Statement of Basis
Renewal

Title V Air Quality Permit

Molded Fiber Glass Companies – Aberdeen, South Dakota

South Dakota
Department of Environment and Natural Resources

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1.0 BACKGROUND

On June 19, 2008, the South Dakota Department of Environment and Natural Resources (DENR) issued a Title V air quality permit to Molded Fiber Glass (MFG) Companies for a wind turbine blade manufacturing facility in Aberdeen, South Dakota. MFG Companies produce reinforced plastic wind turbine blades for the wind energy market. At full production, the facility manufactured up to nine wind turbine blades ranging in size from 37 to 49 meters long per day.

On August 25, 2009, DENR issued a modified Title V air quality permit to MFG Companies. MFG Companies to add a CNC machine, pulsejet cartridge dust collector.

On November 5, 2012, DENR issued a construction permit to MFG Companies to add a manufacturing process to construct spiral wound fiberglass reinforced plastic (FRP) storage tanks at their current facility. On December 13, 2012, DENR received a request for a minor amendment to the construction permit to update some process steps and the resulting changes in emissions.

On December 20, 2012, DENR received a renewal application for MFG Companies. MFG Companies submitted the required application fee on February 8, 2013. In 2012, MFG Companies phased out the 37 and 40 meter blades and begin molding exclusively only 49 meter blades. The facility can produce a maximum of four blades per day. MFG Companies is limited to blades 50 meters or less due to the dimension of the existing building and paint system.

On May 28, 2014, DENR received notification from MFG Companies that the FRP manufacturing process was disconnected and in the process of being removed from the facility. The application was considered complete on May 28, 2014.

The primary standard industrial classification (SIC) code is 3089 – Miscellaneous Plastics Products – Plastics Products, Not Elsewhere Classified.

1.1 Existing Equipment

Table 1-1 lists the equipment currently operated by MFG Companies as found under the statement of basis associated with the existing Title V air quality permit issued August 25, 2009.

Table 1-1 – Description of Permitted Units, Operations, and Processes

Unit	Description	Maximum Operating Rate	Control Device
#1	Wind turbine blade drilling, cutting, sanding, and grinding operations.	Nine blades per Day	2008 Eurovac pulse jet baghouse
#2			2008 Eurovac pulse jet baghouse
#3	Blade paint booth – 2008 Erie Industrial Supply Company spray booth, model #2826822. The paint booth uses an air atomization spraying method		Not applicable
#4	CNC Router Machine	Nine blades per day	2009 Eurovac pulse jet baghouse

1.2 Other Existing Equipment

Other existing equipment at MFG Companies that will be reviewed is the following:

1. 2008 Blade Paint Booth IR Curing Oven, natural gas fired, 3.6 MMBtu/hour;
2. 6 - 2008 Epoxy Resin Storage Tanks (no HAPs or VOCs emitted) 5,000 gallons each;
3. 3 - 2008 Post Cure Oven with five burners at 0.5 MMBtu/hour each; and
4. 2008 Cummins, Serial# C080165477, 57 kilowatt natural gas emergency generator.

2.0 New Source Performance Standards

2.1 Standards for Stationary Spark Ignition Engines

Subpart JJJJ is applicable to owners and operators of stationary spark ignition (SI) internal combustion engines (ICE) that commence construction after June 12, 2006, where the stationary SI ICE are manufactured:

1. On or after July 1, 2007, for engines with a maximum engine power greater than or equal to 500 horsepower (except lean burn engines with a maximum engine power greater than or equal to 500 horsepower and less than 1,350 horsepower);
2. On or after January 1, 2008, for lean burn engines with a maximum engine power greater than or equal to 500 horsepower and less than 1,350 horsepower;
3. On or after July 1, 2008, for engines with a maximum engine power less than 500 horsepower;
4. On or after January 1, 2009, for emergency engines with a maximum engine power greater than 19 kilowatts (25 horsepower); or
5. Owners and operators of stationary SI ICE that commence modification or reconstruction after June 12, 2006.

The emergency generator is a spark ignition engine with a maximum engine power less than 500 horsepower. The emergency generator was constructed after June 12, 2006, but prior to July 1, 2008. Therefore, the emergency generator is not subject to Subpart JJJJ.

2.2 Other NSPS Standards

DENR has reviewed New Source Performance Standards and determined that no other NSPS standards are applicable to MFG Companies at this time.

3.0 New Source Review

ARSD 74:36:10:01 states that New Source Review (NSR) regulations apply to areas of the state which are designated as nonattainment pursuant to the Clean Air Act for any pollutant regulated under the Clean Air Act. MFG Companies is located in Aberdeen, South Dakota, which is in

attainment for all the pollutants regulated under the Clean Air Act. Therefore, MFG Companies is not subject to NSR review.

4.0 Prevention of Significant Deterioration

A prevention of significant deterioration (PSD) review applies to new major stationary sources and major modifications to existing major stationary sources in areas designated as attainment under Section 107 of the Clean Air Act for any regulated air pollutant. The following is a list of regulated air pollutants under the PSD program:

1. Total suspended particulate (PM);
2. Particulate with a diameter less than or equal to 10 microns (PM10);
3. Particulate with a diameter less than or equal to 2.5 microns (PM2.5);
4. Sulfur dioxide (SO_2);
5. Nitrogen oxides (NOx);
6. Carbon monoxide (CO);
7. Ozone – measured as volatile organic compounds (VOCs);
8. Lead;
9. Fluorides
10. Sulfuric acid mist;
11. Hydrogen sulfide;
12. Reduced sulfur compounds;
13. Total reduced sulfur; and
14. Greenhouse gases (carbon dioxide, methane, nitrous oxide, etc.).

If the source is considered one of the 28 named PSD source categories listed in Section 169 of the federal Clean Air Act, the major source threshold is 100 tons per year of any regulated air pollutant, except for greenhouse gases. The major source threshold for all other sources is 250 tons per year of any regulated air pollutant, except for greenhouse gases.

According to the Clean Air Act, once a pollutant is regulated under any part of the Act, (as was the case with greenhouse gas emissions after the motor vehicle regulations were finalized in March 2010) major new sources or major modifications are subject to the PSD program and Title V air quality operating permit program. Under the Clean Air Act, PSD and Title V air quality operating permits are required for all sources that emit a regulated air pollutant above 100 or 250 tons per year, depending on the source. This threshold, if applied to greenhouse gases, would greatly increase the number of facilities requiring a PSD review or Title V air quality operating permit. Based on administrative necessity, EPA increased these thresholds through the "Tailoring Rule."

On May 13, 2010, EPA issued the final version of the "Tailoring Rule" for greenhouse gas emissions. The major source threshold for greenhouse gases is listed below:

1. New PSD source because of a criteria air pollutant, the major source threshold for greenhouse gases is 75,000 tons per year of carbon dioxide equivalent or more;

2. New PSD source if greenhouse gas emissions are 100,000 tons per year of carbon dioxide equivalent or more;
3. For an existing PSD source because of a criteria air pollutant, a major modification for greenhouse gases is an increase of 75,000 tons per year of carbon dioxide equivalent or more;
4. For an existing non-PSD source that has the potential to emit 100,000 tons per year of carbon dioxide equivalent emissions or more, a major modification for greenhouse gases is an increase of 75,000 tons per year of carbon dioxide equivalent or more; and
5. In addition to subsection (2) and (4), a specific greenhouse gas, without calculating the carbon dioxide equivalent, also needs to emit greater than 100 or 250 tons per year, whichever is applicable, to be regulated.

MFG Companies is not one of the 28 named PSD source categories; therefore, the major source threshold is 250 tons per year.

The US Supreme Court heard challenges to EPA's "Tailoring Rule". On June 24, 2014, the Supreme Court decided greenhouse gases may not be regulated under the PSD program unless the facility requires a PSD permit for the other regulated air pollutants.

4.1 Potential Emissions

The department uses stack test results to determine air emissions whenever stack test data is available from the source or a similar source. When stack test results are not available, the department relies on manufacturing data, material balance, EPA's Compilation of Air Pollutant Emission Factors (AP-42, Fifth Edition, Volume 1), information submitted in the application, or other methods to determine potential air emissions. Potential emissions for each applicable pollutant are calculated by assuming the unit operates every day of the year at the maximum design capacity.

MFG Companies stated the facility operates 24 hours per day for 250 days out of the year. According to this information, the facility operates 6,000 hours per year. The facility has the potential to operate 8,760 hours per year; therefore, DENR will use 8,760 hours per year to estimate the potential emissions from MFG Companies' actual emissions as needed. For usage estimates, a multiplying factor of 1.46 will be used as needed.

4.2 Potential Emissions from Wind Blade Manufacturing Process

The epoxy resin infusion molding process does not generate volatile organic compounds or other criteria pollutants with the use of epoxy resin and amine catalyst. The fugitive emissions in Bay 3 from the use of mold cleaning, surface preparation, and tool cleaning will be discussed in that section.

4.2.1 Eurovac dust collector emissions

After molding and post curing, the blades are edge trimmed and the blade surfaces are repaired and sanded. Surface defects and pinholes are filled using common polyester body filler. Dust

generated during these operations is collected by the central dust collection system. The central dust collection system consists of two Eurovac pulse jet cartridge dust collectors equipped with HEPA filters. The manufacturer's stated collection efficiency for the system is 99.97 percent. The central dust collection system will be exhausted indoors during the winter and outdoors during the summer. MFG Companies stated that up to four turbine blades will be produced each day and 50 pounds of particulate matter will be collected by dust collector #1 and #2 per blade. The potential uncontrolled and controlled particulate matter emissions from dust collectors #1 and #2 are based on Equations 4-1 and 4-2, respectively.

Equation 4-1 – Potential Uncontrolled Emissions

$$Potenial\ \left[\frac{tons}{year}\right] = 50\frac{pounds\ particulate}{blade} \times 4\ \frac{blades}{day} \times 365\frac{days}{year} \div 2{,}000\frac{pounds}{ton}$$

Equation 4-2 – Potential Controlled Emissions

$$Potenial\ \left[\frac{tons}{year}\right] = 50\frac{pounds\ particulate}{blade} \times 4\ \frac{blades}{day} \times 0.03\% \times\ 365\frac{days}{year} \div 2{,}000\frac{pounds}{ton}$$

Potential uncontrolled emissions for the Eurovac dust collector system is 36.5 tons per year while controlled emissions result in 0.01 tons per year.

4.2.2 CNC Routing Process Emissions

The amount of dust generated by the CNC routing process is dependent on the amount of core materials processed per blade and the number of blades processed. The maximum production from this facility is limited to four 49 meter blades per day.

Each blade contains 140.7 cubic feet of PVC foam core material, with a density of 3.7 pounds per cubic foot. Each blade contains 140.1 cubic feet of balsa wood at a density of 9.36 pounds per cubic foot. MFG Companies assumes the amount of dust created by the CNC machine from the PVC foam core and balsa wood is 0.5 percent or less of the total maximum core materials processed; and the emissions are considered as total suspended particulate (TSP).

Equation 4-3 was used to estimate the TSP potential uncontrolled emissions from the CNC machine while routing each blade.

Equation 4-3 – Potential TSP Uncontrolled Emissions of CNC Router on each blade

$$Foam\ TSP = 4\frac{blades}{day} \times 46.9\ feet^3\ foam\ \times 3.7\ \frac{pounds}{feet^3} = 694.12\ \frac{pounds}{day}$$

$$Balsa\ TSP = 4\ \frac{blades}{day} \times 140.1\ feet^3\ wood\ \times 9.36\ \frac{pounds}{feet^3} = 5{,}245.34\ \frac{pounds}{day}$$

$$Potential\ \left[\frac{tons}{year}\right] = (694.12\ \frac{pounds}{day} + 5{,}245.34\ \frac{pounds}{day}) \times 0.5\%\ \times 365\ \frac{days}{year}\ \div 2{,}000\frac{pounds}{ton}$$

MFG's potential uncontrolled TSP from the CNC router is 5.4 tons per year.

4.2.3 Eurovac Dust Collector

Dust generated during the CNC machine routing process will be collected by a dust collection system. The dust collection system will consist of a Eurovac RCC-426 pulse jet cartridge dust collector equipped with polyester cartridge filters. The dust collector will have a 10 HP fan capable of producing an exhaust of 2000 CFM at 15 inches W.C. The manufacturer's stated collection efficiency for the system is 99.97 percent, down to 3 microns. The dust collection system will be exhausted indoors during the winter and outdoors during the summer.

Equation 4-4 was used to estimate the TSP potential controlled emissions from the CNC machine while routing each 49 meter blade using the Eurovac dust collection system.

Equation 4-4 – Potential TSP Controlled Emissions of CNC Router Using Eurovac Dust Collection System

$$Potential\ \left[\frac{tons}{year}\right] = Result\ of\ Equation\ 4-3\ \times \%\ filter\ loss$$

$$Potential\ \left[\frac{tons}{year}\right] = 5.4\ \frac{tons}{year} \times 0.03\%$$

The TSP potential controlled emissions from the CNC machine while routing the four 49 meter blades per day is 0.002 tons per year.

4.2.4 Surface coating emissions

The emissions were derived from the material safety data sheets for the products used in the surface coating system. The potential emissions are estimated from the amount of primer, topcoat, and solvents used and the amount of time the spray booth is operated. MFG Companies stated in the permit application that a maximum of four wind turbine blades will be produced each day. The application indicates that the facility will operate 24 hours per day, 250 days per year (6,000 hours per year). Potential emissions are calculated assuming that the facility operates 24 hours per day 365 days per year (8,760 hours per year).

MFG Companies stated in the application that the facility will use 16.03 gallons urethane topcoat per blade. The urethane topcoat coating (Part A) weighs 11.48 pounds per gallon and contains 32.4 percent VOCs by weight while the urethane topcoat hardener (Part B) weighs 9.34 pounds per gallon and contains 9.96 percent VOCs by weight. Part A to Part B Ratio is 3.75 to 1. The potential VOC emissions from urethane topcoat are calculated using Equation 4-5.

Equation 4-5 – Urethane Topcoat VOC Potential Emissions

$$Part\ A\ usage = 16.03\frac{gallons}{blade}\ \times \left(\frac{3.75}{4.75}\right) \times 4\frac{blades}{day} \times 365\frac{days}{year} = 18,476.7\ \frac{gallons}{year}$$

$$Part\ B\ usage = 16.03\frac{gallons}{blade}\ \times \left(\frac{1}{4.75}\right) \times 4\frac{blades}{day} \times 365\frac{days}{year} = 4,927.1\ \frac{gallons}{year}$$

Equation 4-5 Cont'd – Urethane Topcoat VOC Potential Emissions

$$Part\ A\ \ emissions\ \left[\frac{pounds}{year}\right] = 18{,}476.7\,\frac{gallons}{year}\ \times 11.48\,\frac{pounds}{gallon} \times 32.4\%\ VOC$$

$$Part\ A\ topcoat\ emissions = 68{,}724.5\ \frac{pounds\ VOC}{year}$$

$$Part\ B\ topcoat\ emissions = 4{,}927.1\,\frac{gallons}{year} \times 9.34\,\frac{pounds}{gallon} \times 9.96\%\ VOC$$

$$Part\ B\ topcoat\ missions = 4{,}583.5\ \frac{pounds\ VOC}{year}$$

$$Topcoat\ VOC\ emissions\ \left[\frac{tons}{year}\right] = (68{,}724.5\,\frac{pounds}{year} +\ 4{,}583.5\ \frac{pounds}{year}) \div 2{,}000\,\frac{pounds}{ton}$$

The urethane topcoat volatile organic compound potential emissions are 36.7 tons per year.

4.2.4.1 Urethane Coating Particulate Matter Emissions

Usage assumptions are based on current robotic spray usage on a 40 meter blade plus a 30% increase in the material usage to account for the new 48.7 meter blade while the actual increase is 23%. Calculations will include both overspray (35%) and coating material loss (33%). Annual total uncontrolled particulate matter emissions are derived from removing the filter loss factor and assuming all overspray is emitted. Paint filter media is rated at 99.67% efficiency and assumes that all particulate that falls out attaches to booth floors, walls, and equipment surfaces. This material is not subtracted out of the equation.

Equation 4-6 - Solids Content as applied

$$Part\ A\ Solids\ Content\ as\ applied =\ 11.48\,\frac{pounds}{gallon}\ \times 78\%\ solids * \frac{3.75}{4.75} = 7.1\,\frac{pounds}{gallon}$$

$$Part\ B\ Solids\ Content\ as\ applied =\ 9.34\,\frac{pounds}{gallon} \times 90\%\ solids \times \frac{1}{4.75} = 1.8\,\frac{pounds}{gallon}$$

$$Part\ A + Part\ B\ Solids\ Content\ as\ applied = 8.9\ \frac{pounds}{gallon}$$

Equation 4-7 – Urethane Topcoat Uncontrolled Particulate Matter Emissions

$$Annual\ PM\ Emissions\left[\frac{tons}{year}\right] =\ 8.9\,\frac{pounds}{gallons} \times\ 23{,}404\ gallons\ \times 35\%\ \div\ 2{,}000\,\frac{pounds}{ton}$$

The total urethane topcoat uncontrolled particulate matter emissions are 36.5 tons per year. The controlled particulate matter emissions with a filter loss of 33% results in 12.0 tons per year.

4.2.4.2 Epoxy Primer Volatile Organic Compound Emissions

MFG Companies stated in the application that the facility will use 17.78 gallons per blade of epoxy primer. The epoxy primer coating (Part A) weighs 14.18 pounds per gallon and contains 12.27 percent while the hardener (Part B) weighs 7.76 pounds per gallon and contains 35.57 percent VOCs by weight. The ratio of Part A to Part B is 4 to 1. The potential VOC emissions from epoxy primer coating and hardener are calculated using Equation 4-8.

Equation 4-8 – Epoxy Primer VOC Emissions

$$Part\ A\ usage = 25{,}959\frac{gallons}{year} \times 14.18\frac{pounds}{gallon} \times 12.27\%\ VOC = 44{,}910.9\frac{pounds}{year}$$

$$Part\ B\ usage = 5{,}192\frac{gallons}{year} \times 7.76\frac{pounds}{gallon} \times 35.57\%\ VOC = 14{,}331.1\ \frac{pounds}{year}$$

$$Potential\ VOC\ emissions\left[\frac{tons}{year}\right] = \left[(44{,}910.9 + 14{,}331.1)\ \frac{pounds}{year}\right] \div\ 2{,}000\frac{pounds}{ton}$$

The total epoxy primer volatile organic compounds emissions are 29.6 tons per year.

4.2.4.3 Epoxy Primer Particulate Matter Emissions

Particulate matter emissions for the urethane coating process are calculated using Equations 4-9 and 4-10. The annual uncontrolled particulate emissions assume that all overspray solids are emitted. Part A to Part B ratio is 4 to1 where part A is 89% solids and part B is 57% solids with 35% overspray.

Equation 4-9 Solids Content as applied

$$Part\ A\ Solids\ Content\ as\ applied = \ 14.18\frac{pounds}{gallon} \times 89\%\ solids \times \frac{4}{5} = 10.1\frac{pounds}{gallon}$$

$$Part\ B\ Solids\ Content\ as\ applied = \ 7.76\frac{pounds}{gallons} \times 57\%\ solids \times \frac{1}{5} = 0.9\frac{pounds}{gallon}$$

$$Part\ A + Part\ B\ Solids\ Content\ as\ applied = \ 10.1\frac{pounds}{gallon} + 0.9\frac{pounds}{gallon}$$

Equation 4-10 – Urethane Topcoat Uncontrolled Particulate Matter Emissions

$$Annual\ PM\ Emissions = \ 11.0\frac{pounds}{gallons} \times\ 14{,}224\ gallons\ \times 35\%\ \div\ 2{,}000\frac{pounds}{ton}$$

The total urethane topcoat uncontrolled particulate matter emissions are 27.4 tons per year.

4.2.4.4 Gun Cleaner Volatile Organic Compound Emissions

Volatile organic compound emissions also results from gun cleaning. In 2012, the gun cleaner solvent was switched from MAK/MEL blend which was 100% VOC to a 70/30 acetone heptane blend which is only 30% VOC. The acetone heptane blend will be used to clean the spray guns and flush the paint lines following each coating application. The cleaning solvent will be captured in containers for off-site disposal or recycling. Using Equation 4-11, evaporative losses will be estimated at 25% and a VOC content of 1.97 pounds per gallon.

Equation 4-11 – Gun Cleaner Solvent VOC Emissions

$$Solvent\ Usage = 20\frac{gallons}{blade} \times 1{,}460\frac{blades}{year} = 29{,}200\ \frac{gallons}{year}$$

$$Potential\ Emissions\ \left[\frac{tons}{year}\right] = \ 29{,}200\ \frac{gallons}{year}\ \times 25\% \ \times\ 1.97\frac{pounds}{gallon}\ \div\ 2{,}000\frac{pounds}{ton}$$

The total gun cleaner solvent volatile organic compounds emissions are 7.2 tons per year.

4.2.4.5 Blade Wipe-Down Volatile Organic Compound Emissions

Volatile organic compound emissions also result from blade wipe-down prior to coating. The wipe-down solvent is diluted with water in a 50/50 mixture. It is assumed that 100% of the alcohol will be emitted. Isopropanol weighs 8.17 pounds per gallon. Equation 4-12 was used to determine VOC emissions from the process of wiping down blades.

Equation 4-12 – VOC Emissions from Wiping Blades

$$Solvent\ Usage = \ 0.125\frac{gallons}{blade} \times 1{,}460\frac{blades}{year} = 182.5\frac{gallons}{year}$$

$$Potential\ Emissions\ \left[\frac{tons}{year}\right] = \ 182.5\ \frac{gallons}{year} \times 8.17\frac{pounds}{gallons} \div\ 2{,}000\frac{pounds}{ton}$$

The total volatile organic compounds emissions from wiping blades are 0.75 tons per year.

4.2.4.6 Mold Release Volatile Organic Compound Emissions

Volatile organic compounds are emitted from mold release emissions. Molds are prepared daily with mold release (Frekote 55-NC or comparable product) that uses approximately 0.8 gallons per mold with a density of 6.4 pounds per gallon. Mold release VOC emissions are calculated using Equation 4-13.

Equation 4-13 – Mold Release VOC Emissions

$$Mold\ Release\ Usage = \ 0.8\frac{gallons}{mold} \times 1{,}460\frac{molds\ (blades)}{year} = 1{,}168\frac{gallons}{year}$$

$$Potential\ Emissions\ \left[\frac{tons}{year}\right] = 1{,}168\frac{gallons}{year} \times 6.4\frac{pounds}{gallon} \div 2{,}000\frac{pounds}{ton}$$

The total volatile organic compounds emissions from mold release are 3.74 tons per year.

4.2.4.7 Mold Cleaner Volatile Organic Compound Emissions

Each blade mold is cleaned an average of twice per year with a solvent cleaner (Frekote PM cleaner or comparable product) which uses approximately 3 gallons per mold with a density of 6.92 pounds per gallon. Potential VOC emissions are calculated using Equation 4-14.

Equation 4-14 – Mold Cleaner VOC Emissions

$$Mold\ Cleaner\ Usage = 3.0\frac{gallons}{mold} \times 4\frac{molds}{year} \times \frac{2\ times}{year} = 24\frac{gallons}{year}$$

$$Potential\ Emissions\ \left[\frac{tons}{year}\right] = 6.92\frac{pounds}{gallon} \times 24\frac{gallons}{year} \div 2{,}000\frac{pounds}{ton}$$

The total volatile organic compounds emissions from mold cleaner are 0.08 tons per year.

4.2.4.8 Mold Sealer Volatile Organic Compound Emissions

Each blade mold is cleaned an average of twice per year with a mold sealer (Frekote B-15 Sealer or comparable product) which uses approximately 3 gallons per mold with a density of 6.5 pounds per gallon. Potential VOC emissions are calculated using Equation 4-15.

Equation 4-15 – Mold Sealer VOC Emissions

$$Mold\ Sealer\ Usage = 3.0\frac{gallons}{mold} \times 4\frac{molds}{year} \times \frac{2\ times}{year} = 24\frac{gallons}{year}$$

$$Potential\ Emissions\ \left[\frac{tons}{year}\right] = 6.5\frac{pounds}{gallon} \times 24\frac{gallons}{year} \div 2{,}000\frac{pounds}{ton}$$

The total volatile organic compounds emissions from mold sealer are 0.08 tons per year.

4.3 Potential Emissions from Emergency Generator (Unit #5)

Uncontrolled emission factors for the emergency generator are derived from the Compilation of Air Pollutant Emission Factors, Fifth Edition, Volume 1 (AP-42), Chapter 3.2 Natural Gas Fired Reciprocating Engines, 7/00, Table 3.2-1.

Table 4-1 – Generator Emission Factors Summary for Natural Gas

Emission Factors							
Unit Description	**TSP**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**NO_x**	**VOC**	**CO**

Emission Factors							
Unit Description	**TSP**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**NO_x**	**VOC**	**CO**
Emergency Generator[1]	0.00008	0.00008	0.00008	0.00059	4.1	0.12	0.32

[1] –Emission factor are in terms of pounds per million Btus.

The potential emissions from the emergency generators may be based on operating 500 hours per year, based on EPA's memo from John S. Seitz to the directors of EPA's regional offices, dated September 6, 1995.

DENR converted this unit's output rating to an estimated heat input rating based on the conversion factors of 3,413 Btus per hour per kilowatt, 0.746 kilowatts per horsepower, and 1,000,000 Btus per MMBtus and the generator efficiency in equation 4-16. The results of the conversions are shown in Table 4-2 below.

Equation 4-16– Generator Conversion

$$HeatInput\left[\frac{MMBtu}{hour}\right] = Output[hp] \times 0.746\left[\frac{kW}{hp}\right] \times 3{,}413\left[\frac{Btus}{kW}\right] \div 10^6\left[\frac{Btus}{MMBtus}\right] \div 35\%$$

Table 4-2 – Engine Specifications

Unit	Output Capacity (hp)	Efficiency	Estimated Heat Input Capacity (MMBtu/hr)
#5	100	35%	0.41

Equation 4-17 calculates the generators' potential emissions of each pollutant based on the capacities (heat input), the listed emission factor, and 500 operating hours per year.

Equation 4-17– Generator Potential Emissions

$$Potential\left[\frac{tons}{year}\right] = 0.41\left[\frac{MMBtu}{hour}\right] \times emission\ factor\left[\frac{pounds}{MMBtu}\right] \times 500\left[\frac{hours}{year}\right] \div 2{,}000\ \frac{pounds}{ton}$$

4.4 Oven Potential Emissions

MFG Companies operates four curing ovens. The blade paint booth IR curing oven (BPBCOV) is a natural gas fired catalytic infrared paint cure oven with a maximum operating rate of 3.6 million Btus per hour. The facility also operates three post cure ovens (PC01, PCOV2, and PCOV3). All three natural gas fired post cure ovens are equipped with 5 - 0.5 million Btu per hour burners for a total of 2.5 million Btus per hour for each oven. Compilation of Air Pollutant Emission Factors, Fifth Edition, Volume 1 (AP-42), Chapter 1.4 Natural Gas Combustion, 7/98, Table 1.4-1 and Table 1.4-2. Potential emissions for all for ovens were calculated using Equation 4-18, Equation 4-19, and Table 4-2.

Table 4-2: Post Cure Oven Emission Factors Summary for Natural Gas

Emission Factors

Unit Description	TSP	PM_{10}	$PM_{2.5}$	SO_2	NO_x	VOC	CO
Post Cure Ovens[1]	7.6	7.6	5.7	0.6	100	5.5	84

[1] –Emission factor are in terms of pounds per million cubic feet.

Equation 4-18 – Three Post Cure Oven Potential Emissions

$$Potential\ throughput = 2.5\frac{MMBtu}{hour} \times 8{,}760\ \frac{hours}{year} \div 1{,}000\frac{Btu}{cu\ ft} = 21.9\frac{MMCF}{year}$$

$$Potential\ Emissions\ \left[\frac{tons}{year}\right] = 21.9\frac{MMCF}{year} \times emission\ factor\ \frac{pounds}{MMCF} \div 2{,}000\frac{pounds}{ton}$$

Equation 4-19 – Blade Post Cure Oven Potential Emissions

$$Potential\ throughput = 3.6\frac{MMBtu}{hour} \times 8{,}760\ \frac{hours}{year} \div 1{,}000\frac{Btu}{cu\ ft} = 15.8\frac{MMCF}{year}$$

$$Potential\ Emissions\ \left[\frac{tons}{year}\right] = 15.8\frac{MMCF}{year} \times emission\ factor\ \frac{pounds}{MMCF} \div 2{,}000\frac{pounds}{ton}$$

Table 4-3: Post Cure Oven Potential Emission Summary (tons per year)

Unit Description	TSP	PM_{10}	$PM_{2.5}$	SO_2	NO_x	VOC	CO
Post Cure Ovens (3)	0.1	0.1	0.1	0.0	1.1	0.1	0.9
Blade Cure Oven	0.1	0.1	0.0	0.0	0.8	0.0	0.7
Total	0.2	0.2	0.1	0.0	1.9	0.1	1.6

4.5 Facility Potential Emissions

The summaries of the potential emissions by the existing units and proposed changes located at MFG Companies are summarized in Table 4-4. The existing units are based on the application provided by MFG Companies.

Table 4-4: Potential Uncontrolled Emissions (tons per year)

Description	TSP	PM_{10}	$PM_{2.5}$	VOC	SO_2	NOx	CO
Blade Drilling, Cutting, & Finishing	0.0						
CNC machine	5.4						
Blade Urethane Topcoat[1]	36.5	36.5	36.5	36.7			
Blade Epoxy Primer[1]	27.4	27.4	27.4	29.6			
Blade Gun Cleaner				7.2			
Blade wipe-down				0.8			
Blade Mold Release				3.7			
Blade Mold Cleaner				0.1			
Blade Mold Sealer				0.1			

Post Cure Ovens (4)	0.2	0.2	0.1	0.1	0.0	1.9	1.6
Emergency Generator	0.0	0.0	0.0	0.0	0.0	0.4	0.1
Total	**70**	**64**	**64**	**78**	**0**	**2**	**2**

In the application, MFG Companies requested a federally enforceable facility wide VOC emission limit of 238 tons per year, based on a 12 month rolling average per South Dakota's ARSD 74:36:05.01 and ARSD 74:36:05.02. Since the FRP process has been removed from the facility, MFG Companies does not have the potential to exceed the 238 ton per year threshold.

4.6 PSD Summary

On June 24, 2014, the Supreme Court decided greenhouse gases may not be regulated under the PSD program unless the facility requires a PSD permit for the other regulated air pollutants. MFG Companies' potential VOC emissions are less than the major source threshold of 250 tons per year. Therefore, MFG Companies is a minor source under the PSD program and is not subject to a PSD review so a greenhouse gas review will not be required.

5.0 National Emission Standards for Hazardous Air Pollutants (NESHAP)

Presently, there are no finalized or promulgated National Emissions Standards for Hazardous Air Pollutants standards applicable to this type of operation.

6.0 Maximum Achievable Control Technology Standards (MACT)

The federal Maximum Achievable Control Technology Standards are applicable to both major and area sources of hazardous air pollutants. A major source of hazardous air pollutants is defined as having the potential to emit 10 tons or more per year of a single hazardous air pollutant or 25 tons per year or more of a combination of hazardous air pollutants. An area source is a source that is not a major source of hazardous air pollutants.

The department uses stack test results to determine air emissions whenever stack test data is available from the source or a similar source. When stack test results are not available, the department relies on manufacturing data, material balance, EPA's Compilation of Air Pollutant Emission Factors (AP-42, Fifth Edition, Volume 1) document, the applicant's application, or other methods to determine potential air emissions.

6.1 Potential HAP Emissions

6.1.1 Urethane HDI Monomer Emissions from Surface coating

The volatile organic compound emissions outlined in the surface coating emissions of Chapter 4 provide the basis for the hazardous air pollutant calculations.

The potential Hexemethylene Diisocyanate (HDI) monomer emissions from the use of the urethane coating manufactured by Sherwin Williams will be evaluated for HAP emissions. The HDI (Aliphatic) Polyisocyanate is manufactured by Bayer Polymers. Information from Bayer Polymers and Sherwin Williams MSDS will be used to evaluate the HAP emissions for MFG Companies.

The Bayer Health and Safety Information Booklet state that the maximum residual monomeric HDI of this type of polymer is 0.3% by weight, and remains stable during storage. The stack testing by Bayer Polymers indicated that in actual use as a paint Part B hardener in spray painting tests, a maximum of 30% of the available monomer is exhausted out of the stack while the remainder is rapidly consumed in the reaction with the Part A coating side. Therefore, less than 0.1% by weight of the polymer is emitted as HDI vapor in a spray coating operation. The concentration was used to calculate the HDI emissions from the use of the urethane topcoat using Equation 6-1.

Equation 6-1: Concentration of HDI Emissions Calculations

$$Part\ B\ usage = 16.03\frac{gallons}{blade} \times \left(\frac{1}{4.75}\right) \times 4\frac{blades}{day} \times 365\frac{days}{year} = 4{,}927.1\ \frac{gallons}{year}$$

$$HDI\ Emissions = Part\ B\ usage\ \times Part\ B\ density\ \times HDI\ emissions\ factor\ (0.1\%)$$

$$Annual\ HDI\ Emissions = 4{,}927.1\frac{gallons}{year}\ \times 9.34\frac{pounds}{gallon} \times 0.1\% \div 2{,}000\frac{pounds}{ton}$$

$$Annual\ HDI\ Emissions = 0.187\frac{pounds}{hour} \times 8{,}760\frac{hours}{year} \times 0.1\%\ \div 2{,}000\ \frac{pounds}{ton}$$

The potential HDI emissions from MFG Companies are 0.02 tons per year.

6.1.2 Emergency Generator and Post Cure Ovens– Natural Gas

Stationary internal combustion engines are classified by AP-42 – Fifth Edition according to their heat output rating. Based on the application, the maximum output rating of the emergency generator is 57 kW. Table 6-2 provides the emission factor for HAPs for natural gas derived from AP 42, Fifth Edition, Volume 1, Chapter 3.2, Table 3.2.2 and Chapter 1.4, Table 1.4-3 for the HAPs emitted in the greatest amounts. Using the most prevalent HAP, hexane – 1.8 pounds per million standard cubic foot, for the post cure ovens and Equation 4-18 and Equation 4-19, the HAPs for all of the post cure ovens are less than one ton per year. Using Equation 4-17, the result of the emission factor was zero tons per year for the emergency generator. Therefore, DENR assumed all potential HAPs for the emergency generator is zero tons per year.

6.1.3 HAP Emissions Summary

Potential HDI emissions are 0.02 tons per year, 0.08 tons per year from all four post cure ovens, and zero tons per year of HAPs from the emergency generator. Therefore, MFG Companies is an area source of HAPs emissions.

6.2 MACT Standards

DENR reviewed the Maximum Achievable Control Technology (MACT) standards under 40 CFR Part 63 and determined the following need to be reviewed further to determine if they are applicable.

6.2.1 40 CFR Part 63 Subpart ZZZZ

In accordance with 40 CFR Part 63 Subpart ZZZZ—National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines (RICE) an affected source is any existing, new, or reconstructed stationary reciprocating internal combustion engines located at a major or area source of hazardous air pollutant emissions, excluding stationary reciprocating internal combustion engines being tested at a stationary reciprocating internal combustion engines test cell/stand (40 CFR § 63.6590).

A stationary RICE located at an area source of HAP emissions, a stationary RICE is existing if you commenced construction or reconstruction of the stationary RICE before June 12, 2006.

The generator was constructed after June 12, 2006 and is located at an area source. Therefore the emergency generator is not applicable to this subpart.

6.3 Other MACT Standards

DENR reviewed all potentially applicable MACT Standards and determined no other standards are applicable to MFG Companies at this time.

7.0 State Requirements

7.1 State Particulate Emission Limits

ARSD 74:36:06:02(1) and 74:36:06:03(1), establish state emission limits for total suspended particulate matter. In addition, ARSD 74:36:12:01 establishes a visible emission limit of 20 percent opacity for each unit.

In accordance with ARSD 74:36:06:01, a unit that must comply with a total suspended particulate matter emission limit under the New Source Performance Standards, Maximum Achievable Control Technology Standards, the Acid Rain Program, or the Prevention of Significant Deterioration Program is exempt from having to meet the state's total suspended particulate matter emission limits. Therefore, Unit #5 (emergency generator) is exempt from the state particulate limit.

In accordance with ARSD 74:36:06:02(1)(a), a fuel burning unit with heat input value less than 10 million Btus per hour may not exceed 0.6 pounds of particulate emissions per million Btu of heat input. Based on the heat input capacities of the permitted units, there are no units applicable to this total suspended particulate matter emission limit.

The particulate emission limits for process units are derived from ARSD 74:36:06:03(1). Equation 7-1, taken from ARSD 74:36:06:03(1)(a), is used to calculate the state limit of particulate emissions for each process unit with operating rates less than or equal to 30 tons per hour.

Equation 7-1 – State Particulate Emission Limit for Process Units ≤ 30 tons per hour

$E_{TSP} = 4.10 \times P^{0.67}$

Where:

- E_{TSP} = Emission limit for total suspended particulate matter, in pounds per hour; and
- P = Design process rate, in tons per hour.

The process rate for determining the state particulate limit is based on the weight of the blade. According to conversations with MFG Companies in, a 48.7 meter blade weighs 18,500 pounds. Therefore, MFG Companies would produce approximately 74,000 pounds per day or 3,083.3 pounds per hour (1.54 tons per hour). Using a process weight rate of 1.54 tons per hour in Equation 7-1, the total suspended particulate matter emission limit would be 5.48 pounds per hour. Table 7-1 compares the emission rate to the state emission limit.

Table 7-1: Emission Rate Comparison

Unit	Particulate Emission Rate (pounds per hour)		
	Potential Controlled	**Potential Uncontrolled**	**Limit**
#1/#2	0.000	0.0006	5.5
#4[1]	0.000	0.0006	5.5

1- Pounds per hour.

The emission rate comparison demonstrates that MFG Companies is capable of meeting the state's particulate emission limit without operating the air pollution control equipment.

Conditions will be placed in the permit to ensure that the dust collection systems are operated and maintained according to the manufacturer's specifications.

7.2 State Sulfur Dioxide Emissions Limits

In accordance with ARSD 74:36:06:02(2) and ARSD 74:36:06:03(2), the permitted units may not emit sulfur dioxide emissions to the ambient air in an amount greater than three pounds of sulfur dioxide per million Btus of heat input.

Unit #5 (emergency generator) is fired with natural gas and applicable to the state sulfur dioxide limit.

Table 7-4 – Sulfur Dioxide Emission Limit for Fuel Burning Units

Unit	Maximum Operating Rate	Emission Limit
#5	100 horsepower	3.0 pounds per million Btus of heat input

7.3 Performance Tests

MFG Companies will be required to conduct performance tests as required by the New Source Performance Standards and will be outlined in the air quality operating permit. The permit will contain language that allows DENR to require a stack performance test or fuel analysis during the term of the permit if an investigation of the facility warrants it.

7.4 Compliance Assurance Monitoring

Compliance assurance monitoring is applicable to permit applications received on or after April 20, 1998, from major sources applying for a Title V air quality permit. Compliance assurance monitoring is applicable to any unit that meets the following criteria:

1. The unit is subject to an emission limit or standard for the applicable regulated air pollutant;
2. The unit uses a control device to achieve compliance with any such emission limit or standard; and
3. The unit has potential uncontrolled emissions of the applicable regulated air pollutant that are equal to or greater than 100 percent of the amount, in tons per year, required for a source to be classified as a major source.

MFG Companies submitted its permit application after April 20, 1998 and does not operate equipment that falls under the listed criteria. Therefore, compliance assurance monitoring is not applicable to MFG Companies at this time.

7.5 Periodic Monitoring

Periodic monitoring is required for each emission unit that is subject to an applicable requirement at a source subject to Title V of the Federal Clean Air Act. Units that are subject to opacity limits are typically based on periodic visible emission readings. Therefore, periodic visible emission readings will be required for MFG Companies.

7.6 Insignificant Activity

After the molding operations are complete, the blades are placed in one of three natural gas fired ovens for post curing. Each oven contains five-500,000 Btu per hour burners, with an aggregate capacity of 2,500,000 Btus per hour for each oven. In accordance with the Administrative Rules of South Dakota (ARSD) 74:36:05:04.01(4), a device or apparatus with a heat input capacity of 3,500,000 Btus per hour or less is considered an insignificant activity and is exempt from permitting. Therefore, all three post cure ovens are exempt from permitting at this time.

In accordance with ARSD 74:36:05:04.01(7), the blade cure oven has the potential to emit less than two tons per year as shown in Table 4-3. Therefore, the blade cure oven is considered to be insignificant activity at this time.

An automated machining and drilling station machines the root end surface of the blades and drills anchor bolt holes. Dust generated at the machining and drilling station is controlled using source pickup connected to a small, dedicated dust collector that exhausts indoors. The blades

are prepared for painting using orbital sanders connected to portable dust collectors equipped with HEPA filters. The dedicated dust collector for the automated machining and drilling station and the portable dust collectors are exempt from permitting because they exhaust indoors.

MFG Companies has also designated that the facility air condition or ventilating systems are insignificant because they are not designed to remove air pollutants in accordance with 74:36:05:04.01(5).

8.0 Recommendation

Any source operating in South Dakota that meets the requirements of the Administrative Rules of South Dakota (ARSD) 74:36:05:03 is required to obtain a Title V air quality permit. A major source is defined as having the potential to emit greater than 100 tons per year of a criteria pollutant or greater than or equal to 10 tons per year of a single hazardous air pollutant, or greater than or equal to 25 tons per year of a combination of hazardous air pollutants. A source that is required to comply with federal new source performance standards or national emission standards for hazardous air pollutants must obtain a Title V air quality permit.

Originally, MFG Companies was permitted for production of nine blades per day which made them a major source of VOCs. At maximum production, MFG Companies can only produce four blades per day; therefore, MFG Companies is not a major source of VOCs with the current operational equipment and the daily production limit. MFG Companies is not a major source since removing the FRP from the facility. Discussions with Don Kirkham, MFG Companies HSE Manager indicate that MFG Companies would like to remain permitted as a Title V source for recordkeeping and reporting requirements which includes 12-month rolling requirements included in the permit. This will allow MFG Companies to have possible expansion projects in the future and would not require major recordkeeping and reporting differences if MFG Companies would become a major source again in the future. Therefore, MFG Companies will be required to operate within the requirements stipulated in the following regulations:

- ARSD 74:36:05 - Operating Permits for Part 70 Sources;
- ARSD 74:36:06 - Regulated Air Pollutant Emissions;
- ARSD 74:36:11 - Performance Testing;
- ARSD 74:36:12 – Control of Visible Emissions;
- ARSD 74:36:07:04 – New Source Performance Standards;
- ARSD 74:36:06:03 – Allowable Emissions for Process Industry Units;
- ARSD 74:36:12 - Control of Visible Emissions; and
- ARSD 74:37:01 - Air Emission Fees.

Based on the information submitted in the air quality permit application, DENR recommends conditional approval of a Title V air quality permit modification for MFG Companies in Aberdeen, South Dakota. Questions regarding this permit review should be directed to Ashley Brakke, Engineer II.