VERMONT AGENCY OF NATURAL RESOURCES
Department of Environmental Conservation
Air Pollution Control Division

# TECHNICAL SUPPORT DOCUMENT

# FOR

# TITLE V
# PERMIT TO CONSTRUCT AND OPERATE

# #AOP-09-034

December 30, 2009

## Weidmann Electrical Technology, Inc. – St. Johnsbury, VT

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Air Pollution Control Division

*This Technical Support Document details the Agency of Natural Resources, Department of Environmental Conservation, Air Pollution Control 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.*

**Facility:**
Weidmann Electrical Technologies, Inc.
Transformer Board Manufacturing and
Assembly Facility
One Gordon Mills Way
St. Johnsbury, VT 05819

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## 1.0 INTRODUCTION

Weidmann Electrical Technologies (hereinafter "The Permittee") owns and operates the transformer board manufacturing and assembly facility (also referred to herein as "Facility") located off U.S. Route 5 in St. Johnsbury, Vermont. The Permittee has proposed to modify the Facility by increasing the No.6 fuel limit for Boiler No. 3 from 558,500 to 800,000 gallons/year. In addition, the Permittee is proposing to limit the sulfur content in the No. 6 oil used in the Boiler No. 1 to 0.5% sulfur content by weight.

The allowable emissions, as approved in permit AOP-09-034, for the Facility are summarized below:

| **Allowable Air Contaminant Emissions (tons/year)[1]** | | | | | |
|---|---|---|---|---|---|
| ***PM/PM$_{10}$*** | ***SO$_2$*** | ***NO$_x$*** | ***CO*** | ***VOC*** | ***Total HAPs [2]*** |
| 88.1 | 113.1 | 99.2 | 7.7 | <50 | <10/25 |

[1] PM/PM$_{10}$ - particulate matter, SO$_2$ - sulfur dioxide, NO$_x$ - oxides of nitrogen, CO - carbon monoxide, HAPs - hazardous air pollutants.
[2] Emissions of each individual HAP is < 10 tpy and emissions of total HAPs combined is <25 tpy.

## 2.0 FACILITY DESCRIPTION AND LOCATION

### *2.1* Facility Locations and Surrounding Area

The Permittee owns and operates a transformer board manufacturing and assembly plant located off U.S. Route 5 in St. Johnsbury, Vermont. The area surrounding the Facility is rural and consists of a mixture of industrial and residential uses. The Facility is located approximately 130 miles from the Lye Brook Wilderness Area in Vermont and approximately 38 miles from the Great Gulf and Dry River Wilderness Areas in New Hampshire. The nearest Vermont designated "sensitive area" is roughly 8 miles to the northeast on Burke Mountain.

## *2.2* Facility Description

The Facility operations are listed under the Standard Industrial Classification ("SIC") Code 2361 (Paperboard Mills). The Permittee manufactures a transformer board, transformer board assemblies as well as board products for other industrial uses. The transformer boards are sold to businesses involved in the manufacturing and/or repairing of transformers and are available in standard or special sizes. The regulated sources of air contaminant emissions at the Facility are listed in Table 2-1. Refer to Table 2-2 for information on air pollution control equipment used at the facility

**TABLE 2-1: Equipment and Stack Information**

| DESCRIPTION AND MODEL NUMBER | SIZE OR CAPACITY (MAX. ALLOWED) | FUEL TYPE(S) OR PROCESS INPUT | DATE INSTALLED | POLLUTION CONTROL EQUIPMENT | STACK HEIGHT (FT Above Grade) |
|---|---|---|---|---|---|
| West Building Boiler #1 Cleaver Brooks Boiler | 29.3 MMBTU/hr (700 HP) | No.6 oil | 1970 | None | 54 |
| West Building Boiler #3 Johnston Boiler | 19.4 MMBTU/hr (500 HP) | No.6 Oil | 2001 | None | 53 |
| North Building Boiler #1 Peerless | 2.67 MMBtu/hr | No.2 Oil | 1995 | None | N/A |
| North Building Boiler #2 Peerless | 2.67 MMBtu/hr | No.2 Oil | 1995 | None | N/A |
| North Building Boiler #3 | 1.05 MMBtu/hr | No. Oil | 1/06/2006 | None | N/A |
| West Building Dust Collector (stack #3) | 15,000 acfm | Paperboard | 1974 | Carter Day Fabric Filter (72RJ96) | Horizontal vent |
| West Building Board Machining | 15,560 acfm | Paperboard | **Removed June 2009** | Carter Day Fabric Filter (72RJ60) | Horizontal vent |
| North Building Dust Collector (stack #6) | 26,000 acfm | Paperboard | 6/3/1985 | Carter Day Fabric Filter (232RFT8) | Horizontal vent |
| North Building Dust Collector (stack #7) | 25,000 acfm | Paperboard | 1996 | Torit & Day Fabric Filter (232RFW8) | Horizontal vent |
| Laminating Line | 6,120 acfm | Laminated Transformer Board | 1970's | None | 50 |
| | 26,500 acfm | | | | Horizontal vent |
| | N/A | | | | Horizontal vent |
| Nomex Press Line | 5,500 acfm | Paperboard, Resings & Solvents | 1985 | None | 45.5 |
| Gluing Operations | Fugitive | Various glues & adhesives | 1970's | None | Fugitive |

| Table 2-2: Existing Air Pollution Control Equipment & Techniques | |
|---|---|
| West Building Dust Collector (stack #3) | Manufacturer: Carter Day Fabric Filter<br>Model: 72RJ96<br>Estimated Collection Efficiency: 99.7%<br>Dimensions (cloth area): $ft^2$<br>Air Flow Rate: 15,000 acfm |
| North Building Dust Collector (stack #6) | Manufacturer: Carter Day Fabric Filter<br>Model: 232RFT8<br>Estimated Collection Efficiency: 99.7%<br>Dimensions (cloth area): $ft^2$<br>Air Flow Rate: 26,000 acfm |
| North Building Dust Collector (stack #7) | Manufacturer: Torit & Day Fabric Filter<br>Model: 232RFW8<br>Estimated Collection Efficiency: 99.7%<br>Dimensions (cloth area): $ft^2$<br>Air Flow Rate: 25,000 acfm |

Table 2-3 shows the various descriptions that have been and still are used for the dust collectors at the Facility. The description in the far right column will be used for the AOP-09-034 Permit and this Technical Support Document.

| Table 2-3: Equipment/Building Identification | | | | | |
|---|---|---|---|---|---|
| Dust Collector Manufacturer Type & Model | APCD Annual Registration File | Stack ID in Permits and TSDs prior to 2009 | Building Names in permits and TSD prior to 2009 | Referenced in Weidmann's 6-month compliance report | Description for new permit |
| Carter Day Fabric Filter (72RJ96) | Line 1 | M51 | Main Bldg | Fab West Dust Collector (stack #3) | West Building Dust Collector (stack #3) |
| Carter Day Fabric Filter (72RJ60) | Line 2 | M41 | Main Bldg | BM #2 Dust Collector (stack #4) | (removed from service) |
| Carter Day Fabric Filter (232RFT8) | Line 3 | FN15 | Fab North | Fab North Dust Collector (stack #6) | North Building Dust Collector (stack #6) |
| Torit & Day Fabric Filter (232RFW8) | Line 4 | FN? | Fab North | Fab North Dust Collector (stack #7) | North Building Dust Collector (stack #7) |

### 2.3 Description of the Process:

The transformer board and other board products are manufactured from unbleached kraft pulp and/or recycled transformer board materials. A specialty transformer board, known as Nomex board, is also manufactured at the Facility. The Nomex board is produced using a synthetic fiber manufactured by DuPont.

The process begins by re-pulping material using a combination of water and "proprietary recipes" for the formulation of the pulp-type needed. A large "pulper" is used in this process (driven by an electric motor acting much like a large blender). The resulting mixture of water and fibers is then cleaned by centrifugal treatment of the fiber-water suspension. Next, it is applied via a screen roll to a felt belt in a manner conventional in paper-making. The wet material is accumulated in thin plies on an accumulating roll to thicknesses that vary between 0.25 to 1.25 inches. When the desired amount has been laid, the wet material is parted within the "making roll," and the flat sheet (approximately 20 feet by 10 feet) is conveyed to a drying station. One of two methods is employed to dry the material, either by convection in an oven, or by pressing it between heated plates.

When the end user needs transformer board that is thicker than what can be manufactured using the "making roll", individual board sheets are laminated together to reach the required thickness. The laminating process utilizes polyester resin between layers of material. Sheets are cut and fed through a machine that applies a thin layer of polyester resin to the top surface. The sheets accumulate to a height of about 24 inches, and are then passed into a hydraulic press where they remain until the resin has cured. Subsequently, the pressed sheets are removed and cut to the required size and sent either to the external customer or internal for further processing.

**Boardmaking:** The Permittee has two "boardmaking" lines referred to as BM1 and BM2. Steam and particulates are the only emissions produced in the boardmaking process. Nearly all of the particulates are captured pneumatically through a duct connected to a fabric filter collector: West Building Dust Collector (stack #3). Note that this building had a second fabric filter dust collector (Carter Day 72RJ60) that was no longer needed and was removed in June 2009.

**Lamination Line:** The lamination line is used to laminate boards produced from either BM1 or BM2 to produce thicker board. The board is laminated by means of a curtain coater. In the past, the Permittee also utilized a reciprocator to laminate sheets. However, this device was eliminated from the production process in 1997. The majority of the laminating material (adhesive) used is a styrene monomer resin which requires the addition of a hardener. Water-based adhesives (Casein glue and Dextrin glue) are also used. The curtain coater is used to apply the adhesive. The adhesive is premixed with a hardener and then poured over the board. Once the board has gone through the adhesive application step, another board is placed on top and this continues until the desired board thickness has been achieved. The stack of boards is then compressed in a press for approximately seven (7) hours. While the boards are being pressed, the adhesive applicator is cleaned. Acetone is used to clean the curtain coater laminating applicators after laminating with the polyester (styrene) resin. Water is used to clean the laminating applicators after laminating with the water-based adhesives.

**Nomex Boards:** The Nomex boards are a specialty board produced on the BM2 line. The Nomex pulp has a different formulation than the wood pulp. Once the boards have been produced and cut, they may be sent to the Nomex process area or to other fabricating areas of the Facility.

In the Nomex process area, the boards are heated in an oven and pressed together to form a bond. This process also uses a release agent called Trasys 428. During the thermal bonding process, the boards are heated up to approximately 550 $^{o}$F.

**Board Machining Operations:** Various machines are employed to cut the boards to desired shapes and sizes. Depending upon the number of machines in use, dust produced by the machines may be vented to one of two fabric filter collectors: North Building Dust Collector (stack #6) or North Building Dust Collector (stack #7). When a small number of machines are in use, the Facility may choose not to operate the collection system. During these instances, the majority of the dust material falls to the floor and is manually recovered (i.e., broom and dust pan).

**Gluing Operations:** Glues and adhesives are used throughout the Facility. Nearly all emissions from gluing operations are considered fugitive emissions. The Permittee has eliminated formaldehyde emissions from its use of adhesives on-site.

**Miscellaneous Other Processes:** The Permittee operates an oil impregnation process which saturates the transformer boards with oil. This process is located in the North Building. Occasionally, Nomex boards are laminated together using a phenolic bonding film. Finally, a liquid product called Zipguard is applied to some fabricated parts, primarily static rings made in the Metallizing Department of the North Building. When the Zipguard is dry, it acts as a moisture barrier.

### 2.4 Description of Compliance Monitoring Devices

This Facility is not equipped with devices to continuously monitor the emission of air contaminants to the ambient air.

### 2.5 Proposed Modifications to Facility

The Permittee has proposed to modify the Facility by increasing the No.6 fuel oil limit on the Boiler #3 (19.4 MMBtu/hr Johnston Boiler) from 558,500 to 800,000 gallons per year. In addition, the Permittee has proposed a facility wide limit for the sulfur content in fuel oil of 0.5% sulfur by weight.

### 2.6 Identification of Sources with Insignificant or Negligible Emissions

Activities which qualify as an "insignificant activity" pursuant to '5-1002(h) of the Regulations need not be considered when determining the applicability of Subchapter X of the Regulations and must only be listed as such within the operating permit application. The fuel burning equipment listed below each are classified as "insignificant activity" pursuant to '5-1002(h)(1)(i):

1. Three (3) No. 2 oil-fired boilers located in the North Building;
2. One (1) propane-fired heating and cooling unit located in the WDS Laboratory (formerly Recycle Center);
3. One (1) Boiler located in the Training Center; and
4. Three (3) propane-fired roof top mounted heating and cooling units installed in 1999. The rated heat input for each unit is less than 300,000 BTU/hr.

Other activities classified as producing insignificant emissions include: oil impregnation process, Nomex board lamination process, and finishing application (i.e., use of Zipguard product).

It should be noted that a process or piece of equipment which is considered a "negligible activity" does not relieve the owner or operator from the responsibility of complying with any applicable requirements associated with said process or equipment.

## 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 Estimating Potential Emissions of Criteria Pollutants from the Existing Stationary Source

**Table 3-1: Cleaver-Brooks Boiler #1 - Allowable Emissions**

| 1,712,580 gallons No.6 fuel oil 0.5%S | Emission Factor | | | Allowable Emissions |
|---|---|---|---|---|
| | Factor | Units [2] | Source | tons per year |
| $SO_2$ | 157S [1] | lb/1000 gal | AP-42, Fuel Oil Combustion, Table 1.3-1 (9/98) | 67.2 |
| $NO_x$ | 72.74 | | AP-42, Fuel Oil Combustion, Table 1.3-1 (9/98) | 62.3 |
| PM | 9.32 | | AP-42, Fuel Oil Combustion, Tables 1.3-1 and 1.3-2 (9/98) | 8.0 |
| CO | 5 | | AP-42, Fuel Oil Combustion, Table 1.3-1 (9/98) | 4.3 |
| VOC | 0.28 | | AP-42, Fuel Oil Combustion, Table 1.3-3 (9/98) | 0.2 |
| HAPs | 0.155 | | AP-42, Fuel Oil Combustion, Tables 1.3-8 to 1.3-10 (9/98) | 0.13 |

[1] S represents the weight % of sulfur in the oil. For example if the fuel is 0.5% sulfur, then S=0.5
[2] lb/1000 gal: pounds of pollutant emitted per 1000 gallons of fuel input to the boiler.

| Table 3-2: Johnston - Boiler #3 - Allowable Emissions | | | | |
|---|---|---|---|---|
| 800,000 gallons No.6 fuel oil 0.5%S | Emission Factor | | | Allowable Emissions |
| | Factor | Units | Source | tons per year |
| $SO_2$ | 10.1 | lbs/hr | Boiler Manufacturer | 31.1 |
| $NO_x$ | 10.2 | | | 31.4 |
| PM | 2.35 | | | 7.2 |
| CO | 0.78 | | | 2.4 |
| VOC | 0.2 | | | 0.6 |
| HAPs | 0.155 | | AP-42, Fuel Oil Combustion, Tables 1.3-8 to 1.3-10 (9/98) | 0.06 |

| Table 3-3: Peerless Boilers - Allowable Emissions | | | | |
|---|---|---|---|---|
| Total No. 2 fuel oil: 332,880 gal | Emission Factor | | | Allowable Emissions |
| | Factor | Units | Source | tons per year |
| $SO_2$ | 71 | lbs/1000 gal | Boiler Manufacturer | 11.8 |
| $NO_x$ | 28 | | | 4.7 |
| PM | 4.2 | | | 0.7 |
| CO | 5 | | | 0.8 |
| VOC | 4.1 | | | 0.7 |
| HAPs | 0.0622 | | AP-42, Fuel Oil Combustion, Tables 1.3-8 to 1.3-10 (9/98) | 0.01 |

| Table 3-4: All other No.2 Oil Boilers/Heaters - Allowable Emissions | | | | |
|---|---|---|---|---|
| Total No. 2 fuel oil: 83,900 gal | Emission Factor | | | Allowable Emissions |
| | Factor | Units | Source | tons per year |
| $SO_2$ | 71 | lb/1000 gal | AP-42, Fuel Oil Combustion, Table 1.3-1 (9/98) | 3.0 |
| $NO_x$ | 20 | | AP-42, Fuel Oil Combustion, Table 1.3-1 (9/98) | 0.8 |
| PM | 2 | | AP-42, Fuel Oil Combustion, Tables 1.3-1 and 1.3-2 (9/98) | 0.1 |
| CO | 5 | | AP-42, Fuel Oil Combustion, Table 1.3-1 (9/98) | 0.2 |
| VOC | 0.34 | | AP-42, Fuel Oil Combustion, Table 1.3-3 (9/98) | 0.014 |
| HAPs | 0.0622 | | AP-42, Fuel Oil Combustion, Tables 1.3-8 to 1.3-10 (9/98) | 0.003 |

| Table 3-5: Allowable Emissions by Production Process – Particulate Emissions | | | | |
|---|---|---|---|---|
| ***Equipment/Source*** | ***Emission Factor (gr/dscf)*** | ***Source of Emission Factor*** | ***Maximum Flow Rate (dscfm)*** | ***Emission Rate (ton/yr)[1]*** |
| West Building Dust Collector (stack #3) | 0.06 | AP-96-011 | 15,000 | 33.8 |
| North Building Dust Collector (stack #6) | 0.02 | AP-96-011 | 26,000 | 19.5 |
| North Building Dust Collector (stack #7) | 0.02 | AP-96-011 | 25,000 | 18.8 |

[1] Annual emission rate based on 8760 hours of operation.

| Table 3-6: Summary of Allowable Air Contaminant Emissions by Source (tons/year) | | | | | | |
|---|---|---|---|---|---|---|
| ***Source*** | ***PM/PM10*** | ***SO2*** | ***NOx*** | ***CO*** | ***VOC*** | ***Total HAPs*** |
| Cleaver Brooks – Boiler #1 | 8.0 | 67.2 | 62.3 | 4.3 | 0.2 | 0.13 |
| Johnston – Boiler #3 | 7.2 | 31.1 | 31.4 | 2.4 | 0.6 | 0.06 |
| Peerless Boilers (2) | 0.7 | 11.8 | 4.7 | 0.8 | 0.7 | 0.01 |
| All other fuel burning boilers/ heaters | 0.1 | 3.0 | 0.8 | 0.2 | 0.01 | 0.003 |
| Production Processes (board machining) | 72.1 | - | - | - | - | - |
| Laminating LIne | - | - | - | - | | 8.3 |
| Nomex Press Line | - | - | - | - | | |
| Gluing Operations | - | - | - | - | | |
| **Facility Totals** | **88.1** | **113.1** | **99.2** | **7.7** | **<50** | **<10/25** |

As summarized in Table 3-6 above, the Facility has allowable emissions of all air contaminants in the aggregate of ten (10) or more tons per year.

The Facility is therefore subject to Subchapter X of the *Regulations* and is designated as a Subchapter X Major Source. The Facility has over 100 ton/year allowable emissions of $SO_2$ which classifies the source as a "Title V Subject Source" and therefore is subject to the federal operating permit requirements of 40 *C.F.R*. Part 70 and 71.

### 3.2 Estimating Actual Emissions of Hazardous Air Contaminants from the Existing Stationary Source.

The following table summarizes the estimated actual emissions of HACs:

Based on the Facility's annual registration information for the reporting years 2006, 2007 and 2008, the following table summarizes the estimated actual emission rate of HACs from the Facility. To be conservative, for each HAC

emitted, the year with the highest emission rate was used in this evaluation.

| Table 3-7 Quantification of HAC Emissions | | | | |
|---|---|---|---|---|
| **Hazardous Air Contaminant** | **CAS#** | **Toxic Category** | **Emission Rate (lb/8-hrs)[1]** | **Action Level (lb/8-hrs)** |
| styrene | 100425 | 1 | 17.5 [2] | 8.3 |
| acetone | 67641 | 2 | 303.8 | 26.10 |
| cumene | 98828 | 2 | 4.94 | 33 |
| formaldehyde | 50000 | 1 | 0.0007 | 0.0065 |
| ethanol | 64175 | 2 | 0.64 | 37.2 |
| methanol | 67561 | 2 | 0.024 | 97 |
| methyl isobutyl ketone | 108101 | 2 | 0.013 | 249 |
| acetephenone | 98862 | none | 2.47 | none |

1 For category 1 & 2 contaminants, the emission rate is based on 8760 hours/year.
2 The emission rate for styrene is not from the annual registration data, is has been determined as shown below.

Until 2009, the emission of styrene from the polyester resins used in the lamination line was based on an emission factor that was used in the application for permit AP-96-011. The emission factor was from AP-42, and was based on a similar resin application process. Since that time, the industry has conducted more testing to help determine the loss of styrene during the application of polyester resins.

While using the same manufacturing equipment, the use of polyester resins at the Facility has increased to keep pace with the increasing demand for their laminated board product(s). As a result, in 2008, the estimated emission of styrene was 11.9 tons. This prompted the Permittee to re-evaluate the methods used to estimate the emission of styrene from the Facility. In conjunction with this permit application, the Permittee hired a consultant to study the lamination process at the Facility and develop both an improved estimate of the emission of styrene as well as to identify possible changes to the process to reduce the emission of styrene.

The result of this effort included new emission calculations:

<u>Resin application emissions:</u>

From a paper published May 27, 2009 titled “VOC Emissions from Production of Reinforced Composite Sheet Molding Compound,” the following equation was developed:

$Ea = t * (0.1457 * Aa – 0.1454)$

Where:

Ea = emission of styrene from the application process in lbs/8 hour shift.

t = the hours per 8 hour shift when the resin is being applied
Aa = the total exposed wet resin area on the line in square feet

For the laminating line, there is a short working time for the resin, and the resin application process must be completed in ½ hour. For the rest of an 8 hour shift the stack of resin coated boards are in the press curing. t = 0.5 hours

The exposed surfaces of the uncured resin during the application process were determined to be 215 square feet. Aa = 215.15 $ft^2$

**Ea = 0.5 * (0.1457 * 215.15 – 0.1454) = 15.6 lb / 8 hour shift**

Resin curing emissions:

Ec = 0.014809 * Ac

Where:

Ec = emission of styrene from the curing process
Ac = the total exposed resin area during the curing cycle in square feet.

The exposed surfaces of the curing resin (press squeeze out and various drip collection troughs) are estimated to be 130.2 square feet. Ac = 130.2 $ft^2$

**Ec = 0.014809 * 130.2 = 1.93 lbs / 8 hour shift**

Potential to Emit (PTE) Calculations:

PTE = (Ea + Ec) * shifts/day * days/year.

There are 3 shifts/day and the lamination line does not run more than 327 days per year.

PTE – [(15.6 + 1.93) * 3 * 327] / 2000 = **8.60 tons/year styrene**

The Facility is not a major source of HAPs.

### 3.3 Designation of Proposed Modification for the Permit to Construct

The designation of the proposed modification is determined by the designation of the existing Facility and the allowable emissions associated with the proposed modification. The existing Facility, before construction or installation of the proposed modification, is designated as a major stationary source of air contaminants, as defined in §5-101 of the Regulations, is designated as a major modification and is subject to review under §5-502 of the Regulations. The modification's allowable emissions are calculated according to the following procedure.

*Step a*: Calculate the allowable emissions for each new piece of equipment or process being added.

The Permittee has proposed to increase the No.6 fuel oil limit for the #3 Boiler from 558,500 to 800,000 gallons/year.

| Table 3-8: Total for fuel increase (241,500 gallons/yr) to #3 Boiler - Air Contaminant Emissions, tons/year | | | | |
|---|---|---|---|---|
| **$PM/PM_{10}$** | **$SO_2$** | **$NO_X$** | **CO** | **VOC** |
| 2.2 | 9.4 | 9.5 | 0.7 | 0.2 |

*Step b*: Calculate the allowable emissions for all existing processes that are affected by the modification.

*None*

*Step c*: Calculate the actual emissions from all existing processes that are affected by the modification (i.e., that were included in Step b) that were installed prior to 1979 or have already been reviewed as being major under §5-502 of the Regulations.

*None*

*Step d*: Calculate the allowable emissions from all other equipment or processes at the facility modified since 1979 that have not been reviewed as being major in the past.

When the #3 Boiler was initially approved, its No.6 fuel oil limit was 558,500 gallons/year.

| Table 3-9: Boiler #3 with 558,500 gallons: Air Contaminant Emissions, tons/year | | | | |
|---|---|---|---|---|
| **$PM/PM_{10}$** | **$SO_2$** | **$NO_X$** | **CO** | **VOC** |
| 5.0 | 21.7 | 21.9 | 1.7 | 0.4 |

Since 1979, the Facility has received approval to install two (2) Peerless Boilers; a 25 HP Boiler; a Recycling Center Heater; a Training Center Heater; and the Nomex Board Manufacturing Line (approved 8/21/1996).

On 12/30/1998 the Agency approved the installation of the Recycle Bldg. Fabric Filter and Duct Heater. This equipment was never installed, and the 12/30/1998 approval is no longer valid, so the potential emissions from this equipment are not included in this review.

| Table 3-10: Total for small boiler/heaters: Air Contaminant Emissions, tons/year | | | | |
|---|---|---|---|---|
| **$PM/PM_{10}$** | **$SO_2$** | **$NO_X$** | **CO** | **VOC** |
| 0 | 14.8 | 5.5 | 1.0 | 3.6 |

| Table 3-11: Total Emissions Increase from all Prior Modifications, tons/year | | | | |
|---|---|---|---|---|
| **$PM/PM_{10}$** | **$SO_2$** | **$NO_X$** | **CO** | **VOC** |
| 0 | 36.5 | 27.4 | 2.7 | 4.0 |

*Step e*: Calculate the size of the modification on a pollutant-by-pollutant basis using the following formula:

Results of [step a + step b – step c + step d] = size of modification

| Table 3-12: Aggregated Modifications, tons/year | | | | | |
|---|---|---|---|---|---|
| Step | **$PM/PM_{10}$** | **$SO_2$** | **$NO_X$** | **CO** | **VOC** |
| (a) | 2.2 | 9.4 | 9.5 | 0.7 | 0.2 |
| (b) | 0 | 0 | 0 | 0 | 0 |
| (c) | 0 | 0 | 0 | 0 | 0 |
| (d) | 5.0 | 36.5 | 27.4 | 2.7 | 4.0 |
| (e) | 7.2 | 45.9 | 36.9 | 3.4 | 4.2 |
| Significant Level | 25/15 | 40 | 40 | 50 | 40 |

The proposed modification's allowable emissions are summarized in Table 3-12 and are estimated to result in an emissions increase greater than significance levels for $SO_2$. Therefore, the proposed modification is designated as a major modification.

## 4.0 DISCUSSION OF SELECT APPLICABLE AND NON-APPLICABLE REQUIREMENTS

The Agency will assess compliance with these regulations during any inspections of the Facility. The inspections will include confirmation of the proper operation and maintenance of equipment and air pollution control devices, visual observations of emission points, and review of any records required by the Permit.

## 4.1 Vermont Air Pollution Control Regulations and Statutes

***§5-201 and §5-202 - Open Burning Prohibited and Permissible Opening Burning***
Open burning of materials is prohibited except in conformance with the requirements of this section.

***§5-211(2) - Prohibition of Visible Air Contaminants - Installations constructed subsequent to April 30, 1970***
This emission standard applies facility-wide.

***§5-221(1) - Prohibition of Potentially Polluting Materials in Fuel; Sulfur Limitation in Fuel***
This prohibition applies to all stationary fuel burning equipment used on-site.

***§5-231(1) - Prohibition of Particulate Matter; Industrial Process Emissions***
This emission standard applies to any stack or vent associate with an industrial process at the Facility. The limit of 0.06 gr/dscf has been previously determined to be applicable to the fabric filter discharge serving the board processing operations. (West Building – #M51 - Carter-Day #72RJ96).

The PM emission limits for three fabric collectors (#M41 in the West Building and the two collectors in the Fab North Building) are subject to more stringent requirements due to the application of MSER. The MSER limits are 0.020 gr/dscf.

***§5-231(3) - 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. The allowable particulate emissions from the subject equipment are shown in Table 4-1.

(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:

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

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.

| Table 4-1: Equipment Subject to §5-231(3) | | | | |
|---|---|---|---|---|
| ***Equipment ID*** | ***Size/Capacity MMBtu/hr*** | ***§5-231 Emission Standard, lbs/MMBtu*** | ***Permit Emission Limit lbs/MMBtu*** | ***Allowable Emissions, lbs/hr*** |
| Boiler #1 West Building | 29.3 | 0.30 | 0.21 | 6.2 |
| Boiler #3 West Building | 19.4 | 0.37 | 0.12 | 2.35 |
| Boiler #1 North Building | 2.67 | 0.5 | 0.5 | 1.3 |
| Boiler #2 North Building | 2.67 | 0.5 | 0.5 | 1.3 |
| Boiler #3 North Building | 1.05 | 0.5 | 0.5 | 0.5 |

Compliance with the standard in §5-231(3)(a)(ii) of the *Regulations* is generally based on the use of Reference Method 5 (40 *CFR* Part 60, Appendix A). Note: A $PM/PM_{10}$ emission limit for West Building Boilers #1 and #3 are identified in the existing Permit to Construct and Operate which are more stringent than §5-231. This permit restriction overrules the limit derived from §5-231(3)(a)(ii) of the *Regulations*.

The Permittee has stated that they comply with the standard based on their emission estimates, and the scheduled maintenance of the boilers.

Emissions of $PM/PM_{10}$ will result from the burning of fuel in the boilers at the Facility. The quantity of these emissions produced will depend upon the quality of their operation, maintenance, and the quality of the fuel being burned. In an effort to maintain compliance with this requirement the Agency will require the Permittee to properly maintain and operate its fuel burning equipment following the manufacturer's recommendations, and that the Permittee shall perform periodic maintenance tuneups on its equipment. The Agency will also assess visible emissions from the fuel burning equipment while on-site performing inspections of the Facility, and if visible emissions are observed to be in excess of the limits specified in §5-211(2) of the *Regulations*, the Agency may require the performance of a stack test to verify compliance with the above referenced PM standards or that other corrective measures be taken.

***§5-231(4) - Prohibition of Particulate Matter; Fugitive Particulate Matter***
This section requires the use of fugitive PM control equipment on all process operations and the application of reasonable precautions to prevent PM from becoming airborne during the handling, transportation, and storage of materials, or use of roads. This requirement applies to the entire Facility, and the Facility is therefore expected to comply with the fugitive emission limitations of this section.

***§5-241 - Prohibition of Nuisance and Odor***
This requirement applies to the entire Facility and prohibits the discharge of air contaminants that would be a nuisance to the public or the discharge of objectionable odors beyond the property-line of the Facility.

***§5-261 - Control of Hazardous Air Contaminants***
See Section 7.0 below.

## 4.2 Federal Air Pollution Control Regulations and the Clean Air Act

**40 *CFR* Part 60 Subpart Dc – *Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units***
"The affected facility to which this Subpart applies is each steam generating unit for which construction, modification, or reconstruction is commenced after June 9, 1989 and that has a maximum design heat input capacity of 20 megawatts (MW) (100 million BTU per hour (BTU/hr)) or less, but greater than or equal to 2.9 MW (10 million BTU/hr)." The regulation limits fuel oil sulfur content to a maximum of 0.5 weight percent.

The #3 Boiler Johnston Boiler in the West Building is subject to this regulation.

**Section 112 of the Clean Air Act - *National Emission Standards for Hazardous Air Pollutants (NESHAPs).***
NESHAPs are promulgated under 40 C.F.R. Part 61 and 63. No promulgated NESHAPs in 40 CFR Part 61 or 63 currently are applicable to the Facility.

**40 *CFR* Part 64 - Compliance Assurance Monitoring**
§64.2 in 40 CFR Part 64 specifies that each pollutant specific emission unit (PSEU) at a facility that meets a three-part test is subject to the requirements for CAM. An emission unit must:

(A) Be subject to an emission limitation or standard,
(B) Use a control device to achieve compliance, and
(C) Have pre-control emissions that exceed or are equivalent to the major source threshold in 40 CFR Part 70 (i.e., 10 tpy individual HAP, 25 tpy total HAPs, 50 tpy VOCs, or 100 tpy for any other air contaminant).

- The boilers at the Facility have do not have a control device, so CAM does not apply.
- The lamination line does not have a control device to reduce the emissions of HAPs, so CAM does not apply
- The board machining operations, are controlled with bag houses, and have an emission limit, but do not have pre-control emissions that are equivalent to the major source threshold. The bulk of the PM emissions from these processes are very coarse particles; the pre-control emission of PM10 is far less than 100 tpy.

### 4.3 Non-Applicable Requirements for Which a Permit Shield Provision Has Been Requested

Pursuant to §5-1015(a)(14) of the Regulations, an owner/operator may request to be shielded from potentially applicable state or federal requirements. From a prior permit application, the Permittee requested a permit shield with respect to several potentially applicable requirements. Listed in Table 4-2 below are those potentially applicable requirements which the Agency determined are not applicable to the Facility's operations. The Agency's determinations are based upon the information submitted by the Owner/Operator in its application, and are summarized in section (F)(b) of permit AOP-09-034. The resulting permit shield shall be effective only with respect to activities disclosed in the application.

**Table 4-2: Permit Shield Determinations**

| ***Requirement for Which a Permit Shield Has Been Granted*** | ***Description of Requirement*** |
|---|---|
| §5-241(3) of *Regulations* | Prohibition of Nuisance and Odor - Control of Odor from Industrial Processes |
| §5-251(1) of *Regulations* | Control of Nitrogen Oxide Emissions |
| §5-251(3) of *Regulations* | Control of Nitrogen Oxide Emissions - Reasonably Available Control Technology for Large Stationary Sources |
| §5-252 of *Regulations* | Control of Sulfur Dioxide Emissions |
| §5-253.10 of *Regulations* | Control of VOCs - Paper Coating |
| §5-253.14 of *Regulations* | Control of VOCs - Solvent Metal Cleaning |
| §5-253.20 of *Regulations* | Control of VOCs - Other Sources That Emit Volatile Organic Compounds |

## 5.0 CONTROL TECHNOLOGY REVIEW FOR MAJOR SOURCES AND MAJOR MODIFICATIONS

Pursuant to §5-502 of the Regulations each new major source and major modification must apply control technology adequate to achieve the Most Stringent Emission Rate ("MSER") with respect to those air contaminants for which there would be a major or significant emission increase, respectively.

MSER is established following the procedures identified in the Agency's "Air Pollution Control Permitting Handbook", NESCAUM's "BACT Guideline", and the U.S. EPA's "New Source Review Workshop Manual". The process of determining MSER is to first list all available options for reducing emissions and then rank the alternatives in order of effectiveness from top to bottom (top being the most effective). MSER requires the application of the top option unless it can be demonstrated based upon costs (economic, energy, and environmental) or technical constraints that such an option is not achievable for the proposed project. If the Agency concurs with the applicant that an option is not achievable, then the next most effective option is selected as MSER. Again, the same arguments may be presented, and if found unacceptable

the next most stringent option is considered. This process may take several iterations before MSER is established.

$SO_2$ MSER Analysis

Step 1: Identify all Control Technologies:

A. Inherently Lower-Emitting Processes/Practices:

Sulfur oxides ($SO_X$) emissions are generated during oil combustion from the oxidation of sulfur contained in the fuel. The emissions of $SO_X$ from conventional combustion systems are predominantly in the form of $SO_2$. Uncontrolled emissions of $SO_2$ are almost entirely dependent on the sulfur content of the fuel and are minimally affected by boiler size, burner design, or grade of fuel being fired. A common practice to reduce/minimize the $SO_2$ emissions from a boiler is to select fuels with low sulfur content.

B. Add-On Controls

U.S. EPA AP-42 provides a list of add-on technologies that are employed to control the emissions of $SO_2$ from boilers. From Table 1.3-13:

**Table 5-1: Post Combustion $SO_2$ Controls For Fuel Oil Combustion Sources**

| Control Technology | Process | Typical Control Efficiencies | Remarks |
|---|---|---|---|
| Wet scrubber | Lime/limestone | 80-95+% | Applicable to high-sulfur fuels, Wet sludge product |
| | Sodium carbonate | 80-98% | 5-430 MMBtu/hr typical application range, High reagent costs |
| | Magnesium oxide/hydroxide | 80-95+% | Can be regenerated |
| | Dual alkali | 90-96% | Uses lime to regenerate sodium-based scrubbing liquor |
| Spray drying | Calcium hydroxide slurry, vaporizes in spray vessel | 70-90% | Applicable to low-and medium-sulfur fuels, Produces dry product |
| Furnace injection | Dry calcium carbonate/ hydrate injection in upper furnace cavity | 25-50% | Commercialized in Europe, Several U.S. demonstration projects underway |
| Duct injection | Dry sorbent injection into duct, sometimes combined with water spray | 25-50+% | Several R&D and demonstration projects underway, Not yet Commercially available in the U.S. |

Step 2: Eliminate technically unfeasible control options:

The RACT-BACT-LAER Clearinghouse (RBLC) database was used to help identify which of these control technologies have been used as BACT for fuel oil boilers of a similar size. A search of the RBLC database for BACT-PSD listings for Commercial/Institutional-Size Boilers/Furnaces <100 MMBtu/hr, 13.200 – Liquid Fuel &Liquid Fuel Mixtures, yielded the following:

| Table 5-2: Summary of BACT-PSD Determinations from RBLC | | | | | | |
|---|---|---|---|---|---|---|
| Date | RBLC-ID | Heat Input (MMBtu /hr) | Fuel | P2/Add-on Description | Fuel oil sulfur content | $SO_2$ Emission rate (lb/MMBtu) |
| 10/24/01 | NJ-0036 | 99 | Distillate fuel oil (backup fuel for natural gas) | Low sulfur oil | 0.05% | 0.051 |
| 10/10/03 | AK-0600 | 29.3 | Jet A and Diesel No.2 fuel blend | Low sulfur fuel | 0.24% | 0.24 |
| 9/23/03 | AK-0059 | 2.01–2.79 | Diesel | Low sulfur fuel | 0.3% | 0.030 |
| 7/15/04 | MN-0053 | 40 | No.2 fuel oil | Low sulfur fuel | 0.05% | 0.051 |
| 5/10/06 | NY-0095 | 28 | Distillate oil | Low sulfur fuel | 0.04% | 0.041 |
| 5/3/07 | OH-0309 | 20.4 | No.2 fuel oil | No description. This appears to be low sulfur fuel. | 0.5% | 0.51 |
| 10/5/07 | VA-0307 | 90 | Residual oil | 0.5% S and wet or dry scrubber, good combustion practices. SO2 emission limit of 9.5 lb/hr would require a scrubber with 80% control efficiency | 0.5% | 0.11 |
| 2/26/08 | NV-0047 | 1.063 | Diesel oil | Low sulfur fuel. Note that the 0.05% sulfur fuel is not expected to meet the 0.0094 lb/MMBtu emission limit. | 0.05% | 0.0094 |

Only one boiler, a 90 MMBtu/hr unit, had BACT determined to be a scrubber (with 80% control efficiency). The rest of the boilers in this size range (0 – 100 MMBtu/hr), utilized low sulfur fuel with the sulfur contents ranging from 0.04 to 0.5%.

The BACT determination identifying a scrubber for $SO_2$ control, allowed for wet or dry technologies. Neither of these technologies is feasible for this site for the following reasons:

Wet technology is not practical at this facility as there are no municipal sewer wastewater disposal options. The facility is served by on-site leach field wastewater treatment. Additionally, retrofitting this facility is challenging and deemed too expensive. Therefore, add-on controls are cost prohibitive and not feasible.

Dry scrubbers must be positioned ahead of a PM collection system to capture the solids that are emitted from the dry scrubber. Ordinarily dry scrubber are installed on boiler that require both PM control as well as SO2 control, so the PM air pollution control device is already part of the overall design. For this Facility, there is not a PM control device on this boiler.

Step 3: Rank remaining control technologies by control effectiveness:

Since add on emission controls have been found to be technically and economically infeasible, only low sulfur fuels will be considered. For the low sulfur fuel control technology, we will consider the following fuels:

(1) No.6 fuel oil with 0.5% sulfur by weight. This is the sulfur content was required by NSPS for boiler No.3. This analysis and permit expands the 0.5% sulfur limit to the No.1 boiler which is currently allowed to use 2% No.6 fuel oil. This change reduces the Facilities allowable $SO_2$ emission from 301 tons/yr to 113 tons/yr.
(2) No.2 fuel oil with 0.05% sulfur by weight,
(3) Ultra Low Sulfur Diesel (ULSD) with 0.0015% sulfur by weight.
(4) Note that a natural gas pipeline does not exist in St. Johnsbury, VT, so natural gas is not a feasible low sulfur fuel at this location.

**Table 5-3: Step 3: Ranking of Control Technology Control Effectiveness**

| Alternative | $SO_2$ Control Efficiency |
|---|---|
| **Use of No. 6 Residual Oil, 0.5% Sulfur** | 0% |
| **Use of 0.3% Sulfur Residual Fuel** | 40% |
| **Use of Distillate Fuel Oil (0.05%S)** | 90% |
| **Use of ULSD (0.0015% S)** | 99.7% |

Step 4: Evaluate most effective controls and document results:

When researching the pricing of fuel oil products, it was not possible to get competitive pricing for 0.3% No.6 fuel oil because three of the main suppliers of residual fuel oil in New England (Sprague, Global and Hess), do not offer this fuel product. So 0.3% No.6 fuel oil was dropped from consideration as a viable option for this Facility.

**Table 5-4: Economic Analysis of Potentially Feasible MSER Options for $SO_2$ Emissions from Johnston Boiler**

| Alternative | Increased Annual Cost | $SO_2$ Emissions Decrease (tons)[1] | Cost per Ton | Determination |
|---|---|---|---|---|
| **Use of No. 6 Residual Oil, 0.5% Sulfur** | $ 0 (currently used) | - | - | Economically feasible |
| **Use of Distillate Fuel Oil (0.05%S)** | $ 545,000 [2] | 28.3 | $19,300 | Economically Infeasible |
| **Use of ULSD (0.0015% S)** | $ 663,900 [3] | 31.3 | $21,200 | Economically Infeasible |

[1] Total allowable $SO_2$ emissions for 0.5% No.6 fuel oil = 31.4 tpy. $SO_2$ emission decreases are based on the $SO_2$ control efficiency listed in Table 5-3.:
[2] Based on the two years of fuel contract pricing for the State of Vermont for 0.5% No.6 fuel oil and No.2 fuel oil, including delivery to St. Johnsbury. No.6 oil: 800,000 gal/yr @ $2.05/gal. No.2 oil: 857,000 gallons @ $2.55/gal.
[3] Based on fuel pricing contract with the State of Vermont for 0.5% No.6 fuel oil and ULSD, including delivery to St. Johnsbury. No.6 oil: 800,000 gal/yr @ $2.05/gal. ULSD: 876,000 gallons @ $2.63/gal.

Step 5: Select BACT

Based on review of the proposed alternatives, the Agency has determined that the best available control technology for $SO_2$ emissions from the Johnston Boiler is the use of No. 6 fuel oil containing a maximum of 0.5% sulfur by weight.

## 6.0 AMBIENT AIR QUALITY IMPACT EVALUATION

An ambient air quality impact evaluation is performed to demonstrate whether or not a proposed project will cause or contribute to violations of the ambient air quality standards and/or significantly deteriorate existing air quality. The Agency's implementation procedures concerning the need for an ambient air quality impact evaluation under §5-406(1) of the Regulations, specifies that such analyses may be required when a project results in an allowable emissions increase of ten (10) tons per year or more of any air contaminant, excluding VOCs. Additionally, the Agency may require an air quality impact evaluation where the short-term allowable emission rates will significantly increase as a result of a project.

Table 3-12 summarizes the aggregated emissions from the proposed modification as well as all prior modifications at the Facility. The increase in allowable emissions of $SO_2$ from these modifications is 45.9 tons/year. To offset this potential increase in $SO_2$ emission, the Permittee has proposed to reduce the permitted No.6 fuel oil sulfur content used in Boiler #1 (West Building) from 2.0% to 0.5% sulfur content by weight. This reduces the allowable emissions of $SO_2$ from the Boiler #1 by 201.7 tons/year which more than offsets the increase in allowable $SO_2$ emissions from the other boilers. The Agency has determined that an ambient air quality impact evaluation is not necessary for this modification.

## 7.0 HAZARDOUS AIR CONTAMINANTS

The emissions of hazardous air contaminants (“HACs”) are regulated under to §5-261 of the Regulations. The Owner/Operator of a source must quantify its emissions of HACs regulated by this rule. Any Facility whose emission rate of a HAC exceeds its respective Action Level (“AL”) is subject to the rule for the HAC, and the Owner/Operator must then demonstrate that the emissions of the HAC are minimized to the greatest extent practicable by achieving the Hazardous Most Stringent Emission Rate (“HMSER”) for that HAC. If the emission rate of any HAC after achieving HMSER is still estimated to exceed its action level after achieving HMSER, an air quality impact evaluation may be required to further assess the ambient impacts for compliance with the Hazardous Ambient Air Standard (“HAAS”) or Stationary Source Hazardous Air Impact Standard (“SSHAIS”).

The emission of hazardous air pollutants (“HAPs”) may also be regulated separately under to §112 of the Federal Clean Air Act.

As shown in Section 3, the facility is expected to exceed the action level of acetone and styrene and is therefore subject to §5-261.

### 7.1 HMSER Selection

If the emission of any HAC from all regulated sources at the Facility is estimated to exceed its AL, then the Facility is subject to the rule and the emissions must be reduced to achieve HMSER for that HAC.

HMSER for styrene has been determined to be:

1 The use of a non-atomizing resin application, such as the curtain coater currently being used.
2 Where possible, the use of covered resin handling equipment to include, but not limited to: an enclosed curtain coating head (currently in use) and a tight fitting cover on the resin mix tank.
3 Reconfiguring catch troughs to reduce exposed wet areas.
4 Continued to investigation of alternatives to polyester resins.
5 Annual limit of 8.6 tons/yr of styrene emissions

HMSER for acetone has been determined to be reduction in the use of acetone through a combination of the following activities:

1 Evaluate lower viscosity polyester resins so less solvent is required to clean the resin handling system. The lower viscosity resin should result in a more complete draining of the resin from the system and improve cleanup, thereby reducing the time acetone is circulating through the system, and the associated evaporative losses.
2 Evaluate how to modify the resin handling system to minimize the wetted surfaces. This is to include, but is not limited to, trialing a single pipe feed to the coating head. Currently three pipes feed the coating head; any decrease in the wetted surface area to be cleaned should reduce acetone flush duration, and therefore evaporative losses.
3 Evaluation of alternate cleaning solvents. The alternate cleaning solvents shall include, but are not limited to, a product called Acrastrip.
4 Continue to evaluate the effectiveness of using masking materials on the conveyor belts. This should require less physical cleaning with acetone and further reduce evaporative losses.