

NORTH CAROLINA
DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
DIVISION OF AIR QUALITY
AIR PERMITS SECTION

PREVENTION OF SIGNIFICANT DETERIORATION
PRE-CONSTRUCTION REVIEW AND PRELIMINARY DETERMINATION

FOR

DSM PHARMACEUTICALS, INC.
PITT COUNTY
GREENVILLE, NORTH CAROLINA

THIS REVIEW WAS PERFORMED BY THE
DIVISION OF AIR QUALITY

In Accordance With NC DAQ Regulations For
Prevention of Significant Deterioration of Air Quality
15A NCAC 2D .0530 and 15A NCAC 2Q .0300

NOVEMBER 2007

Mailing List

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LIBRARY	Mr. Willie Nelms Director, Sheppard Memorial Library 530 Evans Street Greenville, NC 27858	Preliminary Determination & Application
SOURCE	Mr. Stephen Lijoi Site Director Greenville DSM Pharmaceuticals, Inc. 5900 NW Greenville Boulevard Post Office Box 1887 Greenville, NC 27835	Preliminary Determination
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BACT Input
Summary Sheet

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Preliminary Determination

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APPENDIX A: DRAFT PERMIT
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Fact Sheet

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- DSM Pharmaceuticals, Inc. submitted a Prevention of Significant Deterioration (PSD) application to the North Carolina Division of Air Quality Section (NCDAQ) on September 15, 2006. The application prepared by RTP Environmental Associates, Inc.
- The application was deemed complete for review purposes pursuant to 40 CFR 51.166(q) and 15A NCAC 2D .0530(o) as of September 15, 2006.
- The applicant proposes to construct eleven fiber manufacturing lines and six fiber processing lines.
- The facility is a major stationary source under the definition contained in 40 CFR 51.166. A source is considered major if it belongs to any one of the 28 source categories listed in the PSD regulations and if it has the potential to emit more than 100 tpy of any PSD-regulated pollutant, or any other source that has the potential to emit more than 250 tons per year of any PSD regulated pollutant. DSM is considered a major source under the PSD regulations because pharmaceutical operations at the facility (SIC Code 2833/2834) qualify the source as a chemical processing plant, which is one of the 28 listed source categories. The facility has the potential to emit greater than 100 tons per year of at least one PSD regulated pollutant including nitrogen oxides (NO_x), volatile organic compounds (VOC), and sulfur dioxide (SO₂).
- In this application, DSM is proposing to expand the existing facility by adding eleven (11) fiber manufacturing lines (DAP Line Nos. 1, 2, 3, 4, 5, 6A, 6B, 7A, 7B, 8A, and 8B) and six (6) fiber processing lines (FL-1, FL-2, FL-3, FL-4, FL-5, and FL-6).
- This project will result in increases in emissions of PM (11.1 tpy), PM-10 (11.1 tpy), PM-2.5 (11.1 tpy), SO₂ (limited to less than 40 tpy), NO_x (limited to less than 40 tpy), VOC (499 tpy), and CO (75.4 tpy). The increases in emissions of VOC will exceed the respective PSD significance emission rate of 40 tpy. NO_x and SO₂ emissions associated with the project will be limited to less than 40 tpy. Emissions increases of PM, PM-10, PM-2.5, and CO are less than the respective significant emission rates.
- NCDAQ proposes the following Best Available Control Technology (BACT) emission limits and control techniques are proposed for the emission sources located at the facility:

EMISSION SOURCE	POLLUTANT	BACT EMISSION LIMITS	CONTROL TECHNOLOGY
Fiber Manufacturing Lines, including:	VOC	12 lbs/ton solvent (6-month average)	See Below
<i>Concentrated Evaporative Losses</i>	<i>VOC</i>	<i>(See Above)</i>	<i>Concentrators in series with RTOs</i>
<i>General Building Vents</i>	<i>VOC</i>	<i>(See Above)</i>	<i>No Control</i>
<i>Storage Tanks</i>	<i>VOC</i>	<i>(See Above)</i>	<i>No Control</i>
<i>UDY Roll-Off Boxes</i>	<i>VOC</i>	<i>(See Above)</i>	<i>Best Operation/ Maintenance Practices</i>
Combustion Sources	VOC	-	Best Combustion Practices
Fiber Processing Lines	VOC	25 tons/rolling 12-months	No Control

1.0 INTRODUCTION

DSM Pharmaceuticals, Inc. (DSM) has submitted to the North Carolina Division of Air Quality (NCDAQ) a combined Prevention of Significant Deterioration (PSD) permit application for a major modification and a Title V significant modification (Application No. 7400021.06C) for the existing pharmaceuticals, fiber, and non-woven fabrics manufacturing facility in Greenville, Pitt County, North Carolina. In this application, DSM requests a major PSD modification permit for eleven (11) fiber manufacturing lines Dyneema Americas Plant-Polyethylene Fiber Production Lines (DAP Line Nos. 1, 2, 3, 4, 5, 6A, 6B, 7A, 7B, 8A, and 8B) and six (6) fiber processing lines (FL-1, FL-2, FL-3, FL-4, FL-5, and FL-6).

DSM is currently operating under a Special Order by Consent (“ORDER”). The ORDER requires that DSM submit a complete PSD Application for DAP Line Nos. 1, 2, and 3, which are currently operating under PSD avoidance conditions pursuant to 15A NCAC 2Q .0317. This PSD application is being submitted in accordance with the ORDER. In addition, the application includes DAP Line Nos. 4 and 5, which are currently operating under PSD avoidance conditions, existing fiber processing lines (FL-1, FL-2, FL-3, and FL-4), and two new fiber processing lines (FL-5 and FL-6).

In the fiber manufacturing process, polyethylene powder is mixed with an organic solvent, extruded into a multifilament fiber, and dried. Emissions from the fiber manufacturing process are predominately volatile organic compound (VOC) emissions from solvent loss. There are also associated particulate matter (PM) emissions associated with the polyethylene powder handling and storage and various emissions from combustions sources.

The fiber processing lines produce non-woven fabrics from fibers manufactured at DSM facilities both in the United States and in the Netherlands. The process entails impregnating the manufactured fibers with a polymer resin, laminating the fibers into a non-woven fabric, printing logos/designs on the fabric, and winding the finished fabric into rolls. Emissions associated with the fiber processing lines include VOC emissions, including methyl ethyl ketone, toluene, and triethylamine, from the polymer resin and printing inks.

The proposed project will increase VOC emissions by more than the prevention of significant deterioration (PSD) significance level of 40 tons per year. Thus, the proposed project is subject to review and processing under the North Carolina Administrative Code, Title 15A, Sub-Chapter 2D, Section .0530 "Prevention of Significant Deterioration". The plant must also comply with other specific NCDAQ air pollution regulations where applicable.

Pursuant to the Federal Register notice on February 23, 1982, North Carolina has full authority by the Environmental Protection Agency (EPA) to implement the PSD regulations in the State effective May 25, 1982. Accordingly, the NCDAQ will conduct a full PSD review and process the PSD permit for the proposed project. NCDAQ's State Implementation Plan (SIP)-approved PSD regulations have been codified in 15A NCAC 2D .0530, which implements the requirements of 40 CFR 51.166.

In accordance with PSD requirements, DSM has conducted a best available control technology (BACT) analysis, additional impacts (soils, vegetation, visibility) analysis, and Class I area analysis. BACT analysis concluded that concentrators followed by regenerative thermal oxidation is BACT for the extrusion and primary drying processes and certain building exhaust points associated with the fiber manufacturing lines. The BACT analysis also concluded that add-on controls are not practical or cost-effective for the remaining proposed operations. NCDAQ proposes to approve the company submitted BACT analysis, as summarized below:

EMISSION SOURCE	POLLUTANT	BACT EMISSION LIMITS	CONTROL TECHNOLOGY
Fiber Manufacturing Lines, including:	VOC	12 lbs/ton solvent (6-month average)	See Below
<i>Concentrated Evaporative Losses</i>	<i>VOC</i>	<i>(See Above)</i>	<i>Concentrators in series with RTOs</i>
<i>General Building Vents</i>	<i>VOC</i>	<i>(See Above)</i>	<i>No Control</i>
<i>Storage Tanks</i>	<i>VOC</i>	<i>(See Above)</i>	<i>No Control</i>
<i>UDY Roll-Off Boxes</i>	<i>VOC</i>	<i>(See Above)</i>	<i>Best Operation/ Maintenance Practices</i>
Combustion Sources	VOC	-	Best Combustion Practices
Fiber Processing Lines	VOC	25 tons/rolling 12-months	No Control

The additional impacts and Class I area evaluations concluded that the proposed project will not cause adverse air quality impacts in the surrounding community or nearest Class I area.

1.1 Preliminary Determination

The PSD application submitted by DSM has been reviewed by the NCDAQ, Permits Section staff to determine compliance with the requirements of all NCDAQ air pollution regulations. The review was performed for the following:

- PSD including determination of BACT with consideration of non-PSD regulated toxic pollutants, an air quality impact analysis, and an additional impact analysis on soils, vegetation, and visibility; and,
- Compliance with the North Carolina Environmental Management Commission regulations Title 15A, North Carolina Administrative Code.

The NCDAQ, Permits Section staff has conducted its preconstruction review of the application and made a preliminary determination that the proposed project will comply with all applicable North Carolina Environmental Management Commission air pollution regulations including the PSD requirements. Therefore, the NCDAQ proposes to issue an air permit for the modification described in Section 1 above, with specific permit conditions and emission limits. Preliminary preconstruction approval under the PSD requirements was contingent upon the following findings:

- A demonstration that National Ambient Air Quality Standards (NAAQS) will not be violated as a result of emissions from the proposed project.
- A demonstration that air emissions resulting from the proposed facility will not adversely impact any PSD Class I area.
- A demonstration the Best Available Control Technology is applied to each emission unit that will emit any amount of a significant pollutant.
- A demonstration that emissions from the proposed project will neither cause adverse impacts to soils and vegetation nor cause degradation of visibility, and that economic growth

associated with the project will not cause a significant increase in regional air pollutant levels.

The remainder of this report contains a review by NCDAQ of the requested demonstration and analyses presented by DSM. Sections 2 and 3 of this report present a general description of the proposed project and a description of the site location. Section 4 presents a regulatory analysis of the North Carolina and Federal air pollution regulations that apply to the project construction and operation. Section 5 contains the BACT analysis and Section 6 presents the results of the air quality analysis. The NCDAQ draft air permit is contained in Appendix A.

In addition to the regulatory analysis, the public is afforded an opportunity to comment on the proposed permit. The NCDAQ solicits and encourages participation by the general public, industry, and other affected persons impacted by the proposed project. Specific public notice requirements and a 30-day public comment period are required before the NCDAQ takes final action on this application. Appendix B contains a copy of the public notice.

2.0 GENERAL DESCRIPTION

2.1 Process Descriptions

2.1.1 Fiber Manufacturing Lines (DAP Line Nos. 1, 2, 3, 4, 5, 6A, 6B, 7A, 7B, 8A, and 8B)

In the fiber manufacturing process, powdered polyethylene (PE) is mixed with an organic solvent, extruded into a multifilament fiber, dried, and spun. The organic solvent used is non-hazardous and non-toxic, with a maximum true vapor pressure of less than 0.02 pounds per square inch (psia).

In each DAP Line, the process begins by pneumatically transporting the PE powder, which is stored in **silos**, to the **PE hopper**, and then from the PE hopper to the **dosing vessel**, and finally from the dosing vessel to the **suspension make-up tank**. Particulate matter emissions from the PE silos, hopper, dosing vessel, and make-up tank are all controlled by bagfilters. In the make-up tank, virgin and recycled solvent and a small amount of anti-static additives are added to the PE powder and agitated to create a suspension. The suspension is then sent to the **suspension mixing vessel** for additional agitation, and from the mixing vessel to the **solution supply vessel**. In the solution supply vessel, the incoming suspension is subjected to intense agitation at elevated temperatures to create the solution.

The solution from the supply vessel is pumped into the spinning (extrusion)/quenching portion of the fiber manufacturing process through tees, dividing the solution stream into identical lines. Spinning pumps press the solution through spin blocks (**extruders**) containing a spin plate with specially designed apertures in which the filaments are formed. Immediately upon leaving the spin plate, the solvent in the solution begins to vaporize and the filaments begin to cool and crystallize. The filaments are further cooled upon entering the **quench baths**. In the quench baths, the filaments become fixed gel structures.

Filaments leaving the quench baths are called “undrawn yarn” (UDY). The UDY is directed through a series of rollers into the **primary drying oven**, where solvent is removed by circulating nitrogen gas at an elevated temperature. Filaments leaving the primary drying oven, called “partially-drawn yarn” (PDY), typically have a solvent content of less than 1% by weight. PDY is wound onto bobbins, which are in turn placed on creels to be fed through the **final**

drying and drawing oven. Yarn from the final drying and drawing oven is called “fully-drawn yarn” (FDY). FDY is wound onto bobbins, inspected, and packaged as a final product.

During periods of fiber manufacturing startup, shutdown, and malfunction, the UDY generated between the fiber spinning head and the oven is unusable. This unusable, solvent-laden UDY is placed into totes, which are closed and carried to a UDY Roll-Off Box located outside the DAP building for storage until it can be picked up for offsite disposal. Fugitive VOC emissions may occur from the UDY Roll-Off Box each time the box is opened.

2.1.3 Fiber Processing Lines (FL-1, FL-2, FL-3, FL-4, FL-5, and FL-6).

The fiber processing lines produce non-woven fabrics from fibers manufactured at DSM facilities both in the United States and in the Netherlands. The process entails impregnating the manufactured fibers with a polymer resin, laminating the fibers into a non-woven fabric, printing logos/designs on the fabric, and winding the finished fabric into rolls.

2.2 Emissions

The fiber manufacturing lines will result in potential increases of particulate matter from PE storage and handling prior to introduction of the solvent. All potential PM sources are controlled by bagfilters. Note that only silo emissions are exhausted to the atmosphere. Bagfilters associated with the hopper, dosing vessel, and suspension make-up tank are exhausted indoors.

Solvent losses occur throughout the fiber manufacturing process, including concentrated evaporative losses from the extrusion/quench operations, lower concentration emissions from general building exhaust vents, evaporative losses and breathing/working losses from solvent storage tanks, and fugitive emissions from the UDY Roll-Off Box. There are also relatively small quantities of VOC emissions resulting from combustion operations at hot oil heaters, boilers, and thermal oxidizers associated with the fiber manufacturing lines.

The fiber processing lines have associated VOC emissions, including methyl ethyl ketone, toluene, and triethylamine, from the polymer resin and printing inks.

3.0 REGIONAL DESCRIPTION

3.1 Area Classification

The DSM facility is located approximately 4.5 kilometers (2.8 miles) north of Greenville in Pitt County, North Carolina. Air Quality in that area is classified with respect to the National Ambient Air Quality Standards (NAAQS) as listed below:

<u>Pollutant</u>	<u>Attainment Status</u>
Particulate	Attainment
Sulfur Dioxide	Attainment
Nitrogen Dioxide	Attainment
Carbon Monoxide	Attainment
Ozone	Attainment

Pitt County is a Class II Area with ambient air increments for PM-10 and NOx.

The closest Class I area is the Swanquarter Wildlife Refuge, which is located approximately 88 kilometers east southeast of the facility.

4.0 REGULATORY ANALYSIS

The following discussion pertains to the regulatory requirements that must be met for the modification of the DSM facility. These requirements include both federal Prevention of Significant Deterioration (PSD) regulations and State air quality regulations.

4.1 PSD Applicability and Required Analysis

The goal of the PSD regulations is to ensure that the air quality in clean (i.e. attainment) areas does not deteriorate significantly while maintaining a margin for future industrial growth. The PSD regulations focus on industrial facilities, both new and modified, that create significant increases in the emission of certain pollutants. The U.S. EPA promulgated final regulations governing the PSD permitting program in the Federal Register published August 7, 1980. Effective March 25, 1982, the DAQ received full authority from the EPA to implement PSD regulations in the State. Revisions to the PSD Regulations were subsequently promulgated on December 31, 2002 and adopted by the DAQ on July 28, 2006.

Under PSD requirements, all major new or modified stationary sources of air pollutants regulated as defined in Section 169 of the Clean Air Act (CAA) must be reviewed and approved prior to construction by U.S. EPA or the permitting authority, as applicable, in accordance with Section 165 of the CAA. A "major stationary source" is defined as any one of 28 named source categories that has the potential to emit 100 tons per year of any regulated pollutant, or any other stationary source that has the potential to emit 250 tons per year of any PSD regulated pollutant.

DSM is considered a major source under the PSD regulations because pharmaceutical operations at the facility (SIC Code 2833/2834) qualify the source as a chemical processing plant, which is one of the 28 listed source categories. DSM has the potential to emit greater than 100 tons per year of at least one PSD regulated pollutant including nitrogen oxides (NO_x), volatile organic compounds (VOC), and sulfur dioxide (SO₂) and is therefore an existing PSD major stationary source, as defined in 40 CFR 51.166(b)(1)(i)(b).

Because the existing facility is considered a major stationary source, each pollutant with a net emission increase greater than the significance levels is subject to PSD review and must meet certain review requirements. Thus, the emission increases as a result of this modification must

be compared to the "significance levels" as listed in 40 CFR 51.166(b)(23)(i) to determine which pollutants must undergo PSD review.

Potential emissions from the proposed project, including all eleven fiber manufacturing lines and all six fiber processing lines are summarized in the following table:

Pollutant	PSD Significant Net Emissions Increase (tpy)	Emissions Increase (tpy)⁽¹⁾	PSD Review Required?
PM	25	11.1	No
PM-10	15	11.1	No
PM-2.5 ⁽²⁾	Not Available	11.1	-
SO ₂	40	<40 ⁽³⁾	No
NO _x	40	<40 ⁽³⁾	No
CO	100	75.4	No
VOC (ozone precursor)	40	512	Yes

⁽¹⁾ Note that the proposed project is not expected to “debottleneck” any existing operations at the facility. Nor was any emissions netting included in the PSD applicability determination. The emissions increases shown in this table are based on the potential emissions from the equipment identified in the PSD permit application.

⁽²⁾ In the absence of quantified emissions for PM-2.5 for the proposed project, NCDAQ has assumed that PM-2.5 emissions are equal to PM-10 emissions, which is a conservative assumption.

⁽³⁾ Both SO₂ and NO_x emissions from new heaters associated the project shall be limited to no greater than 40 tpy in accordance with 15A NCAC 2Q .0317.

- The potential VOC emissions increase resulting from the proposed project will exceed the respective significant emission rate. Therefore, a major PSD modification review is required for this pollutant.
- In accordance with 15A NCAC 2Q .0317, DSM is accepting permitted limitations on NO_x and SO₂ emissions associated with the proposed project of no greater than 40 tpy each to avoid major PSD modification reviews of these pollutants.
- The potential PM, PM-10, PM-2.5, and CO emissions increases associated with the proposed project are less than the respective significant emission rates. Therefore, a major PSD modification review of these pollutants is not required.
- There are little or no emissions of other PSD regulated pollutants, including lead, fluorides, sulfuric acid mist, hydrogen sulfide, and total reduced sulfur compounds. Therefore, a major PSD modification review of these pollutants is not required.

DSM performed the following reviews and analyses, required for each modified emission unit contributing to the emission increase for any regulated air pollutant equal to or exceeding its significance threshold pursuant to 40 CFR 51.166(j) through (q), for the emission of VOC:

- 1) A Best Available Control Technology (BACT) determination,
- 2) Source impact analysis
- 3) Air quality impact analysis
- 4) Additional Impacts Analysis including effects on soils, vegetation, and visibility
- 5) Class I analysis

Under PSD regulations, the determination of the necessary emission control equipment is developed through a BACT review. BACT is defined, in pertinent part, in 40 CFR 51.166 (b)(12) as:

An emissions limitation... based on the maximum degree of reduction for each pollutant... which would be emitted from any proposed major stationary source or major modification which the reviewing authority, on a case-by-case basis, taking into account energy, environment, and economic impacts and other costs, determines is achievable... for control of such a pollutant.

The BACT requirements are intended to ensure that the control systems incorporated in the design of the proposed project reflect the latest control technologies used in a particular industry and take into consideration existing and future air quality in the vicinity of the facility. Additionally, the BACT analysis must consider the impacts of non-criteria pollutants and unregulated toxic air pollutants, if any are emitted, when making the BACT decision for regulated pollutants. Under the BACT requirement of the PSD regulations, all BACT emission limits must, at a minimum, comply with any applicable standard of performance under 40 CFR Part 60 (New Source Performance Standards) and Part 61 (National Emission Standards for Hazardous Air Pollutants), and the North Carolina State Implementation Plan (SIP). A discussion of the BACT determination can be found in Section 5 of this document.

4.2 NCDAQ Air Pollution Regulations

In addition to the PSD requirements, the NCDAQ has promulgated air pollution control and permitting requirements under Title 15A NCAC Sub-Chapters 2D and 2Q. The NCDAQ emission control regulations that affect the proposed facility are summarized in this section.

4.2.1 15A NCAC 2Q .0101 (All Emission Sources)

This regulation requires the owner or operator of all sources for which there is an ambient air quality or emission control standard that is not exempted from permit requirements to apply for an air quality permit. The owner or operator of a source required to have a permit shall not begin construction or operation of the source without first obtaining a permit. The proposed new and modified emissions sources are not exempted and thus, DSM is required to file an air permit application and obtain a permit prior to any construction of the source. DSM has submitted the required application and information sufficient to obtain an air quality permit, including all information required pursuant to 15A NCAC 2D .0530 "Prevention of Significant Deterioration".

4.2.2 15A NCAC 2D .0503 (Combustion Sources)

Emissions of particulate matter from the combustion of natural gas and No. 2 fuel oil are limited based on the facility-wide heat input capacity of affected sources. Emissions of PM from previously permitted combustion sources (ID Nos. F0951, F0952, F0953, F0954, and F0955) shall not exceed 0.31 pounds per million Btu heat input. Emissions of PM from combustion sources being permitted for the first time (ID Nos. F0956A, F0956B, F0957A, F0957B, F0958A, F0958B, HWH1, HWH2, HWH3, HWH4, HWH5, HWH6A, HWH6B, HWH7A, HWH7B, HWH8A, and HWH8B) shall not exceed 0.22 pounds per million Btu heat input.

4.2.3 15A NCAC 2D .0516 (Combustion Sources)

Sulfur dioxide emissions from combustion sources may not exceed 2.3 pounds per million Btu heat input. Due to the inherently low sulfur concentrations in natural gas and No. 2 fuel oil, compliance with this standard is anticipated.

4.2.4 15A NCAC 2D .0521 (All Potential Sources of Visible Emissions)

Visible emissions from all potential sources that are not covered under any other applicable regulation, including both combustion sources and process units, shall be limited to no greater than 20% opacity when averaged over a six-minute period. However, six-minute averaging

periods may exceed 20% not more than once in any hour and not more than four times in any 24-hour period. In no event shall the six-minute average exceed 87 percent opacity.

4.2.5 15A NCAC 2D .0524, 40 CFR 60, Subpart HHH (Fiber Manufacturing Lines)

This New Source Performance Standard (NSPS) limits overall VOC emissions from the fiber manufacturing process to no greater than 34 pounds per ton of solvent used (lbs/ton solvent). Testing, monitoring, and recordkeeping associated with the NSPS limit shall be identical to the requirements for demonstrating compliance with the BACT limit for these sources (12 lbs ton/solvent). The NSPS is not applicable to the fiber processing line, as no fiber manufacturing occurs at these sources.

4.2.6 15A NCAC 2D .0530 (All VOC Emission Sources)

PSD review and implementation of BACT is required for this major modification. Further information regarding the BACT requirements and project-specific BACT determination are provided in Sections 4.1 and 5.0 of this document.

4.2.7 15A NCAC 2D .0535 (All Emission Sources)

This regulation applies to all permitted facilities and outlines the procedures of reporting excess emissions as a result of malfunctions or operational upsets. The facility owner/operator must notify the appropriate regional office of any excess emissions that last for greater than four hours. This report must be made within 24 hours of becoming aware of the occurrence.

4.2.8 15A NCAC 2D .1100 and 2Q .0700 (Fiber Processing Lines)

This rule limits the emissions of toxics air pollutants (TAPs) (state-enforceable only) requiring air dispersion modeling for any regulated TAP with actual emissions in exceedance of the TAP Permitting Emission Rate (TPER) to demonstrate compliance with the Acceptable Ambient Level (AAL) guidelines. The fiber manufacturing lines are not a potential source of TAP emissions (except from the combustion of unadulterated fuel, which is exempt), and are not subject to this rule. However, the printing operations associated with the fiber processing lines are potential sources of TAP, including as much as 3 tpy methyl ethyl ketone (MEK) and as much as 9 tpy of toluene and triethylamine, combined.¹ The DSM permit has existing TAP

¹ Maximum increases based on a BACT limitation of 12 tons per consecutive 12-month period for all six lines.

limitations in its permit based on previously submitted and approved compliance demonstrations. The emissions increases associated with this project will not exceed previously determined emissions limitations. No additional TAP modeling is required as part of this permit application.

4.2.9 15A NCAC 2D .1111 (MACT Standards)

The existing permit has a MACT avoidance condition (15A NCAC 2Q .0317) in Section 2.2.F.2. that requires monthly monitoring of facility-wide hazardous air pollutant (HAP) emissions and semiannual reporting of such emissions. Facility-wide emissions shall not exceed 10 tons per year (tpy) of any individual HAP or 25 tpy of combined, aggregated HAP in order to avoid applicability of any potentially applicable MACT standards. DSM proposes to continue complying with this 10 tpy/25 tpy emission limitation to avoid MACT applicability. DSM shall include all HAP emitting sources in the monthly compliance demonstration, including new combustion sources and fiber processing lines included in this proposed modification.

4.2.10 15A NCAC 2D .0958 (VOC Emission Sources)

This rule provides work practice standards for VOC emissions sources to limit evaporative losses. Both the fiber manufacturing lines and the fiber processing lines are subject to these work practice standards.

4.2.11 15A NCAC 2Q .0317 (Combustion Sources, NO_x)

In order to avoid applicability of the PSD permitting requirements pursuant to 15A NCAC 2D .0530, total NO_x emissions from affected sources, specifically combustion sources associated with the proposed project, shall be limited to less than 40 tpy.

4.2.12 15A NCAC 2Q .0317 (Combustion Sources, SO₂)

In order to avoid applicability of the PSD permitting requirements pursuant to 15A NCAC 2D .0530, total SO₂ emissions from affected sources, specifically combustion sources associated with the proposed project, shall be limited to less than 40 tpy.

5.0 BEST AVAILABLE CONTROL TECHNOLOGY

5.1 Introduction

Each pollutant subject to a PSD review must apply BACT, which refers to the maximum amount of emission reduction currently possible with respect to technical application and economic, energy, and environmental considerations. Given the variation between emission sources, facility configuration, local airsheds, and other case-by-case considerations, Congress determined that it was impossible to establish a single BACT determination for a particular pollutant or source. Economics, energy, and environmental impact are mandated in the Clean Air Act to be considered in the determination of case-by-case BACT for specific emission sources. In most instances BACT may be defined through an emission limitation. In cases where this is impossible BACT can be defined by the use of a particular type of control device and its achievable emission reduction efficiency. In no event can a technology be recommended which would not comply with any applicable standard of performance under 40 CFR Parts 60 and 61.

As a result of the EPA remand involving the North County Resource Recovery project in Region IX, the effects of non-regulated PSD pollutants, such as toxic air pollutants, are to be accounted for in determining if the BACT otherwise being prescribed for a regulated pollutant still represents an appropriate level and type of control. There is no specific formula for making PSD decisions for unregulated pollutants; this is a case-by-case process involving the judgment of the reviewing authority. If the reviewing authority judges the potential environmental effects of such unregulated pollutants to be of possible concern to the public, then the final BACT decision for a regulated pollutant should address these efforts and reflect, as appropriate, the control technology beyond what might be otherwise chosen as BACT.

To assist in bringing consistency to the BACT process, the EPA developed guidance for PSD applicants to use the "top-down" approach to BACT. However, NCDAQ does not strictly adhere to EPA's top-down guidance. Rather DAQ implements BACT in strict accordance with the statutory and regulatory language. As such, DAQ's BACT conclusions may differ from those of the applicant or EPA.

In general, the top-down approach consists of five basic steps. These are:

- Step 1. **Identify all control technologies** – Develop a comprehensive listing of control technologies for each applicable pollutant.
- Step 2. **Eliminate technically infeasible options** – Conduct a demonstration of technical feasibility to ensure the technology evaluated was appropriate for the characteristic gas stream to be treated.
- Step 3. **Rank remaining control technologies by control efficiencies** – Rank the remaining control technologies by control effectiveness, including the control efficiencies (percent of pollutant removed), expected emission rate (tons per year), expected emission reduction (tons per year), economic impacts (total cost effectiveness, incremental cost effectiveness), environmental impacts (including emissions of toxic or hazardous air contaminants), and energy impacts (benefits or disadvantages).
- Step 4. **Evaluate the most effective controls and document results** – Conduct a case-by-case evaluation of energy, environmental, and economic impacts
- Step 5. **Select BACT** – Select the most effective option not rejected as BACT for the emission source

As indicated in Section 4.1 above, the change in emissions due to the project for VOC will exceed the respective significance thresholds. This BACT analysis will focus on applicable VOC control techniques for the proposed fiber manufacturing lines and fiber processing lines.

5.2 Previous BACT/LAER Determinations

DSM and NCDAQ searched the RACT/BACT/LAER Clearinghouse (RBLC) to identify any previous BACT determinations for emissions of VOC from fiber manufacturing/processing facilities (Synthetic Fibers Production, Process Type 65.000). The search was based on the time period beginning January 1, 2001 and ending June 30, 2007. The search identified two previous determinations for solvent recovery at fiber manufacturing facilities, as follows:

Determination A: RBLC ID No. AI-0193, October 1, 2002

Facility/Process: Radicispandex Corporation, Spandex Fiber Production

BACT: Fish Tail Condensers

Limits: 37 ppm VOC, 17 lbs VOC/1,000 lbs solvent

Cost Effectiveness: \$3,526/ton

Determination B: VA-0252, December 8, 2002

Facility/Process: EI Dupont De Nemours & Co., Nomex Production Area & Solvent Recovery Area

BACT: LDAR (fugitive sources), Scrubber (point sources)

Limits: Nomex Production Area – 1,278 lbs/hr, 557.3 tpy, 50% control

Solvent Recovery Area – 3.5 lbs/hr, 1.5 tpy, 95% control

Cost Effectiveness: Not Provided

Because of the low number of identified determinations for fiber manufacturing/processing plants, DSM also conducted an RBLC database search on Surface Coating/Printing/Graphic Arts processes (Process Type 41.000) to identify more technologies determined to be BACT for evaporative-type VOC emissions. This RBLC search identified condensation, oil scrubbers, adsorption, and thermal oxidation as BACT for the control of building and process vents and carbon absorption, floating roofs, and venting to a thermal oxidation units as BACT for VOC storage tanks.

5.3 Applicable New Source Performance Standards (NSPS) and National Emission Standards for Hazardous Air Pollutants (NESHAP)

As provided in Section 5.1 above, BACT for the affected fiber manufacturing lines and fiber processing lines cannot be less stringent than any applicable NSPS or NESHAP. The fiber processing lines are not subject to any NSPS or NESHAP pursuant to 40 CFR Parts 60, 61 and 63. The fiber manufacturing line is subject to the NSPS for Synthetic Fiber Production Facilities (40 CFR Part 60, Subpart HHH), which limits VOC emissions from the process to no greater than 34 lbs VOC per ton of solvent feed.

There are no NESHAPs applicable to the fiber manufacturing line. This facility is an area source of HAP, with federally-enforceable permit conditions limiting emissions of any individual HAP to no greater than 10 tpy and of total, aggregated HAP to no greater than 25 tpy. In addition, the manufactured fiber is not an acrylic, modacrylic, or spandex fiber (40 CFR 63, Subparts UU, YY, and LLLLLL) or a cellulose product (40 CFR 63, Subpart UUUU).

5.4 Company-Submitted BACT Analysis

5.4.1 Fiber Manufacturing Lines – Characterization of the Waste Streams

VOC emissions from each proposed manufacturing line result from evaporative solvent losses in the manufacturing process, fugitive emissions from UDY roll-off boxes, storage tank vents, and combustion sources. Each DAP line is contained in its own production building with extensive exhaust systems that are balanced to maintain a negative pressure in the building such that there are no fugitive emissions from the building. Waste streams from the proposed fiber manufacturing lines can be placed in five (5) general categories, as follows:

- **Concentrated Evaporative Losses** – Waste streams from the manufacturing process contain VOCs at varying concentrations. Some level of solvent loss occurs throughout the process, but it is most heavily concentrated at the extrusion/quench area, the inlet and outlet areas of the primary drying oven. Emissions from these areas are collected by a localized exhaust hood capture system. In addition, various building exhaust areas surrounding the manufacturing process contain more heavily concentrated VOC. These exhaust areas are collected in a system of ductwork called the Air Handling Unit (AHU).

Each of these streams are routed to VOC concentrators (condensers) to recover and recycle solvent. Solvent recovered from these streams is routed to a recycle solvent separator and super separator and then re-used in the fiber manufacturing process. Exhaust from the concentrators is subject to further emissions control, pursuant to the BACT determination detailed in Section 5.4.3.1 of this document.

- **General Building Exhaust** – In addition to the exhaust points listed above, there are general building exhaust points (EF-Ps) with lower VOC concentrations, including building exhaust points near the final drying oven, areas affected by fiber line breaks, and miscellaneous exhaust points. There can be rapid changes in the concentration of organics as a result of upsets (fiber breaks) in the manufacturing process. The somewhat frequent, but non-routine, fiber line breaks result in exhaust gas VOC concentrations three times higher than routine operations. In evaluating technical feasibility, DSM considers the effect of fluctuations in the VOC concentration of this waste stream. In addition, the exhaust vents close to the final drying ovens have concentrations of paraffin, which are also considered when evaluating the available control technologies.

Stack testing at DAP1 and DAP2 (January and June 2006) show that emission rates from the general building exhaust points vary between 0.08 pounds per hour and 1.17 pounds per hour with the highest emission rates being associated with the final drying oven areas. The combined air flow from these exhaust points is approximately 33,000 standard cubic feet per minute (scfm) and total, uncontrolled emissions are approximately 16 tpy. Results from these stack tests are presented in Table 4-2 of the PSD permit application.

- **Roll-Off Box Fugitive Emissions** – During periods of fiber manufacturing startup, shutdown, and malfunction, the undrawn yarn (UDY) generated between the fiber spinning head and the oven is unusable. This unusable, solvent-laden UDY is placed into totes, which are closed and carried to a UDY Roll-Off Box located outside the DAP building for storage until it can be picked up for offsite disposal. Fugitive VOC emissions may occur from the UDY Roll-Off Box each time the box is opened.
- **Storage Tank Vents** – Solvent for the fiber manufacturing process is stored in vented tanks. Working and breathing losses from the tanks result in VOC emissions.
- **Combustion Source Emissions** – Each DAP manufacturing line has natural gas/No. 2 fuel oil fired heaters. There are some VOC emissions associated with natural gas and No. 2 fuel oil firing.

5.4.2 Identification of VOC Control Technologies and Technical Feasibility

DSM identified the following VOC control technologies from the RBLC database search and additional research:²

² NOTE: The following table does not include all control options for storage tanks. Tank-specific control options are provided in Section 5.4.3.4, which includes the BACT determination for the affected tanks.

TABLE 5.4.2-1. Identification of VOC Control Technologies

CONTROL TECHNOLOGY	TECHICAL FEASABILITY DISCUSSION	CONSIDERED FURTHER?
<p>Thermal Oxidation (Direct-Flame Incineration/Recuperative Incinerators)</p>	<p>Direct-flame incineration is the thermal oxidation of VOC in the presence of a flame. The technology is generally used when the vent streams contain high concentrations of VOCs. In vent streams containing low concentrations of VOCs, supplemental fuel such as natural gas must supply almost all the heat required to reheat the vent gases from inlet temperatures to combustion temperatures of 1,600°F to 2,000°F. Destruction efficiencies of 98% are typical for direct-flame incinerators. This technology is technically feasible and is evaluated further.</p> <p>A recuperative incinerator is a contained direct-flame incinerator with heat recovery in the form of a waste gas inlet/outlet heat exchanger. Considerable fuel cost savings are realized by using the hot outlet gases from the combustion chamber to preheat the inlet gases. These inlet/outlet heat exchangers can recover up to 70 percent of the energy released in the combustion chamber. The combustion chamber is typically fired with a supplementary fuel, such as natural gas/No. 2 fuel oil, if the heat of combustion associated with the waste gas combustibles are not sufficient to maintain adequate destruction efficiencies. High temperature, high residence time recuperative incinerators can achieve destruction efficiencies greater than 98 percent. This technology is technically feasible and is evaluated further.</p>	<p>YES</p>
<p>Regenerative Thermal Oxidizers (RTOs)</p>	<p>The most energy efficient type of thermal oxidizer is the RTO, which can recover 75 to 95 percent of the heat used during oxidation, thereby reducing fuel costs. A major problem affecting the technical and economic feasibility of the RTO is the plugging of the passageways in the ceramic media beds by particulate matter, which is known as fouling. Fouling adversely affected the operation, performance, and efficiency of the control device. Therefore, at some frequency the solid residues plugging the media bed must be removed or the bed material must be replaced. This technology is technically feasible and is evaluated further.</p>	<p>YES</p>

TABLE 5.4.2-1. Identification of VOC Control Technologies

CONTROL TECHNOLOGY	TECHICAL FEASABILITY DISCUSSION	CONSIDERED FURTHER?
Catalytic Incineration	<p>Catalytic incinerators contain a catalyst bed that facilitates the overall combustion/oxidation reaction by increasing the reaction rate. The catalyst also enables conversion of VOCs to carbon dioxide and water a lower reaction temperatures than in thermal incineration devices. Limitations to catalytic incinerators include potential “poisoning”, or degradation, of the catalyst by the compounds in the waste stream. In addition, particulate matter can blind the pores of the catalyst, again reducing the catalytic activity. In addition, the volumetric flow rate and the concentration of combustibles in the gas flowing to the catalytic incinerator should be constant for optimal operations. Large fluctuations in the flow rate and/or concentration of VOCs will cause the conversion of the VOCs to fluctuate also and can potentially increase temperatures in the catalyst bed resulting in destruction or degradation of the catalyst.</p> <p><i>This technology is NOT technically feasible and is not evaluated further because of the rapid changes in the concentration of organics in the proposed waste stream due to fiber breaks.</i></p>	NO
Absorption (Wet Scrubbers)	<p>Absorption is a process where one or more soluble components of a gas mixture are dissolved in a liquid. Scrubbers typically used as solvents include water, mineral oils, non-volatile hydrocarbon oils, and aqueous solutions. The suitability of scrubbers as a pollution control method is generally dependent on (a) the availability of a suitable solvent, (b) required removal efficiency, (c) pollutant concentration in the inlu vapor, (d) capacity required for handling waste gas, and (e) recovery value of the pollutants or the disposal cost of the spent solvent. This technology is technically feasible and is evaluated further.</p>	YES

TABLE 5.4.2-1. Identification of VOC Control Technologies

CONTROL TECHNOLOGY	TECHICAL FEASABILITY DISCUSSION	CONSIDERED FURTHER?
Condensation	<p>Condensation is the physical change of a vapor to a liquid. Condensers, may be refrigerated or non-refrigerated. The removal efficiency of a condenser is dependent on the emission stream characteristics, including the nature of the VOC, concentration of the VOC, and the type (if any) of coolant used. A condenser cannot lower the VOC concentration of the exhaust stream to levels below the saturation concentration at the temperature of the condenser. This technology is used for solvent recovery following the primary drying oven. This control technology is technically feasible and is evaluated further.</p>	YES
Adsorption/Desorption (“Concentrators”)	<p>In adsorption devices, condensable VOC vapors in the exhaust streams are “adsorbed” onto the surface of a solid on the surface of an adsorbent material. The adsorbed material is held to the surface of the adsorption material physically (vs. chemically), and can be released (desorbed) by either elevated temperature or a vacuum. When desorbed, the VOC vapors are generally released at a higher concentration of VOC to allow more economical destruction by incineration, or recovery by either membrane or condenser. For this reason, adsorption/desorption systems are often called “concentrators”.</p> <p><i>Adsorption is not considered to be technically feasible for the control of the building exhaust vents, which include the areas around the final drying oven. The emissions from the final drying oven may include concentrations of low-volatility paraffin (from the anti-static additives). The auto-ignition temperature of the paraffin is lower than the regenerative temperature for the concentrators, which would prevent safe regeneration of the control devices. Without regeneration, the adsorption material would become coated in volatile organic liquid and be rendered ineffective. This control technology is deemed to be technically infeasible for control of the general building exhaust vents, only.</i></p> <p>This control technology is technically feasible for the control of other VOC emission sources associated with the proposed project.</p>	<p>YES (except for the building vent exhaust streams)</p>

TABLE 5.4.2-1. Identification of VOC Control Technologies

CONTROL TECHNOLOGY	TECHICAL FEASABILITY DISCUSSION	CONSIDERED FURTHER?
Biofiltration	<p>In a typical biofilter application, the waste stream is humidified prior to entering a biological reactor. The conditioned waste stream then flows through a fixed bed reactor where the VOCs contact a filter media and transfer from the vapor phase to the liquid phase. The liquid phase is represented by a thin biological (bacterial) film surrounding each filter media particle. The bacteria break down the VOCs, which are ultimately oxidized into carbon dioxide and water through biological processes. The reactor is designed to consistently control moisture and temperature to achieve maximum bacterial performance. Although biofilters can achieve relatively high destruction efficiencies (>98%), the nature of the contaminant, its gas stream concentration, and the volumetric flow rate of the gas stream can result in the need for long residence times. The following gas stream conditions require large reactor volumes to achieve sufficient residence times, making the process uneconomical: moderate to high gas flow rates, moderate to high VOC concentrations, highly variable VOC concentrations, moderate to heavy molecular weight VOCs, and biologically toxic VOCs.</p> <p><i>This technology is NOT technically feasible and is not evaluated further. The chemical structure of the VOC makes it more difficult for biological digestion and would require a very long retention time (requiring a very large and impractical biofilter). There is currently no biofilter vendor with experience with biological destruction of the emitted VOC.</i></p>	NO

5.4.3 BACT Determination – DAP Manufacturing Lines

5.4.3.1 Concentrated Evaporative Losses (Extruders/Quenchers, Primary Drying Oven, AHUs)

From the RACT/BACT/LAER Clearinghouse (RBLC) database and other reference sources, the following VOC control technologies were identified as being technically feasible for building and process vents: condensation, oil scrubbers, adsorption, and destruction using thermal oxidation. VOC destruction using thermal oxidation is almost always the most effective control option. Because the extruder and primary oven vents emit 50 to 60% of the VOC emissions from each building, DSM proposes the use of regenerative thermal oxidation (RTO) as BACT to achieve a maximum VOC emission rate from each of the fiber manufacturing lines of no greater than 12 lbs per ton of solvent feed (12 lbs/ton solvent).

After the extruders and the primary drying oven, the next highest emitting building emission point is the air handling unit (AHU) exhaust. Because the AHU emits 15% of the VOC emissions from each building DSM proposes as BACT the use of regenerative thermal oxidation as the control option for the air handling unit exhaust for DAP2 through DAP8B. DSM also evaluated the feasibility of routing the AHU at DAP1 (ID Nos. GBL1-1) to the existing RTO at DAP2 and DAP3. This control option was found to be \$70,000 per ton of VOC removed due to the high flow rate and low VOC concentration of the stream, and the cost of the retrofitting, and was therefore deemed to be economically infeasible.

Enclosure was evaluated as a method of improving capture and control of the concentrated evaporated loss area. It was determined that enclosure of these process areas (i.e., the extrusion/quench and primary drying operations) would require much higher exhaust fan flow rates (due to OSHA indoor air requirements). Without enclosure, required exhaust fan rates are approximately 20,000 standard cubic feet per minute (scfm). With enclosure, required exhaust fan rates would increase to approximately 200,000 scfm. The increased airflow would require much larger RTOs, and increase the cost of control to the point that it would no longer be economically feasible.

Proposed BACT. BACT for the concentrated evaporated losses is proposed to be concentrators followed by RTOs. Overall BACT for each fiber manufacturing line (DAP1 through DAP8B) shall be 12 lbs VOC/ton solvent. This limitation shall include losses from the controlled concentrated evaporative loss stream, the building exhaust vents, the UDY Roll-Off Boxes, and the storage tank emissions.

5.4.3.2 General Building Exhaust

Four methods of VOC control are evaluated as technically feasible options: direct flame oxidizers (including recuperative-type oxidizers), RTOs, wet scrubbers, and condensers. These control technologies have varying VOC control efficiencies, as provided below:

Direct Flame Oxidation:	98% VOC Control
RTO:	95% VOC Control
Wet Scrubbing:	95% VOC Control
Condensation:	85%-95% VOC Control

Environment Impacts Analysis: NCDAQ eliminated Direct Flame Oxidation from further evaluation because it results in significantly higher NO_x emissions than the RTO, wet scrubber, and condenser. Each installed direct-flame oxidation unit would result in NO_x emissions of approximately 15 tpy, versus approximately 2 tpy for each RTO, and no NO_x from the wet scrubbing and condensation units. It should be emphasized here that ozone formation in the southeast is generally “NO_x-limited” due to high concentrations of natural VOC concentrations in the ambient air. Because ozone formation in the southeast is more dependent on increases in NO_x emissions than increases in VOC emissions, the environmental impacts analysis excludes the relatively higher NO_x-emitting control technology from further consideration. Remaining control strategies include the RTOs, wet scrubbers, and condensers.

Economic Impacts Analysis. In the economic analysis, DSM assumed the combination of the building exhaust vents from three DAP lines (using DAP 1, 2, and 3). The concentrated evaporative losses from these streams are currently controlled by a single RTO, which reduces the required capital investment and operating/maintenance costs for multiple control devices. Combined, the building exhaust vents have an air flow rate of approximately 120,000 scfm and

combined VOC emission rate of approximately 56 tpy (See Section 5.4.1 of this document for details). Due to the high volume, low concentration nature of the controlled streams, the economic impact of using add-on control to reduce VOC emissions was deemed to be infeasible. Cost per ton controlled estimates (in \$/ton) are shown below:

RTO:	\$36,124/ton
Wet Scrubbing:	\$50,668/ton
Condensation:	\$50,407/ton

The economic impact analysis is provided in Table 4-4 and Appendix B of the PSD permit application. Based on recent BACT determinations (i.e., \$3,526/ton, RBLC ID No. AI-0193, October 1, 2002) the installation and operations of these control devices is deemed to be cost prohibitive.

Per NCDAQ request, DSM also performed an analysis of the cost of controlling only the “next-highest” VOC concentration streams, which are the exhaust points near the final drying ovens. These streams cannot be routed through existing concentrators due to the presence of paraffin in the exhaust. The high flow rates associated with these streams (33,000 acfm, 20.3 tpy VOC) also prevent the stream from being routed to existing RTOs. The installation of a new add-on control device for only the final drying oven streams is over twice as high as controlled all building exhaust vents together, and is deemed to be cost prohibitive.

Proposed BACT. BACT for the general building exhaust streams is proposed to be no control. Overall BACT for the fiber manufacturing process shall be 12 lbs VOC/ton solvent used. This limitation shall include losses from the controlled concentrated evaporative loss stream, the building exhaust vents, the UDY Roll-Off Boxes, and the storage tank emissions.

5.4.3.3 UDY Roll-Off Boxes

As described in Section 5.4.1, fugitive VOC emissions occur each time the UDY Roll-Off Box is opened. DSM anticipates filling/shipping approximately three (3) boxes per month. Fugitive VOC emissions are calculated assuming approximately 0.27 lbs of VOC are emitted each time the box is opened. Based on the volume of each tote, the volume of the UDY Roll-Off Box, and

the estimated number of shipments, annual VOC emissions from the facility are estimated to be 0.25 tpy:

$$\frac{3 \text{ boxes/month} * 12 \text{ months/yr} * 52 \text{ totes/box} * 0.27 \text{ lbs/tote}}{2,000 \text{ lbs/ton}} = 0.25 \text{ tons/yr}$$

To demonstrate that no add-on control device for a 0.25 tpy VOC exhaust stream would be economically feasible, DSM determined the annual or capital cost of an add-on control device that would result in a cost efficiency of \$10,000/ton controlled (a value well above the cost effectiveness of previous BACT determinations for similar industries), as follows:

Annual Cost: \$2,500/year
 $0.25 \text{ tons/yr} * \$10,000/\text{ton} = \$2,500/\text{yr}$

Capital Cost*: \$16,800
 $\$2,500 / 0.149 = \$16,800$
** Assuming a money cost of 8%, the capital recovery factor for a ten-year life is 0.149.*

Proposed BACT. Based on the economic feasibility analysis shown above, BACT is determined to be good operating and maintenance practices, including minimizing the number of times the Roll-Off Box is opened, and maintaining the mechanical integrity of the Roll-Off Box such that the box and door seals of the box are maintained in a leak free condition. Operation at the Roll-Off Boxes must be consistent with the VOC Work Practice Standards, applicable pursuant to 15A NCAC 2D .0958. Overall BACT for the fiber manufacturing process shall be 12 lbs VOC/ton solvent used. This limitation shall include losses from the controlled concentrated evaporative loss stream, the building exhaust vents, the UDY Roll-Off Boxes, and the storage tank emissions.

5.4.3.4 Storage Tanks³

The solvent, which is a not a regulated toxic or hazardous air pollutant, will be stored in two vented tanks with storage capacities of 37,509 gallons and 52,834 gallons. The solvent has an

³ NOTE: The organic solvent stored does not contained regulated hazardous or toxic air pollutants. The maximum true vapor pressure of the solvent is less than 0.02 psia. The NSPS for VOL storage tanks, 40 CFR 60, Subpart Kb, does not apply to these tanks.

average vapor pressure of less than 0.01 psia and a maximum true vapor pressure of less than 0.02 psia. Note that the NSPS for VOL storage tanks (40 CFR 60, Subpart Kb) does not require emission control of storage tanks of this size with vapor pressures below 3.5 psia. Based on the U.S. EPA-approved TANKS 4.1.9d program, VOC emissions from the two solvent tanks total 44 pounds per year. DSM identified the following available storage/emission control strategies: floating roofs, fixed roof tanks equipped with conservation (pressure/vacuum vents), fixed roof tanks equipped with vapor collection and control equipment, and uncontrolled fixed roof tanks.

However, based on the economic analysis, the cost effectiveness of each of the identified control technologies exceeded \$10,000/ton. None of the identified control technologies was found to be economically feasible for the control of 44 pounds VOC per year.

Proposed BACT. BACT for the storage tanks is proposed to be no control. Overall BACT for the fiber manufacturing process shall be 12 lbs VOC/ton solvent used. This limitation shall include losses from the controlled concentrated evaporative loss stream, the building exhaust vents, the UDY Roll-Off Boxes, and the storage tank emissions.

5.4.3.5 Overall BACT Compliance Demonstration Requirements

Overall BACT for the fiber manufacturing process shall be 12 lbs VOC/ton solvent used. This limitation shall include losses from the controlled concentrated evaporative loss stream, the building exhaust vents, the UDY Roll-Off Boxes, and the storage tank emissions. Compliance with the limitation shall be demonstrated on a monthly basis by monitoring emissions, as follows:

- Solvent feed rates to each fiber line will be monitored,
- Emissions from the concentrator and RTO stacks and the air handling units with a VOC analyzer and flow meter (i.e., continuous monitoring),
- Emissions from the uncontrolled building exhaust vents will be determined by multiplying the pre-concentrator emission rate from the AHUs by a multiplier determined during stack testing (see draft permit for details),
- Emissions from the UDY Roll-Off boxes will be determined by tracking the number of totes generated by each manufacturing line and multiplying the total by 0.27 lbs/tote, and
- Emissions from the storage tanks will be monitored by tracking tank throughputs.

5.4.4 BACT Determination – Combustion Sources

Each DAP manufacturing line has associated natural gas and No.2 fuel oil-fired hot oil heaters, hot water heaters, and RTOs. An economically feasible add-on control device for these small sources of VOC emissions is not available. BACT for these control devices is determined to be best combustion practices.

5.4.5 BACT Determination – Fiber Processing Lines

At the six fiber processing lines (ID Nos. FL-1 through FL-6), fiber from DSM's fiber manufacturing facilities located in the Netherlands and United States is made into a non-woven fabric. Potential VOC emissions result from the evaporation of low concentrations of toluene and triethylamine in the laminating additives, and methyl ethyl ketone (MEK) in the printing solvent. The toluene and triethylamine in the laminating additives originates from the use of these chemicals as equipment cleaning agents in the manufacturing process, and are not a required part of the additive formula. As such, the concentration levels are less than one percent of the laminating additives. The MEK is the ink solvent used in the ink to print the Dyneema name/logo on the non-woven fabric.

DSM is proposing to limit total VOC emissions from the fiber processing lines to no more than 25 tons per consecutive 12-month period. The BACT analysis, detailed below, shows that no add-on control device is economically feasible to control VOC emissions from these lines.

BACT Analysis. Each six fiber processing lines will be housed in a separate building, each equipped with three exhaust vents as follows:

- one located above the fiber impregnation area (~3,500 scfm);
- one located above the lamination area (~2,000 scfm); and,
- one located over the unwinding/winding station (~3,500 scfm).

Total airflow from each of this six buildings will be approximately 9,000 scfm. To determine the lowest possible cost of installing and operating an add-on VOC control device, it was

assumed that the exhaust from all six fiber processing lines would be ducted together and routed to a shared emissions control device, resulting in a total inlet airflow of ~54,000 scfm.⁴

Under this assumption, the cost of controlling VOC varied from \$24,238/ton (Regenerative Thermal Oxidation) to \$203,047/ton (Recuperative Thermal Oxidation). From this analysis, it was determined that add-on control of 25 tpy VOC from the six fiber processing lines is cost prohibitive.

Proposed BACT. The fiber processing lines are given a BACT limit of 25 tons per consecutive 12-month period with no add-on control equipment. Compliance with the emission limitations shall be demonstrated on a monthly basis by tracking total laminating additive and ink usage at each line, along with VOC concentrations of these compounds, and assuming 100% evaporative loss to the atmosphere.

5.5 Overall BACT Summary

The following table presents a summary of the BACT determinations for the PSD affected sources proposed in the air permit application.

Overall BACT Summary

EMISSION SOURCE	POLLUTANT	BACT EMISSION LIMITS	CONTROL TECHNOLOGY
Fiber Manufacturing Lines, including:	VOC	12 lbs/ton solvent (6-month average)	See Below
<i>Concentrated Evaporative Losses</i>	<i>VOC</i>	<i>(See Above)</i>	<i>Concentrators in series with RTOs</i>
<i>General Building Vents</i>	<i>VOC</i>	<i>(See Above)</i>	<i>No Control</i>
<i>Storage Tanks</i>	<i>VOC</i>	<i>(See Above)</i>	<i>No Control</i>
<i>UDY Roll-Off Boxes</i>	<i>VOC</i>	<i>(See Above)</i>	<i>Best Operation/ Maintenance Practices</i>
Combustion Sources	VOC	-	Best Combustion Practices
Fiber Processing Lines	VOC	25 tons/rolling 12-months	No Control

⁴ The fiber processing lines will not be located close enough to the fiber manufacturing lines to share an add-on control system.

6.0 AIR QUALITY IMPACT ANALYSIS

PSD regulations [40 CFR 51.166 (k)] require an applicant to perform an ambient impact analysis to demonstrate, 1) that no National Ambient Air Quality Standard (NAAQS) will be exceeded at any location and during any time period where the proposed new source or modification will have significant impact; and 2) that the proposed new source or modification, in combination with other increment-affecting sources, will not cause any allowable PSD increment to be exceeded. Volatile organic compounds are the only NAAQS pollutant to exceed the PSD significance level, thus requiring a review.

6.1 Volatile Organic Compounds (VOC's)

VOC's are considered precursors to ozone formation. PSD regulations [40 CFR 51.166(i)] states that an ambient impact analysis of ozone, including the gathering of ambient air quality data, is required if the net VOC emission increase is greater than 100 tons per year. The emissions increase due to the proposed modification will increase VOC emissions in excess of 100 tons per year. Previous and ongoing regional air dispersion modeling efforts to determine ozone attainment within the North Carolina air shed have shown that VOC emissions at this level (512 tons per year) will not contribute to significant ozone formation. No additional monitoring or modeling is required.

6.2 Non-Regulated Pollutant Impact Analysis (North Carolina Toxics)

NC DAQ received and approved a facility-wide toxics compliance demonstration previously submitted by DSM. In the previous compliance demonstration, facility-wide TAP emissions were maximized such that the modeled ambient impacts fell just below the respective Acceptable Ambient Level (AAL) guidelines. The proposed project will not increase regulated TAP emissions above the permitted limitations and an updated compliance demonstration is not required as part of this permit application.

7.0 ADDITIONAL IMPACT ANALYSES

An additional impacts analysis was performed to determine air pollution impacts on visibility, growth, soils, and vegetation from the proposed modifications at the DSM facility. The additional impact analysis focused on the potential effects of VOC's because these are the compounds that will be emitted in excess of PSD significance emissions levels.

A literature search was performed to identify information on the potential adverse impacts of VOC's in general. Although significant literature exists documenting adverse impacts on vegetation, soils, and visibility from other criteria pollutants (e.g., SO₂, NO_x, PM), very few studies have addressed the effects of VOC's. Because VOC's can be photochemically transformed into tropospheric ozone, the potential adverse impacts of ozone were also researched and are discussed below. The analyses are presented pursuant to the requirements of the PSD regulations.

Based on the findings, no adverse impacts to soils, vegetation, or visibility are expected from the proposed facility expansion.

7.1 Growth Impact Analysis

The proposed project will add jobs to DSM, which may result in small increases in employee traffic entering and leaving the facility. In addition, the increased production at the facility will result in a limited increase of truck traffic at the facility. This facility has had a steady increase in jobs and associated traffic over the past ten years. The increases associated with this project are less than the growth associated with the past ten years, and are considered to be insignificant in comparison.

7.2 Effects on Vegetation

The vegetation analysis is limited to an evaluation of “vegetation with any commercial or recreational value” (*NSR Workshop Manual*). The major cash crops grown in Pitt County include corn, wheat, and tobacco.

The health and well being of vegetative ecosystems are dependent on many environmental (e.g., precipitation, insects, disease) and anthropogenic factors (e.g. logging, urban sprawl, pollution). All

of these factors combined influence the overall health and productivity of vegetative ecosystems, including croplands and forests. The effects of ozone on individual plants and the factors that modify plant response to ozone are complex and vary with species, environmental conditions, and soil and nutrient conditions. Factors such as genetic susceptibility, light, temperature, relative humidity, soil nutrients, and soil moisture influence the uptake of ozone. Symptoms of air pollution-related damage include reduction in growth rates, reduction in reproductive rates, direct foliar damage, and mortality.

Biogenic sources are also very important contributors to VOC emissions. In the Southeastern US it is estimated that biogenic sources exceed anthropogenic VOC emissions by a factor of five. In NC, the biogenic emissions are estimated to be a factor of two greater than point sources (900 tons/day verses 400 tons/day), which includes industrial facilities such as DSM. Operating at its potential to emit (499 tpy), DSM would be an insignificant fraction of the statewide biogenic and anthropogenic point source emission totals.

Studies have shown that ozone formation in the southeast is generally “NO_x-limited;” that is, ozone formation is more dependent on ambient NO_x than VOC concentrations. Current regulatory strategies for addressing ozone nonattainment in the Eastern US are focused almost exclusively on reducing NO_x emissions. Because NO_x emissions associated with the proposed project will be limited to no greater than 40 tpy, it is reasonable to conclude that the proposed project will not result in significant increases in ozone formation, and therefore will not adversely affect vegetation in the surrounding area.

7.3 Effects on Soil

According to the U.S. Department of Agriculture’s soil survey of Pitt County, soil types within the region are predominantly Norfolk-Lynchburg-Goldsboro, Rains-Lynchburg-Goldsboro, Foreston-Torhunta-Autryville, and Johnston-Meggett-Muckalee. These soils are characterized by well-drained, sandy, and/or loamy soils.

Studies of direct pollutant impacts to soils via atmospheric deposition have focused on acidic precipitation and particulate deposition. Acidic deposition is most closely connected with emissions of SO₂. Because SO₂ emissions associated with the proposed project will be limited to no greater

than 40 tpy and potential PM emissions increases are estimated to be only 11.1 tpy, it is reasonable to conclude that the proposed project will not result in significant increases in acid rain or particulate deposition, and therefore will not adversely soil health in the surrounding area.

7.4 Effects on Visibility

Atmospheric ammonium sulfate $[(\text{NH}_4)_2\text{SO}_4]$, which likely increases with increased SO_2 emissions to the atmosphere, is the major contributor to visibility impairment in North Carolina Class 1 areas. Because SO_2 emissions associated with the proposed project will be limited to no greater than 40 tpy, it is reasonable to conclude that the proposed project will not result in significant visibility impairment.

APPENDIX A
PROPOSED PERMIT

APPENDIX B
PUBLIC NOTICE