Application p. 1))[10].

We have attached a copy of the draft permit recently issued by Illinois EPA (Exhibit 4). For the protection of citizens of Smyrna and beyond, EPD should follow its sister agency's lead by imposing the following permit conditions:

1. **The permit should incorporate an annual EtO usage limitation.** The Illinois permit contains an annual usage limitation of 300,000 lbs., a reduction in allowed usage of 984,000 lbs from the prior iteration of the permit. The Georgia permit currently contains no usage limitation, and as a result, Sterigenics is bound neither by the 2018 usage levels assumed for purposes of its modeling, nor even the upper bound PTE usage of 625,000 lbs. This is a serious oversight. Illinois is not alone in imposing an annual usage limitation; one also appears in permits issued by the State of California to Sterigenics facilities there (including one which suffered a large explosion in 2004.[11] EPD is well within its authority to impose an annual usage limitation, and it would ensure that the emission reductions claimed in the application will in fact occur.

2. **The permit should include an annual emissions limit.** Sterigenics claims the improvements will reduce annual EtO emissions to just 39.62 lbs. (which is based, of course, on 2018 usage levels, and per recommendation 1 above, the current permit contains no usage limitation). If Sterigencis is confident in this emission projection, it should be willing to accept an annual emissions limit. The new Illinois permit imposes an annual emissions limit of 85 lbs.

3. **The permit should mandate the installation and use of Continuous Emissions Monitoring Systems (CEMS) in each of the 80-foot stacks.** Sterigenics has agreed to deploy CEMS at its Willowbrook facility, which will provide an ongoing read of its EtO emissions while providing a mechanism for determining compliance with its annual emissions limit. The same should be done here. In addition, the permit should require that all CEMS data be made readily available, such as through a publicly-accessible website. Emissions data should also be disclosed to a publicly accessible regulatory emissions inventory, such as the EPA Toxics Release Inventory (TRI). Sterigenics stopped reporting to TRI in 2016 at all of its facilities nationally. As best we can determine, Sterigenics was able to evade TRI reporting requirements by changing its North American Industry Classification System (NAICS) classification to one that is not required to report (but without changing the nature of its operations). Had Sterigenics ceased reporting prior to 2014, it is likely that the public would still be unaware of the

[10] *See* Ga. Comp. R. & Regs. r. 391-3-1-.03(1)(b) (requiring that application for a construction permit be made on forms supplied by the Director and signed by the applicant and that it include "all pertinent information as the Director may require for a full evaluation of the proposed construction or modification of the facility.").
[11] South Coast Air Quality Management District Permit to Construct/Operate for Sterigenics US, LLC located at 687 Wanamaker Ave., Ontario, CA 91761, Condition 4 on p. 1, (Aug. 17, 2018), attached as Exhibit 5.

problematic nature of its EtO emissions because they would not have been captured in the EPA's 2014 National Air Toxics Assessment (NATA).

4. **The permit should require a "permanent total enclosure" for the capture of fugitive emissions.** For its Willowbrook facility, Sterigenics has proposed a more stringent system for capturing and controlling fugitive emissions than the "negative pressure system" proposed for the Smyrna facility. A permanent total enclosure (subject to verification under EPA Method 204) will assure far better capture of fugitive emissions than the system described in the Smyrna application, which purports to evacuate EtO from large open areas using fans. Sterigenics has offered no explanation why a similar system could not be deployed here. EPD should discuss this with Sterigenics, and if technically feasible, mandate use of a permanent total enclosure for the Smyrna facility.

Note that in addition to being less stringent than a total permanent enclosure as a general matter, the negative pressure system described in Sterigenics' Smyrna application omits mention of "dispensing stations" in its recitation of internal areas that would be subject to the new controls. In the Willowbrook application, dispensing areas are properly included in the statement of areas covered by the permanent total enclosure. While this omission may have been inadvertent, EPD should seek assurance from Sterigenics that dispensing stations will be covered by any new system for capturing fugitive emissions.

5. **The permit should prohibit Sterigenics from storing EtO drums outside the facility.** Given Sterigenics' past issues with leaking drums, including a report to EPD of a leaking drum at the Smyrna facility and a whistleblower report from the Willowbrook facility of an employee being instructed to place a leaking drum outside, outdoor storage should be prohibited. Outdoor storage negates the potential benefits of the "negative pressure" system, which might otherwise mitigate leaking drums if they are stored inside the facility.

III. Conclusion

Because Sterigenics has failed to submit a "high-quality" application as required by EPD's procedures for expedited permitting, EPD should reject the application and require correction of the deficiencies described above. In addition, EPD should insist that Sterigenics deploy controls comparably stringent to those it has agreed to implement at its Willowbrook facility, and ultimately, issue a new permit of comparable stringency to that issued by Illinois EPA.

We appreciate the opportunity to submit these comments. We are happy to make Dr. Sahu available for discussion with members of your team should you have questions regarding these comments. I am also available.

[*Signature on next page.*]

Sincerely yours,

Kurt D. Ebersbach
Senior Attorney
Southern Environmental Law Center
404-521-9900
kebersbach@selcga.org

EXHIBIT 1

RANAJIT (RON) SAHU, Ph.D, QEP, CEM (Nevada)

CONSULTANT, ENVIRONMENTAL AND ENERGY ISSUES

311 North Story Place
Alhambra, CA 91801
Phone: 702.683.5466
e-mail (preferred): ronsahu@gmail.com; sahuron@earthlink.net

EXPERIENCE SUMMARY

Dr. Sahu has over twenty nine years of experience in the fields of environmental, mechanical, and chemical engineering including: program and project management services; design and specification of pollution control equipment for a wide range of emissions sources including stationary and mobile sources; soils and groundwater remediation including landfills as remedy; combustion engineering evaluations; energy studies; multimedia environmental regulatory compliance (involving statutes and regulations such as the Federal CAA and its Amendments, Clean Water Act, TSCA, RCRA, CERCLA, SARA, OSHA, NEPA as well as various related state statutes); transportation air quality impact analysis; multimedia compliance audits; multimedia permitting (including air quality NSR/PSD permitting, Title V permitting, NPDES permitting for industrial and storm water discharges, RCRA permitting, etc.), multimedia/multi-pathway human health risk assessments for toxics; air dispersion modeling; and regulatory strategy development and support including negotiation of consent agreements and orders.

He has over twenty six years of project management experience and has successfully managed and executed numerous projects in this time period. This includes basic and applied research projects, design projects, regulatory compliance projects, permitting projects, energy studies, risk assessment projects, and projects involving the communication of environmental data and information to the public.

He has provided consulting services to numerous private sector, public sector and public interest group clients. His major clients over the past twenty five years include various trade associations as well as individual companies such as steel mills, petroleum refineries, cement manufacturers, aerospace companies, power generation facilities, lawn and garden equipment manufacturers, spa manufacturers, chemical distribution facilities, and various entities in the public sector including EPA, the US Dept. of Justice, several states, various agencies such as the California DTSC, various municipalities, etc.). Dr. Sahu has performed projects in all 50 states, numerous local jurisdictions and internationally.

In addition to consulting, Dr. Sahu has taught numerous courses in several Southern California universities including UCLA (air pollution), UC Riverside (air pollution, process hazard analysis), and Loyola Marymount University (air pollution, risk assessment, hazardous waste management) for the past seventeen years. In this time period he has also taught at Caltech, his alma mater (various engineering courses), at the University of Southern California (air pollution controls) and at California State University, Fullerton (transportation and air quality).

Dr. Sahu has and continues to provide expert witness services in a number of environmental areas discussed above in both state and Federal courts as well as before administrative bodies (please see Annex A).

EXPERIENCE RECORD

2000-present **Independent Consultant.** Providing a variety of private sector (industrial companies, land development companies, law firms, etc.) public sector (such as the US Department of Justice) and public interest group clients with project management, air quality

consulting, waste remediation and management consulting, as well as regulatory and engineering support consulting services.

1995-2000 Parsons ES, **Associate, Senior Project Manager and Department Manager for** Air Quality/Geosciences/Hazardous Waste Groups, Pasadena. Responsible for the management of a group of approximately 24 air quality and environmental professionals, 15 geoscience, and 10 hazardous waste professionals providing full-service consulting, project management, regulatory compliance and A/E design assistance in all areas.

Parsons ES, **Manager for Air Source Testing Services**. Responsible for the management of 8 individuals in the area of air source testing and air regulatory permitting projects located in Bakersfield, California.

1992-1995 Engineering-Science, Inc. **Principal Engineer and Senior Project Manager** in the air quality department. Responsibilities included multimedia regulatory compliance and permitting (including hazardous and nuclear materials), air pollution engineering (emissions from stationary and mobile sources, control of criteria and air toxics, dispersion modeling, risk assessment, visibility analysis, odor analysis), supervisory functions and project management.

1990-1992 Engineering-Science, Inc. **Principal Engineer and Project Manager** in the air quality department. Responsibilities included permitting, tracking regulatory issues, technical analysis, and supervisory functions on numerous air, water, and hazardous waste projects. Responsibilities also include client and agency interfacing, project cost and schedule control, and reporting to internal and external upper management regarding project status.

1989-1990 Kinetics Technology International, Corp. **Development Engineer.** Involved in thermal engineering R&D and project work related to low-NOx ceramic radiant burners, fired heater NOx reduction, SCR design, and fired heater retrofitting.

1988-1989 Heat Transfer Research, Inc. **Research Engineer**. Involved in the design of fired heaters, heat exchangers, air coolers, and other non-fired equipment. Also did research in the area of heat exchanger tube vibrations.

EDUCATION

1984-1988 Ph.D., Mechanical Engineering, California Institute of Technology (Caltech), Pasadena, CA.

1984 M. S., Mechanical Engineering, Caltech, Pasadena, CA.

1978-1983 B. Tech (Honors), Mechanical Engineering, Indian Institute of Technology (IIT) Kharagpur, India

TEACHING EXPERIENCE

Caltech

"Thermodynamics," Teaching Assistant, California Institute of Technology, 1983, 1987.

"Air Pollution Control," Teaching Assistant, California Institute of Technology, 1985.

"Caltech Secondary and High School Saturday Program," - taught various mathematics (algebra through calculus) and science (physics and chemistry) courses to high school students, 1983-1989.

"Heat Transfer," - taught this course in the Fall and Winter terms of 1994-1995 in the Division of Engineering and Applied Science.

“Thermodynamics and Heat Transfer,” Fall and Winter Terms of 1996-1997.

U.C. Riverside, Extension

"Toxic and Hazardous Air Contaminants," University of California Extension Program, Riverside, California. Various years since 1992.

"Prevention and Management of Accidental Air Emissions," University of California Extension Program, Riverside, California. Various years since 1992.

"Air Pollution Control Systems and Strategies," University of California Extension Program, Riverside, California, Summer 1992-93, Summer 1993-1994.

"Air Pollution Calculations," University of California Extension Program, Riverside, California, Fall 1993-94, Winter 1993-94, Fall 1994-95.

"Process Safety Management," University of California Extension Program, Riverside, California. Various years since 1992-2010.

"Process Safety Management," University of California Extension Program, Riverside, California, at SCAQMD, Spring 1993-94.

"Advanced Hazard Analysis - A Special Course for LEPCs," University of California Extension Program, Riverside, California, taught at San Diego, California, Spring 1993-1994.

"Advanced Hazardous Waste Management" University of California Extension Program, Riverside, California. 2005.

Loyola Marymount University

"Fundamentals of Air Pollution - Regulations, Controls and Engineering," Loyola Marymount University, Dept. of Civil Engineering. Various years since 1993.

"Air Pollution Control," Loyola Marymount University, Dept. of Civil Engineering, Fall 1994.

"Environmental Risk Assessment," Loyola Marymount University, Dept. of Civil Engineering. Various years since 1998.

"Hazardous Waste Remediation" Loyola Marymount University, Dept. of Civil Engineering. Various years since 2006.

University of Southern California

"Air Pollution Controls," University of Southern California, Dept. of Civil Engineering, Fall 1993, Fall 1994.

"Air Pollution Fundamentals," University of Southern California, Dept. of Civil Engineering, Winter 1994.

University of California, Los Angeles

"Air Pollution Fundamentals," University of California, Los Angeles, Dept. of Civil and Environmental Engineering, Spring 1994, Spring 1999, Spring 2000, Spring 2003, Spring 2006, Spring 2007, Spring 2008, Spring 2009.

International Programs

"Environmental Planning and Management," 5 week program for visiting Chinese delegation, 1994.

"Environmental Planning and Management," 1 day program for visiting Russian delegation, 1995.

"Air Pollution Planning and Management," IEP, UCR, Spring 1996.

"Environmental Issues and Air Pollution," IEP, UCR, October 1996.

PROFESSIONAL AFFILIATIONS AND HONORS

President of India Gold Medal, IIT Kharagpur, India, 1983.

Member of the Alternatives Assessment Committee of the Grand Canyon Visibility Transport Commission, established by the Clean Air Act Amendments of 1990, 1992-present.

American Society of Mechanical Engineers: Los Angeles Section Executive Committee, Heat Transfer Division, and Fuels and Combustion Technology Division, 1987-present.

Air and Waste Management Association, West Coast Section, 1989-present.

PROFESSIONAL CERTIFICATIONS

EIT, California (#XE088305), 1993.

REA I, California (#07438), 2000.

Certified Permitting Professional, South Coast AQMD (#C8320), since 1993.

QEP, Institute of Professional Environmental Practice, since 2000.

CEM, State of Nevada (#EM-1699). Expiration 10/07/2019.

PUBLICATIONS (PARTIAL LIST)

"Physical Properties and Oxidation Rates of Chars from Bituminous Coals," with Y.A. Levendis, R.C. Flagan and G.R. Gavalas, *Fuel*, **67**, 275-283 (1988).

"Char Combustion: Measurement and Analysis of Particle Temperature Histories," with R.C. Flagan, G.R. Gavalas and P.S. Northrop, *Comb. Sci. Tech.* **60**, 215-230 (1988).

"On the Combustion of Bituminous Coal Chars," PhD Thesis, California Institute of Technology (1988).

"Optical Pyrometry: A Powerful Tool for Coal Combustion Diagnostics," *J. Coal Quality*, **8**, 17-22 (1989).

"Post-Ignition Transients in the Combustion of Single Char Particles," with Y.A. Levendis, R.C. Flagan and G.R. Gavalas, *Fuel*, **68**, 849-855 (1989).

"A Model for Single Particle Combustion of Bituminous Coal Char." Proc. ASME National Heat Transfer Conference, Philadelphia, **HTD-Vol. 106**, 505-513 (1989).

"Discrete Simulation of Cenospheric Coal-Char Combustion," with R.C. Flagan and G.R. Gavalas, *Combust. Flame*, **77**, 337-346 (1989).

"Particle Measurements in Coal Combustion," with R.C. Flagan, in "**Combustion Measurements**" (ed. N. Chigier), Hemisphere Publishing Corp. (1991).

"Cross Linking in Pore Structures and Its Effect on Reactivity," with G.R. Gavalas in preparation.

"Natural Frequencies and Mode Shapes of Straight Tubes," Proprietary Report for Heat Transfer Research Institute, Alhambra, CA (1990).

"Optimal Tube Layouts for Kamui SL-Series Exchangers," with K. Ishihara, Proprietary Report for Kamui Company Limited, Tokyo, Japan (1990).

"HTRI Process Heater Conceptual Design," Proprietary Report for Heat Transfer Research Institute, Alhambra, CA (1990).

"Asymptotic Theory of Transonic Wind Tunnel Wall Interference," with N.D. Malmuth and others, Arnold Engineering Development Center, Air Force Systems Command, USAF (1990).

"Gas Radiation in a Fired Heater Convection Section," Proprietary Report for Heat Transfer Research Institute, College Station, TX (1990).

"Heat Transfer and Pressure Drop in NTIW Heat Exchangers," Proprietary Report for Heat Transfer Research Institute, College Station, TX (1991).

"NOx Control and Thermal Design," Thermal Engineering Tech Briefs, (1994).

“From Purchase of Landmark Environmental Insurance to Remediation: Case Study in Henderson, Nevada,” with Robin E. Bain and Jill Quillin, presented at the AQMA Annual Meeting, Florida, 2001.

“The Jones Act Contribution to Global Warming, Acid Rain and Toxic Air Contaminants,” with Charles W. Botsford, presented at the AQMA Annual Meeting, Florida, 2001.

PRESENTATIONS (PARTIAL LIST)

"Pore Structure and Combustion Kinetics - Interpretation of Single Particle Temperature-Time Histories," with P.S. Northrop, R.C. Flagan and G.R. Gavalas, presented at the AIChE Annual Meeting, New York (1987).

"Measurement of Temperature-Time Histories of Burning Single Coal Char Particles," with R.C. Flagan, presented at the American Flame Research Committee Fall International Symposium, Pittsburgh, (1988).

"Physical Characterization of a Cenospheric Coal Char Burned at High Temperatures," with R.C. Flagan and G.R. Gavalas, presented at the Fall Meeting of the Western States Section of the Combustion Institute, Laguna Beach, California (1988).

"Control of Nitrogen Oxide Emissions in Gas Fired Heaters - The Retrofit Experience," with G. P. Croce and R. Patel, presented at the International Conference on Environmental Control of Combustion Processes (Jointly sponsored by the American Flame Research Committee and the Japan Flame Research Committee), Honolulu, Hawaii (1991).

"Air Toxics - Past, Present and the Future," presented at the Joint AIChE/AAEE Breakfast Meeting at the AIChE 1991 Annual Meeting, Los Angeles, California, November 17-22 (1991).

"Air Toxics Emissions and Risk Impacts from Automobiles Using Reformulated Gasolines," presented at the Third Annual Current Issues in Air Toxics Conference, Sacramento, California, November 9-10 (1992).

"Air Toxics from Mobile Sources," presented at the Environmental Health Sciences (ESE) Seminar Series, UCLA, Los Angeles, California, November 12, (1992).

"Kilns, Ovens, and Dryers - Present and Future," presented at the Gas Company Air Quality Permit Assistance Seminar, Industry Hills Sheraton, California, November 20, (1992).

"The Design and Implementation of Vehicle Scrapping Programs," presented at the 86th Annual Meeting of the Air and Waste Management Association, Denver, Colorado, June 12, 1993.

"Air Quality Planning and Control in Beijing, China," presented at the 87th Annual Meeting of the Air and Waste Management Association, Cincinnati, Ohio, June 19-24, 1994.

Annex A

Expert Litigation Support

A. Occasions where Dr. Sahu has provided Written or Oral testimony before Congress:

1. In July 2012, provided expert written and oral testimony to the House Subcommittee on Energy and the Environment, Committee on Science, Space, and Technology at a Hearing entitled "Hitting the Ethanol Blend Wall – Examining the Science on E15."

B. Matters for which Dr. Sahu has provided affidavits and expert reports include:

2. Affidavit for Rocky Mountain Steel Mills, Inc. located in Pueblo Colorado – dealing with the technical uncertainties associated with night-time opacity measurements in general and at this steel mini-mill.
3. Expert reports and depositions (2/28/2002 and 3/1/2002; 12/2/2003 and 12/3/2003; 5/24/2004) on behalf of the United States in connection with the Ohio Edison NSR Cases. *United States, et al. v. Ohio Edison Co., et al.,* C2-99-1181 (Southern District of Ohio).
4. Expert reports and depositions (5/23/2002 and 5/24/2002) on behalf of the United States in connection with the Illinois Power NSR Case. *United States v. Illinois Power Co., et al.,* 99-833-MJR (Southern District of Illinois).
5. Expert reports and depositions (11/25/2002 and 11/26/2002) on behalf of the United States in connection with the Duke Power NSR Case. *United States, et al. v. Duke Energy Corp.*, 1:00-CV-1262 (Middle District of North Carolina).
6. Expert reports and depositions (10/6/2004 and 10/7/2004; 7/10/2006) on behalf of the United States in connection with the American Electric Power NSR Cases. *United States, et al. v. American Electric Power Service Corp., et al.,* C2-99-1182, C2-99-1250 (Southern District of Ohio).
7. Affidavit (March 2005) on behalf of the Minnesota Center for Environmental Advocacy and others in the matter of the Application of Heron Lake BioEnergy LLC to construct and operate an ethanol production facility – submitted to the Minnesota Pollution Control Agency.
8. Expert Report and Deposition (10/31/2005 and 11/1/2005) on behalf of the United States in connection with the East Kentucky Power Cooperative NSR Case. *United States v. East Kentucky Power Cooperative, Inc*., 5:04-cv-00034-KSF (Eastern District of Kentucky).
9. Affidavits and deposition on behalf of Basic Management Inc. (BMI) Companies in connection with the BMI vs. USA remediation cost recovery Case.
10. Expert Report on behalf of Penn Future and others in the Cambria Coke plant permit challenge in Pennsylvania.

11. Expert Report on behalf of the Appalachian Center for the Economy and the Environment and others in the Western Greenbrier permit challenge in West Virginia.

12. Expert Report, deposition (via telephone on January 26, 2007) on behalf of various Montana petitioners (Citizens Awareness Network (CAN), Women's Voices for the Earth (WVE) and the Clark Fork Coalition (CFC)) in the Thompson River Cogeneration LLC Permit No. 3175-04 challenge.

13. Expert Report and deposition (2/2/07) on behalf of the Texas Clean Air Cities Coalition at the Texas State Office of Administrative Hearings (SOAH) in the matter of the permit challenges to TXU Project Apollo's eight new proposed PRB-fired PC boilers located at seven TX sites.

14. Expert Testimony (July 2007) on behalf of the Izaak Walton League of America and others in connection with the acquisition of power by Xcel Energy from the proposed Gascoyne Power Plant – at the State of Minnesota, Office of Administrative Hearings for the Minnesota PUC (MPUC No. E002/CN-06-1518; OAH No. 12-2500-17857-2).

15. Affidavit (July 2007) Comments on the Big Cajun I Draft Permit on behalf of the Sierra Club – submitted to the Louisiana DEQ.

16. Expert Report and Deposition (12/13/2007) on behalf of Commonwealth of Pennsylvania – Dept. of Environmental Protection, State of Connecticut, State of New York, and State of New Jersey (Plaintiffs) in connection with the Allegheny Energy NSR Case. *Plaintiffs v. Allegheny Energy Inc., et al.,* 2:05cv0885 (Western District of Pennsylvania).

17. Expert Reports and Pre-filed Testimony before the Utah Air Quality Board on behalf of Sierra Club in the Sevier Power Plant permit challenge.

18. Expert Report and Deposition (October 2007) on behalf of MTD Products Inc., in connection with *General Power Products, LLC v MTD Products Inc*., 1:06 CVA 0143 (Southern District of Ohio, Western Division) .

19. Expert Report and Deposition (June 2008) on behalf of Sierra Club and others in the matter of permit challenges (Title V: 28.0801-29 and PSD: 28.0803-PSD) for the Big Stone II unit, proposed to be located near Milbank, South Dakota.

20. Expert Reports, Affidavit, and Deposition (August 15, 2008) on behalf of Earthjustice in the matter of air permit challenge (CT-4631) for the Basin Electric Dry Fork station, under construction near Gillette, Wyoming before the Environmental Quality Council of the State of Wyoming.

21. Affidavits (May 2010/June 2010 in the Office of Administrative Hearings))/Declaration and Expert Report (November 2009 in the Office of Administrative Hearings) on behalf of NRDC and the Southern Environmental Law Center in the matter of the air permit challenge for Duke Cliffside Unit 6. Office of Administrative Hearing Matters 08 EHR 0771, 0835 and 0836 and 09 HER 3102, 3174, and 3176 (consolidated).

22. Declaration (August 2008), Expert Report (January 2009), and Declaration (May 2009) on behalf of Southern Alliance for Clean Energy in the matter of the air permit challenge for Duke Cliffside Unit 6. *Southern Alliance for Clean Energy et al., v. Duke Energy Carolinas, LLC*, Case No. 1:08-cv-00318-LHT-DLH (Western District of North Carolina, Asheville Division).

23. Declaration (August 2008) on behalf of the Sierra Club in the matter of Dominion Wise County plant MACT.us

24. Expert Report (June 2008) on behalf of Sierra Club for the Green Energy Resource Recovery Project, MACT Analysis.

25. Expert Report (February 2009) on behalf of Sierra Club and the Environmental Integrity Project in the matter of the air permit challenge for NRG Limestone's proposed Unit 3 in Texas.

26. Expert Report (June 2009) on behalf of MTD Products, Inc., in the matter of *Alice Holmes and Vernon Holmes v. Home Depot USA, Inc., et al.*

27. Expert Report (August 2009) on behalf of Sierra Club and the Southern Environmental Law Center in the matter of the air permit challenge for Santee Cooper's proposed Pee Dee plant in South Carolina).

28. Statements (May 2008 and September 2009) on behalf of the Minnesota Center for Environmental Advocacy to the Minnesota Pollution Control Agency in the matter of the Minnesota Haze State Implementation Plans.

29. Expert Report (August 2009) on behalf of Environmental Defense, in the matter of permit challenges to the proposed Las Brisas coal fired power plant project at the Texas State Office of Administrative Hearings (SOAH).

30. Expert Report and Rebuttal Report (September 2009) on behalf of the Sierra Club, in the matter of challenges to the proposed Medicine Bow Fuel and Power IGL plant in Cheyenne, Wyoming.

31. Expert Report (December 2009) and Rebuttal reports (May 2010 and June 2010) on behalf of the United States in connection with the Alabama Power Company NSR Case. *United States v. Alabama Power Company*, CV-01-HS-152-S (Northern District of Alabama, Southern Division).

32. Pre-filed Testimony (October 2009) on behalf of Environmental Defense and others, in the matter of challenges to the proposed White Stallion Energy Center coal fired power plant project at the Texas State Office of Administrative Hearings (SOAH).

33. Pre-filed Testimony (July 2010) and Written Rebuttal Testimony (August 2010) on behalf of the State of New Mexico Environment Department in the matter of Proposed Regulation 20.2.350 NMAC – *Greenhouse Gas Cap and Trade Provisions*, No. EIB 10-04 (R), to the State of New Mexico, Environmental Improvement Board.

34. Expert Report (August 2010) and Rebuttal Expert Report (October 2010) on behalf of the United States in connection with the Louisiana Generating NSR

Case. *United States v. Louisiana Generating, LLC*, 09-CV100-RET-CN (Middle District of Louisiana) – Liability Phase.

35. Declaration (August 2010), Reply Declaration (November 2010), Expert Report (April 2011), Supplemental and Rebuttal Expert Report (July 2011) on behalf of the United States in the matter of DTE Energy Company and Detroit Edison Company (Monroe Unit 2). *United States of America v. DTE Energy Company and Detroit Edison Company*, Civil Action No. 2:10-cv-13101-BAF-RSW (Eastern District of Michigan).

36. Expert Report and Deposition (August 2010) as well as Affidavit (September 2010) on behalf of Kentucky Waterways Alliance, Sierra Club, and Valley Watch in the matter of challenges to the NPDES permit issued for the Trimble County power plant by the Kentucky Energy and Environment Cabinet to Louisville Gas and Electric, File No. DOW-41106-047.

37. Expert Report (August 2010), Rebuttal Expert Report (September 2010), Supplemental Expert Report (September 2011), and Declaration (November 2011) on behalf of Wild Earth Guardians in the matter of opacity exceedances and monitor downtime at the Public Service Company of Colorado (Xcel)'s Cherokee power plant. No. 09-cv-1862 (District of Colorado).

38. Written Direct Expert Testimony (August 2010) and Affidavit (February 2012) on behalf of Fall-Line Alliance for a Clean Environment and others in the matter of the PSD Air Permit for Plant Washington issued by Georgia DNR at the Office of State Administrative Hearing, State of Georgia (OSAH-BNR-AQ-1031707-98-WALKER).

39. Deposition (August 2010) on behalf of Environmental Defense, in the matter of the remanded permit challenge to the proposed Las Brisas coal fired power plant project at the Texas State Office of Administrative Hearings (SOAH).

40. Expert Report, Supplemental/Rebuttal Expert Report, and Declarations (October 2010, November 2010, September 2012) on behalf of New Mexico Environment Department (Plaintiff-Intervenor), Grand Canyon Trust and Sierra Club (Plaintiffs) in the matter of *Plaintiffs v. Public Service Company of New Mexico* (PNM), Civil No. 1:02-CV-0552 BB/ATC (ACE) (District of New Mexico).

41. Expert Report (October 2010) and Rebuttal Expert Report (November 2010) (BART Determinations for PSCo Hayden and CSU Martin Drake units) to the Colorado Air Quality Commission on behalf of Coalition of Environmental Organizations.

42. Expert Report (November 2010) (BART Determinations for TriState Craig Units, CSU Nixon Unit, and PRPA Rawhide Unit) to the Colorado Air Quality Commission on behalf of Coalition of Environmental Organizations.

43. Declaration (November 2010) on behalf of the Sierra Club in connection with the Martin Lake Station Units 1, 2, and 3. *Sierra Club v. Energy Future Holdings Corporation and Luminant Generation Company LLC*, Case No. 5:10-cv-00156-DF-CMC (Eastern District of Texas, Texarkana Division).

44. Pre-Filed Testimony (January 2011) and Declaration (February 2011) to the Georgia Office of State Administrative Hearings (OSAH) in the matter of Minor Source HAPs status for the proposed Longleaf Energy Associates power plant (OSAH-BNR-AQ-1115157-60-HOWELLS) on behalf of the Friends of the Chattahoochee and the Sierra Club).

45. Declaration (February 2011) in the matter of the Draft Title V Permit for RRI Energy MidAtlantic Power Holdings LLC Shawville Generating Station (Pennsylvania), ID No. 17-00001 on behalf of the Sierra Club.

46. Expert Report (March 2011), Rebuttal Expert Report (June 2011) on behalf of the United States in *United States of America v. Cemex, Inc.*, Civil Action No. 09-cv-00019-MSK-MEH (District of Colorado).

47. Declaration (April 2011) and Expert Report (July 16, 2012) in the matter of the Lower Colorado River Authority (LCRA)'s Fayette (Sam Seymour) Power Plant on behalf of the Texas Campaign for the Environment. *Texas Campaign for the Environment v. Lower Colorado River Authority*, Civil Action No. 4:11-cv-00791 (Southern District of Texas, Houston Division).

48. Declaration (June 2011) on behalf of the Plaintiffs MYTAPN in the matter of Microsoft-Yes, Toxic Air Pollution-No (MYTAPN) v. State of Washington, Department of Ecology and Microsoft Corporation Columbia Data Center to the Pollution Control Hearings Board, State of Washington, Matter No. PCHB No. 10-162.

49. Expert Report (June 2011) on behalf of the New Hampshire Sierra Club at the State of New Hampshire Public Utilities Commission, Docket No. 10-261 – the 2010 Least Cost Integrated Resource Plan (LCIRP) submitted by the Public Service Company of New Hampshire (re. Merrimack Station Units 1 and 2).

50. Declaration (August 2011) in the matter of the Sandy Creek Energy Associates L.P. Sandy Creek Power Plant on behalf of Sierra Club and Public Citizen. *Sierra Club, Inc. and Public Citizen, Inc. v. Sandy Creek Energy Associates, L.P.*, Civil Action No. A-08-CA-648-LY (Western District of Texas, Austin Division).

51. Expert Report (October 2011) on behalf of the Defendants in the matter of *John Quiles and Jeanette Quiles et al. v. Bradford-White Corporation, MTD Products, Inc., Kohler Co., et al.,* Case No. 3:10-cv-747 (TJM/DEP) (Northern District of New York).

52. Declaration (October 2011) on behalf of the Plaintiffs in the matter of *American Nurses Association et. al. (Plaintiffs), v. US EPA (Defendant)*, Case No. 1:08-cv-02198-RMC (US District Court for the District of Columbia).

53. Declaration (February 2012) and Second Declaration (February 2012) in the matter of *Washington Environmental Council and Sierra Club Washington State Chapter v. Washington State Department of Ecology and Western States Petroleum Association*, Case No. 11-417-MJP (Western District of Washington).

54. Expert Report (March 2012) and Supplemental Expert Report (November 2013) in the matter of *Environment Texas Citizen Lobby, Inc and Sierra Club v.*

ExxonMobil Corporation et al., Civil Action No. 4:10-cv-4969 (Southern District of Texas, Houston Division).

55. Declaration (March 2012) in the matter of *Center for Biological Diversity, et al. v. United States Environmental Protection Agency*, Case No. 11-1101 (consolidated with 11-1285, 11-1328 and 11-1336) (US Court of Appeals for the District of Columbia Circuit).

56. Declaration (March 2012) in the matter of *Sierra Club v. The Kansas Department of Health and Environment*, Case No. 11-105,493-AS (Holcomb power plant) (Supreme Court of the State of Kansas).

57. Declaration (March 2012) in the matter of the Las Brisas Energy Center *Environmental Defense Fund et al., v. Texas Commission on Environmental Quality*, Cause No. D-1-GN-11-001364 (District Court of Travis County, Texas, 261st Judicial District).

58. Expert Report (April 2012), Supplemental and Rebuttal Expert Report (July 2012), and Supplemental Rebuttal Expert Report (August 2012) on behalf of the states of New Jersey and Connecticut in the matter of the Portland Power plant *State of New Jersey and State of Connecticut (Intervenor-Plaintiff) v. RRI Energy Mid-Atlantic Power Holdings et al.,* Civil Action No. 07-CV-5298 (JKG) (Eastern District of Pennsylvania).

59. Declaration (April 2012) in the matter of the EPA's EGU MATS Rule, on behalf of the Environmental Integrity Project.

60. Expert Report (August 2012) on behalf of the United States in connection with the Louisiana Generating NSR Case. *United States v. Louisiana Generating, LLC*, 09-CV100-RET-CN (Middle District of Louisiana) – Harm Phase.

61. Declaration (September 2012) in the Matter of the Application of *Energy Answers Incinerator, Inc.* for a Certificate of Public Convenience and Necessity to Construct a 120 MW Generating Facility in Baltimore City, Maryland, before the Public Service Commission of Maryland, Case No. 9199.

62. Expert Report (October 2012) on behalf of the Appellants (Robert Concilus and Leah Humes) in the matter of Robert Concilus and Leah Humes v. Commonwealth of Pennsylvania Department of Environmental Protection and Crawford Renewable Energy, before the Commonwealth of Pennsylvania Environmental Hearing Board, Docket No. 2011-167-R.

63. Expert Report (October 2012), Supplemental Expert Report (January 2013), and Affidavit (June 2013) in the matter of various Environmental Petitioners v. North Carolina DENR/DAQ and Carolinas Cement Company, before the Office of Administrative Hearings, State of North Carolina.

64. Pre-filed Testimony (October 2012) on behalf of No-Sag in the matter of the North Springfield Sustainable Energy Project before the State of Vermont, Public Service Board.

65. Pre-filed Testimony (November 2012) on behalf of Clean Wisconsin in the matter of Application of Wisconsin Public Service Corporation for Authority to

Construct and Place in Operation a New Multi-Pollutant Control Technology System (ReACT) for Unit 3 of the Weston Generating Station, before the Public Service Commission of Wisconsin, Docket No. 6690-CE-197.

66. Expert Report (February 2013) on behalf of Petitioners in the matter of Credence Crematory, Cause No. 12-A-J-4538 before the Indiana Office of Environmental Adjudication.

67. Expert Report (April 2013), Rebuttal report (July 2013), and Declarations (October 2013, November 2013) on behalf of the Sierra Club in connection with the Luminant Big Brown Case. *Sierra Club v. Energy Future Holdings Corporation and Luminant Generation Company LLC*, Civil Action No. 6:12-cv-00108-WSS (Western District of Texas, Waco Division).

68. Declaration (April 2013) on behalf of Petitioners in the matter of *Sierra Club, et al., (Petitioners) v Environmental Protection Agency et al. (Resppondents),* Case No., 13-1112, (Court of Appeals, District of Columbia Circuit).

69. Expert Report (May 2013) and Rebuttal Expert Report (July 2013) on behalf of the Sierra Club in connection with the Luminant Martin Lake Case. *Sierra Club v. Energy Future Holdings Corporation and Luminant Generation Company LLC*, Civil Action No. 5:10-cv-0156-MHS-CMC (Eastern District of Texas, Texarkana Division).

70. Declaration (August 2013) on behalf of A. J. Acosta Company, Inc., in the matter of *A. J. Acosta Company, Inc., v. County of San Bernardino*, Case No. CIVSS803651.

71. Comments (October 2013) on behalf of the Washington Environmental Council and the Sierra Club in the matter of the Washington State Oil Refinery RACT (for Greenhouse Gases), submitted to the Washington State Department of Ecology, the Northwest Clean Air Agency, and the Puget Sound Clean Air Agency.

72. Statement (November 2013) on behalf of various Environmental Organizations in the matter of the Boswell Energy Center (BEC) Unit 4 Environmental Retrofit Project, to the Minnesota Public Utilities Commission, Docket No. E-015/M-12-920.

73. Expert Report (December 2013) on behalf of the United States in *United States of America v. Ameren Missouri*, Civil Action No. 4:11-cv-00077-RWS (Eastern District of Missouri, Eastern Division).

74. Expert Testimony (December 2013) on behalf of the Sierra Club in the matter of Public Service Company of New Hampshire Merrimack Station Scrubber Project and Cost Recovery, Docket No. DE 11-250, to the State of New Hampshire Public Utilities Commission.

75. Expert Report (January 2014) on behalf of Baja, Inc., in *Baja, Inc., v. Automotive Testing and Development Services, Inc. et. al*, Civil Action No. 8:13-CV-02057-GRA (District of South Carolina, Anderson/Greenwood Division).

76. Declaration (March 2014) on behalf of the Center for International Environmental Law, Chesapeake Climate Action Network, Friends of the Earth, Pacific

Environment, and the Sierra Club (Plaintiffs) in the matter of *Plaintiffs v. the Export-Import Bank (Ex-Im Bank) of the United States,* Civil Action No. 13-1820 RC (District Court for the District of Columbia).

77. Declaration (April 2014) on behalf of Respondent-Intervenors in the matter of *Mexichem Specialty Resins Inc., et al., (Petitioners) v Environmental Protection Agency et al.,* Case No., 12-1260 (and Consolidated Case Nos. 12-1263, 12-1265, 12-1266, and 12-1267), (Court of Appeals, District of Columbia Circuit).

78. Direct Prefiled Testimony (June 2014) on behalf of the Michigan Environmental Council and the Sierra Club in the matter of the Application of DTE Electric Company for Authority to Implement a Power Supply Cost Recovery (PSCR) Plan in its Rate Schedules for 2014 Metered Jurisdictional Sales of Electricity, Case No. U-17319 (Michigan Public Service Commission).

79. Expert Report (June 2014) on behalf of ECM Biofilms in the matter of the US Federal Trade Commission (FTC) v. ECM Biofilms (FTC Docket #9358).

80. Direct Prefiled Testimony (August 2014) on behalf of the Michigan Environmental Council and the Sierra Club in the matter of the Application of Consumers Energy Company for Authority to Implement a Power Supply Cost Recovery (PSCR) Plan in its Rate Schedules for 2014 Metered Jurisdictional Sales of Electricity, Case No. U-17317 (Michigan Public Service Commission).

81. Declaration (July 2014) on behalf of Public Health Intervenors in the matter of *EME Homer City Generation v. US EPA* (Case No. 11-1302 and consolidated cases) relating to the lifting of the stay entered by the Court on December 30, 2011 (US Court of Appeals for the District of Columbia).

82. Expert Report (September 2014), Rebuttal Expert Report (December 2014) and Supplemental Expert Report (March 2015) on behalf of Plaintiffs in the matter of *Sierra Club and Montana Environmental Information Center (Plaintiffs) v. PPL Montana LLC, Avista Corporation, Puget Sound Energy, Portland General Electric Company, Northwestern Corporation, and Pacificorp (Defendants),* Civil Action No. CV 13-32-BLG-DLC-JCL (US District Court for the District of Montana, Billings Division).

83. Expert Report (November 2014) on behalf of Niagara County, the Town of Lewiston, and the Villages of Lewiston and Youngstown in the matter of CWM Chemical Services, LLC New York State Department of Environmental Conservation (NYSDEC) Permit Application Nos.: 9-2934-00022/00225, 9-2934-00022/00231, 9-2934-00022/00232, and 9-2934-00022/00249 (pending).

84. *Declaration (January 2015) relating to Startup/Shutdown in the MATS Rule (EPA Docket ID No. EPA-HQ-OAR-2009-0234) on behalf of the Environmental Integrity Project.*

85. Pre-filed Direct Testimony (March 2015), Supplemental Testimony (May 2015), and Surrebuttal Testimony (December 2015) on behalf of Friends of the Columbia Gorge in the matter of the Application for a Site Certificate for the Troutdale Energy Center before the Oregon Energy Facility Siting Council.

86. Brief of Amici Curiae Experts in Air Pollution Control and Air Quality Regulation in Support of the Respondents, On Writs of Certiorari to the US Court of Appeals for the District of Columbia, No. 14-46, 47, 48. *Michigan et. al., (Petitioners) v. EPA et. al., Utility Air Regulatory Group (Petitioners) v. EPA et. al., National Mining Association et. al., (Petitioner) v. EPA et. al.,* (Supreme Court of the United States).

87. Expert Report (March 2015) and Rebuttal Expert Report (January 2016) on behalf of Plaintiffs in the matter of *Conservation Law Foundation v. Broadrock Gas Services LLC, Rhode Island LFG GENCO LLC, and Rhode Island Resource Recovery Corporation (Defendants),* Civil Action No. 1:13-cv-00777-M-PAS (US District Court for the District of Rhode Island).

88. Declaration (April 2015) relating to various Technical Corrections for the MATS Rule (EPA Docket ID No. EPA-HQ-OAR-2009-0234) on behalf of the Environmental Integrity Project.

89. Direct Prefiled Testimony (May 2015) on behalf of the Michigan Environmental Council, the Natural Resources Defense Council, and the Sierra Club in the matter of the Application of DTE Electric Company for Authority to Increase its Rates, Amend its Rate Schedules and Rules Governing the Distribution and Supply of Electric Energy and for Miscellaneous Accounting Authority, Case No. U-17767 (Michigan Public Service Commission).

90. Expert Report (July 2015) and Rebuttal Expert Report (July 2015) on behalf of Plaintiffs in the matter of *Northwest Environmental Defense Center et. al., v. Cascade Kelly Holdings LLC, d/b/a Columbia Pacific Bio-Refinery, and Global Partners LP (Defendants),* Civil Action No. 3:14-cv-01059-SI (US District Court for the District of Oregon, Portland Division).

91. Declaration (August 2015, Docket No. 1570376) in support of "Opposition of Respondent-Intervenors American Lung Association, et. al., to Tri-State Generation's Emergency Motion;" Declaration (September 2015, Docket No. 1574820) in support of "Joint Motion of the State, Local Government, and Public Health Respondent-Intervenors for Remand Without Vacatur;" Declaration (October 2015) in support of "Joint Motion of the State, Local Government, and Public Health Respondent-Intervenors to State and Certain Industry Petitioners' Motion to Govern, *White Stallion Energy Center, LLC v. US EPA*, Case No. 12-1100 (US Court of Appeals for the District of Columbia).

92. Declaration (September 2015) in support of the Draft Title V Permit for Dickerson Generating Station (Proposed Permit No 24-031-0019) on behalf of the Environmental Integrity Project.

93. Expert Report (Liability Phase) (December 2015) and Rebuttal Expert Report (February 2016) on behalf of Plaintiffs in the matter of *Natural Resources Defense Council, Inc., Sierra Club, Inc., Environmental Law and Policy Center, and Respiratory Health Association v. Illinois Power Resources LLC, and Illinois Power Resources Generating LLC (Defendants),* Civil Action No. 1:13-cv-01181 (US District Court for the Central District of Illinois, Peoria Division).

94. Declaration (December 2015) in support of the Petition to Object to the Title V Permit for Morgantown Generating Station (Proposed Permit No 24-017-0014) on behalf of the Environmental Integrity Project.

95. Expert Report (November 2015) on behalf of Appellants in the matter of *Sierra Club, et al. v. Craig W. Butler, Director of Ohio Environmental Protection Agency et al.*, ERAC Case No. 14-256814.

96. Affidavit (January 2016) on behalf of Bridgewatch Detroit in the matter of *Bridgewatch Detroit v. Waterfront Petroleum Terminal Co., and Waterfront Terminal Holdings, LLC.*, in the Circuit Court for the County of Wayne, State of Michigan.

97. Expert Report (February 2016) and Rebuttal Expert Report (July 2016) on behalf of the challengers in the matter of the Delaware Riverkeeper Network, Clean Air Council, et. al., vs. Commonwealth of Pennsylvania Department of Environmental Protection and R. E. Gas Development LLC regarding the Geyer well site before the Pennsylvania Environmental Hearing Board.

98. Direct Testimony (May 2016) in the matter of Tesoro Savage LLC Vancouver Energy Distribution Terminal, Case No. 15-001 before the State of Washington Energy Facility Site Evaluation Council.

99. Declaration (June 2016) relating to deficiencies in air quality analysis for the proposed Millenium Bulk Terminal, Port of Longview, Washington.

100. Declaration (December 2016) relating to EPA's refusal to set limits on PM emissions from coal-fired power plants that reflect pollution reductions achievable with fabric filters on behalf of Environmental Integrity Project, Clean Air Council, Chesapeake Climate Action Network, Downwinders at Risk represented by Earthjustice in the matter of *ARIPPA v EPA, Case No. 15-1180.* (D.C. Circuit Court of Appeals).

101. Expert Report (January 2017) on the Environmental Impacts Analysis associated with the Huntley and Huntley Poseidon Well Pad on behalf citizens in the matter of the special exception use Zoning Hearing Board of Penn Township, Westmoreland County, Pennsylvania.

102. Expert Report (January 2017) on the Environmental Impacts Analysis associated with the Apex Energy Backus Well Pad on behalf citizens in the matter of the special exception use Zoning Hearing Board of Penn Township, Westmoreland County, Pennsylvania.

103. Expert Report (January 2017) on the Environmental Impacts Analysis associated with the Apex Energy Drakulic Well Pad on behalf citizens in the matter of the special exception use Zoning Hearing Board of Penn Township, Westmoreland County, Pennsylvania.

104. Expert Report (January 2017) on the Environmental Impacts Analysis associated with the Apex Energy Deutsch Well Pad on behalf citizens in the matter of the special exception use Zoning Hearing Board of Penn Township, Westmoreland County, Pennsylvania.

105. Affidavit (February 2017) pertaining to deficiencies water discharge compliance issues at the Wood River Refinery in the matter of *People of the State of Illinois (Plaintiff) v. Phillips 66 Company, ConocoPhillips Company, WRB Refining LP (Defendants)*, Case No. 16-CH-656, (Circuit Court for the Third Judicial Circuit, Madison County, Illinois).

106. Expert Report (March 2017) on behalf of the Plaintiff pertaining to non-degradation analysis for waste water discharges from a power plant in the matter of *Sierra Club (Plaintiff) v. Pennsylvania Department of Environmental Protection (PADEP) and Lackawanna Energy Center*, Docket No. 2016-047-L (consolidated), (Pennsylvania Environmental Hearing Board).

107. Expert Report (March 2017) on behalf of the Plaintiff pertaining to air emissions from the Heritage incinerator in East Liverpool, Ohio in the matter of *Save our County (Plaintiff) v. Heritage Thermal Services, Inc. (Defendant), Case No. 4:16-CV-1544-BYP*, (US District Court for the Northern District of Ohio, Eastern Division).

108. Rebuttal Expert Report (June 2017) on behalf of Plaintiffs in the matter of *Casey Voight and Julie Voight (Plaintiffs) v Coyote Creek Mining Company LLC (Defendant),* Civil Action No. 1:15-CV-00109 (US District Court for the District of North Dakota, Western Division).

109. Expert Affidavit (August 2017) and Penalty/Remedy Expert Affidavit (October 2017) on behalf of Plaintiff in the matter of *Wildearth Guardians (Plaintiff) v Colorado Springs Utility Board (Defendant,)* Civil Action No. 1:15-cv-00357-CMA-CBS (US District Court for the District of Colorado).

110. Expert Report (August 2017) on behalf of Appellant in the matter of *Patricia Ann Troiano (Appellant) v. Upper Burrell Township Zoning Hearing Board (Appellee)*, Court of Common Pleas of Westmoreland County, Pennsylvania, Civil Division.

111. Expert Report (October 2017), Supplemental Expert Report (October 2017), and Rebuttal Expert Report (November 2017) on behalf of Defendant in the matter of *Oakland Bulk and Oversized Terminal (Plaintiff) v City of Oakland (Defendant,)* Civil Action No. 3:16-cv-07014-VC (US District Court for the Northern District of California, San Francisco Division).

112. Declaration (December 2017) on behalf of the Environmental Integrity Project in the matter of permit issuance for ATI Flat Rolled Products Holdings, Breckenridge, PA to the Allegheny County Health Department.

113. Expert Report (Harm Phase) (January 2018), Rebuttal Expert Report (Harm Phase) (May 2018) and Supplemental Expert Report (Harm Phase) (April 2019) on behalf of Plaintiffs in the matter of *Natural Resources Defense Council, Inc., Sierra Club, Inc., and Respiratory Health Association v. Illinois Power Resources LLC, and Illinois Power Resources Generating LLC (Defendants)*, Civil Action No. 1:13-cv-01181 (US District Court for the Central District of Illinois, Peoria Division).

114. Declaration (February 2018) on behalf of the Chesapeake Bay Foundation, et. al., in the matter of the Section 126 Petition filed by the state of Maryland in *State of*

Maryland v. Pruitt (Defendant), Civil Action No. JKB-17-2939 (Consolidated with No. JKB-17-2873) (US District Court for the District of Maryland).

115. Direct Pre-filed Testimony (March 2018) on behalf of the National Parks Conservation Association (NPCA) in the matter of *NPCA v State of Washington, Department of Ecology and BP West Coast Products, LLC*, PCHB No. 17-055 (Pollution Control Hearings Board for the State of Washington.

116. Expert Affidavit (April 2018) and Second Expert Affidavit (May 2018) on behalf of Petitioners in the matter of *Coosa River Basin Initiative and Sierra Club (Petitioners) v State of Georgia Environmental Protection Division, Georgia Department of Natural Resources (Respondent) and Georgia Power Company (Intervenor/Respondent)*, Docket Nos: 1825406-BNR-WW-57-Howells and 1826761-BNR-WW-57-Howells, Office of State Administrative Hearings, State of Georgia.

117. Direct Pre-filed Testimony and Affidavit (December 2018) on behalf of Sierra Club and Texas Campaign for the Environment (Appellants) in the contested case hearing before the Texas State Office of Administrative Hearings in Docket Nos. 582-18-4846, 582-18-4847 (Application of GCGV Asset Holding, LLC for Air Quality Permit Nos. 146425/PSDTX1518 and 146459/PSDTX1520 in San Patricio County, Texas).

118. Expert Report (February 2019) on behalf of Sierra Club in the State of Florida, Division of Administrative Hearings, Case No. 18-2124EPP, Tampa Electric Company Big Bend Unit 1 Modernization Project Power Plant Siting Application No. PA79-12-A2.

119. Declaration (March 2019) on behalf of Earthjustice in the matter of comments on the renewal of the Title V Federal Operating Permit for Valero Houston refinery.

120. Expert Report (March 2019) on behalf of Plaintiffs for Class Certification in the matter of *Resendez et al v Precision Castparts Corporation* in the Circuit Court for the State of Oregon, County of Multnomah, Case No. 16cv16164.

C. Occasions where Dr. Sahu has provided oral testimony <u>in depositions, at trial or in similar proceedings</u> include the following:

121. Deposition on behalf of Rocky Mountain Steel Mills, Inc. located in Pueblo, Colorado – dealing with the manufacture of steel in mini-mills including methods of air pollution control and BACT in steel mini-mills and opacity issues at this steel mini-mill.

122. Trial Testimony (February 2002) on behalf of Rocky Mountain Steel Mills, Inc. in Denver District Court.

123. Trial Testimony (February 2003) on behalf of the United States in the Ohio Edison NSR Cases, *United States, et al. v. Ohio Edison Co., et al.*, C2-99-1181 (Southern District of Ohio).

124. Trial Testimony (June 2003) on behalf of the United States in the Illinois Power NSR Case, *United States v. Illinois Power Co., et al.*, 99-833-MJR (Southern District of Illinois).

125. Deposition (10/20/2005) on behalf of the United States in connection with the Cinergy NSR Case. *United States, et* al. *v. Cinergy Corp., et al.*, IP 99-1693-C-M/S (Southern District of Indiana).

126. Oral Testimony (August 2006) on behalf of the Appalachian Center for the Economy and the Environment re. the Western Greenbrier plant, WV before the West Virginia DEP.

127. Oral Testimony (May 2007) on behalf of various Montana petitioners (Citizens Awareness Network (CAN), Women's Voices for the Earth (WVE) and the Clark Fork Coalition (CFC)) re. the Thompson River Cogeneration plant before the Montana Board of Environmental Review.

128. Oral Testimony (October 2007) on behalf of the Sierra Club re. the Sevier Power Plant before the Utah Air Quality Board.

129. Oral Testimony (August 2008) on behalf of the Sierra Club and Clean Water re. Big Stone Unit II before the South Dakota Board of Minerals and the Environment.

130. Oral Testimony (February 2009) on behalf of the Sierra Club and the Southern Environmental Law Center re. Santee Cooper Pee Dee units before the South Carolina Board of Health and Environmental Control.

131. Oral Testimony (February 2009) on behalf of the Sierra Club and the Environmental Integrity Project re. NRG Limestone Unit 3 before the Texas State Office of Administrative Hearings (SOAH) Administrative Law Judges.

132. Deposition (July 2009) on behalf of MTD Products, Inc., in the matter of *Alice Holmes and Vernon Holmes v. Home Depot USA, Inc., et al*.

133. Deposition (October 2009) on behalf of Environmental Defense and others, in the matter of challenges to the proposed Coleto Creek coal fired power plant project at the Texas State Office of Administrative Hearings (SOAH).

134. Deposition (October 2009) on behalf of Environmental Defense, in the matter of permit challenges to the proposed Las Brisas coal fired power plant project at the Texas State Office of Administrative Hearings (SOAH).

135. Deposition (October 2009) on behalf of the Sierra Club, in the matter of challenges to the proposed Medicine Bow Fuel and Power IGL plant in Cheyenne, Wyoming.

136. Deposition (October 2009) on behalf of Environmental Defense and others, in the matter of challenges to the proposed Tenaska coal fired power plant project at the Texas State Office of Administrative Hearings (SOAH). (April 2010).

137. Oral Testimony (November 2009) on behalf of the Environmental Defense Fund re. the Las Brisas Energy Center before the Texas State Office of Administrative Hearings (SOAH) Administrative Law Judges.

138. Deposition (December 2009) on behalf of Environmental Defense and others, in the matter of challenges to the proposed White Stallion Energy Center coal fired power plant project at the Texas State Office of Administrative Hearings (SOAH).

139. Oral Testimony (February 2010) on behalf of the Environmental Defense Fund re. the White Stallion Energy Center before the Texas State Office of Administrative Hearings (SOAH) Administrative Law Judges.

140. Deposition (June 2010) on behalf of the United States in connection with the Alabama Power Company NSR Case. *United States v. Alabama Power Company*, CV-01-HS-152-S (Northern District of Alabama, Southern Division).

141. Trial Testimony (September 2010) on behalf of Commonwealth of Pennsylvania – Dept. of Environmental Protection, State of Connecticut, State of New York, State of Maryland, and State of New Jersey (Plaintiffs) in connection with the Allegheny Energy NSR Case in US District Court in the Western District of Pennsylvania. *Plaintiffs v. Allegheny Energy Inc., et al.,* 2:05cv0885 (Western District of Pennsylvania).

142. Oral Direct and Rebuttal Testimony (September 2010) on behalf of Fall-Line Alliance for a Clean Environment and others in the matter of the PSD Air Permit for Plant Washington issued by Georgia DNR at the Office of State Administrative Hearing, State of Georgia (OSAH-BNR-AQ-1031707-98-WALKER).

143. Oral Testimony (September 2010) on behalf of the State of New Mexico Environment Department in the matter of Proposed Regulation 20.2.350 NMAC – *Greenhouse Gas Cap and Trade Provisions,* No. EIB 10-04 (R), to the State of New Mexico, Environmental Improvement Board.

144. Oral Testimony (October 2010) on behalf of the Environmental Defense Fund re. the Las Brisas Energy Center before the Texas State Office of Administrative Hearings (SOAH) Administrative Law Judges.

145. Oral Testimony (November 2010) regarding BART for PSCo Hayden, CSU Martin Drake units before the Colorado Air Quality Commission on behalf of the Coalition of Environmental Organizations.

146. Oral Testimony (December 2010) regarding BART for TriState Craig Units, CSU Nixon Unit, and PRPA Rawhide Unit) before the Colorado Air Quality Commission on behalf of the Coalition of Environmental Organizations.

147. Deposition (December 2010) on behalf of the United States in connection with the Louisiana Generating NSR Case. *United States v. Louisiana Generating, LLC*, 09-CV100-RET-CN (Middle District of Louisiana).

148. Deposition (February 2011 and January 2012) on behalf of Wild Earth Guardians in the matter of opacity exceedances and monitor downtime at the Public Service Company of Colorado (Xcel)'s Cherokee power plant. No. 09-cv-1862 (D. Colo.).

149. Oral Testimony (February 2011) to the Georgia Office of State Administrative Hearings (OSAH) in the matter of Minor Source HAPs status for the proposed

Longleaf Energy Associates power plant (OSAH-BNR-AQ-1115157-60-HOWELLS) on behalf of the Friends of the Chattahoochee and the Sierra Club).

150. Deposition (August 2011) on behalf of the United States in *United States of America v. Cemex, Inc.*, Civil Action No. 09-cv-00019-MSK-MEH (District of Colorado).

151. Deposition (July 2011) and Oral Testimony at Hearing (February 2012) on behalf of the Plaintiffs MYTAPN in the matter of Microsoft-Yes, Toxic Air Pollution-No (MYTAPN) v. State of Washington, Department of Ecology and Microsoft Corporation Columbia Data Center to the Pollution Control Hearings Board, State of Washington, Matter No. PCHB No. 10-162.

152. Oral Testimony at Hearing (March 2012) on behalf of the United States in connection with the Louisiana Generating NSR Case. *United States v. Louisiana Generating, LLC*, 09-CV100-RET-CN (Middle District of Louisiana).

153. Oral Testimony at Hearing (April 2012) on behalf of the New Hampshire Sierra Club at the State of New Hampshire Public Utilities Commission, Docket No. 10-261 – the 2010 Least Cost Integrated Resource Plan (LCIRP) submitted by the Public Service Company of New Hampshire (re. Merrimack Station Units 1 and 2).

154. Oral Testimony at Hearing (November 2012) on behalf of Clean Wisconsin in the matter of Application of Wisconsin Public Service Corporation for Authority to Construct and Place in Operation a New Multi-Pollutant Control Technology System (ReACT) for Unit 3 of the Weston Generating Station, before the Public Service Commission of Wisconsin, Docket No. 6690-CE-197.

155. Deposition (March 2013) in the matter of various Environmental Petitioners v. North Carolina DENR/DAQ and Carolinas Cement Company, before the Office of Administrative Hearings, State of North Carolina.

156. Deposition (August 2013) on behalf of the Sierra Club in connection with the Luminant Big Brown Case. *Sierra Club v. Energy Future Holdings Corporation and Luminant Generation Company LLC*, Civil Action No. 6:12-cv-00108-WSS (Western District of Texas, Waco Division).

157. Deposition (August 2013) on behalf of the Sierra Club in connection with the Luminant Martin Lake Case. *Sierra Club v. Energy Future Holdings Corporation and Luminant Generation Company LLC*, Civil Action No. 5:10-cv-0156-MHS-CMC (Eastern District of Texas, Texarkana Division).

158. Deposition (February 2014) on behalf of the United States in *United States of America v. Ameren Missouri*, Civil Action No. 4:11-cv-00077-RWS (Eastern District of Missouri, Eastern Division).

159. Trial Testimony (February 2014) in the matter of *Environment Texas Citizen Lobby, Inc and Sierra Club v. ExxonMobil Corporation et al.*, Civil Action No. 4:10-cv-4969 (Southern District of Texas, Houston Division).

160. Trial Testimony (February 2014) on behalf of the Sierra Club in connection with the Luminant Big Brown Case. *Sierra Club v. Energy Future Holdings*

Corporation and Luminant Generation Company LLC, Civil Action No. 6:12-cv-00108-WSS (Western District of Texas, Waco Division).

161. Deposition (June 2014) and Trial (August 2014) on behalf of ECM Biofilms in the matter of the *US Federal Trade Commission (FTC) v. ECM Biofilms* (FTC Docket #9358).

162. Deposition (February 2015) on behalf of Plaintiffs in the matter of *Sierra Club and Montana Environmental Information Center (Plaintiffs) v. PPL Montana LLC, Avista Corporation, Puget Sound Energy, Portland General Electric Company, Northwestern Corporation, and Pacificorp (Defendants)*, Civil Action No. CV 13-32-BLG-DLC-JCL (US District Court for the District of Montana, Billings Division).

163. Oral Testimony at Hearing (April 2015) on behalf of Niagara County, the Town of Lewiston, and the Villages of Lewiston and Youngstown in the matter of CWM Chemical Services, LLC New York State Department of Environmental Conservation (NYSDEC) Permit Application Nos.: 9-2934-00022/00225, 9-2934-00022/00231, 9-2934-00022/00232, and 9-2934-00022/00249 (pending).

164. Deposition (August 2015) on behalf of Plaintiff in the matter of *Conservation Law Foundation (Plaintiff) v. Broadrock Gas Services LLC, Rhode Island LFG GENCO LLC, and Rhode Island Resource Recovery Corporation (Defendants)*, Civil Action No. 1:13-cv-00777-M-PAS (US District Court for the District of Rhode Island).

165. Testimony at Hearing (August 2015) on behalf of the Sierra Club in the matter of *Amendments to 35 Illinois Administrative Code Parts 214, 217, and 225* before the Illinois Pollution Control Board, R15-21.

166. Deposition (May 2015) on behalf of Plaintiffs in the matter of *Northwest Environmental Defense Center et. al., (Plaintiffs) v. Cascade Kelly Holdings LLC, d/b/a Columbia Pacific Bio-Refinery, and Global Partners LP (Defendants)*, Civil Action No. 3:14-cv-01059-SI (US District Court for the District of Oregon, Portland Division).

167. Trial Testimony (October 2015) on behalf of Plaintiffs in the matter of *Northwest Environmental Defense Center et. al., (Plaintiffs) v. Cascade Kelly Holdings LLC, d/b/a Columbia Pacific Bio-Refinery, and Global Partners LP (Defendants)*, Civil Action No. 3:14-cv-01059-SI (US District Court for the District of Oregon, Portland Division).

168. Deposition (April 2016) on behalf of the Plaintiffs in *UNatural Resources Defense Council, Respiratory Health Association, and Sierra Club (Plaintiffs) v. Illinois Power Resources LLC and Illinois Power Resources Generation LLC (Defendants)*, Civil Action No. 1:13-cv-01181 (Central District of Illinois, Peoria Division).

169. Trial Testimony at Hearing (July 2016) in the matter of Tesoro Savage LLC Vancouver Energy Distribution Terminal, Case No. 15-001 before the State of Washington Energy Facility Site Evaluation Council.

170. Trial Testimony (December 2016) on behalf of the challengers in the matter of the Delaware Riverkeeper Network, Clean Air Council, et. al., vs. Commonwealth of Pennsylvania Department of Environmental Protection and R. E. Gas Development LLC regarding the Geyer well site before the Pennsylvania Environmental Hearing Board.

171. Trial Testimony (July-August 2016) on behalf of the United States in *United States of America v. Ameren Missouri*, Civil Action No. 4:11-cv-00077-RWS (Eastern District of Missouri, Eastern Division).

172. Trial Testimony (January 2017) on the Environmental Impacts Analysis associated with the Huntley and Huntley Poseidon Well Pad Hearing on behalf citizens in the matter of the special exception use Zoning Hearing Board of Penn Township, Westmoreland County, Pennsylvania.

173. Trial Testimony (January 2017) on the Environmental Impacts Analysis associated with the Apex energy Backus Well Pad Hearing on behalf citizens in the matter of the special exception use Zoning Hearing Board of Penn Township, Westmoreland County, Pennsylvania.

174. Trial Testimony (January 2017) on the Environmental Impacts Analysis associated with the Apex energy Drakulic Well Pad Hearing on behalf citizens in the matter of the special exception use Zoning Hearing Board of Penn Township, Westmoreland County, Pennsylvania.

175. Trial Testimony (January 2017) on the Environmental Impacts Analysis associated with the Apex energy Deutsch Well Pad Hearing on behalf citizens in the matter of the special exception use Zoning Hearing Board of Penn Township, Westmoreland County, Pennsylvania.

176. Deposition Testimony (July 2017) on behalf of Plaintiffs in the matter of *Casey Voight and Julie Voight v Coyote Creek Mining Company LLC (Defendant)* Civil Action No. 1:15-CV-00109 (US District Court for the District of North Dakota, Western Division).

177. Deposition Testimony (November 2017) on behalf of Defendant in the matter of *Oakland Bulk and Oversized Terminal (Plaintiff) v City of Oakland (Defendant,)* Civil Action No. 3:16-cv-07014-VC (US District Court for the Northern District of California, San Francisco Division).

178. Deposition Testimony (December 2017) on behalf of Plaintiff in the matter of *Wildearth Guardians (Plaintiff) v Colorado Springs Utility Board (Defendant)* Civil Action No. 1:15-cv-00357-CMA-CBS (US District Court for the District of Colorado).

179. Deposition Testimony (January 2018) in the matter of National Parks Conservation Association (NPCA) v. State of Washington Department of Ecology and British Petroleum (BP) before the Washington Pollution Control Hearing Board, Case No. 17-055.

180. Trial Testimony (January 2018) on behalf of Defendant in the matter of *Oakland Bulk and Oversized Terminal (Plaintiff) v City of Oakland (Defendant,)* Civil

Action No. 3:16-cv-07014-VC (US District Court for the Northern District of California, San Francisco Division).

181. Trial Testimony (April 2018) on behalf of the National Parks Conservation Association (NPCA) in the matter of NPCA v State of Washington, Department of Ecology and BP West Coast Products, LLC, PCHB No. 17-055 (Pollution Control Hearings Board for the State of Washington.

182. Deposition (June 2018) (harm Phase) on behalf of Plaintiffs in the matter of *Natural Resources Defense Council, Inc., Sierra Club, Inc., and Respiratory Health Association v. Illinois Power Resources LLC, and Illinois Power Resources Generating LLC (Defendants)*, Civil Action No. 1:13-cv-01181 (US District Court for the Central District of Illinois, Peoria Division).

183. Trial Testimony (July 2018) on behalf of Petitioners in the matter of *Coosa River Basin Initiative and Sierra Club (Petitioners) v State of Georgia Environmental Protection Division, Georgia Department of Natural Resources (Respondent) and Georgia Power Company (Intervenor/Respondent)*, Docket Nos: 1825406-BNR-WW-57-Howells and 1826761-BNR-WW-57-Howells, Office of State Administrative Hearings, State of Georgia.

184. Deposition (January 2019) and Trial Testimony (January 2019) on behalf of Sierra Club and Texas Campaign for the Environment (Appellants) in the contested case hearing before the Texas State Office of Administrative Hearings in Docket Nos. 582-18-4846, 582-18-4847 (Application of GCGV Asset Holding, LLC for Air Quality Permit Nos. 146425/PSDTX1518 and 146459/PSDTX1520 in San Patricio County, Texas).

185. Trial Testimony (March 2019) on behalf of Sierra Club in the State of Florida, Division of Administrative Hearings, Case No. 18-2124EPP, Tampa Electric Company Big Bend Unit 1 Modernization Project Power Plant Siting Application No. PA79-12-A2.

EXHIBIT 2

22568

RECEIVED
APR 29 2014
AIR PROTECTION BRANCH

April 15, 2014

State of Georgia
Department of Natural Resources
Environmental Protection Division
Air Protection Branch

To Whom It May Concern,

The enclosed Air Permit Application is in support of an expansion project currently in the planning stages for our contract sterilization facility at:

Sterilization Services of Georgia
6005 Boat Rock Road
Atlanta, GA

The current facility has 5 emission points (stacks) emitting small amounts of Ethylene Oxide and is covered under permit number 3841-121-0010-S-02-0. The expansion project will eventually increase the emission points (stacks) to 7 with an accompanying increase in the total Ethylene Oxide emissions from the facility.

Air dispersion models were created for several scenarios. Our interpretation of the guidance documents suggests that concentrations resulting from the air dispersion model as described below are appropriate to assess the impact of the emissions.

Emission Data – Maximum potential emissions as determined from actual production for the period from 1/1/2011 through 12/31/2012.
Modeling Domain – 5 km X 5 km with the building at the center
Receptor Array – 100 m centers covering the entire 25 km2 area. Actual receptor grid size is 53 x 51 center at the first emission point. 2703 total receptors.
MET Data – Surface data is KATL and Profile data is KFFC as recommended by and downloaded from the DNR/EPD/APB website.
Terrain Data – NDS1 GEOTIFF (10m) data as downloaded from WebGIS.
Downwash Calculations – by BPIP modeling.

There were several changes/corrections made to the previous air permit application. These include the following.

- We had originally anticipated adding 2 new sterilization chambers. We have changed our plans and this application is based on adding a single new sterilizer.
- The material balance analysis, which was originally created in 1993, has been updated to 1) incorporate more reasonable assumptions based on current process knowledge and 2) include the collective experience of other gas sterilization facilities gathered in trade associations.

The guidance document suggests that 15 minute average maximum concentration and 24 hour average maximum concentration values are used to compare to the limits. The results from the AERMOD modeling are summarized below.

Averaging Period	Maximum Concentration	Acceptable Ambient Concentrations
15 minute	12.113 $\mu g/m^3$	901 $\mu g/m^3$
24 hour	2.912 $\mu g/m^3$	4.29 $\mu g/m^3$

The attachments enclosed include the following.

1. Attached as part of the Air Permit Application
    a. Attachment A – Ethylene Oxide Gas Sterilization Process Description
    b. Attachment B1-B4 – 2010 & 2011 Actual Ethylene Oxide Usage and Production Analysis
    c. Attachment C – Process Block Diagram
    d. Attachment D – Process Block Diagram with EO Rates
    e. Attachment E – Scrubber Flow Rate Analysis
    f. Attachment F – Scrubber Volumetric Flow Analysis
    g. Attachment G – Oxidizer Flow Rate Analysis
    h. Attachment H – Oxidizer Volumetric Flow Analysis

We appreciate in advance your consideration of our air permit application. Please call or email with any questions or if addition information is needed.

Tom Fisher
Tom Fisher
General Manager
404-344-8423
tfisher@sterilization-services.com

State of Georgia
Department of Natural Resources
Environmental Protection Division
Air Protection Branch

Stationary Source Permitting Program
4244 International Parkway, Suite 120
Atlanta, Georgia 30354
404/363-7000
Fax: 404/363-7100

SIP AIR PERMIT APPLICATION

RECEIVED
EPD Use Only
Date Received: APR 29 2014 Application No. 22568
AIR PROTECTION BRANCH

FORM 1.00: GENERAL INFORMATION

1. Facility Information

Facility Name: Sterilization Services of Georgia
AIRS No. (if known): 04-13- 121 - 00010
Facility Location: Street: 6005 Boat Rock Road
City: Atlanta Georgia Zip: 30336 County: Fulton
Is this facility a "small business" as defined in the instructions? Yes: ☒ No: ☐

2. Facility Coordinates

Latitude: 33° 43' 33" **NORTH** Longitude: 84° 35' 02" **WEST**
UTM Coordinates: _____ **EAST** _____ **NORTH** **ZONE** _____

3. Facility Owner

Name of Owner: _____
Owner Address Street: _____
City: _____ State: _____ Zip: _____

4. Permitting Contact and Mailing Address

Contact Person: Tom Fisher Title: General Manager
Telephone No.: 404-344-8423 Ext. _____ Fax No.: 404-344-8665
Email Address: tfisher@sterilization-services.com
Mailing Address: Same as: Facility Location: ☒ Owner Address: ☐ Other: ☐
If Other: Street Address: _____
City: _____ State: _____ Zip: _____

5. Authorized Official

Name: Tom Fisher Title: General Manager
Address of Official Street: 6005 Boat Rock Road
City: Atlanta State: Georgia Zip: 30336

This application is submitted in accordance with the provisions of the Georgia Rules for Air Quality Control and, to the best of my knowledge, is complete and correct.

Signature: Tom Fisher Date: 4-25-2014

6. **Reason for Application: (Check all that apply)**

☐ New Facility (to be constructed)

☒ Existing Facility (initial or modification application)

☒ Permit to Construct

☒ Permit to Operate

☐ Change of Location

☒ Permit to Modify Existing Equipment: Affected Permit No.: 3841-121-0010-s-02-0

☐ Revision of Data Submitted in an Earlier Application

Application No.: _____

Date of Original Submittal: _____

7. **Permitting Exemption Activities (for permitted facilities only):**

Have any exempt modifications based on emission level per Georgia Rule 391-3-1-.03(6)(i)(3) been performed at the facility that have not been previously incorporated in a permit?

☒ **No** ☐ **Yes, please fill out the SIP Exemption Attachment** (See Instructions for the attachment download)

8. **Has assistance been provided to you for any part of this application?**

☒ **No** ☐ **Yes, SBAP** ☐ **Yes, a consultant has been employed or will be employed.**

If yes, please provide the following information:

Name of Consulting Company: _____

Name of Contact: _____

Telephone No.: _____ Fax No.: _____

Email Address: _____

Mailing Address: Street: _____

City: _____ State: _____ Zip: _____

Describe the Consultant's Involvement:

9. **Submitted Application Forms:** Select only the necessary forms for the facility application that will be submitted.

No. of Forms	Form
1	2.00 Emission Unit List
	2.01 Boilers and Fuel Burning Equipment
	2.02 Storage Tank Physical Data
	2.03 Printing Operations
	2.04 Surface Coating Operations
	2.05 Waste Incinerators (solid/liquid waste destruction)
1	2.06 Manufacturing and Operational Data
1	3.00 Air Pollution Control Devices (APCD)
1	3.01 Scrubbers
	3.02 Baghouses & Other Filter Collectors
	3.03 Electrostatic Precipitators
1	4.00 Emissions Data
1	5.00 Monitoring Information
	6.00 Fugitive Emission Sources
1	7.00 Air Modeling Information

10. **Construction or Modification Date**

Estimated Start Date: 2015

11. If confidential information is being submitted in this application, were the guidelines followed in the "Procedures for Requesting that Submitted Information be treated as Confidential"?

☐ No ☐ Yes

12. New Facility Emissions Summary

Criteria Pollutant	New Facility	
	Potential (tpy)	Actual (tpy)
Carbon monoxide (CO)		
Nitrogen oxides (NOx)		
Particulate Matter (PM) (filterable only)		
PM <10 microns (PM10)		
PM <2.5 microns (PM2.5)		
Sulfur dioxide (SO_2)		
Volatile Organic Compounds (VOC)		
Greenhouse Gases (GHGs) (in CO2e)		
Total Hazardous Air Pollutants (HAPs)		
Individual HAPs Listed Below:		

13. Existing Facility Emissions Summary

Criteria Pollutant	Current Facility		After Modification	
	Potential (tpy)	Actual (tpy)	Potential (tpy)	Actual (tpy)
Carbon monoxide (CO)	0	0	0	0
Nitrogen oxides (NOx)	0	0	0	0
Particulate Matter (PM) (filterable only)	0	0	0	0
PM <10 microns (PM10)	0	0	0	0
PM <2.5 microns (PM2.5)	0	0	0	0
Sulfur dioxide (SO_2)	0	0	0	0
Volatile Organic Compounds (VOC)	0	0	0	0
Greenhouse Gases (GHGs) (in CO2e)	0	0	0	0
Total Hazardous Air Pollutants (HAPs)	0.373	0.326	0.518	0.462
Individual HAPs Listed Below:				
Ethylene Oxide	0.373	0.326	0.518	0.462

14. 4-Digit Facility Identification Code:

SIC Code: 3559 SIC Description: Special Industry Machery, Not Elsewhere Classified

NAICS Code: 561910 NAICS Description: Packaging and Labeling Services

15. Description of general production process and operation for which a permit is being requested. If necessary, attach additional sheets to give an adequate description. Include layout drawings, as necessary, to describe each process. References should be made to source codes used in the application.

Gas Sterilization Facility using Ethylene Oxide

Products to be sterilized are placed in vacuum chambers. The air in the chamber is then evacuated. Ethylene Oxided (EO) is introduced into the chamber as the sterilant to surround and penetrate the product being sterilized. When the strilization process is completed the used EO is evacuated from the chamber to a scrubber. The product is then removed from the chamber and placed in aeration rooms for further outgassing of EO. The EO out gassed in the aeration room is exhausted to a catalytic thermal oxidizer. When the product is removed from the chamber a back vent removes the remaining, very small amount of EO which is vented to the atmosphere.

See Attachement A - Ethylene Oxide Gas Sterilization Process Description

The primary sources "producing" EO are the sterlization chambers.
[CH1 through CH3 (existing), CH4 & CH5 (proposed)]
The secondary sources "producing" EO are the aeration rooms.
[AR1 & AR2 (existing), AR3 & AR4 (proposed)]

16. Additional information provided in attachments as listed below:

Attachment A - Process Description

Attachment B - Emission Unit Operational Data

Attachment C - Process Block Diagram

Attachment D - Process Block Diagram with EO Processing Rates

Attachment E - Scrubber Pollutant Flow Rate Attachment G - Oxidizer Pollutant Flow Rate

Attachment F - Scrubber Volumetric Flow Attachment H - Oxidizer Volumetric Flow

17. Additional Information: Unless previously submitted, include the following two items:

☒ Plot plan/map of facility location or date of previous submittal:

☒ Flow Diagram or date of previous submittal:

18. Other Environmental Permitting Needs:

Will this facility/modification trigger the need for environmental permits/approvals (other than air) such as Hazardous Waste Generation, Solid Waste Handling, Water withdrawal, water discharge, SWPPP, mining, landfill, etc.?

☒ **No** ☐ **Yes, please list below:**

Facility Name: Sterilization Services of Georgia **Date of Application:** _____

FORM 2.00 – EMISSION UNIT LIST

Emission Unit ID	Name	Manufacturer and Model Number	Description
CH1	Chamber #1	Vacudyne Incorporated	Existing - 13 Pallet Ethylene Oxide Gas Sterilization Chamber
CH2	Chamber #2	Vacudyne Incorporated	Existing - 8 Pallet Ethylene Oxide Gas Sterilization Chamber
Ch3	Chamber #3	Vacudyne Incorporated	Existing - 13 Pallet Ethylene Oxide Gas Sterilization Chamber
CH4	Chamber #4	Vacudyne Incorporated	Proposed - 15 Pallet Ethylene Oxide Gas Sterilization Chamber
AR1	Aeration Room #1	Contracted Construction	Existing - Enclosed Outgassing Room with Exhaust
AR2	Aeration Room #2	Contracted Construction	Existing - Enclosed Outgassing Room with Exhaust
AR3	Aeration Room #3	Contracted Construction	Proposed - Enclosed Outgassing Room with Exhaust
AR4	Aeration Room #4	Contracted Construction	Proposed - Enclosed Outgassing Room with Exhaust

Facility Name: Sterilization Services of Georgia Date of Application: _____

FORM 2.06 – MANUFACTURING AND OPERATIONAL DATA

Normal Operating Schedule: 24 hours/day 7 days/week 52 weeks/yr

Additional Data Attached? ☐ - No ☐ - Yes, please include the attachment in list on Form 1.00, Item 16.

Seasonal and/or Peak Operating Periods: not applicable

Dates of Annually Occurring Shutdowns: not applicable

PRODUCTION INPUT FACTORS

Emission Unit ID	Emission Unit Name	Const. Date	Input Raw Material(s)	Annual Input	Hourly Process Input Rate		
					Design	Normal	Maximum
CH1	Chamber #1		Ethylene Oxide	48,541	n.a.	5.541	6.078
CH2	Chamber #2		Ethylene Oxide	28,448	n.a.	3.248	4.295
CH3	Chamber #3		Ethylene Oxide	48,541	n.a.	5.541	6.078
CH4	Chamber #4		Ethylene Oxide	56,581	n.a.	6.459	6.791
CH5	Chamber #5		Ethylene Oxide	56,581	n.a.	6.459	6.791
AR1	Aeration Room #1		Ethylene Oxide	1,492	n.a.	0.171	0.188
AR2	Aeration Room #2		Ethylene Oxide	1,492	n.a.	0.171	0.188
AR3	Aeration Room #3		Ethylene Oxide	1,492	n.a.	0.171	0.188
AR4	Aeration Room #4		Ethylene Oxide	1,492	n.a.	0.171	0.188

PRODUCTS OF MANUFACTURING

Emission Unit ID	Description of Product	Production Schedule		Hourly Production Rate (Give units: e.g. lb/hr, ton/hr)			
		Tons/yr	Hr/yr	Design	Normal	Maximum	Units
CH1	Ethylene Oxide	23.7	8760	n.a.	5.403	5.926	lb/hr
CH2	Ethylene Oxide	13.9	8760	n.a.	3.166	4.188	lb/hr
CH3	Ethylene Oxide	23.7	8760	n.a.	5.403	5.926	lb/hr
CH4	Ethylene Oxide	27.6	8760	n.a.	6.297	6.621	lb/hr
CH5	Ethylene Oxide	27.6	8760	n.a.	6.297	6.621	lb/hr
AR1	Ethylene Oxide	0.6	8760	n.a.	0.136	0.150	lb/hr
AR2	Ethylene Oxide	0.6	8760	n.a.	0.136	0.150	lb/hr
AR3	Ethylene Oxide	0.6	8760	n.a.	0.136	0.150	lb/hr
AR4	Ethylene Oxide	0.6	8760	n.a.	0.136	0.150	lb/hr

Facility Name: Sterilization Services of Georgia **Date of Application:** _____

Form 3.00 – AIR POLLUTION CONTROL DEVICES - PART A: GENERAL EQUIPMENT INFORMATION

APCD Unit ID	Emission Unit ID	APCD Type (Baghouse, ESP, Scrubber etc)	Date Installed	Make & Model Number (Attach Mfg. Specifications & Literature)	Unit Modified from Mfg Specifications?	Gas Temp. °F		Inlet Gas Flow Rate (acfm)
						Inlet	Outlet	
SC1	CH1-CH3	Scrubber	1987	Chemrox, Model - DEOXX	n.a.	130	70	700
OX1	AR1-AR4	Thermal Oxidizer	1997	Anguil, Model - 150	n.a.	mn 80 mx 130	mn 240 mx 850	7500
SC2	CH4-CH5	Scrubber	2014	Unknown	n.a.	130	70	700

Facility Name: Sterilization Services of Georgia **Date of Application:** _____

Form 3.00 – AIR POLLUTION CONTROL DEVICES – PART B: EMISSION INFORMATION

APCD Unit ID	Pollutants Controlled	Percent Control Efficiency		Inlet Stream To APCD		Exit Stream From APCD		Pressure Drop Across Unit (Inches of water)
		Design	Actual	lb/hr	Method of Determination	lb/hr	Method of Determination	
SC1	Ethylene Oxide	99%	>99.5%	13.900	Material Balance and Prod Analysis	0.070	Material Balance and Prod Analysis	3.0
OX1	Ethylene Oxide	99%	>99.8%	0.545	Material Balance and Prod Analysis	0.005	Material Balance and Prod Analysis	0.2
SC2	Ethylene Oxide	99%	>99.5%	6.265	Material Balance and Prod Analysis	0.031	Material Balance and Prod Analysis	3.0

Facility Name: Sterilization Services of Georgia **Date of Application:** _____

FORM 3.01 – SCRUBBERS

APCD Unit ID	Scrubber Type	Materials of Construction (Plastic, 1040 steel, etc.)	Scrubbant	pH Range	Pressure Drop Range (inches of H2O)	Minimum Scrubbant Flow Rate (Gal/min)	Is Scrubbant Recirculated?	Minimum Makeup Rate (Gal/min)	Size of Pond or Holding Tank (Acre-ft or gal)
SC1	Liquid	Polyethylene	Water / Sulfuric Acid	< 1.0	3.0	70	☒	n.a. - Closed System	8400
							☐		
SC2	Liquid	Polyethylene	Water / Sulfuric Acid	< 1.0	3.0	70	☒	n.a. - Closed System	4100
							☐		
							☐		
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Facility Name: Sterilization Services of Georgia **Date of Application:** _____

FORM 4.00 – EMISSION INFORMATION

Emission Unit ID	Air Pollution Control Device ID	Stack ID	Pollutant Emitted	Emission Rates				
				Hourly Actual Emissions (lb/hr)	Hourly Potential Emissions (lb/hr)	Actual Annual Emission (tpy)	Potential Annual Emission (tpy)	Method of Determination
CH1	n.a.	EP1	Ethylene Oxide	0.002	0.002	0.007	0.008	Material Balance
CH2	n.a.	EP2	Ethylene Oxide	0.001	0.001	0.004	0.006	Material Balance
CH3	n.a.	EP3	Ethylene Oxide	0.002	0.002	0.007	0.008	Material Balance
CH1 - CH3	SC1	EP4	Ethylene Oxide	0.070	0.080	0.304	0.349	Material Balance
AR1 - AR4	OX1	EP5	Ethylene Oxide	0.005	0.006	0.024	0.026	Material Balance
CH4	n.a.	EP6	Ethylene Oxide	0.002	0.002	0.008	0.009	Material Balance
CH4	SC2	EP8	Ethylene Oxide	0.031	0.033	0..136	0.145	Material Balance

Facility Name: Sterilization Services of Georgia **Date of Application:** _____

FORM 5.00 MONITORING INFORMATION

Emission Unit ID/ APCD ID	Emission Unit/APCD Name	Monitored Parameter		Monitoring Frequency
		Parameter	Units	
CH1/SC1	Chambers/Scrubber 1	Volume	Gal	Daily
CH2/SC1		pH	<1	Daily
CH3/SC1		Holding Temp	deg F	Daily
		Tower Temp	deg F	Daily
CH4/SC2	Chambers/Scrubber 2	Volume	Gal	Daily
		pH	<1	Daily
		Holding Temp	deg F	Daily
		Tower Temp	deg F	Daily
AR1/OX1	Aer Rooms/Oxidizer	Outlet Temperature	F	15 Minutes
AR2/OX1				
AR3/OX1				
AR4/OX1				

Comments:

Facility Name: Sterilization Services of Georgia **Date of Application:** _____

FORM 7.00 – AIR MODELING INFORMATION: Stack Data

Stack ID	Emission Unit ID(s)	Stack Information			Dimensions of largest Structure Near Stack		Exit Gas Conditions at Maximum Emission Rate			
		Height Above Grade (ft)	Inside Diameter (ft)	Exhaust Direction	Height (ft)	Longest Side (ft)	Velocity (ft/sec)	Temperature (°F)	Flow Rate (acfm)	
									Average	Maximum
EP1	CH1	75	1.3	Towards Sky	n.a.	n.a.	38.8	120	3000	3000
EP2	CH2	75	1.3	Towards Sky	n.a.	n.a.	38.8	120	3000	3000
EP3	CH3	75	1.3	Towards Sky	n.a.	n.a.	38.8	120	3000	3000
EP4	SC1	75	0.25	Towards Sky	n.a.	n.a.	140	70.0	140	420
EP5	OX1	45	2.5	Towards Sky	n.a.	n.a.	31.2	240	9200	9200
EP6	CH4	75	1.3	Towards Sky	n.a.	n.a.	38.8	120	3000	3000
EP7	SC2	75	0.25	Towards Sky	n.a.	n.a.	107	70.0	160	320

NOTE: If emissions are not vented through a stack, describe point of discharge below and, if necessary, include an attachment. List the attachment in Form 1.00 *General Information*, Item 16.

Facility Name: Sterilization Services of Georgia **Date of Application:** ____________

FORM 7.00 AIR MODELING INFORMATION: Chemicals Data

Chemical	Potential Emission Rate (lb/hr)	Toxicity	Reference	MSDS Attached
Ethylene Oxide	29.072	1.8 mg/m3	OSHA PEL(TWA)	X
		1.8 mg/m3	ACGIH TLV	☐
				☐
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Attachment A

Ethylene Oxide Gas Sterilization Process Description

The gas sterilization process introduces Ethylene Oxide (EO) gas into a chamber under vacuum that contains products to be sterilized. The products are typically moisture conditioned, often at elevated temperatures, prior to the introduction of EO into the evacuated chamber. The products to be sterilized are often in enclosed packaging and are exposed to the EO for controlled periods of time to kill biological matter that may have become part of the product or product packaging. A graphical depiction of an EO gas sterilization process and facility is shown below. Arrows indicate the flow or movement of EO through the process.

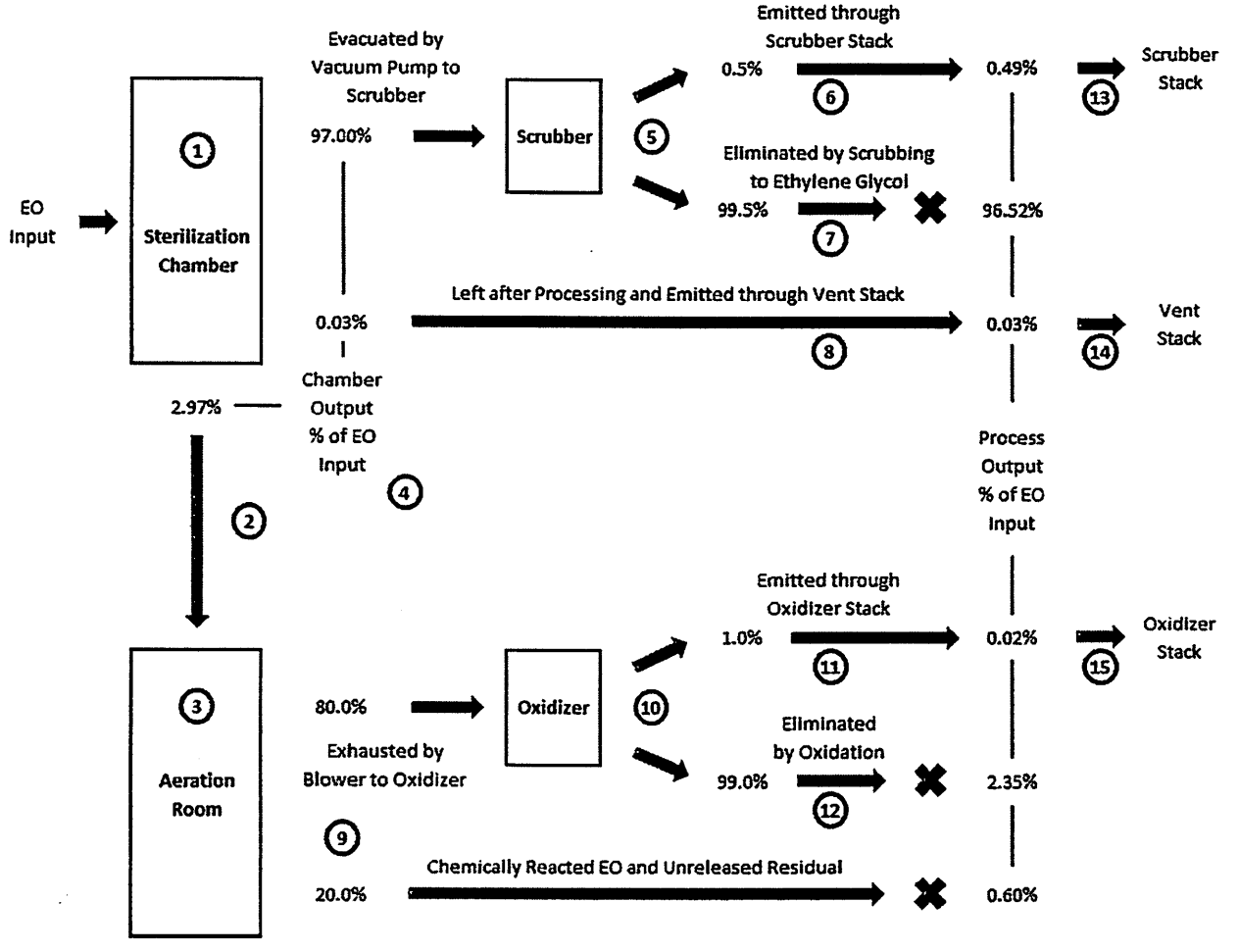


Figure 1 –Ethylene Oxide Gas Sterilization Process

A brief description of the EO gas sterilization process follows. The numbers below refer to points identified in Figure 1 – Ethylene Oxide Gas Sterilization Process shown on the previous page.

EO Sterilization

1. Product to be sterilized is loaded into the sterilization chamber. The chamber is evacuated and EO is introduced into the chamber.
2. After sterilization is completed product is removed from the sterilization chamber and transported to aeration rooms.
3. In the aeration room, air is continuously recirculated around the product as it continues to outgas EO.
4. Typically, at least 97% of the EO used is evacuated from the chamber to a scrubber after sterilization is completed. An analysis of the sterilization cycle indicates no more than 0.03% of the EO used remains in the chamber and is vented to atmosphere. Therefore, about 2.97% of the EO used is carried with the sterilized product into the aeration rooms.

EO Scrubbing

5. Ethylene Oxide gas that is evacuated from the chamber by vacuum pumps is passed to a liquid scrubber. The scrubber mixes the EO with an acid/water solution. The acid acts as a catalyst for reacting the EO gas with water. This reaction converts the EO gas removed from the chamber into liquid Ethylene Glycol. The scrubbing process is designed to be no less than 99% efficient in converting the EO gas to Ethylene Glycol. Measured scrubbing efficiencies are in excess of 99.5%.
6. Therefore, no more than 0.5% of the EO gas processed by the scrubber is assumed to be released to the atmosphere through the scrubber stack.
7. Similarly, at least 99.5% of the EO gas processed by the scrubber is assumed to be eliminated through conversion to Ethylene Glycol.

EO Ventilation

8. The relatively small amount of EO left in the chamber after sterilization, already stated as typically no more than 0.03% of the EO used, is released to the atmosphere through the vent stack.

Aeration

9. Product outgassing of EO continues in aeration rooms. Air is continuously recirculated around the sterilized product. A portion of the recirculating air containing outgassed EO is continuously removed from the aeration room by exhaust blowers. Studies and experience show that at least 80% of the residual EO from the aerated product is exhausted to a thermal oxidizer during the aeration process. Therefore, no more than 20% remains in the sterilized product as chemically reacted and unreleased residual EO.

Thermal Oxidation

10. Ethylene oxide gas that is exhausted from the aeration room is passed to a thermal oxidizer. The thermal oxidizer is designed to be at least 99% efficient in eliminating EO gas.
11. Typical measured efficiencies are in excess of 99.8%. Therefore, it is assumed no more than 1% of the EO gas processed by the oxidizer is released to the atmosphere through the oxidizer stack.
12. Similarly, at least 99% of the EO gas processed by the oxidizer is assumed to be eliminated through the combustion process.

EO Emissions

13. No more than 0.5% of the EO used by the sterilization process is assumed to be released through the Scrubber Stack. This is calculated as no more than 0.5% (after scrubbing) of 97% (after sterilizing) of the EO used in the sterilization process.
14. No more than 0.03% of the EO used by the sterilization process is assumed to be released through the Vent Stack.
15. No more than 0.02% of the EO used by the sterilization process is assumed to be released through the Oxidizer Stack. This is calculated as no more than 1% (after oxidizing) of 80% (after aeration) of 2.97% (after sterilization) of the EO used in the sterilization process.

The above assumptions are consistent with those used throughout the EO gas sterilization industry.

Attachment B1
Emission Unit Operational Data

Total Loads, Time and EO Gas Used for all Cycles Processed in 2011 and 2012

	Total Loads Processed			Total Load Processing Time (hrs)			Total EO Gas Used (#)	EO Gas Used Distributed (#)		
	Chamber 1	Chamber 2	Chamber 3	Chamber 1	Chamber 2	Chamber 3		Chamber 1	Chamber 2	Chamber 3
2011	417	363	338	4837	6341	3549	67752	26676	18915	22161
2012	408	464	311	5227	7445	3975	74475	27853	25855	20767
Total	825	827	649	10,064	13,786	7,524		54,528	44,771	42,928
						2011-2012 Average EO Used per Processing Hour		5.418	3.248	5.706

Ethylene Oxide Input Processing Calculations for Sterilizing Chambers (Average and Maximum EO Use Input Rate)

The normal EO hourly processing rate is calculated as the average of actual EO use during 2011 & 2012

2011-2012 Average EO Used per Processing Hour (Chamber 2 - 44,771 # EO used / 13,786 hrs)	8	pallet chamber	3.248	lb/hr
2011-2012 Average EO Used per Processing Hour (Chambers 1 & 3 - (54,528 + 42,928) # EO used / (10,064 + 7,524) Hrs)	13	pallet chamber	5.541	lb/hr
Predicted Average EO Used per Processing Hour (Extrapolated from actual use in 8 & 13 pallet chambers)	15	pallet chamber	6.459	lb/hr

The maximum EO hourly processing rate is calculated from the maximum use month during 2012

Maximum EO Used per Processing Hour (July-2012 used 2580.7 # EO in chamber 2 in 600.9 processing hours)	8	pallet chamber	4.295	lb/hr
Maximum EO Used per Processing Hour (February - 2012 used 2164.6 # EO in chamber 3 in 356.17 processing hours)	13	pallet chamber	6.078	lb/hr
Predicted Maximum EO Used per Processing Hour (Extrapolated from maximum month use in 8 & 13 pallet chambers)	15	pallet chamber	6.791	lb/hr

The annual input is based on full utilization (24/7/365) at the average (normal) hourly processing rate during 2011 & 2012

Expected Annual EO Input with Full Utilization (Chamber 2 - 3.248 #/hr * 24 hr/dy * 365 dy)	8	pallet chamber	28448	lb/yr
Expected Annual EO Input with Full Utilization (Chambers 1 & 3 2 - 5.541 #/hr * 24 hr/dy * 365 dy)	13	pallet chamber	48541	lb/yr
Predicted Annual EO Input with Full Utilization (New Chambers 4 & 5 - 6.459 #/hr * 24 hr/dy * 365 dy)	15	pallet chamber	56581	lb/yr

Ethylene Oxide Sterilizing Chamber Production Output Calculations (Average and Maximum EO Use Input Rate)
(all calculated as 97.5% of process input consistent with the material balance analysis documented elsewhere)

The normal EO output hourly processing rate from the sterilizing chambers

EO Output Hourly Production Rate from Chamber (Chamber 2 - 3.248 #/hr * 97.03%)	8	pallet chamber	3.151	lb/hr
EO Output Hourly Production Rate from Chamber (Chambers 1 & 3 - 5.541 #/hr * 97.03%)	13	pallet chamber	5.377	lb/hr
EO Output Hourly Production Rate from Chamber (New Chambers 4 & 5 - 6.459 #/hr * 97.03%)	15	pallet chamber	6.267	lb/hr

The maximum EO output hourly processing rate from the sterilizing chambers

EO Output Hourly Production Rate from Chamber (Chamber 2 - 4.295 #/hr * 97.03%)	8	pallet chamber	4.168	lb/hr
EO Output Hourly Production Rate from Chamber (Chambers 1 & 3 - 6.078 #/hr * 97.03%)	13	pallet chamber	5.897	lb/hr
EO Output Hourly Production Rate from Chamber (New Chambers 4 & 5 - 6.791 #/hr * 97.03%)	15	pallet chamber	6.589	lb/hr

The annual EO output production from the sterilizing chambers

EO Output Production from Chamber (Chamber 2 - 28,448 # * 97.03% / 2000)	8	pallet chamber	13.8	tons/yr
EO Output Production from Chamber (Chambers 1 & 3 - 48,541 # * 97.03% / 2000)	13	pallet chamber	23.5	tons/yr
EO Output Production from Chamber (New Chambers 4 & 5 - 56,581 # * 97.03% / 2000)	15	pallet chamber	27.5	tons/yr

Attachment B2
Emission Unit Operational Data

Ethylene Oxide Input Processing Calculations for Each Aeration Room

The normal EO hourly processing rate is asummed to equal the maximum rate

Expected Normal EO Used per Processing Hour in Each of 4 Aeration Rooms	0.154	lb/hr

The maximum EO hourly processing rate is calculated as the expected annual input divided by the maximum annual processing hours

Expected Maximum EO Used per Processing Hour in Each of 4 Aeration Rooms	0.173	lb/hr

The annual input is calculated as 1/4 of 2.5% of the total Sterilizer annual input of **182111 lb/yr**

Expected Annual EO Input with Full Utilization in Each of 4 Aeration Rooms	1352	lb/yr
(2.97% of 182,111 / 4)		

Ethylene Oxide Output Processing Calculations for Each Aeration Room

(all calculated as 80% of process input values consistent with the material balance analysis documented elsewhere)

The normal EO output hourly processing rate for each aeration room

Expected Normal EO Used per Processing Hour in Each of 4 Aeration Rooms	0.123	lb/hr
(0.154 * 80%)		

The maximum EO output hourly processing rate for each aeration room

Expected Maximum EO Used per Processing Hour in Each of 4 Aeration Rooms	0.138	lb/hr
(0.173 * 80%)		

The annual output for each aeration room

Expected Annual EO Input with Full Utilization in Each of 4 Aeration Rooms	0.5	tons/yr
(80% of 1,352 / 2000)		

Attachment B3
Emission Unit Operational Data - 2011

Sterilization Services of Georgia
Loads, Time and EO Gas Used for all Cycles Processed in 2011

	Total Loads Processed			Total Load Processing Time (min)			Total EO Gas Used	EO Gas Used Distributed (#)		
	Chamber 1	Chamber 2	Chamber 3	Chamber 1	Chamber 2	Chamber 3	(#)	Chamber 1	Chamber 2	Chamber 3
AN	10		27	90.4		241.1	2605	704		1901
TR	0		14			88.1	921			921
SI	78		125	549.9		777.6	8116	3118		4998
HE	1		7	8.3		56.3	492	62		431
DU		4			34.8		132		132	
AR		192			4491.9		9893		9893	
AR	4		10	41.3		99.0	1105	316		789
AN	60			581.8			3755	3755		
MI	35			294.4			2579	2579		
AD			2			18.8	114			114
WL	79		9	1543.8	122.2	146.5	6108	5483		625
WL			7			143.7	495			495
WL	21		37	486.6		752.7	4233	1533		2700
WL	2		6	42.6		124.7	539	135		404
AM			62			749.4	5132			5132
CP	6			63.3			468	468		
AN			22			256.7	2722			2722
WR		19			237.1		905		905	
AD		1			10.1		43		43	
WE		20	5		161.7	41.1	1838		1307	531
XO		6			63.3		239		239	
CO	121		2	1134.3		18.5	8664	8523		141
BE		121	3		1219.6	35.1	6654		6396	258
Totals	417	363	338	4836.7	6340.7	3549.3	67752	26676	18915	22161
						EO Used per Processing Hour		5.515	2.983	6.244

2011 Average EO Used per Processing Hour (#) 8 Pallet Chamber 2.983 #/hr
2011 Average EO Used per Processing Hour (#) 13 Pallet Chamber 5.824 #/hr

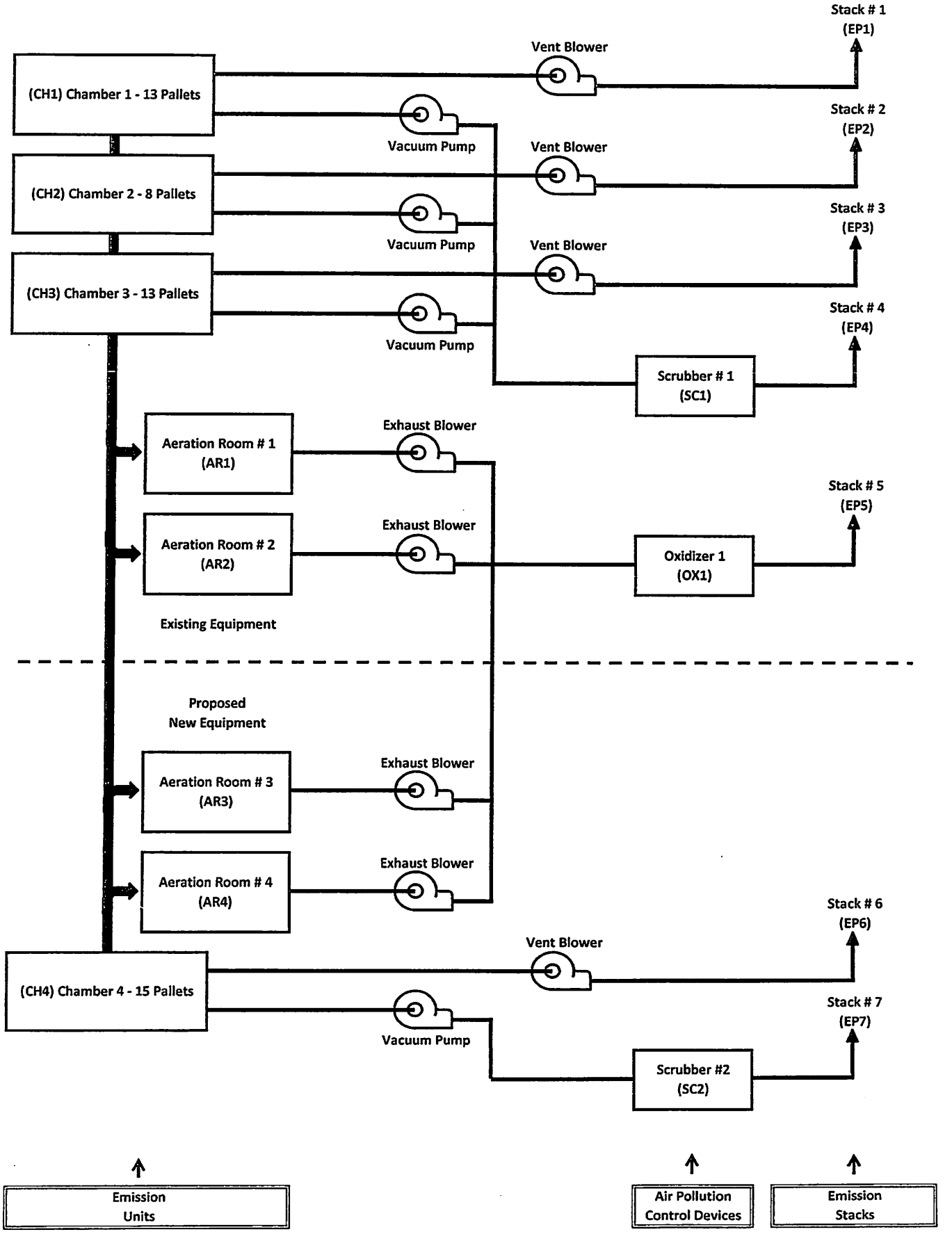
Attachment B4
Emission Unit Operational Data - 2012

Sterilization Services of Georgia
Loads, Time and EO Gas Used for all Cycles Processed in 2012

	Total Loads Processed			Total Load Processing Time (min)			Total EO Gas Used	EO Gas Used Distributed (#)		
	Chamber 1	Chamber 2	Chamber 3	Chamber 1	Chamber 2	Chamber 3	(#)	Chamber 1	Chamber 2	Chamber 3
AN	13	-	24	117		221	2679	941		1738
TR			11			69	712			712
SI	78		86	516		515	6551	3116		3435
HE			3			25	185			185
DU		3			26		102		102	
AR		230	5		5356	95	12355		11933	422
AR			4			91	330			330
AR			6			72	552			552
AN	61			579			3863	3863		
MI	67			546			4984	4984		
AD	1			9			102	102		
WL	72		12	1386		346	6083	5214		869
WL	1		22	20		455	1746	76		1670
WL	37		31	798		662	4938	2687		2251
WL	3		11	64		237	1001	215		787
AM			81			999	6106			6106
CP	8			88			637	637		
AN			12			135	1484			1484
WR		14			170		671		671	
AD		2			20		85		85	
WE	9	88		221	607		7475	1065	6410	
WE	23		2	560		47	2353	2165		188
XO		1			12		35		35	
CO	24			209			1792	1792		
BE		121			1225		6419		6419	
AV	2			16			140	140		
SI	2		1	13		6	116	77		39
AM	7			86			779	779		
OS		5			29		200		200	
Totals	408	464	311	5227	7445	3975	74475	27853	25855	20767
						EO Used per Processing Hour		5.329	3.473	5.225

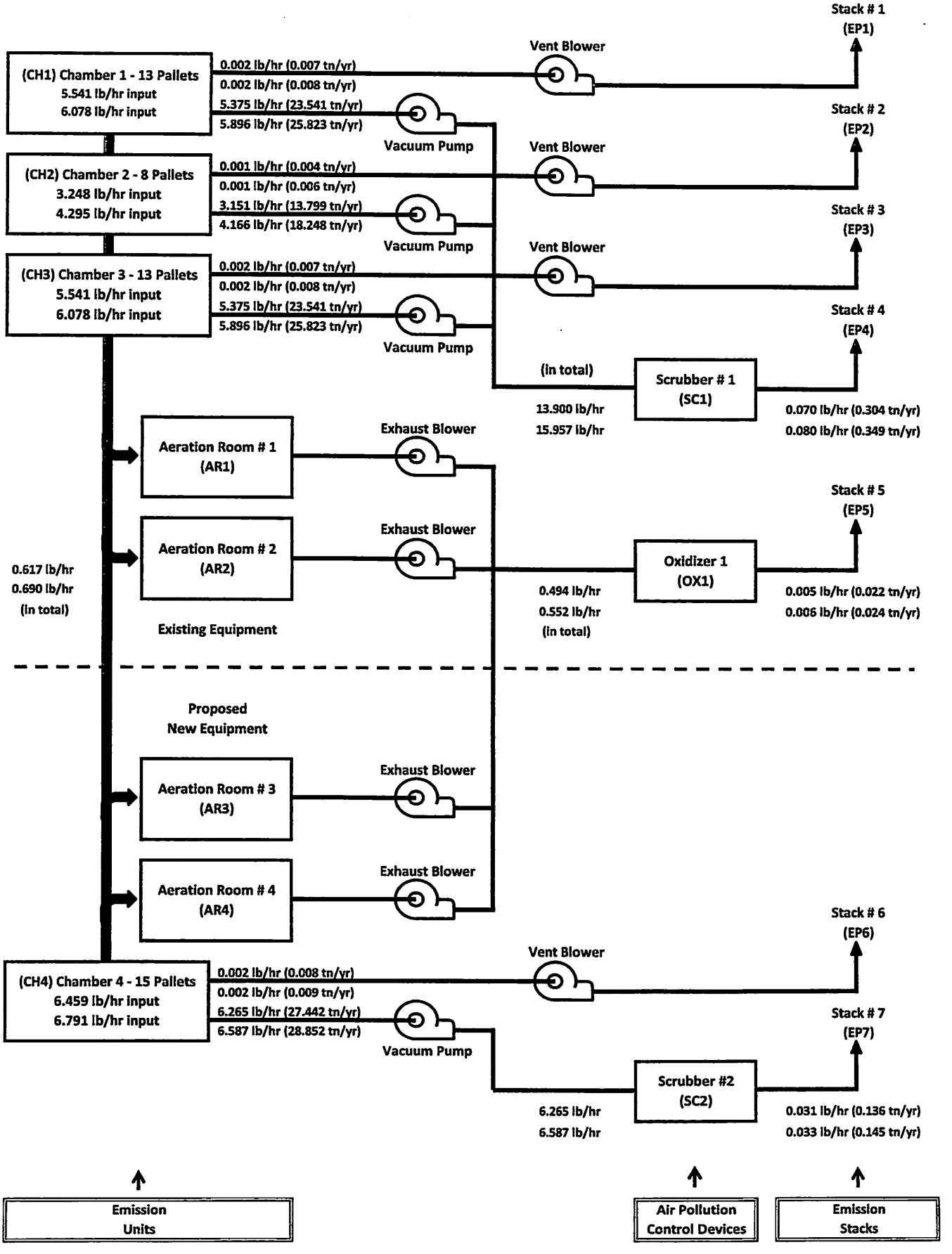
2012 Average EO Used per Processing Hour	8	Pallet Chamber	3.473	#/hr
2012 Average EO Used per Processing Hour	13	Pallet Chamber	5.284	#/hr
2012 Maximum EO Used per Processing Hour	8	Pallet Chamber	4.295	#/hr
2012 Maximum EO Used per Processing Hour	13	Pallet Chamber	6.078	#/hr

Attachment C
Process Block Diagram



Attachment D

Block Diagram with Ethylene Oxide Rates



Attachment E

Scrubber Flow Rate Analysis

Analysis of the 2011 and 2012 facility operation at Sterilization Services of Georgia produced the following actual and predicted flow rates for Ethylene Oxide (EO) use through the sterilizing chamber. The numbers are repeated from Attachment B1 – Emission Unit Operational Data.

Normal EO Hourly Processing Rate based on Actual EO use during 2011 and 2012

8 Pallet Sterilizing Chamber	3.248	lb/hr
13 Pallet Sterilizing Chamber	5.541	lb/hr
15 Pallet Sterilizing Chamber	6.459	lb/hr

Maximum EO Hourly Processing Rate based on Actual EO use during 2011 and 2012

8 Pallet Sterilizing Chamber	4.295	lb/hr
13 Pallet Sterilizing Chamber	6.078	lb/hr
15 Pallet Sterilizing Chamber	6.791	lb/hr

Ethylene Oxide Inlet Flow Rate to Scrubbers

The flow rates into the scrubbers can be calculated from the combined flow rates through the chambers and the amount of gas through the chamber that is sent to the scrubbers (97% - see attachment A). As shown in attachment C, chambers one (CH1), two (CH2) & three (CH3) are evacuated to Scrubber 1 (SC1). Therefore, the EO flow rate into Scrubber 1 can be calculated as the aggregate flow rates from chambers 1 through 3.

Normal Aggregate Ethylene Oxide Processing Rate into Scrubber 1

R_{norm} (lb/hr) = (3.248 lb/hr + 2 * 5.541 lb/hr) * 0.97 = 13.900 lb/hr (1)

Maximum Aggregate Ethylene Oxide Processing Rate into Scrubber 1

R_{max} (lb/hr) = (4.295 lb/hr + 2 * 6.078 lb/hr) * 0.97 = 15.957 lb/hr (2)

Similarly, the EO flow rate into Scrubber 2 (SC2) can be calculated from the flow rate from chamber 4 and the fractional amount of EO processed that is evacuated to Scrubber 2.

Normal Aggregate Ethylene Oxide Processing Rate into Scrubber 2

R_{norm} (lb/hr) = 6.459 lb/hr * 0.97 = 6.265 lb/hr (3)

Maximum Aggregate Ethylene Oxide Processing Rate into Scrubber 2

R_{max} (lb/hr) = 6.791 lb/hr) * 0.97 = 6.587 lb/hr (4)

Ethylene Oxide Outlet Flow Rate from Scrubbers

The Scrubbers are designed to remove 99% of the Ethylene Oxide from the input flow. Therefore, the EO flow rates out of the scrubbers can be calculated from the previous EO input flow rates. The output flow rates are also shown calculated in tons/year.

Normal Aggregate Ethylene Oxide Processing Rate out of Scrubber 1

$R_{norm\text{-}out}$ (lb/hr) = 13.900 lb/hr * 0.005 = 0.070 lb/hr (5)

$R_{norm\text{-}out}$ (tn/yr) = 0.070 lb/hr * 8760 hr/yr / 2000 lb/tn= 0.304 tn/yr

Maximum Aggregate Ethylene Oxide Processing Rate out of Scrubber 1

$R_{max\text{-}out}$ (lb/hr) = 15.957 lb/hr * 0.005 = 0.080 lb/hr (6)

$R_{max\text{-}out}$ (tn/yr) = 0.080 lb/hr * 8760 hr/yr / 2000 lb/tn= 0.349 tn/yr

And similarly for Scrubber 2.

Normal Aggregate Ethylene Oxide Processing Rate out of Scrubber 2

$R_{norm\text{-}out}$ (lb/hr) = 6.265 lb/hr * 0.005 = 0.031 lb/hr (7)

$R_{norm\text{-}out}$ (tn/yr) = 0.031 lb/hr * 8760 hr/yr / 2000 lb/tn= 0.136 tn/yr

Maximum Aggregate Ethylene Oxide Processing Rate out of Scrubber 2

$R_{max\text{-}out}$ (lb/hr) = 6.587 lb/hr) * 0.005 = 0.033 lb/hr (8)

$R_{max\text{-}out}$ (tn/yr) = 0.033 lb/hr * 8760 hr/yr / 2000 lb/tn= 0.145 tn/yr

Summary

The Ethylene Oxide Inlet stream and Exit stream processing rates for the scrubbers will be stated as the normal aggregate values previously calculated in equations (1) and (5) for Scrubber 1 and equations (3) and (7) for Scrubber 2 .

Scrubber 1

(1) Input Stream Processing Rate = 13.900 lb/hr (used on Form 3.00, Part B for SC1)

(5) Output Stream Processing Rate = 0.070 lb/hr (used on Form 3.00 for SC1)

Scrubber 2

(3) Input Stream Processing Rate = 6.265 lb/hr (used on Form 3.00 Part B for SC2)

(7) Output Stream Processing Rate = 0.031 lb/hr (used on Form 3.00 Part B for SC2)

Attachment F

Scrubber Volumetric Flow Analysis

The sterilizing chambers are evacuated using vacuum pumps. Ethylene Oxide is removed from the chambers by the vacuum pumps and routed through pipes to scrubbers.

Attachment C shows the three existing chambers (CH1-CH3) as being evacuated to the existing scrubber (SC1). Sterilizing chambers 1 and 3 use vacuum pump model KLRC525 manufactured by Kinney. A table of discharge flow rates taken from the vacuum pump curve is shown below.

Vacuum Level Pressure Drop (inHg)	Discharge Flow to Atmosphere (SCFM)
30	350
25	317
20	280
15	230
10	170
5	93
4	72
3	52
2	30
1.2	11

Figure 1 – Kinney KLRC525

The average flow rate (or average capacity) of the range shown in the table is about 160 SCFM.

Sterilizing chamber 2 uses a vacuum pump model BSO 750/300W manufactured by Intervac Corporation. A table of discharge flow rates taken from the vacuum pump curve is shown below.

Vacuum Level Pressure Drop (inHg)	Discharge Flow to Atmosphere (SCFM)
30	250
15	150
10	100
5	50
4	100
2	50
0.5	13

The average flow rate (or average capacity) of the range shown in the table is about 100 SCFM.

Scrubber 1 Discharge

Inlet and Outlet (Discharge) Flow Rate

Sterilizing chambers 1 through 3 (CH1 – CH3) are evacuated to Scrubber 1 (SC1). The average volume flow of Ethylene Oxide through the scrubber can be estimated as the average of the individual flows from sterilizing chambers 1 through 3.

Average Flow through Scrubber = (160 CFM + 100 CFM + 160 CFM) / 3 = 140 CFM

It is possible, though unlikely, for all three sterilizing chambers to be evacuated simultaneously. Therefore, the maximum flow of Ethylene Oxide through the scrubber can be estimated as the total of the individual flows from sterilizing chambers 1 through 3.

Maximum Flow through Scrubber = 160 CFM + 100 CFM + 160 CFM = 420 CFM

Discharge Velocity

The scrubber discharges Ethylene Oxide through a stack that is a 3 inch ID pipe. This discharge opening is calculated as follows.

$A_{dis} = PI * r^2$ - or - $A_{dis}\ (ft^2) = 3.14159 * 1.5^2\ (in^2) / 144\ (in^2/ft^2) = 0.05\ ft^2$

This allows the average and maximum discharge velocity to be calculated.

$V_{avg}\ (ft/sec) = Flow_{avg}\ (ft^3/min) / Discharge\ Area\ (ft^2) / 60\ (sec/min)$

$V_{avg}\ (ft/sec) = 140\ (ft^3/min) / 0.05\ ft^2 / 60\ (sec/min) = 47\ ft/sec$

The maximum velocity can be similarly calculated.

$V_{avg}\ (ft/sec) = 420\ (ft^3/min) / 0.05\ ft^2 / 60\ (sec/min) = 140\ ft/sec$

Scrubber 2 Proposed New Scrubber) Discharge

Inlet and Outlet (Discharge) Flow Rate

Sterilizing chamber 4 (CH4) is evacuated to Scrubber 2 (SC2). The average flow of Ethylene Oxide through the scrubber is the flow from a single vacuum pump.

Average Flow through Scrubber = 160 CFM

The maximum flow through the scrubber is the flow at maximum discharge.

Maximum Flow through Scrubber = 350 CFM

Discharge Velocity

Given the same 3" stack diameter, the discharge velocities are.

$A_{dis} = PI * r^2$ - or - $A_{dis}\ (ft^2) = 3.14159 * 1.5^2\ (in^2) / 144\ (in^2/ft^2) = 0.05\ ft^2$

This average discharge velocity for Scrubber 2 is sa follows.

$V_{avg}\ (ft/sec) = 160\ (ft^3/min) / 0.05\ ft^2 / 60\ (sec/min) = 54\ ft/sec$

The maximum discharge velocity for Scrubber 2 is as follows.

$V_{avg}\ (ft/sec) = 350\ (ft^3/min) / 0.05\ ft^2 / 60\ (sec/min) = 117\ ft/sec$

Summary

The exit gas volumetric flow rates and velocities will be stated as calculated and here summarized.

Scrubber 1 Discharge (used on Form 7.00 for SC1)
Average Flow through Scrubber = 140 CFM
Maximum Flow through Scrubber = 420 CFM
Maximum Discharge Velocity = 140 ft/sec

Scrubber 2 Discharge (used on Form 7.00 for SC2)
Average Flow through Scrubber = 160 CFM
Maximum Flow through Scrubber = 320 CFM
Maximum Discharge Velocity = 117 ft/sec

Attachment G

Aeration Room / Oxidizer Flow Rate Analysis

Analysis of the 2011 and 2012 actual facility operation at Sterilization Services of Georgia produced the following actual and predicted flow rates for Ethylene Oxide (EO) use through the sterilizing chambers. The numbers are repeated from Attachment B1 – Emission Unit Operational Data.

Normal EO Hourly Processing Rate based on Actual EO use during 2011 and 2012

8 Pallet Sterilizing Chamber	3.248	lb/hr
13 Pallet Sterilizing Chamber	5.541	lb/hr
15 Pallet Sterilizing Chamber	6.459	lb/hr

Maximum EO Hourly Processing Rate based on Actual EO use during 2011 and 2012

8 Pallet Sterilizing Chamber	4.295	lb/hr
13 Pallet Sterilizing Chamber	6.078	lb/hr
15 Pallet Sterilizing Chamber	6.791	lb/hr

There is no way to anticipate which aeration rooms will receive which loads after being sterilized in the chambers. Furthermore, the facility exhausts all aeration rooms to a single oxidizer. Therefore, for purposes of analyzing EO flow through the oxidizer, it seems reasonable to treat all of the Ethylene Oxide gas that passes through the chambers in aggregate. In other words, if the facility has a single 8 pallet sterilizer, two 13 pallet sterilizers and two 15 sterilizers in operation the aggregate processing rates would be as shown below.

Normal Aggregate Ethylene Oxide Processing Rate through Sterilizing Chambers

R_{norm} (lb/hr) = 3.248 lb/hr + 2 * 5.541 lb/hr + 2 * 6.459 lb/hr = 27.247 lb/hr (1)

Maximum Aggregate Ethylene Oxide Processing Rate through Sterilizing Chambers

R_{norm} (lb/hr) = 4.295 lb/hr + 2 * 6.078 lb/hr + 2 * 6.791 lb/hr = 30.031 lb/hr (2)

Similarly, since all of the product goes to aeration rooms that exhaust to a single oxidizer, it seems reasonable to complete the calculations as if there is only one aeration room.

Ethylene Oxide Input Stream to Aeration Rooms and Oxidizer

Attachment A summarizes that no more the 2.5% of the EO gas processed through the sterilizing chamber is carried with the sterilized product to aeration rooms.

Therefore, the assumed aeration room input flow rates are established as 2.5% of the aggregate flow rates in equations (1) and (2) noted above.

Normal Aggregate Ethylene Oxide Input Processing Rate to the Aeration Rooms

$R_{norm\text{-}in}$ (lb/hr) = 27.247 lb/hr * 0.025 = 0.681 lb/hr (3)

Maximum Aggregate Ethylene Oxide Input Processing Rate to the Aeration Rooms

$R_{max\text{-}in}$ (lb/hr) = 30.031 lb/hr * 0.025 = 0.751 lb/hr (4)

The previous equations show the aggregate Ethylene Oxide flow into the aeration rooms. It is difficult to anticipate how product transfers from sterilizing chambers (of which there will be 5) to aeration rooms (of which there will be 4). It seems reasonable to assume that the aggregate amount of Ethylene Oxide carried out of the chambers in sterilized product is evenly distributed to the 4 aeration rooms.

Therefore, the EO flow rate into the individual aeration rooms can be estimated as 1/4th the aggregate flow rate into all of the aeration rooms.

Normal Individual Ethylene Oxide Input Processing Rate to the Aeration Rooms (per room)

$R_{norm\text{-}in}$ (lb/hr) = 0.681 lb/hr * ¼ = 0.170 lb/hr (5)

Maximum Individual Ethylene Oxide Input Processing Rate to the Aeration Rooms (per room)

$R_{max\text{-}in}$ (lb/hr) = 0.751 lb/hr * ¼ = 0.188 lb/hr (6)

Attachment G also summarizes that about 80% of the Ethylene Oxide out gassed in the aeration room is exhausted to the oxidizer. Therefore, the assumed individual aeration room out flow rates can be estimated as 80% of (5) and (6) above and the aggregate oxidizer input flow rate can be estimated as 80% of the aggregate flow through the aeration rooms as shown in equations (3) and (4) noted above.

Normal Individual Ethylene Oxide Output Processing Rate to the Aeration Rooms (per room)

$R_{norm\text{-}in}$ (lb/hr) = 0.170 lb/hr * 0.8 = 0.136 lb/hr (7)

Maximum Individual Ethylene Oxide Output Processing Rate to the Aeration Rooms (per room)

$R_{max\text{-}in}$ (lb/hr) = 0.188 lb/hr * 0.8 = 0.150 lb/hr (8)

Normal Aggregate Ethylene Oxide Input Processing Rate to the Oxidizer

$R_{norm\text{-}in}$ (lb/hr) = 0.681 lb/hr * 0.8 = 0.545 lb/hr (9)

Maximum Aggregate Ethylene Oxide Input Processing Rate to the Oxidizer

$R_{max\text{-}in}$ (lb/hr) = 0.751 lb/hr * 0.8 = 0.601 lb/hr (10)

Ethylene Oxide Output Stream from Oxidizer

Attachment A shows that no more than 1% of the Ethylene Oxide presented to the Oxidizer is output from the oxidizer. Therefore, the EO output stream flow rates (normal and maximum) from the Oxidizer can be calculated from the effective Oxidizer input stream flow rates just calculated. Restated, the Oxidizer output flow rates can be calculated from equations (3) and (4) noted above.

Normal Aggregate Ethylene Oxide Output Processing Rate to the Oxidizer

$R_{norm\text{-}out}$ (lb/hr) = 0.545 lb/hr * 0.01 = 0.005 lb/hr (11)

Maximum Aggregate Ethylene Oxide Output Processing Rate to the Oxidizer

$R_{max\text{-}out}$ (lb/hr) = 0.601 lb/hr * 0.01 = 0.006 lb/hr (12)

Summary

The Ethylene Oxide Inlet stream and Outlet stream processing rates for the Oxidizer will be stated as the normal aggregate values previous stated in equations (3) and (5).

(9) Oxidizer Input Stream Processing Rate = 0.545 lb/hr (used on Form 3.00, Part B for OX1)
(11) Oxidizer Output Stream Processing Rate = 0.005 lb/hr (used on Form 3.00, Part B for OX1)

The Ethylene Oxide input and output processing rates for the Aeration Rooms will be stated as calculated above.

(5) Normal Aeration Room Input Processing Rate = 0.170 lb/hr (used on Form 2.06)
(6) Maximum Aeration Room Input Processing Rate= 0.188 lb/hr (used on Form 2.06)
(7) Normal Aeration Room Output Processing Rate = 0.136 lb/hr (used on Form 2.06)
(8) Maximum Aeration Room Output Processing Rate= 0.150 lb/hr (used on Form 2.06)

Attachment H

Oxidizer Volumetric Flow Analysis

Ethylene Oxide is out gassed in the aeration rooms to the air recirculating in the room. A portion of the recirculating air is exhausted from the aeration rooms (AR1 Through AR 4) to the oxidizer (OX1).

Following are the volumetric flows from the exhaust blowers for the 2 current and 2 proposed aeration rooms.

Aeration Room 1 (current)	1200 ACFM
Aeration Room 2 (current)	2000 ACFM
Aeration Room 3 (proposed)	3000 ACFM
Aeration Room 4 (proposed)	3000 ACFM

The exhaust blowers run continuously. Therefore the maximum and average flows are the same. All aeration rooms exhaust through the Oxidizer

$Flow_{in}$ (ACFM) = 2000 ACFM + 1200 ACFM + 3000 ACFM + 3000 ACFM = 9200 ACFM
$Flow_{in\text{-}avg}$ = 9200 ACFM; $Flow_{out\text{-}avg}$ = 9200 ACFM

Oxidizer Discharge Velocity

The oxidizer discharges Ethylene Oxide through a stack that is a 30 inch ID pipe. This discharge opening area is calculated as follows.

$A_{dis} = PI * r^2$ - or - $A_{dis}\ (ft^2) = 3.14159 * 15^2\ (in^2) / 144\ (in^2/ft^2) = 4.909\ ft^2$

This allows the average and maximum discharge velocity to be calculated.

V_{avg} (ft/sec) = $Flow_{avg}$ (ft^3/min) / Discharge Area (ft^2) / 60 (sec/min)

V_{avg} (ft/sec) = 9200 (ft^3/min) / 4.909 ft^2 / 60 (sec/min) = 31.2 ft/sec

Summary

The oxidizer stack exit gas volumetric flow rates and velocities will be stated as calculated and here summarized.

Oxidizer Discharge (used on Form 7.00 for OX1)
Average Flow through Scrubber = 9200 CFM
Maximum Flow through Scrubber = 9200 CFM
Maximum Discharge Velocity = 31.2 ft/sec

EXHIBIT 3

From: Brown, Heather
To: Boylan, James; Zhang, Henian
Subject: RE: Sterigenics
Date: Wednesday, January 30, 2019 2:40:00 PM
Attachments: image001.jpg

Jim,

We need more information. For the performance testing they are comparing the results to the requirement to get 99% control. So they may be running different configurations, number of chambers, chambers with no product in it, etc. Therefore, the outlet values during a specific run may not be directly scalable or relatable to 24 hour operation. The values I'm seeing on the test report for the Ceilcote scrubber, for example, are extremely low compared to what they presented with the modeling. The modeling calculations are probably based on EtO usage for all units during the year, not just the ones operating during the performance test. The performance testing also doesn't tell us anything about the fugitive emissions.

Thanks,
Heather

From: Boylan, James <James.Boylan@dnr.ga.gov>
Sent: Wednesday, January 30, 2019 2:11 PM
To: Brown, Heather <heather.brown@dnr.ga.gov>; Zhang, Henian <Henian.Zhang@dnr.ga.gov>
Subject: RE: Sterigenics

Heather,

Can you compare these numbers to the performance testing on file? Or, do we need more information?

Jim

From: Brown, Heather <heather.brown@dnr.ga.gov>
Sent: Wednesday, January 30, 2019 2:04 PM
To: Zhang, Henian <Henian.Zhang@dnr.ga.gov>
Cc: Boylan, James <James.Boylan@dnr.ga.gov>
Subject: RE: Sterigenics

Henian,

I looked through my notes from our meetings. The rates below roughly match information they told us verbally, but I don't know how they were derived or how they relate to the performance testing on file. I remember during the in person meeting we were shown different files/papers, but we weren't allowed to keep them. Did they give you any files with background calculations?

Emission Source	2017 EtO Emissions (lb/yr)
AAT Scrubber	13.72
Ceilcote Scrubber	3.98
Fugitives	188.39

Thanks,
Heather

From: Zhang, Henian <Henian.Zhang@dnr.ga.gov>
Sent: Monday, January 28, 2019 10:17 AM
To: Brown, Heather <heather.brown@dnr.ga.gov>
Cc: Boylan, James <James.Boylan@dnr.ga.gov>
Subject: Sterigenics

Dear Heather,

Good morning! Sterigenics has submitted their emission parameters for modeling. Attached are two spread sheets showing the current configuration and proposed configuration. They plan to use two existing stacks to vent out fugitive emission from wall fans. Could you please review the emission parameters and let us know if they are correct? Thank you!

Best,
Henian

From: Boylan, James
Sent: Saturday, January 26, 2019 3:53 PM
To: Hoffman, Kathy; Hays, Karen
Cc: Zhang, Henian
Subject: RE: Update request (Email 1 of 2)

Kathy,

Thanks for sending the modeling files. We received both sets. We will review them next week and let you know if we have any questions.

Thanks!!
Jim

James W. Boylan, Ph.D.
Manager, Planning & Support Program
Georgia Department of Natural Resources

Environmental Protection Division - Air Protection Branch
4244 International Parkway, Suite 120
Atlanta, GA 30354
Office: 404-363-7014 Fax: 404-363-7100
E-mail: James.Boylan@dnr.ga.gov

From: Hoffman, Kathy <KHoffman@sterigenics.com>
Sent: Friday, January 25, 2019 8:45 PM
To: Hays, Karen <Karen.Hays@dnr.ga.gov>
Cc: Boylan, James <James.Boylan@dnr.ga.gov>
Subject: RE: Update request (Email 1 of 2)

Karen:

Sorry for the delay. I have been travelling the past two weeks and also wanted to make sure I had the accurate files from Ramboll, our third-party consultant, and these were received earlier this week. Given the size of the files, I am going to send thee in two separate emails. The zipped file for the current layout is attached here. I will send the file for the revised layout in a separate email. Once reviewed, we can confirm the final scope of work for the project needed.

Please let me know if there is any other information needed.

Thanks,
Kathy

Kathleen Hoffman
Senior Vice President - Global Environmental, Health & Safety and Technical Services
Sterigenics, A Sotera Health Company
2015 Spring Road, Suite 650
Oak Brook, IL 60523
Office: 630.928.1758
khoffman@sterigenics.com
cid:image001.jpg@01D357C2.82E9D1F0

From: Hays, Karen [mailto:Karen.Hays@dnr.ga.gov]
Sent: Friday, January 25, 2019 2:39 PM
To: Hoffman, Kathy
Subject: [EXTERNAL] Update request

Hi Kathy,

When we met in December, we requested Sterigenic's modeling files for the Smyrna, GA facility to facilitate our review and analysis. Are you going to be able to provide them? If so, when can we expect to receive them? Di Tian has left EPD, so the best contact for modeling questions is now James.Boylan@dnr.ga.gov.

Thanks,
Karen

Karen Hays
Chief, Air Protection Branch
Georgia Environmental Protection Division
Office: 404-363-7016
Mobile: 404-788-3955

EXHIBIT 4

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
1021 North Grand Avenue East, P.O. Box 19276, Springfield, Illinois 62794-9276 • (217) 782-3397
JB Pritzker, Governor John J. Kim, Acting Director

217/785-1705

CONSTRUCTION PERMIT
NESHAP SOURCE

PERMITTEE

Sterigenics US, LLC
Attn: Kevin Wagner, EHS Director
2015 Spring Road, Suite 650
Oak Brook, Illinois 60523

Application No.: 19060030 I.D. No.: 043110AAC
Applicant's Designation: Date Received: June 25, 2019
Subject: Improved Control of the Emissions of the Willowbrook I Facility
Date Issued: [**Draft]**
Location: Willowbrook I, 7775 Quincy Street, Willowbrook, DuPage County

This Permit is hereby granted to the above-designated Permittee to CONSTRUCT emission source(s) and/or air pollution control equipment consisting of improvements in the control of emissions of the Willowbrook I sterilization facility, as described in the above-referenced application. This Permit is subject to standard conditions attached hereto and the following conditions.

If you have any questions on this permit, please contact Daniel Rowell at 217/558-4368.

Raymond E. Pilapil
Manager, Permit Section
Bureau of Air

REP:DBR:

Conditions for the Project

1. Introduction

a. This permit addresses improvements to the emission control measures for the ethylene oxide sterilization operations at the Willowbrook I facility. The Permittee is making these improvements to reduce the emissions of ethylene oxide of this facility and its impacts on air quality and to comply with the requirements for control of ethylene oxide emissions in Section 9.16(b) of the Illinois Environmental Protection Act (Act), "Control of Ethylene Oxide Sterilization Sources." These measures would also reduce emissions from any use of propylene oxide at this facility, which would be used to treat tree nuts and certain other food products.

b. The improvements addressed by this permit involve the following:

i. Changes to enable the sterilization processes and related operations to be conducted with permanent total enclosure (PTE), with all exhaust gas streams containing ethylene oxide being captured and ducted to control systems and with all emissions through one stack. These changes include installation of fans and ductwork; construction of a transition room between the area in which unsterilized material is stored and the work aisle for the sterilization chambers and aeration rooms; closing the equipment passage between the areas at the facility in which sterilized and unsterilized materials are stored; and installation of a new emission control device for gas streams that currently vent to the atmosphere as general building ventilation air.

ii. Upgrades to the emission control systems for ethylene oxide to improve overall control efficiency, as follows:

A. Ducting of the outlet gas stream from the existing control system for evacuation of the sterilization chambers, (i.e., a DEOXX™ acid scrubber) to the existing system that controls the gas streams from the backvents on the sterilization chambers and the aeration rooms (i.e., an AAT acid scrubber followed by a dry bed absorption (DBA) device).

B. Installation of two new multi-bed DBA control devices. One of the new DBA devices would be installed following the existing control devices for the sterilization chambers and aeration rooms. The other new DBA device would control emissions of ethylene oxide from the work aisle and the storage and loadout of sterilized material.

iii. Installation of a new stack that would improve dispersion of emissions from the Willowbrook I facility, replacing the stacks that currently serve the existing control systems for the sterilization chambers and the aeration rooms and resulting in one exhaust point for the facility.

c. For the Willowbrook I facility, the Illinois EPA has determined, in accordance with Section 9.16(g) of the Act, that with these improvements "… the facility's emission control system would use technology that produces the greatest reduction in ethylene oxide emissions currently available."

d. This permit does not authorize changes to the Willowbrook I sterilization facility that would increase its sterilization capacity or emissions.

e. For purposes of this permit, the ethylene oxide sterilization operations at the Willowbrook I facility, which includes fourteen sterilization chambers, three aeration rooms, and a storage area for sterilized material, are referred to as the "affected facility."

2-1. New Statutory Requirements for Control of Emissions of Ethylene Oxide

a. For the affected facility, the Permittee will be subject to the requirements for control of emission of ethylene oxide in Section 9.16(b) of the Act, which provides that, beginning 180 days after the effective date of Section 9.16 of the Act (i.e., December 18, 2019), no person shall conduct ethylene oxide sterilization operations unless that person captures, and demonstrates that it captures, 100 percent of all ethylene oxide emissions and reduces ethylene oxide emissions to the atmosphere from each exhaust point at such source by at least 99.9 percent or to no more than 0.2 parts per million.

b. Pursuant to Section 9.16(c) of the Act, if any emissions test conducted more than 180 days after the effective date of Section 9.16 of the Act fails to demonstrate that ethylene oxide emissions to the atmosphere from an exhaust point of the affected facility have been reduced by at least 99.9 percent or to no more than 0.2 parts per million, the Permittee shall immediately cease operation of the affected facility and notify the Illinois EPA within 24 hours of becoming aware of the failed emissions test. Within 60 days after the date of such test, the Permittee must do the following, as specified by Sections 9.16(c)(1, (2), (3) and (4) of the Act:

i. Complete an analysis to determine the root cause of the failed emissions test;

ii. Take any actions necessary to address that root cause;

iii. Submit a report to the Illinois EPA; and

iv. Upon approval by the Illinois EPA of the above required report, restart operation of the affected facility only to the extent necessary to conduct additional emissions test(s) and conduct such emissions test(s). The full operation of the affected facility may be restarted once an emissions test successfully demonstrates compliance, the results of emissions testing have been submitted to the Illinois EPA, and the Illinois EPA has approved the results demonstrating compliance.

Note: This construction permit only addresses requirements of Section 9.16 of the Act that are relevant for the improvements in the control of emissions of ethylene oxide of the Willowbrook I facility that would be undertaken by the Permittee.

2-2. Existing Regulatory Requirements

This permit does not affect the applicability of existing emission standards for ethylene oxide and associated regulatory requirements for testing, monitoring, recordkeeping and reporting related to emissions, as are addressed in Section 4.1 of the current operating permit for the source, Clean Air Act Permit Program (CAAPP), Permit 95120085, issued June 8, 2015. In particular, the sterilization chambers and aeration rooms at the affected facility will continue to be subject to the requirements of the federal National Emission Standards for Hazardous Air Pollutants (NESHAP) for Ethylene Oxide Emissions from Sterilization Facilities, 40 CFR 63 Subpart O, and applicable requirements of the General Provisions of the NESHAP, 40 CFR 63 Subpart A.

Note: If the Permittee were to seek alternatives to the procedures for performance testing in 40 CFR 63.365 to address the new configuration of control devices for the affected facility, the Permittee would need to obtain approval from USEPA in accordance with 40 CFR 63.7(e)(2). In addition, if the Permittee were to seek to rely on the new DBA control devices for compliance with the emission standards of 40 CFR 63.362, it would need to obtain approval of an operational monitoring plan that addresses these new devices in accordance with 40 CFR 63.365(g).

2-3. Other Applicable Requirements

a. This permit does not affect the Seal Order issued by the Illinois EPA on February 15, 2019 for Sterigenic's Willowbrook facilities (Willowbrook I and Willowbrook II), i.e., *Seal Order, In the Matter of: Commercial Sterilization Operations at 7775 South Quincy Street and 830 Midway Street, Willowbrook, DuPage County, Illinois, SO-2019-.*

b. This permit does not relieve the Permittee of the responsibility to comply with all Local, State and Federal Regulations which are part of the applicable Illinois State Implementation Plan, as well as other applicable Federal, State and Local requirements.

c. This permit does not excuse the Permittee from the obligation to undertake any actions related to use of ethylene oxide at the affected facility that are applicable pursuant to Section 9.16 of the Act.

3. Emission Limits and Operational Requirements for Control of Emissions

a. The emissions of ethylene oxide of the affected facility shall not exceed 8.5 pounds/month and 85 pounds/year. Compliance with these emission limits shall be determined by continuous emissions monitoring for ethylene oxide in accordance with Condition 7-1 except that during periods when monitoring data is not available, data for emissions shall be based on the usage of ethylene oxide, operating data for control devices and emission factors developed

from emission testing in accordance with Condition 8-2. In addition, compliance with the annual limit shall be determined from a running total of 12 consecutive months of emission data, with the first determination of compliance with this annual limit addressing the 12-month period that begins with March 2019.

b. i. The Permittee shall operate the affected facility with permanent total enclosure (PTE) for all areas of the facility in which ethylene oxide is used or may be released, including the storage and handling of sterilized material prior to loadout from the facility. This PTE shall be designed and operated to comply with the criteria for PTE in Section 6 of Method 204 in 40 CFR Part 51 Appendix M, as modified by Condition 3(b)(ii), so that 100 percent of the emissions of ethylene oxide of the facility are captured and ducted to control devices. Compliance with these criteria shall be demonstrated by testing in accordance with Condition 8-1 and continuous operational monitoring for differential pressure, comparing pressure inside and outside the PTE, in accordance with Condition 7-2.

ii. For the doors at the loading dock, through which the sterilized material is moved during loadout, the Permittee shall design and operate the PTE to comply with Criteria 5.4 of Method 204 (i.e., maintain an average facial velocity of air through of least 200 feet per minute through open doors, with air flow into the enclosure). However, the PTE need not comply with Criteria 5.1 of Method 204 for these doors (i.e., the doors need not be at least four equivalent diameters from the material that is being loaded out).

iii. In the drum storage area next to the affected facility, all drums for ethylene oxide shall be kept sealed and the Permittee shall not dispense or otherwise allow the release of ethylene oxide from any of these drums while they are in this area.

c. The Permittee shall operate the emission control systems for ethylene oxide at the affected facility in accordance with the following requirements:

i. The Permittee shall operate each control system or segment of a control system at all times that a gas stream containing any ethylene oxide or propylene oxide is ducted to it. In particular:

A. When a sterilization chamber is being evacuated, the control system for the evacuation of the sterilization chambers shall be in operation, i.e., the DEOXX™ scrubber, the AAT scrubber, the initial DBA device and the final DBA device shall be in operation.

B. When a sterilization chamber is being ventilated through the backvent, the segment of the control system for the backvents shall be in operation, i.e.,

the AAT scrubber, the initial DBA device and the final DBA device.

C. When sterilized material is being moved from a sterilization chamber to an aeration room or sterilized material is stored at the facility, the new DBA device for these activities shall be in operation.

4. Construction of a New Stack for the Affected Facility

a. i. The Permittee shall construct a new stack for the affected facility so that the facility has a single exhaust point, replacing the facility's existing stacks and roof vents, which shall be closed off.

ii. The construction of this new stack and replacement of the existing stacks shall be completed before the resumption of operation of the affected facility, provided however, that the Permittee may subsequently add or construct a stack extension to increase the height of the new stack pursuant to this permit if such activity is begun within one year of completion of the initial construction of the new stack.

b. i. The height of the new stack shall be at least the lower of the following:

A. The height approved by the Village of Willowbrook; or

B. 87 feet above ground level.

ii. The Permittee shall apply to the Village of Willowbrook for approval for construction of a new stack with a height that is 87 feet above ground level. This application shall be submitted not later than 15 days of the effectiveness of this permit. Thereafter, the Permittee shall take reasonable actions, e.g., supplementing the application with information as requested by the Village, to support approval of construction of a new stack with a height of at least 87 feet above ground level.

c. Within 30 days of completion of construction of the new stack, the existing stacks and roof vents of the affected facility shall be closed, provided however that this requirement shall not apply during reasonable period(s) as needed to accommodate the construction of a stack extension for the new stack.

5. Operational Limits for the Affected Facility

a. i. The usage of ethylene oxide by the affected facility shall not exceed 15.0 tons/month and 150 tons/year.

Note: The above limits lower the permitted usage of ethylene oxide by the affected facility.

ii. The usage of propylene oxide by the affected facility shall not exceed 2.0 tons/month and 17.0 tons/year.

b. For purposes of the annual limits in Condition 5(a)(i)(A) and (B), compliance shall be determined from a running total of 12 consecutive months of data, with the first determination of compliance with these annual limits addressing the 12-month period that begins with March 2019.

6-1. Operational Requirements Related to Permanent Total Enclosure (PTE)

a. When the affected facility is in operation, the Permittee shall operate the PTE for the affected facility to maintain:

i. The pressure differential across the enclosure to at least 0.007 inches of water, rolling 3-hour average, as demonstrated by operational monitoring in accordance with Condition 6-3(a); and

ii. The direction of air flow through openings in the enclosure into the enclosure at all times.

6-2. Design and Operating Requirements for Control Devices

a. The DBA control devices at the affected facility shall be equipped and operated so that internal inspections, maintenance and repair of these devices are conducted without interrupting the control of emissions or releasing gas streams containing ethylene oxide inside the building. In particular, each DBA device shall be equipped so that an individual bed in the device may be temporarily removed from service for replacement of sorbent or other activities with all gas flow going to beds that are in service.

b. If aeration will continue during inspections, maintenance or repair of the AAT scrubber, the gas streams from aeration shall be able to be ducted directly to the initial DBA device during such periods.

c. i. If the Permittee elects to comply with Section 9.16(b) of the Act (see Condition 2-1) by reducing emissions of ethylene oxide from the affected facility by at least 99.9 percent overall control efficiency), the Permittee shall operate the control devices in the emission control systems to comply with operational limits that are consistent with operation during the most recent emission testing of the affected facility pursuant to Condition 8-2, that shows compliance with this requirement, as follows, as demonstrated by the operational monitoring required by Condition 7-3:

A. DEOXX™ and AAT scrubbers: flow rate and pH of the scrubbant, both on a rolling 3-hour average, as measured pursuant to Condition 7-3(a).

B. Other control devices: Concentration of ethylene oxide in the stack, on a rolling 3-hour average, as monitored pursuant to Condition 7-1(a).

ii. During the period before emission testing is conducted and results are compiled showing compliance, control systems shall be operated in accordance with good air pollution control practice, as required by Condition 6-3(a).

iii. Notwithstanding Condition 6-2(b)(i), the Permittee may operate control systems at different values for operating parameters for purposes of conducting emissions testing provided that the Permittee notifies the Illinois EPA prior to such operation.

6-3. General Operational Requirements for Capture and Control Systems

a. At all times, the Permittee shall maintain and operate the affected facility, including the emission capture and control systems, in a manner consistent with safety and good air pollution control practice for minimizing emissions.

7-1. Emissions Monitoring

a. The Permittee shall install, operate, calibrate and maintain a continuous emissions monitoring system (CEMS) on the stack of the affected facility to measure the concentration of ethylene oxide in the exhaust stream in parts per billion by volume (ppbv). This monitoring system shall be designed and operated to meet the requirements in USEPA's Performance Specification 15 (PS-15) for Extractive Fourier Transform Infrared Spectroscopy (FTIR).

b. The Permittee shall install, operate, calibrate and maintain a continuous monitoring system (CMS) on the stack of the affected facility to measure the gas flow rate in the stack so as to be able to determine the mass emissions of the affected facility in pounds/hour. This CMS shall be located in the same area as the required CEMS and be designed and operated to meet the requirements in USEPA's Performance Specification 6, "Specifications and Test Procedures for Continuous Emission Rate Monitoring Systems in Stationary Sources," 40 CFR Part 60, Appendix B, PS-6.

c. For the monitoring systems required by Conditions 7-1(a) and (b):

i. In addition to automatically recording the data measured by each of these monitoring systems, the Permittee shall automatically record the emissions of ethylene oxide as measured by these systems.

ii. The Permittee shall operate and maintain these monitoring systems to comply with the requirements of 40 CFR 63.8(c).

d. The Permittee shall submit an Emissions Monitoring Plan to the Illinois EPA for review and approval at least 15 days before purchasing monitoring equipment that is intended to be used to satisfy Condition 7-1(a) and (b). This plan shall include the manufacturer, model number, performance specifications, including the limit of quantification for ethylene oxide, and recommended operation and maintenance procedure for the equipment that is

proposed to be purchased and the specific location(s) at which they would be proposed to be installed, with explanation.

e. The requirements of Condition 7-1(a) through (c) shall not apply to the monitoring system(s) as needed to accommodate difficulties in the initial calibrations or certification of the monitoring system(s), e.g., difficulty in obtaining suitable calibration gases, or the relocation and recertification of these system(s), provided the Permittee notifies the Illinois EPA in advance of the relocation of the system(s), including a description of the relocation (e.g., to a higher location in the new stack), the reason(s), and the expected duration of the period until the monitoring system(s) will be certified at their new location.

7-2. Operational Monitoring for Permanent Total Enclosure (PTE)

a. For the affected facility, the Permittee shall install, operate, calibrate and maintain a continuous monitoring system, as follows, to verify the presence of PTE, which system shall be operated whenever the facility is in operation and shall be used to demonstrate compliance with Condition 3(b).

i. This monitoring system shall measure the pressure differential between the interior and exterior of the PTE, with at least the following monitoring devices being operated for pressure inside the PTE.

A. For the work aisle, in which the doors to the sterilization chambers and the doorways to the aeration rooms are located, three monitoring devices (one for the east, one for the center and one for the west sections of the work aisle), however, that if the group of sterilization chambers at the east side of the affected facility is not being used, two monitoring devices (one for the center and one for the west sections of the work aisle).

B. For the east aeration room, one monitoring device if this room is being used for aeration or for otherwise holding sterilized material.

C. For the room in which the vacuum pumps for the group of sterilization chambers at the west side of the facility (Area A) are located, one monitoring device.

D. For the room in which the AAT scrubber and DBA devices are located, one monitoring device.

E. For the area in which sterilized material is stored and then loaded out from the affected facility, one monitoring device.

ii. The monitoring system shall be designed to take measurements no less frequently than every 5 minutes, with the data collected by each monitoring device recorded on a rolling 3-hour average, with each 3-hour rolling average consisting of at least 33 separate measurements of pressure

differential, provided, however, that if data is not recorded from an alternative monitoring device during the malfunction of the principal monitoring device(s) or the automatic recorder, the Permittee shall manually record the measured data at least hourly.

b. The Permittee shall keep a log or other records for the operation and maintenance of this monitoring system that includes information detailing all routine and non-routine maintenance performed and dates and duration of any outages.

c. The Permittee shall submit a Pressure Differential Monitoring Plan to the Illinois EPA for review and approval at least 15 days before purchasing the monitoring equipment that is intended to be used to satisfy Condition 7-2(a). This plan shall include the manufacturer, model number, performance specifications, including the precision of measurement, and recommended operation and maintenance procedure for the equipment that is proposed to be purchased and the location(s) at which such equipment would be proposed to be installed, with explanation.

d. The requirements of Condition 7-2(a) and (b) shall be met prior to resuming operation of the affected facility, provided, however, that the Illinois EPA may provide additional time to address specific difficulties in installation and certification of the monitoring system, e.g., difficulty in locating monitoring devices outside the enclosure to appropriately account for ambient air flow around the building.

7-3. Operational Monitoring and Instrumentation for Control Devices

a. For each scrubber, the Permittee shall install, calibrate, operate and maintain continuous monitoring systems for: 1) Scrubbant flow rate, 2) pH of the scrubbant, and 3) Temperature at the inlet of the device. During a malfunction that prevents automatic recording of data, the Permittee shall manually record measured data for scrubbant flow rate and temperature at least hourly.

b. For the DBA device that follows the AAT scrubber, the Permittee shall install, operate and maintain instrumentation to measure the temperatures before and after the heat exchanger for the inlet gas stream. This information shall be recorded at least twice during each operating day.

c. For each DBA device, the Permittee shall install, operate and maintain instrumentation to measure instrumentation to indicate the flow of gas to individual beds, which may either be determined directly by measuring gas flow to individual beds or indirectly by identifying gas flow to beds based on the temperature of the gas entering the bed or the position of the damper (open or closed). This information shall be recorded whenever the Permittee changes the flow of gas to individual beds in the device, e.g., a bed is taken out of service for replacement of sorbent or a bed is returned to service after replacement of sorbent.

d. The Permittee shall keep a log or other records for the operation, calibration and maintenance of the monitoring systems and instrumentation required by Conditions 7-3(a) through (c) that includes information detailing all routine and non-routine maintenance performed and dates and duration of any outages.

8-1. Requirements for Testing for Permanent Total Enclosure (PTE)

a. The Permittee shall have testing for the presence of PTE on the affected facility, as required by Section 9.16(b) of the Act (Condition 2-1), conducted by a qualified third-party testing service that is independent of the Permittee and is experienced in such testing, as follows.

b. The timing for this testing for PTE shall be as follows:

i. Initial testing shall be completed and results compiled before the initial testing of emissions required by Condition 8-2(a) is conducted.

ii. Thereafter, testing shall be conducted upon written request by the Illinois EPA, with such testing conducted within 90 days of the request or such later date agreed to by the Illinois EPA.

c. At least 30 days prior to the scheduled date for testing of PTE, the Permittee shall submit a proposed test protocol to the Illinois EPA for review. The test protocol submitted to the Illinois EPA shall address the manner in which testing will be conducted, including, the following. This emissions testing shall be performed in accordance with the test protocol, subject to any conditions on or revisions to the test protocol by the Illinois EPA.

i. The person or persons who will be performing measurements and analysis, their experience with similar tests, the firm by which they are employed, and confirmation that the firm is independent of the Permittee.

ii. The test methods to be used.

iii. The conditions under which the test will be performed, including a discussion of why these conditions will be representative and the means by which the operating parameters for the sterilization process and control systems will be determined.

iv. The planned measurement locations.

d. The Permittee shall notify the Illinois EPA prior to conducting this testing to enable the Illinois EPA to observe testing. Notification for the expected date of testing shall be submitted a minimum of 20 days prior to the expected date. Notification of the actual dates and expected times of testing shall be submitted a minimum of 5 working days prior to the actual date of the test.

e. Copies of the Final Reports(s) for required tests shall be submitted to the Illinois EPA as soon as practicable but no later than 30 days after the date of testing. The Final Report shall include as a minimum:

i. A summary of results.

ii. General information.

iii. Description of test method(s), including description of sample points, analysis equipment, and test schedule.

iv. Detailed description of test conditions, including process information and control equipment information, e.g., equipment condition and operating parameters during testing.

v. Data and calculations, including copies of all raw data sheets, records of laboratory analyses, sample calculations, and data on equipment calibration.

8-2. Requirements for Initial and Annual Emission Testing for Ethylene Oxide

a. For the affected facility, the Permittee shall conduct emission testing for the affected facility in accordance with Sections 9.16(b)(1), (2), (3), (4) and (5) of the Act to verify that the ethylene oxide emissions from the affected facility have been reduced to meet the emission control requirement in the Section 9.16(b) of the Act (Condition 2-1(a)), provided, however, that emission testing will not be required if the affected facility does not resume operation or operation is discontinued before such testing would otherwise initially be required to be conducted.

b. All required emissions testing shall be conducted under operating conditions that are representative of maximum emissions by a qualified third-party testing company that is independent of the Permittee and is experienced in conducted such testing.

c. i. Compliance with Condition 2-1(a) shall be determined from the average of the results of three test runs, except as the average of the results of two test runs would be provided for by 35 IAC 283.240.

ii. The scope of the required testing shall be as follows:

A. If the Permittee intends to comply by means of the emission reduction requirement, testing shall be conducted for each inlet gas stream to the control systems and for the stack for the emissions of the affected facility, with at least three separate test runs attempted in each required test and at least two runs successfully completed.

B. If the Permittee intends to comply by means of the concentration of ethylene oxide, testing shall be conducted at the stack for the emission of the

affected facility, with at least three separate test runs attempted and at least two runs successfully completed.

iii. For the gas stream from the sterilization chambers, the duration of each test run shall be sufficient to span the "middle portion" of the sterilization cycle for all chambers that are in operation during the period of testing. For this purpose, the middle portion of the sterilization cycle begins with the initial evacuation of ethylene oxide laden air from a chamber and ends 60 minutes after the sterilized material from that chamber is transferred to an aeration room.

iv. A. The following USEPA methods and procedures shall be used for testing, unless another USEPA method is approved by the Illinois EPA as part of the approval of the required emission test protocol:

Traverse Points	Method 1
Flowrate	Method 2, 2A, 2B, 2C or 2D
Molecular Weight	Method 3 or 320
Moisture Content	Method 4 or 320
Ethylene Oxide	Method 320

B. Notwithstanding Condition 8-2(b)(iv)(A), once the continuous monitoring systems required by Condition 7-1 are certified, measurements of ethylene oxide emissions in the stack of the affected facility may be made using those monitoring systems provided that the certification and use of these systems is addressed in the emission test protocol required by Condition 8-2(c).

v. If a periodic, annual emissions test will be conducted by the same company and by the same individuals in accordance with the emissions test protocol previously approved by the Illinois EPA, including any conditions or revisions to that test protocol imposed by the Illinois EPA, unless the Illinois EPA has notified the Permittee that submittal of a new test protocol is needed for the next test, the Permittee may resubmit the previous test protocol, including any conditions or revisions to that protocol imposed by the Illinois EPA, as the protocol for the forthcoming emissions test.

d. In addition to submitting notifications for scheduled emission test dates at least 30 days prior to such dates, the Permittee shall also submit notifications for the actual dates and expected times of testing at least 5 working days prior to the actual dates of emission tests.

e. The Permittee shall submit reports for all required emissions testing, including test results and accompanying documentation, to the Illinois EPA as soon as practicable but no later than 30 days after the emission test date. Notwithstanding Condition 9(d), the Permittee shall retain a copy of a report for emissions

testing submitted to the Illinois EPA for at least five years beyond the date that the testing is supplanted by subsequent emission testing.

f. If after conducting an emissions test, the Permittee plans to expeditiously conduct new testing, the following provisions for test protocols and test notifications shall apply for that new test. For this purpose, the Permittee shall be considered to plan to expeditiously conduct new testing if it plans to conduct the new test within 60 days of the previous test.

i. The Permittee shall notify the Illinois EPA of its intent to conduct a new test as soon as is practical, with the reason for conducting the new test.

ii. Unless the Illinois EPA informs the Permittee that submittal of a new test protocol is needed, a new protocol need not be submitted for the new test if the new test will be conducted in accordance with the test protocol that has been approved by the Illinois EPA, including any conditions or revisions to that protocol imposed by the Illinois EPA.

iii. A new notification is not needed for the scheduled date of testing and the Permittee shall instead only provide notification for the actual date and expected times of the new test at least 5 working days prior to the actual date of the test.

9. Recordkeeping

a. The Permittee shall maintain the following records for each DBA device:

i. A file containing information for:

A. The design parameters of the device, including number of beds, dimensions of each bed (length, width and depth), sorbent capacity of each bed (pounds of sorbent) and gas flow capacity (scfm).

B. The sorbent used in the device, including material name or trade name, manufacturer’s name, manufacturer’s guarantees for ethylene oxide removal efficiency (percent) and absorption capacity (pounds ethylene oxide removed per pound of material), with supporting documentation and/or calculations.

C. A copy of manufacturer’s recommended operation and maintenance procedures for the device.

D. A copy of the Permittee’s operation and maintenance procedures for the device, including the procedures for disposal of spent sorbent, which procedures may incorporate the manufacturer’s recommended procedures.

ii. An operating log or other records that include:

A. The dates that the performance of individual beds for control of ethylene oxide was evaluated, with: 1) The measured concentration of ethylene oxide in the exhaust stream from the bed, the measured concentrations of ethylene oxide with and without the bed in service, or data for another operational parameter of the bed that is indicative of the current performance of the bed and the need for replacement of sorbent; and 2) The projected date by which the sorbent in the bed will need to be replaced, with explanation.

B. The dates that the sorbent in individual beds is replaced, with data for the performance of the bed before and after the replacement of the sorbent and confirmation that the DBA device continued in operation during replacement of the sorbent, as required by Condition 6-2(a)(i).

C. Information identifying circumstances when the Permittee's current operating and maintenance procedures were not followed, with description and information discussing the reason and the effect on emissions, if any.

iii. Records for the amount of sorbent added to the DBA device (pounds/month and pounds/year).

b. For control devices other the DBA devices, the Permittee shall maintain an operating log or other records that identify periods when the control device was not in operation and confirm compliance with Condition 6-2(a)(ii), (iii) or (iv), as applicable.

c. The Permittee shall maintain records of the usages of ethylene oxide and propylene oxide of the affected facility (tons/month and tons/year, of each material), with supporting data.

d. The Permittee shall maintain records of the emissions of ethylene oxide and propylene oxide of the affected facility (pounds/month and pounds/year, of each pollutant), with supporting data and calculations.

e. The Permittee shall retain all records, including logs, required by this permit for at least five years from the date of entry unless a longer retention period is specified by a particular provision and keep the records at a location at the facility that is readily accessible to the Illinois EPA and USEPA. The Permittee shall make records available for inspection and copying by the Illinois EPA or USEPA upon request, including retrieving and printing on paper any records retained in an electronic format (e.g., computer) in response to an Illinois EPA or USEPA request for records during the course of a facility inspection, or provide an electronic copy of such information in a format that is acceptable to the agency making the request.

10. Additional Requirements for Reporting

a. Beginning with the first complete month after the certification of the continuous monitoring systems for emissions of ethylene oxide required by Condition 7-1 is successfully completed, the Permittee shall submit quarterly emission reports to the Illinois EPA that include the following information. These reports shall be submitted within 30 days of the end of each calendar quarter.

i. The monthly emissions of ethylene oxide.

ii. Changes to the emission monitoring systems, if any, to improve the limit of quantification of these systems.

iii. The results of any testing of the emission control system for ethylene oxide that the Permittee conducted or had conducted, other than testing addressed by Condition 8-2, accompanied by information describing this testing, including the procedures for testing and the operational conditions under which it was conducted.

b. The Permittee shall notify the Illinois EPA of deviation(s) from the requirements of this construction permit, which notifications shall include information describing the deviation(s), the probable cause of the deviation(s), the corrective actions taken, and any preventative measures taken. The timing for these notifications shall be as follows unless otherwise provided for in an operating permit for the source that addresses the requirements of this construction permit.

i. These notifications shall be submitted to the Illinois EPA within five days of the deviation(s), provided, however, that the Permittee may submit an initial notification within five days of the deviation(s) with a follow-up notification submitted within 30 days of the deviation if more time is needed to fully investigate the deviation(s) and assemble the information that must be included in such notifications. In such case, the initial notification need only include information describing the deviation(s) and the corrective actions that were taken.

ii. In addition to the notifications for deviations required by Condition 10(b)(i), if any test for permanent total enclosure conducted pursuant to Conditions 8-1 does not demonstrate compliance with the capture requirement for emissions of ethylene oxide in Condition 2-1(a), the Permittee shall notify the Illinois EPA within 24 hours of becoming aware the results of that test.

c. The Permittee submit Progress Reports to the Illinois EPA on a semi-monthly basis addressing progress toward completing the improvements addressed by this permit, continuing until all improvements are completed and the results for the initial testing required by Condition 8-2 have been submitted to and approved by the Illinois EPA. These reports shall address actions during the first and second halves of each month, with the first report for a month addressing the period ending on the

15th of the month and the second report addressing the remainder of the month. These reports shall be submitted, respectively, by the end of the month or the 15th of the following month. Among other information, these reports shall include the following information:

i. For each new control device, the dates for ordering, beginning installation, completing installation and commencing routine operation of the device.

ii. For the upgrade to the emission control system for the evacuation of sterilization chambers, the dates of completion of the design, completion of construction, completion of installation of new ductwork and completion of the upgrade.

iii. For the changes to achieve permanent total enclosure (PTE), the dates of completion of the design, completion of construction of the wall or partition separating the receiving and shipping storage areas, completion of installation of new ductwork and completion of the PTE.

iv. For the new stack, the dates for submittal of the application and an any subsequent supporting information to the Village of Willowbrook for the new stack, the Village's action on the application, the completion of the design, entering into the construction contract, starting construction and commencing operation. With the report that provides the completion of design, the Permittee shall include a diagram for the new stack that includes the height and the location of the CEMS and the test port(s) on the stack, confirming that they comply with USEPA Method 1.

v. For the existing stacks and vents that are to be removed from service and sealed, the dates of closure.

vi. If a stack extension will be added or constructed for the new stack, the height of the new stack with the extension, a description of any changes to the location of monitoring equipment, the expected duration of any period(s) when the new stack will be out of service, and a demonstration that the Permittee will reduce the operation of the affected facility during those period(s) to the extent that is reasonably practicable.

11. Addresses for the Illinois EPA

a. Plans, notifications and reports required by this permit shall be sent to:

Illinois Environmental Protection Agency
Bureau of Air
Compliance Section (#40)
1021 North Grand Avenue, East
P.O. Box 19276
Springfield, Illinois 62794-9276

Telephone: 217/782-5811

b. In addition, a copy of each plan, notification or report required by this permit that concerns emissions monitoring or emission testing shall also be sent electronically to the Illinois EPA, Bureau of Air, Compliance Section, Source Monitoring Unit, using the State of Illinois File Transfer Website, unless otherwise instructed by the Illinois EPA:

http://filet.illinois.gov

Recipient Email Address: EPA.BOA.SMU@illinois.gov
File Transfer Email Subject: Sterigenics, Willowbrook
Illinois EPA I.D. 043110AAC

STATE OF ILLINOIS
ENVIRONMENTAL PROTECTION AGENCY
DIVISION OF AIR POLLUTION CONTROL
P. O. BOX 19506
SPRINGFIELD, ILLINOIS 62794-9506

STANDARD CONDITIONS FOR CONSTRUCTION/DEVELOPMENT PERMITS ISSUED BY THE ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

July 1, 1985

The Illinois Environmental Protection Act (Illinois Revised Statutes, Chapter 111-1/2, Section 1039) authorizes the Environmental Protection Agency to impose conditions on permits which it issues.

The following conditions are applicable unless superseded by special condition(s).

1. Unless this permit has been extended or it has been voided by a newly issued permit, this permit will expire one year from the date of issuance, unless a continuous program of construction or development on this project has started by such time.

2. The construction or development covered by this permit shall be done in compliance with applicable provisions of the Illinois Environmental Protection Act, and Regulations adopted by the Illinois Pollution Control Board.

3. There shall be no deviations from the approved plans and specifications unless a written request for modification, along with plans and specifications as required, shall have been submitted to the Agency and a supplemental written permit issued.

4. The Permittee shall allow any duly authorized agent of the Agency upon the presentation of credentials, at reasonable times:

    a. to enter the Permittee's property where actual or potential effluent, emission or noise sources are located or where any activity is to be conducted pursuant to this permit,

    b. to have access to and copy any records required to be kept under the terms and conditions of this permit,

    c. to inspect, including during any hours of operation of equipment constructed or operated under this permit, such equipment and any equipment required to be kept, used, operated, calibrated and maintained under this permit,

    d. to obtain and remove samples of any discharge or emission of pollutants, and

    e. to enter and utilize any photographic, recording, testing, monitoring or other equipment for the purpose of preserving, testing, monitoring, or recording any activity, discharge, or emission authorized by this permit.

5. The issuance of this permit:

    a. shall not be considered as in any manner affecting the title of the premises upon which the permitted facilities are to be located,

    b. does not release the Permittee from any liability for damage to person or property caused by or resulting from the construction, maintenance, or operation of the proposed facilities,

    c. does not release the Permittee from compliance with the other applicable statues and regulations of the United States, of the State of Illinois, or with applicable local laws, ordinances and regulations,

    d. does not take into consideration or attest to the structural stability of any units or parts of the project, and

e. in no manner implies or suggests that the Agency (or its officers, agents or employees) assumes any liability, directly or indirectly, for any loss due to damage, installation, maintenance, or operation of the proposed equipment or facility.

6. a. Unless a joint construction/operation permit has been issued, a permit for operation shall be obtained from the Agency before the equipment covered by this permit is placed into operation.

b. For purposes of shakedown and testing, unless otherwise specified by a special permit condition, the equipment covered under this permit may be operated for a period not to exceed thirty (30) days.

7. The Agency may file a complaint with the Board for modification, suspension or revocation of a permit:

a. upon discovery that the permit application contained misrepresentations, misinformation or false statements or that all relevant facts were not disclosed, or

b. upon finding that any standard or special conditions have been violated, or

c. upon any violations of the Environmental Protection Act or any regulation effective thereunder as a result of the construction or development authorized by this permit.

EXHIBIT 5

South Coast Air Quality Management District
21865 Copley Drive, Diamond Bar, CA 91765-4178

PERMIT TO CONSTRUCT/OPERATE

Permit No.
G53770
A/N 579996

This initial permit must be renewed ANNUALLY unless the equipment is moved, or changes ownership.
If the billing for the annual renewal fee (Rule 301(d)) is not received by the expiration date, contact the District.

ID 126060

Legal Owner or Operator:

STERIGENICS US, LLC
2015 SPRING RD, STE 650
OAK BROOK, IL 60523

Equipment Location: 687 WANAMAKER AVE, ONTARIO, CA 91761

Equipment Description :

Ethylene Oxide Sterilizer Chamber No. B, Trumbo, Model Cyclone, with Internal Dimensions of 9'- 6" W. x 55' L. x 9'- 10" H., Steam Heated, with a 550 cfm Vacuum Pump Vented to an ETO Scrubber, and a Back-vent Vented to a Catalytic Oxidizer

Conditions :

1. Operation of this equipment shall be conducted in accordance with all data and specifications submitted with the application under which this permit is issued unless otherwise noted below.

2. This equipment shall be properly maintained and kept in good operating condition at all times.

3. This equipment shall not be operated unless it is vented to the ETO control devices that are in compliance with the AQMD Rule 1405 and have been issued permit to construct or operate by the AQMD.

4. The total amount of ethylene oxide (ETO) used at this facility shall not exceed 657 tons per year averaged over any 12-month period.

5. The ETO purges from the sterilization chambers shall be evenly spread over the course of 24 hours per day.

6. A daily log indicating the date, the sterilization chamber identification number, the sterilization start-up and completion time, the time of the day when he chamber is purged, and pounds of ETO used for each sterilization cycle shall be maintained for each ETO sterilization chamber.

7. This equipment and all the devices and components which are connected to this equipment shall be leak tested every six months using the latest CARB test method during conditions of maximum sterilant gas flow.

8. There shall be no staging or sterilized products in an uncontrolled environment. Any test or bio indicator removal shall be conducted in enclosed environment that is vented to an ETO control equipment.

9. The valves on ethylene oxide drums shall be completely closed when not in use. If closing of a drum valve cannot contain ETO, or if there is an indication of ETO leak from any other part of an ETO drum, the drum shall be immediately moved to an enclosure that is vented to an ETO control equipment.

10. The operator of this equipment shall comply with all requirements specified in the Ethylene Oxide Airborne Toxic Control Measure (ATCM) for sterilizers and aerators, Parts 1 and 2 under Title 17 of California Code of Regulations, Sections 93108 and 93108.5 (17 CCR, Sections 93108 & 93108.5).

11. The operator of this equipment shall comply with all requirements specified in the National Emission Standards for Hazardous Air Pollutants (NESHAP) for ethylene oxide commercial sterilization and fumigation operations under Code of Federal Regulations, Title 40, Part 63 Subpart O (40 CFR 63, Subpart O).

12. Records of leak tests, maintenance and corrective actions, and other records required by this permit shall be maintained on file for a minimum of five years and shall be made available to the AQMD personnel upon request. At minimum the most recent two years of records shall be retained on site.

PERMIT TO CONSTRUCT/OPERATE

NOTICE

In accordance with Rule 206, this Permit to Operate or copy shall be posted on or within 8 meters of the equipment.

This permit does not authorize the emission of air contaminants in excess of those allowed by Division 26 of the Health and Safety Code of the State of California or the applicable Rules and Regulations of the South Coast Air Quality Management District (SCAQMD). This permit cannot be considered as permission to violate existing laws, ordinances, regulations or statutes of other government agencies.

Executive Officer

BY LAKI TISOPULOS, PhD/DL06
8/17/2018