VERMONT AGENCY OF NATURAL RESOURCES
Department of Environmental Conservation
Air Quality & Climate Division

TECHNICAL SUPPORT DOCUMENT

FOR

PERMIT TO CONSTRUCT AND OPERATE

AOP-04-004

Date Permit Issued: May 11, 2015

Ethan Allen Operations, Inc.
Orleans Division
Orleans, Vermont

Facility:
Ethan Allen Operations, Inc. (Orleans Division)
27 Railroad Avenue
Orleans, Vermont 05860

Facility / Applicant – Contact Person:
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This Technical Support Document details the Agency of Natural Resources, Department of Environmental Conservation, Air Quality & Climate Division review for the Air Pollution Control Permit to Construct and is intended to provide additional technical information, discussion and clarification in support of the Permit. It is not intended to provide a comprehensive review of the Facility or permit process or duplicate the information contained in the Permit.

1. Introduction

Ethan Allen, Incorporated (also referred to herein as "Permittee") owns and operates a wood furniture manufacturing and finishing facility located off Railroad Avenue in Orleans, Vermont (also referred to herein as "Facility"). The Facility currently operates under the confines of an existing amended Air Pollution Control Permit to Construct (#AP-92-024e) issued by the Vermont Agency of Natural Resources, Department of Environmental Conservation, Air Pollution Control Division on August 8, 2001.

1.1 Historical Perspective

The Facility has a convoluted history of terminated permit applications and issued/remanded permits. The current permit as of this document's date is a permit to construct AP-92-024e. An Initial application for a permit to operate (AOP-95-110) was issued March 19, 2002 but subsequently remanded back to Agency on April 2, 2003 through appeal by the Facility as a result of anticipated changes expected due to absorbing production from the Randolph shutdown in mid-2002. During the public comment period on the draft Permit to Operate (AOP-95-110), the Agency received plans and specifications from Ethan Allen (Application AOP-95-110A) detailing its plans to equip one of their Riley wood-fired boilers (#233) with an oil burner to provide the unit with the ability to burn residual oil. According to Ethan Allen, the conversion was prompted due to a significant reduction in the number of board feet of lumber being processed in the Rough Mill of the Orleans Division, and the consequent decline in waste wood available to feed the boiler. The Orleans Division began purchasing panel stock for its mill rather than producing it all on-site. Ethan Allen expected to burn approximately 155,000 gallons of No. 4 residual oil in this Riley boiler as a substitute for wood waste. In order to minimize the administrative burden of processing two separate permit applications for the same facility, the Agency took action on the modification of the Riley boiler simultaneously with the issuance of a final Title V Permit to Operate (AOP-95-110) thus terminating AOP-95-110A.

In 2003-2004 the Facility proposed installation of new UV coating line for flat goods (Application AOP-95-110B). Market conditions eventually lead the facility to abandon this project therefore the application was terminated.

Finally, in 2004, the Facility requested a cap on their HAP emissions to 10 tons each individual HAP and 25 tons total HAPs combined. This is the current application and is being rolled into the operating permit, as well as the permit renewal.

The allowable emissions for the Facility are summarized in Table 1-1 below:

Future Allowable Air Contaminant Emissions (tons/year)[1]					
$PM/PM_{10}/PM_{2.5}$	SO_2	NO_x	CO	VOCs [2]	HAPs[3]
432	5.8	<100	780	<314 (Facility-wide)	<10/25

[1] PM/PM_{10} - particulate matter and particulate matter of 10 micrometers in size or smaller; SO_2 - sulfur dioxide; NO_x - oxides of nitrogen measured as NO_2 equivalent; CO - carbon monoxide; VOCs - volatile organic compounds; HAPs - hazardous air pollutants as defined in §112 of the federal Clean Air Act.

[2] VOC's as defined in §5-101(123) of the *Regulations* and 40 CFR 51.100(a). The 314 tpy of VOC emissions is based on 304 tpy from finishing/glueing operations and 10 tpy from the boilers.

[3] Emissions of individual HAPs each < 10 tpy and emissions of total HAPs combined <25 tpy. Actual total combined HAPs estimated at close to but <25 tpy.

2.0 FACILITY DESCRIPTION AND LOCATION

2.1 Facility Location and Surrounding Area

The Facility is located off Railroad Avenue in Orleans, Vermont.

2.2 Facility Description and Explanation of Process

The operations performed at the Facility are described using the Standard Industrial Classification Codes - 2511 (Wood Household Furniture, Except Upholstered).

The Facility was originally constructed in the late 1800's and covers approximately thirty-three (33) acres in the town of Orleans. The manufacturing area consists of several buildings which total 690,000 square feet of area. The site includes a storage area, a machining building, and finishing building.

Kiln dried lumber is received from suppliers and other Ethan Allen facilities and is maintained at approximately eight (8) percent moisture content. Lumber is conveyed to a Rough Mill and gluing operations, which converts the rough dried lumber into dimensional lumber of various sizes. The Rough Mill includes cutting the rough lumber to length/width/thickness by rip-sawing, surface planeing, and rough-sanding. Wood waste from the Rough Mill operations, such as imperfections in the wood and end-cuts, are belt-conveyed to a wood hog to reduce the size of the waste to 2-3" chunks. Wood shavings, saw dust and sander dust are pneumatically conveyed to a cyclone and fabric filter for collection and eventual use as fuel for the boilers.

Exiting the Rough Mill, blanks are then forwarded to a Finish Mill where they are machined to length or shaped. The blanks may be lengthened by gluing the edges of blanks together. Glued pieces are cured under pressure or via radio frequency curing. The operating permit application identifies the following glue-line operations at the Facility: one (1) electronic glue line in the Rough Mill, six (6) glue wheels in the Rough Mill, two (2) glue lines in the Assembly Department, and one (1) glue line in the Lamination Department.

The resulting pieces are further machined and sanded to form individual furniture components. These components are then assembled into furniture. Wood waste and dust generated by these activities is collected via fabric filter collectors.

Protective and/or decorative coatings are then applied to the assembled furniture. Coatings, such as stains, topcoats, etc. are applied to assembled wood items in spray booths using high volume, low pressure spray guns. Ethan Allen operates a total of twenty-six (30+/-) spray booths at the Facility. Three (3) steam heated drying ovens and a flash off tunnel are employed as part of the finishing activities to speed the drying time of coated furniture. The spray guns and spray booths are periodically cleaned using solvent based cleaning products.

Shipping and warehouse activities include finished product inventory control and material handling operations to move furniture inventory. Finished product is later shipped from the warehouse to distribution centers for sale.

There are a total of three (3) main boilers at the Facility which burn wood. The Wickes main boiler is also equipped with burners for residual oil (a.k.a., No. 6 fuel oil). The three (3) main boilers have heat input ratings of 27.8, 34, and 35 million British Thermal Units per hour, respectively. The Facility is also equipped with small distillate oil (a.k.a., No. 2 fuel oil) boiler rated at 2.7 MMBTU/hr of heat input. It is served by a 275 gallon above ground storage tank.

Air contaminants produced at the site include: combustion contaminants, wood dust, and volatile organic compounds from the use of glues, stains, paints, solvents, and coatings.

2.3 Description of Equipment

Equipment specifications details:

Equipment Specifications - Energy Plant

Boiler unit	Unit Rating(s)[1]: MMBtu/hr max heat input / Boiler Heating Surface (ft^2)	Fuel Type(s)	Year of Installation
Wickes Boiler with a multicyclone, no reinjection	27.8 / 4369	Wet Wood	1965
Riley #233 Boiler with a multicyclone, no reinjection	34.0 / 2670 35.0 / 2670	Dry Wood No. 4 Fuel Oil	1965
Riley #234 Boiler with a multicyclone, no reinjection	34.0 / 2670	Dry Wood	1965
Bryan Boiler	2.7	No. 2 Fuel Oil	1973
Fire Pump, Peerless Pump Division, F.M.C. Corporation Model 8AF25B	255 bhp @ 1750 rpm, 2000 gpm. Fire pump operates on diesel only.	ULSD	1973
Kohler Model 14RESA Standby	23.6 bhp @ 3600 rpm	Propane	2012

generator. S/N: 3043962			

Equipment Specifications - Wood Waste Handling Operations	
Equipment/Make/Model[2]	**Date of Installation**
Unit E Rough Mill: Carter Day #999, Model 232 RF10 • Air/cloth ratio of 10:1, Number of bags 232 • Cloth Area = 2960 ft^2 • ACFM of 30,000, hours of operation 8760	1987
Unit Da Boiler Room: American Von Tongeren (AVT), Model 100S • Air/cloth ratio of 18:1, Number of bags 1008 • Cloth Area = 333 ft^2 • ACFM of 6,000, hours of operation 8760	≈ 1973
Unit Db Boiler Room: American Von Tongeren (AVT), Model 100S • Air/cloth ratio of 18:1, Number of bags 1008 • Cloth Area = 333 ft^2 • ACFM of 6,000, hours of operation 8760	≈1973
Unit #1 Finish Mill/Sanding: MAC #1403, Model 144MCF494 • Air/cloth ratio of 7.5:1, Number of bags 494 • Cloth Area = 7163 ft^2 • ACFM of 54,000, hours of operation 3840	2000
Unit #2 Finish Mill/Sanding: MAC #1404, Model 144MCF494 • Air/cloth ratio of 7.5:1, Number of bags 494 • Cloth Area = 7163 ft^2ACFM of 54,000, hours of operation 3840	2000
Unit #3 Finish Mil/Sanding MAC #1405, Model 144MCF494 • Air/cloth ratio of 8.4:1, Number of bags 494 • Cloth Area = 7163 ft^2 • ACFM of 60,000, hours of operation 3840	2000
Unit #4 Rough Mill: MAC 1442, Model 144MCF361 • Air/cloth ratio of 9.6:1, Number of bags 361 • Cloth Area = 5202 ft^2 • ACFM of 50,000, hours of operation 3840	2002
Unit #5 Finish Mill: MAC 1440, Model 144MCF494 • Air/cloth ratio of 7:1, Number of bags 494 • Cloth Area = 7118 ft^2 • ACFM of 50,000, hours of operation 3840	2002
Chip Feed Cyclone CS • Handles green wood woodchips, emissions need not be quantified	1993
Cyclone RS (Vents to AVT Dust Collector) • Closed loop, emissions need not be quantified	1993
Cyclone FS (Vents to AVT Dust Collector) • Closed loop, emissions need not be quantified	1993
Saw Dust Unloading Systems for silo	2008
Miscellaneous Operations	
Thirty (30+/-) spray booths	Various

• Glue lines (wood glues) includes Glue Panel Department. • Assembly Department. • Glues are either PVA or Aliphatic Resins	

2.4 Enforceable Operating Restrictions

The Facility presently operates under the limitations imposed by a Permit to Construct. Ethan Allen proposes to maintain these limitations. Below are summarized the limitations that affect the calculation of allowable emissions for the Facility as contained in the existing Permit to Construct.

(1) Ethan Allen is approved to use the Lilly Industries, Inc. Pre-Catalyzed Sealer #1421C00376 and Pre-Catalyzed Lacquer #1431C0098, or equivalent coatings if approved in writing by the Agency. The free formaldehyde content of the coatings shall not exceed 0.01% by weight, as applied.

(2) Annual usage of the pre-catalyzed sealer and pre-catalyzed lacquer shall not exceed a combined 55,000 gallons per year.

(3) Ethan Allen shall not discharge the exhausts from the MAC fabric filter collectors to the ambient air in excess of 3,840 hours per year each.

(4) Emissions of particulate matter from the Wickes and two Riley wood-fired boilers each shall not exceed 0.20 grains per dry standard cubic foot corrected to 12% CO_2.

(5) Emissions of PM from each of the MAC fabric filters shall at no time exceed limitations listed below.

Particulate Matter Emission Limitations		
Unit	Emission Limitations	
	Gr/dscf[1]	lbs/hour[2]
Unit E Rough Mill: Carter Day #999, Model 232 RF10	0.06	15.4
Unit Da: American Von Tongeren (AVT), Model 100S	0.06	3.1
Unit Db: American Von Tongeren (AVT), Model 100S	0.06	3.1
Unit #1 Finish Mill/Sanding: MAC #1403, Model 144MCF494	0.020	9.3
Unit #2 Finish Mill/Sanding: MAC #1404, Model 144MCF494	0.020	9.3

Particulate Matter Emission Limitations		
Unit	Emission Limitations	
	Gr/dscf[1]	lbs/hour[2]
Unit #3 Finish Mill/Sanding: MAC #1405, Model 144MCF494	0.020	10.3
Unit #4 Rough Mill: MAC 1442, Model 144MCF361	0.010	4.3
Unit #5 Finish Mill: MAC 1440, Model 144MCF494	0.010	4.3

(6) The annual fuel consumption in the Facility for all fuel oil burning equipment shall not exceed a combined 250,000 gallons per year based upon any rolling twelve (12) consecutive calendar month period. [10 *V.S.A.* §§556(c) and 556a(d)]

(7) Emissions of volatile organic compounds from the Facility shall not equal or exceed fifty (50) tons per year based on any rolling twelve (12) consecutive calendar month period. [§5-502 of the *Regulations*]

(8) Hazardous Air Pollutants: Emission of federally regulated hazardous air pollutants (HAPs) from the Facility shall not equal or exceed ten (10) tons per year of any single HAP or twenty-five (25) tons per year of all HAPs combined per year based on any rolling twelve (12) consecutive calendar month period. [40 *CFR* Part 63]

(9) Nitrogen Oxides [Boilers]: In order to maintain emissions of nitrogen oxides (NOx) below the one hundred (100) tons per year threshold of §5-251(3), the Permittee shall not burn fuel in all boilers combined located at its Facility in quantities greater than the following limit during any rolling twelve (12) consecutive calendar month period:

$$0.02*X + 1.94*Y + 7.45*Z < 200{,}000 \text{ lbs.}$$

where:

X = quantity of No.2 and No.4 fuel oil burned in units of gallons;
Y = quantity of wet wood fuel burned in units of tons (as fired, including moisture);
Z = quantity of dry wood fuel burned in units of tons (as fired, including moisture).

The NOx emission rates of 1.94 lbs per ton of wet wood and 7.45 lbs per ton of dry wood in the above formula is based on AP-42 factors. Oil: 0.020 lbs NOx/gal from §1.3 table 1.3-1 (boilers <100MM) ver. 9/98. Wet wood: 0.22 lbs NOx/MMBTU from §1.6 table 1.6-2 ver. 9/03 and an assumed heat value of 4,400 btu/lb for 48.89% moisture "wet" wood. Dry wood: 0.49 lbs NOx/MMBTU from §1.6 table 1.6-2 ver. 9/03 and an assumed heat value of 7,600 btu/lb for 84.44% moisture "dry" wood.

The NOx emission rates of 1.94 lbs per ton of wet wood and 7.45 lbs per ton of dry wood in the above formula is subject to change by the Agency to reflect current emission standards for heat input values of 4,500 Btu/lb for 40% moisture content for "wet" wood and 8000 Btu/lb for 12% moisture content for "dry" wood.

[10 V.S.A. §§556(c) and 556a(d)] [§5-251(3) of the Regulations]

3.0 Quantification of Pollutants

The quantification of emissions from a stationary source is necessary in order to establish the regulatory review process necessary for the operating permit application and to determine applicability with various air pollution control requirements. These determinations are normally based upon allowable emissions. Allowable emission is defined as the emission rate calculated using the maximum rated capacity of the source and, if applicable, either: (a) the applicable emission standard contained in the Regulations, if any, or (b) the emission rate or design, operational or equipment standard specified in any order or agreement issued under the Regulations that is state and federally enforceable. An applicant may impose in its application an emission rate or design, or an operational or equipment limitation which may be incorporated in the Permit to restrict operation to a lower level. Such limitations may include fuel restrictions or production limits.

3.1 Vermont Air Pollution Control Regulations and Statutes

Table 3-1 shows the Facility's actual use of chemicals as reported from 2013 that are classified as Hazardous Air Contaminants (HACs), the average pounds per eight hour emitted, and whether or not it exceeds the action level.

Table 3-1: Hazardous Air Contaminants

Chemical Name	CAS	Toxic Cat.	lb/year	Lbs/8-hour	Action Level[1] (lb / 8-hour)	Exceed Action Level
1,2,4-trimethyl benzene	95-63-6	2A	1700	1.55	0.8	Yes
Methyl amyl ketone	110-43-0	2A	51000	46.58	30.2	Yes
Silica(crystalline quartz)	14808-60-7	2A	30	0.03	0.010	Yes
N-Butyl Acetate	123-86-4	2A	81000	73.97	35.2	Yes
isobutyl acetate	110-19-0	2A	32000	29.22	1.4	Yes
isobutyl alcohol	78-83-1	2A	19000	17.35	8.7	Yes
Ethyl Alcohol	64-17-5	2A	69000	63.01	37.2	Yes
Acetone	67-64-1	2A	92000	84.02	26.1	Yes
1-butoxy-2-propanol	5131-66-8	3	2700	2.47	1.9	Yes
1-2-4-Trimethyl Benzene	95-63-6	2A	1700	1.55	0.8	Yes
Titanium Dioxide	13463-67-7	3	300	0.27	0.31	Yes
Isobutyl Ester Isobutyric Acid	97-85-8	3	3400	3.11	1.9	Yes

4.0 APPLICABLE REQUIREMENTS

The compliance analyses and determinations in this technical analysis rely on data and representations provided by the Owner/Operator. Any statements and conclusions regarding the compliance status contained herein are not binding against the state of Vermont in any future legal or administrative proceedings.

4.1 Vermont Air Pollution Control Regulations and Statutes

§5-231(3)(a) - Prohibition of Particulate Matter; Combustion Contaminants

Based on the application submitted and information available to the Agency, this Facility currently has applicable fuel burning equipment subject to this regulation.

(i) 0.5 pounds per hour per million BTU's of *heat input* in combustion installations where the *heat input* is 10 million BTU's or less per hour.

(ii) For combustion installations where the *heat input* is greater than 10 million BTU's per hour, but where the *heat input* is equal to or less than 250 million BTU's per hour, the applicable limit is determined by using the following formula:

(iii)

$$E_{PM} = 10^{[-0.47039(\log_{10} HI)+0.16936)}$$

where:

E_{PM} - is the *particulate matter emission* limit, expressed to the nearest hundredth pound per hour per million BTU's; and

HI - is the *heat input* in millions of BTU's per hour.

PM Fuel Oil Emissions for the Boilers:

For the Wickes boiler when firing oil:

$$E_{PM} = 10^{[-0.47039(\log_{10} 28.5)+0.16936)}$$
$$E_{PM} = 0.31 \text{ lb/MMBtu}$$

For the Riley boiler when firing oil:

$$E_{PM} = 10^{[-0.47039(\log_{10} 24.6)+0.16936)}$$
$$E_{PM} = 0.32 \text{ lb/MMBtu}$$

PM Wood Emission for the Boilers:

Wickes

$$0.20\frac{gr}{dscf}\cdot 11765\frac{dscf}{\min}\cdot 60\frac{\min}{hr}\cdot\frac{1}{7000}\frac{lb}{gr}=20.2\frac{lb}{hr}$$

Riley

$$0.20\frac{gr}{dscf}\cdot 14242\frac{dscf}{\min}\cdot 60\frac{\min}{hr}\cdot\frac{1}{7000}\frac{lb}{gr}=24.4\frac{lb}{hr}$$

APENDIX A


South Ave
Cross St
Main St
Church St
East St
Willoughby Ave
Liberty St
Union St
School St
Irasburg St
Water St
Marcotte Pl
Cottage St
South St
1st Ave
Ethan Allen Ln
B And B Ln
26
91
58
5