Air Quality and Biodiesel Production

Nebraska Department of Environmental Quality

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This report is a compilation of documents, articles, presentations, and regulatory information related to biodiesel production. The document discusses the biodiesel production process, air pollution emission points, NDEQ's air quality permitting process, and air quality permitting and compliance issues. Information about Nebraska's biodiesel plants is also included.

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Introduction

Biodiesel is a renewable fuel for diesel engines derived from natural oils like soybean oil and animal fats. One bushel of soybeans produces approximately 1.4 gallons of biodiesel.[1] When chemically extracted, mechanical expelling of the oil gains one gallon per bushel.

Biodiesel is most often blended with petroleum-based diesel fuel. Biodiesel and biodiesel blends operate in conventional diesel engines. A 2% blend of biodiesel (B2) improves fuel lubricity by 66%.[1] Biodiesel is also used as an oxygenate - in other words, the biodiesel adds oxygen, which allows the diesel to burn more completely.[2]

Biodiesel is seen to have many environmental and energy benefits. Not only is it primarily created from renewable resources, but it also biodegrades four times faster than #2 diesel fuel. Additionally, it has the highest energy balance of any alternative fuel, which means more energy is created from biodiesel than what is needed to produce it.[1] Generally, for each unit of energy used to produce biodiesel from soybean oil, there is a net gain of 3.2 units of energy. Comparatively, a net loss is produced from petroleum production (for each unit of energy used in production only .8 units are gained).[11]

There have also been studies determining that burning biodiesel in diesel vehicles instead of petroleum diesel has a positive effect on air quality. Burning 100% biodiesel (B100) instead of petroleum diesel could reduce carbon dioxide emissions by more than 75%.[3] Additionally, toxic compounds, carbon monoxide, particulate matter, and sulfates are decreased when burning biodiesel over petroleum diesel. Nitrogen oxide emissions remain the same when burning biodiesel.[4] While air emissions may be reduced by burning biodiesel in engines, the production of biodiesel releases air pollutants, predominantly volatile organic compounds. These compounds are a major component of ozone formation or smog.

Some of the factors inhibiting consumption of biodiesel are the availability, cost, fuel line blockage, and the low gel point. Currently, biodiesel is more expensive than petroleum diesel mostly due to availability. Burning biodiesel in unmodified diesel engines may lead to blockages in the fuel filters and injectors. Biodiesel is a better solvent than standard diesel, thus it removes deposits in the fuel lines. The point at which B100 gels depends on the feedstock oil used to produce it. Biodiesel produced from canola seed starts to gel at approximately -10°C. Conversely, if the biodiesel is produced from tallow, the gel point will be closer to 16°C. Utilizing biodiesel in cold temperatures is possible when blended with petroleum diesel up to 20% biodiesel.[12]

Currently, biodiesel production in the U.S. is experiencing tremendous growth. Biodiesel sales have increased from 500,000 gallons in 1999 to approximately 25 million gallons in 2004. The current U.S. biodiesel production capacity is 354 million gallons, which is expected to exceed one billion gallons by 2008.[1] The majority of commercial biodiesel production plants are located in the eastern half of the U.S. (see Figure 1).

The national growth in biodiesel production is a result of the rising cost of petroleum diesel, federal incentives, and key state incentives. The average retail price of petroleum diesel rose approximately 56% in 2005 from 2000-2004 average prices. Three federal programs have given biodiesel production incentives, including an excise tax credit and a commodity credit program intended to offset the cost of

agricultural feedstock. The excise tax credit ($1.00 per gallon) is provided to fuel blenders. While the commodity credit program was the most important incentive initially, it is not currently being funded.[1]

Additionally, the Energy Policy Act of 2005 establishes a minimum renewable fuels standard that grows to 7.5 billion gallons of renewable fuels production by 2012 and provides a small producer (<60 million gallons per year) credit of 10 cents per gallon on the first 15 million gallons produced. Further, many states have initiated their own state incentives to increase biodiesel production.[1]

The current growth in biodiesel production in Nebraska can be attributed to the aforementioned factors, local legislation and incentive efforts, resources, and consumption. Legislative Bill 626, introduced to the Nebraska legislature by State Senator Dierks in January 2007, provides the biodiesel fuel producer 30 cents for each gallon of biodiesel sold. Nebraska State Senator Preister in Legislative Bill 9 introduced an incentive for renewable energy consumers. The bill allows a nonrefundable credit against the individual income tax, corporate income tax, premium or related retaliatory tax, or franchise tax equal to twenty-five percent of the costs incurred by the taxpayer on or after January 1, 2007, for installation or improvement to his or her home or business for energy conservation or for renewable energy generation. If these bills are passed, the incentives could generate additional biodiesel production in Nebraska.

In addition to the local incentive efforts, Nebraska has tremendous resources in terms of the vegetable oils and animal fats that are used in this process. Furthermore, the market demand for biodiesel products could also lead to an increase in biodiesel production in Nebraska. According to the Nebraska Soybean Association's biodiesel feasibility study, the agriculture sector in Nebraska has the highest farm diesel consumption of any state in the Midwest.[11]

Due to the increased activity in the biodiesel industry and the potential for more activity in the future, the Nebraska Department of Environmental Quality (NDEQ) recognizes the need to provide a report to the general public, industry personnel of both existing and proposed biodiesel production plants, environmental consultants, community officials, and economic development professionals that would encompass varying aspects of the biofuels industry and the Clean Air Act.

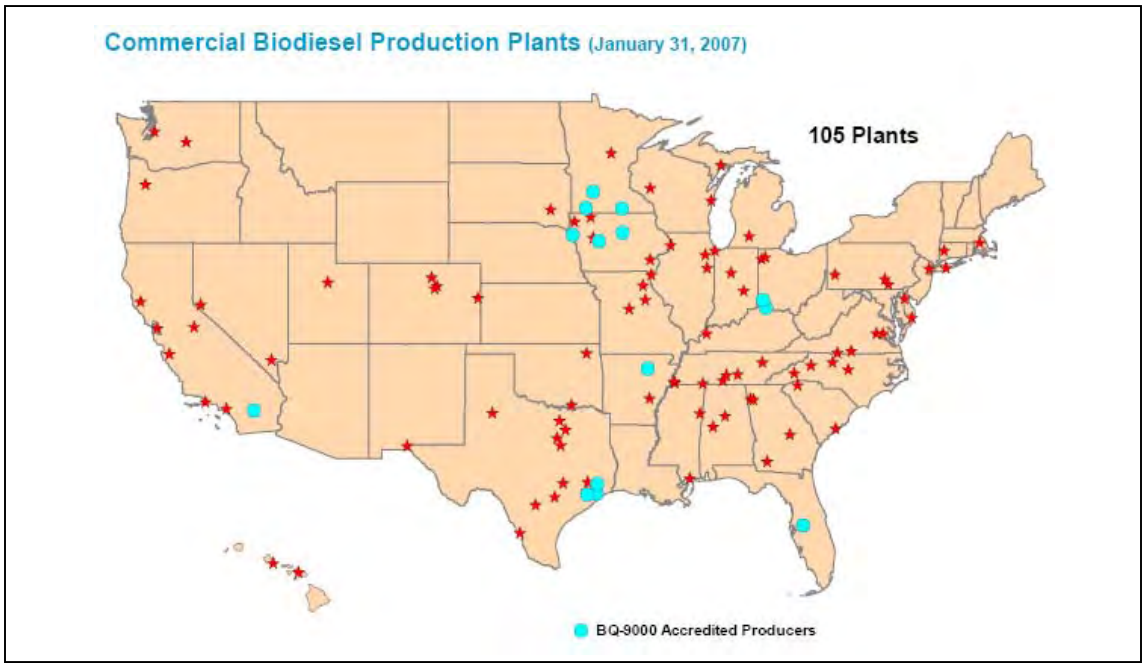

Figure 1 **National Biodiesel Board**[10]

Biodiesel Production

Biodiesel, also known as methyl esters, is created through a process called transesterification. Transesterification is a reversible reaction in which one ester is converted into another. Biodiesel can be made from new or used vegetable oils and animal fats. Used fats/oils include:

- yellow grease (used restaurant vegetable oil);
- brown grease (trap grease collected from restaurant kitchen drain lines); and
- black grease (grease collected from walls of sewer lines prior to transferring to a sewage treatment plant).

The fats and oils are chemically reacted with an alcohol, usually methanol or ethanol, in the presence of a catalyst to produce glycerin and biodiesel. A typical catalyst may be sodium or potassium hydroxide. About half of the alcohol is recovered and reused.[5] The general process description is outlined in Figure 1 below.

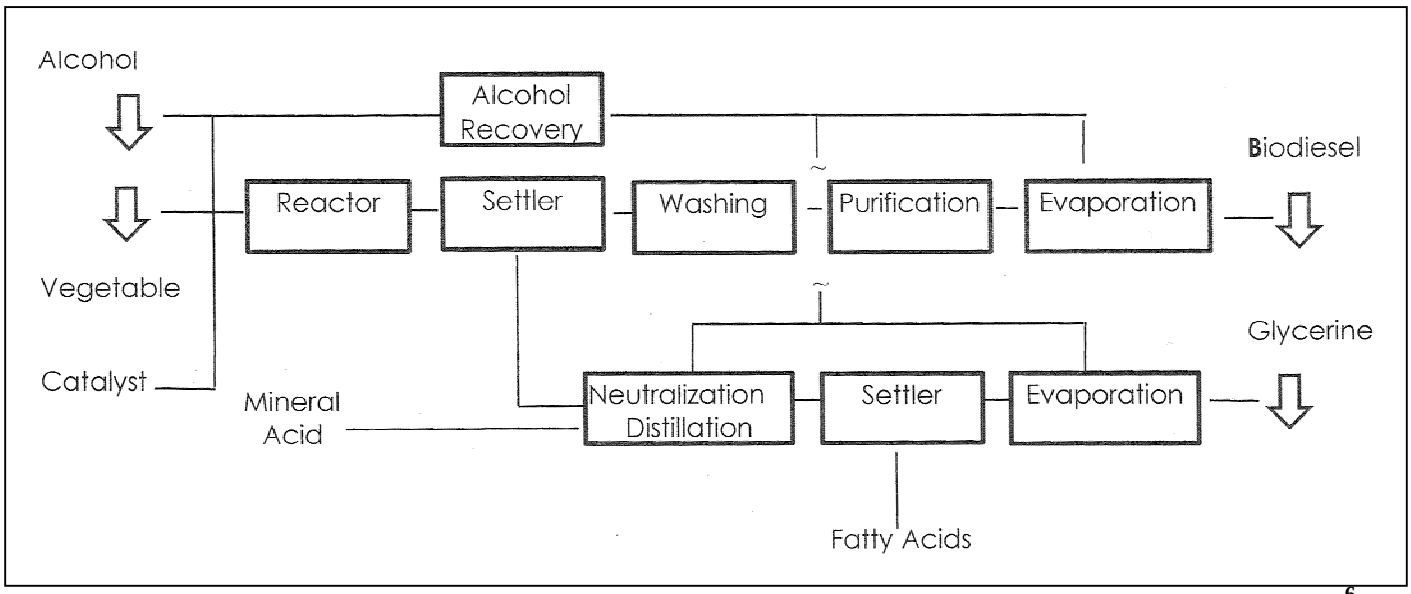

Figure 2 **National Biodiesel Board[6]**

Biodiesel production plants may crush oilseeds at their facilities to obtain vegetable oil. Others may purchase recycled oil or oil that has been expelled or extracted elsewhere. Vegetable oil is most commonly chemically extracted utilizing solvents, like hexane. Oilseeds can also be mechanically extracted or expelled utilizing presses and crushers. Chemical extraction yields more oil and is typically less expensive than mechanical extraction, but involves the use hexane. Hexane is a toxic solvent and can leave residual in both the oil and meal. Generally, chemical extraction is utilized at large, centralized facilities in excess of 20 million gallons per year. In Nebraska, we have three vegetable oil extraction plants located in Fremont, Hastings, and Blair. Each plant utilizes hexane to extract the oil. However, the facility in Blair utilizes a solvent containing less hexane (<3%).

Oil Refinery

The oil must be refined to ensure consistent quality in the soybean oil prior to the transesterification reaction and to comply with the American Society of Testing and Materials (ASTM) standards for this fuel. Some facilities refine the oil on-site, while others purchase vegetable oil or animal fat that has

already been refined. If waste oil is used, it will require filtration to remove dirt and other non-oil material prior to the refining process.

Crude vegetable oil refining removes gums, waxes, phosphatides (glycerol combined with fatty acids, phosphoric acid, and nitrogen-containing compounds), and free fatty acids. The crude oil is heated and mixed with phosphoric acid. The oil mixture is passed directly to an acid reactor, which precipitates out the wet gums, metal compounds, and other impurities. The acid-conditioned oil is mixed with a dilute caustic (for example, sodium hydroxide - NaOH) to adjust the pH of the water phase. Hydration water is added to and mixed into the caustic mixture to enhance hydration and formation of large gum particles. The large gum masses (soapstock) are removed and used as a by-product of the process. The oil solids are dried and cooled.

Production Processes

There are currently three methods used to produce biodiesel from oils and fats: base catalyzed transesterification; direct acid catalyzed transesterification; and conversion of the oil to fatty acids and then to biodiesel. Most commercially produced biodiesel utilizes the base catalyzed reaction. This is the process described in this section.[7]

Alcohol and Catalyst Mixing

The catalyst used is typically potassium hydroxide or sodium hydroxide. The catalyst is dissolved in the alcohol.[7] Commercially, these components are more commonly purchased in a pre-mixed form (~30% in strength) for ease of use and elimination of the 'chemical water' that arises through the dissolution of the solid catalyst in oil. These materials are known as sodium methylate or potassium ethylate to reflect the particular alcohol and catalysts utilized in the mixture.

Another catalyst option that is developing rapidly is the use of solid catalysts. These materials are not mixed with the alcohol and help to increase the reaction rates. While use of these materials is very limited based on cost, they offer the advantage of not introducing salts in the process streams, which may have to be removed later.

Transesterification Reaction

The alcohol catalyst mixture is charged into a closed tank and the triglyceride (oil or fat) is added. The reaction mix is heated to approximately 160°F to speed up the reaction. The overall reaction equation is as follows:

$$\text{triglyceride} + \text{alcohol} \xrightarrow{\text{Catalyst}} \text{methyl esters} + \text{glycerol} + \text{excess alcohol}$$

For every 100 pounds of oil used in the reaction, approximately ten pounds of alcohol (ethanol or methanol) is used. After the chemical reaction, there are ten (10) pounds of glycerin and 100 pounds of biodiesel. While ratios using ethanol instead of methanol in the reaction will be similar, slightly more ethanol will be required in the process.

Separation and Alcohol Removal

After the reaction, two products exist, glycerol (glycerin) and methyl esters (biodiesel). There is also excess alcohol (~50% of the initial volume) and other impurities in each of the products that must be removed. The distribution of the alcohol in each of the phases will be approximately 90%, with the remainder present in the fuel. The mixture may be neutralized prior to separation. The glycerin is denser than the biodiesel and can be gravity separated with the glycerin drawn off the bottom or by using a centrifuge.[7]

The excess alcohol is removed with a flash evaporation process or by distillation. The alcohol is recovered using distillation equipment and is reused in the process.[7]

Glycerin Neutralization

The unused catalyst and soaps from the glycerin by-product are neutralized and removed. Salts may also form during this phase and can be recovered as another by-product to be used as fertilizer. Water and alcohol are removed from the glycerin (as a first step). In some operations, the glycerin is distilled for purity and sold to pharmaceutical and cosmetic markets.[7]

Methyl Ester Wash

The final ester treatment is designed to purify the ester by removing free and dissolved glycerol in order to assure the biodiesel contains less than the maximum allowable concentration of total glycerol. High purity water is added to the biodiesel mechanically stirred and air agitated to remove residual catalyst or soaps. The biodiesel is then dried and sent to storage. Not all plants use the water wash process. Some plants distill the biodiesel further to remove small amounts of color in the product.[7] When the water wash is avoided, some other means of removing final impurities will be needed after distillation in order to the meet the ASTM standards.

Air Emissions from Biodiesel Production

Before discussing the details of the permitting process, it is important to be familiar with the regulated pollutants emitted from a typical biodiesel production plant.

If the oilseeds are processed (extracted or expelled) at the plant, tiny particles (particulate matter less than 10 microns in diameter, PM_{10}) are released during receipt and handling of the seeds. PM_{10} could also be released during the mechanical extraction process. During the chemical extraction process and oil pretreatment process volatile organic compounds (VOCs) are released. Some of these VOCs are known as hazardous air pollutants (HAPs), including methanol and hexane.

The biodiesel reaction process units include tanks, reactors, decanters, ester washer and dryer, and distillation columns. This process will emit VOCs including hexane (when chemically extracted soybean oil is used), methanol, and/or ethanol. The biodiesel process may also utilize condensers, scrubbers, and/or a process flare to control emissions. The combustion process from the flare and boilers providing steam and energy to the process generates PM_{10}, VOCs, HAPs (hexane from natural gas or biodiesel combustion), carbon monoxide (CO), nitrogen oxides (NO_x) and sulfur oxides (SO_x). VOCs and HAPs could be emitted from biodiesel storage, crude glycerin storage, biodiesel loadout, and the chemical storage tanks.

Other emissions may result from activities not associated with the production process such as: PM_{10} from the cooling towers; fugitive PM and PM_{10} emissions from haul road traffic; fugitive VOC emissions from equipment leaks; PM_{10}, NO_x, SO_x, CO, and VOCs from fuel combustion in the boilers and emergency equipment (engine driven fire pumps and generators).

Figure 2 illustrates the potential emission points at a biodiesel production plant and the air pollutants emitted from each emission point.

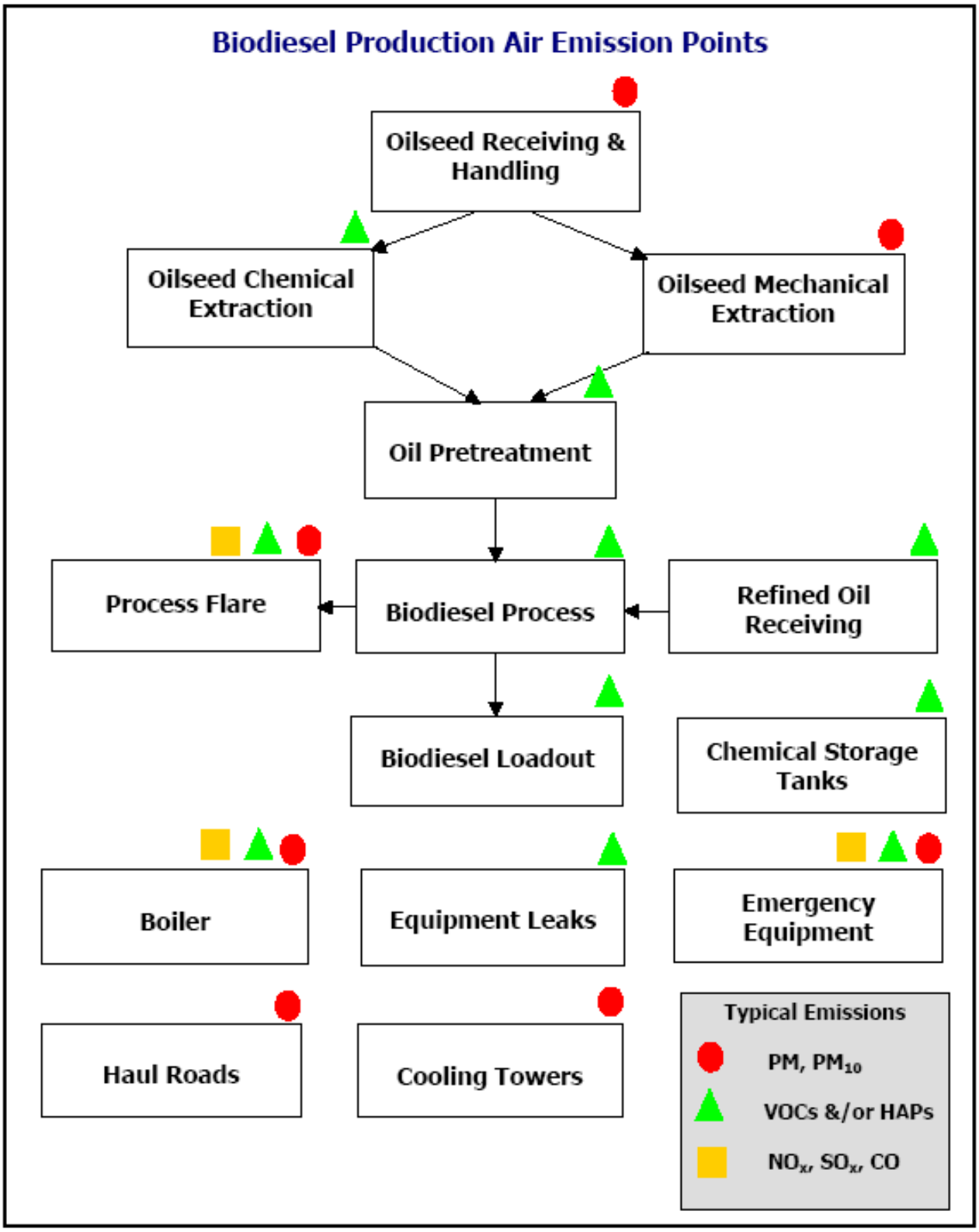

Figure 3 **Nebraska Department of Environmental Quality**

Air Quality Permit Program

The Nebraska air quality regulations require that facilities with the potential to emit air pollutants above specified levels must obtain construction permits and/or operating permits. This section will discuss the air quality permits a biodiesel production plant may need and when they must be obtained, permit application tips, and what information may be incorporated in a permit including a discussion of the federal regulations that could apply to biodiesel plants.

It should be noted that biodiesel production facilities also have water quality permitting requirements. Information on these requirements is available from the NDEQ Wastewater Section at (402) 471-8830.

Construction Permits

Before a new plant is built or before an existing facility is expanded or modified its plant, an air quality construction permit may be required. There are two types of construction permits: state construction permits and federal construction permits, known as Prevention of Significant Deterioration (PSD) permits. The type of construction permit that is needed will depend on the quantity of air pollutants that potentially could be released from the new plant or expansion project.

Purpose

First and foremost, air quality construction permits are needed to protect the ambient air quality. Ambient air is the air outside of buildings to which the general public has access. The U.S. Environmental Protection Agency (EPA) has developed national ambient air quality standards (NAAQS) to protect the public health, welfare, and the environment.

Predictive computer modeling is conducted prior to issuing construction permits to evaluate the potential impact emissions from the plant will have on the ambient air quality. A construction permit cannot be issued if the plant will cause or significantly contribute to predicted violations of any ambient air quality standards. Unless modeling is conducted, NDEQ cannot offer assurances to the source and to the public that the facility is designed appropriately to protect the ambient air quality. Modeling is the basis of permit limits. It also provides assurances to the facility that the controls they are proposing are appropriate and that, with proper planning for the future, retrofits to the facility should not be needed at a later date.

Construction permits also impose enforceable requirements that are recognized by the EPA. Construction permits include emission and/or production limits that will ensure air quality protection. The permits contain recordkeeping, reporting, monitoring, and testing requirements to ensure the plant is able to demonstrate that the permits limits are met.

The public is given notice that a construction permit may be issued and is given an opportunity to comment on activities that affect their environment. The public notice also provides an opportunity for communities to be educated about the environmental impacts of plants locating in their area.

Finally, construction permits are required by the Nebraska Air Quality Regulations – Title 129. Chapter 17 lists the requirements to obtain a state construction permit and Chapter 19 lists the requirements to obtain a federal construction permit. A copy of Title 129 can be obtained by contacting the NDEQ Air Quality Division; Title 129 can also be viewed on the agency website.

State Construction Permits

The NDEQ has had an air quality construction permit program since 1972. Facilities are required to obtain a construction permit before they construct, reconstruct or modify any air contaminant source or emission unit where there is a net increase in the potential-to-emit (PTE) above prescribed quantities. PTE means the maximum emissions that would result from operating the source at full capacity 24 hours a day, 7 days a week, 52 weeks a year taking into consideration federally enforceable requirements (such as previously issued permits or federal rules).

The increases in PTE that trigger construction permits by pollutant are:

- 15 tons per year (tpy) of PM_{10},
- 40 tpy of SO_2 or SO_3 or any combination thereof,
- 40 tpy of NO_x (calculated as NO_2),
- 40 tpy VOC,
- 50 tpy CO,
- 0.6 tpy Pb (Lead), or
- 2.5 tpy of any single HAP or 10 tpy of all HAPs combined.

A biodiesel production plant using methanol will trigger the construction permit thresholds if their production capacity is approximately 318,000 gallons per year. This is assuming only process emissions (98% solvent recovery, but no flare) and internal-floating roof storage tanks for methanol and biodiesel. Under the same assumptions for a plant utilizing ethanol instead of methanol, the construction permit thresholds will be triggered for plants with a production capacity of 4,856,000 gallons per year. These plant sizes are only given for reference. Many factors contribute to the potential emissions of the plant and each plant is unique. For instance, if a plant has a 300 horsepower diesel generator, they will need a construction permit, regardless of the production capacity of their facility. Each plant will have to calculate their potential emissions for their specific emission points to determine if the construction thresholds have been exceeded.

If a plant exceeds the HAP threshold requiring a state construction permit, they must conduct a control device review and install the best available air pollution control technology (BACT) based on that review. In lieu of a BACT analysis, the plant may choose to take a permit limit to keep their emissions below the HAP threshold (2.5 tpy of a single HAP or 10 tpy of combined HAPs).

A facility obtaining a state construction permit may be required to conduct an air quality review using computer modeling to predict the impacts that a facility may have on the ambient air. Whether or not a facility needs to model will depend on the rate of emissions increase, facility history, plant location, type of source, and emission point configurations (e.g. stack heights). More information can be found in the NDEQ modeling guidelines located on the agency website or by contacting the NDEQ Air Quality Division Construction Permit Hotline at (877) 834-0474.

Federal Construction Permits

EPA developed the federal construction permit program, known as the New Source Review program, in 1977. NDEQ has incorporated the federal program into the state regulations and has the authority to implement and enforce these rules. This program assures the following: economic growth will occur in harmony with the preservation of existing clean air resources; public health and welfare will be

protected from adverse effects which might occur even at pollution levels below the ambient standards; and the air quality in areas of special natural recreation, scenic, or historic value, such as national parks and wildlife areas, will be preserved, protected, and enhanced.[8]

Under the New Source Review program there are two types of construction permits. In areas that have pollution levels below the NAAQS, referred to as attainment areas, sources that meet the appropriate criteria will obtain a Prevention of Significant Deterioration (PSD) permit. In areas that have pollution levels above the NAAQS, referred to as nonattainment areas, sources meeting the appropriate criteria will obtain a nonattainment New Source Review permit. Currently, Nebraska is in attainment of all ambient air quality standards.

In order for a facility to trigger the requirement to obtain a PSD or New Source Review construction permit, they must meet both of the following criteria:

1. The facility must have the PTE of:
    - 100 tons per year (tpy) of any regulated PSD pollutant* if the source is one of 26 specific source categories listed in the PSD rules (40 Code of Federal Regulations (CFR) §52.21(b))**
      <u>OR</u>
    - 250 tpy of any regulated PSD pollutant* for sources not specifically listed in the PSD rules, <u>and</u>
2. Have net emissions increases of:
    - 25 tons per year of Particulate Matter (PM) or total suspended particulate (TSP)
    - 15 tons per year (tpy) of PM_{10}
    - 40 tpy of SO_2 or SO_3 or any combination thereof,
    - 40 tpy of NO_x (calculated as NO_2),
    - 40 tpy VOC,
    - 100 tpy CO, or
    - 0.6 tpy Pb (lead)
    - Other pollutants with significance thresholds include fluorides, sulfuric acid mist, hydrogen sulfide (H_2S), total reduced sulfur (TRS), and reduced sulfur compounds.

**PSD pollutants include PM, PM_{10}, NO_x, SO_x CO, VOC, Pb, fluorides, sulfuric acid mist, H_2S, TRS, reduced sulfur compounds, municipal waste combustor organics, metals and acid gases, and municipal waste landfill emissions.*

*** Most biodiesel production plants are included in the PSD specific source category list subject to the 100-ton per year criteria. For further information, contact the NDEQ Air Quality Division.*

If a plant needs to obtain a federal construction permit under the PSD program it must conduct a control device review and install BACT based on that review. PSD permits may be subject to review by EPA, federal land managers, bordering states, and tribal organizations. The plant must also conduct an air quality review using computer modeling to assure that it will not exceed the NAAQS or impact areas of special natural recreation, scenic, or historical significance. As part of the air quality review, an increment analysis must also be performed.

Increment is the term for the amount of additional pollutant concentration allowed beyond a baseline pollutant concentration level. In other words, increment is the maximum allowable deterioration of air quality. Increment is consumed when applicable emissions increases contribute to an increase in

ambient concentrations above the baseline level. This element of the PSD program is key to maintaining compliance with the NAAQS despite increases in industrial activity. For more detailed information on increment, see the fact sheet titled "Maintaining Good Air Quality Through the Increment Rules of the Prevention of Significant Deterioration Program" on the NDEQ website.

If you have questions related to construction permits, please contact the Air Quality Construction Permit Hotline at (877) 834-0474.

Operating Permits

The biodiesel production plant may also need to obtain an air quality operating permit. There are two types of operating permits: major source (federal program) and minor source (state program). Again, the potential emissions from the plant will determine whether a facility will obtain a major or minor operating permit.

Purpose

The federal operating permit program, known as the Title V program, was created by the Clean Air Act Amendments of 1990 and was designed to create a "one stop" permit. The Title V operating permit compiles all of the applicable state and federal regulatory requirements, existing construction permit provisions, and recordkeeping, reporting, testing, and monitoring requirements into one permit. The intention behind listing everything in one permit is to assist facilities with maintaining compliance. Oftentimes, a facility will have several construction permits for several pieces of equipment and it is difficult to keep track of all of the requirements in each permit. One permit with all of the facility's requirements is intended to make it easier to track the requirements.

Notification to the public is also an important aspect of the operating permit program. The public is notified when an operating permit for the facility has been drafted and is given the opportunity to comment during the 30-day public notice period. This gives the public the opportunity to become educated about the impacts that the facility may have on its environment.

The Department was required with the passage of LB1257 (1992) by the Nebraska Legislature to establish and implement a comprehensive operating permit program for facilities emitting certain air pollutants. While the federal Title V operating permit program only regulates larger sources, the Nebraska program also regulates smaller sources. NDEQ took this action to give sources with lower emissions a mechanism to avoid the more onerous Federal program. This approach was consistent with Federal guidelines on limiting a source's potential emissions and provided a reasonable option for sources. The success of this program depends on the source being able to keep its actual emissions below the permit limitations.

As pointed out above, the federal program regulates larger facilities (or major sources) of air pollution while the Nebraska operating permit program regulates both larger and smaller facilities (or minor sources) of air pollution. Nebraska's major source operating permit program is also called the Class I program and the minor source operating permit program is the Class II program. The Class I and Class II operating permit programs are discussed further in the following sections.

Unlike a construction permit that must be obtained prior to construction and is valid for the entire life of the emission unit, an operating permit must be applied for within 12 months after the facility begins operation and is valid for up to five years. The operating permit requirements can be found in Title 129, Chapters 5 and 7 through 12. For a copy of the regulations contact the Air Quality Division or view them on NDEQ's website.

Class I Operating Permits

The Class I program (or the Title V program) regulates major sources of air pollution. A Class I source or major source has the potential-to-emit (PTE) quantities greater than:

- 100 tpy of any criteria air pollutant* excluding Pb (lead),
- 10 tpy of any single HAP or 25 tpy of a combination of HAPs or,
- 5 tpy of Pb

**Criteria pollutants are PM_{10}, NO_x, SO_x, CO, VOCs, and Pb.*

The benefit of operating as a Class I source is the flexibility allowed in facility operation because the facility's PTE is not limited (unless a historical construction permit limits its PTE). However, a Class I source will be subject to paying fees based on its actual emissions, may have more stringent monitoring requirements, and has additional reporting and recordkeeping requirements. Class I permits are also subject to review by EPA, nearby states, and nearby local or tribal air quality programs. As part of the public participation process, the public has the opportunity to petition EPA if they feel NDEQ did not adequately address their comments.

Class II Operating Permits

The Class II program regulates minor sources of air pollution. There are two classifications for minor sources: synthetic minor and natural minor.

- Synthetic Minor
  - PTE above Class I emission levels (see previous section)
  - Federally enforceable limits are taken to keep emissions below Class I emission levels
- Natural Minor
  - PTE below the Class I emission levels
  - Actual emissions above 50% of Class I emission levels
    - 50 tpy of criteria pollutant except Pb
    - 5 tpy of any single HAP or 12.5 tons per year of a combination of HAPs or,
    - 2.5 tpy of Pb

The benefits of becoming a Class II source include: no requirements to pay emission fees, the possibility of less stringent monitoring requirements, less reporting, and less recordkeeping. However, Class II sources have less operational flexibility because they must maintain their emissions below the Class I threshold. EPA will not review a Class II permit to the extent they do a Class I permit. Further, the public does not have the opportunity to petition EPA if they feel NDEQ did not adequately address their comments as they do for a Class I permit.

Permit Process

An air quality construction permit must be obtained from NDEQ prior to physical, on-site construction. The construction permit application needs to be submitted to NDEQ as soon as possible once the design of the plant is known. It typically takes from four to six months to complete our review and draft the construction permit documents, followed by a 30-day public comment period. There are many factors that affect the time it takes to compete the process. These include the completeness of the application, the type and complexity of the facility, and changes in facility plans after the review has commenced.

Operating permit applications must be submitted to NDEQ within 12 months after the emissions unit(s) begin operation or 12 months of becoming subject to the operating permit requirements, whichever is earlier. Permit applications can be obtained by contacting the Air Quality Division, or downloaded from the NDEQ website.

Construction Permit Planning Meeting

To facilitate the submittal of a complete and accurate construction permit application and minimize the time it takes for NDEQ to prepare the permit, the Air Quality Division strongly recommends a project planning meeting and a pre-application meeting. This early communication will help streamline the process and reduce the time required to review the application and issue a permit. In addition, this is the time to bring up any innovative technologies and/or approaches the source anticipates using. This gives the Division time to research the proposal prior to the receipt of the application.

The project-planning meeting should be arranged with the NDEQ Environmental Assistance Division as planning process begins. The project-planning meeting will involve staff from the Air Quality Division and the Water Quality Division. To schedule a project-planning meeting with NDEQ call (402) 471-6974.

The pre-application meeting should occur one to three months prior to submitting the application and the application should be near completion at the time of the meeting. The pre-application meeting will involve discussions related to the air quality permit application and modeling requirements. For more information related to the expectations of the pre-application meeting, contact the Air Quality Construction Permit Hotline at (877) 834-0474 or view the fact sheet titled “Pre-Application Meetings for Air Quality Construction Permits” on the NDEQ website.

Although the permits will differ, the process is virtually the same for both the construction permit and operating permit, with the exceptions of the pre-application meeting discussed above and construction permit application fee. A construction permit application fee must be submitted with the construction permit application. The construction permit application fees are based on facility-wide potential emissions. More information on the construction permit fees can be found by viewing the fact sheet titled “Construction Permit Application Fees” on the NDEQ website or by calling the Air Quality Construction Permit Hotline.

Application Review

Once the permit application and fee, if applicable, are received by NDEQ, the application is reviewed for administrative completeness. The reviewer will determine if a responsible official has signed the application in ink, if the application contains completed forms, and if the applicant has requested confidentiality. If the facility has properly requested confidentiality in accordance with Title 115, Chapter 4 - Public Records Confidentiality, the request will be forwarded to the NDEQ Director for

approval or disapproval. If the confidentiality request is not filed in accordance with Title 115, the application will be returned to the facility. For more information related to properly requesting confidentiality, view the "Air Quality Confidentiality Claims" guidance document on NDEQ's website.

Once the application has been deemed administratively complete, it is assigned to a permit writer for a technical completeness evaluation. The permit writer will determine if the application provides enough detailed information to draft a permit that accurately reflects the facility and assuring that all of the regulatory requirements have been addressed. The following information is a guide to what information the permit writer will look for during the technical completeness evaluation.

√ **General Information**

- Is it a new source or modification of an existing source?
- If it is a modification, has the applicant provided information regarding the existing source?
- Are all of the applicable forms complete with the appropriate information?
- Have emission points been identified, described, and consistently named?
- Does the plant diagram show heights and locations of all buildings, delineations of ambient air (e.g. property boundaries), and emission points?

√ **Emissions Information**

- Are fuel types, fuel use, raw production materials, consumption, production rates, and operating schedule provided?
- Have both actual and potential emissions of regulated air pollutants been provided?
- Have the assumptions and calculations of the actual and potential emissions been included?
- Are citations of emission factors included?
- Can a major or minor source determination be made?
- Is the project subject to Prevention of Significant Deterioration (PSD) review?

√ **Control Equipment and Methodology**

- Has emissions control equipment been identified and described?
- Is supporting information on control equipment efficiencies included?
- Did the facility propose limits on plant operation or work practices that may affect emissions?
- If it is a PSD project, has a Best Available Control Technology (BACT) analysis been provided?

√ **Monitoring, Recordkeeping, and Reporting**

- Have compliance monitoring devices or activities been identified and described?
- Has the facility proposed testing of any emission units?
- Did the facility provide information on existing or proposed record-keeping practices?

√ **Modeling**

- Is the project subject to modeling? (For a copy of the modeling guidance, see the Air Quality Publications/Guidance Documents on the NDEQ web page or contact the Air Quality Construction Permit Hotline at (877) 834-0474)
- If yes, has a modeling protocol been submitted and approved?

- Have the modeling inputs, assumptions, etc. been provided to NDEQ on CD or diskette?
- Was the modeling conducted in accordance with the approved protocol?
- If it is a PSD project, have the ambient standards, PSD increment, and other impacts analyses been provided?
- Was the modeling checklist included with the application? (The "Air Quality Modeling Checklist" can be found in the modeling guidance or separately on the NDEQ web page.)

Draft Permit

Not only must the application be technically complete prior to drafting the permit, the permit writer must review the plant's historical information such as compliance and/or enforcement status and existing permits limits. The construction permit writer must also assess how the plant modification or expansion will impact existing processes and support facilities.

After the historical issues are reviewed, the permit writer must make sure that all of the calculations are correct, all of the regulatory requirements have been appropriately addressed, and the recordkeeping, testing, and monitoring is adequate to demonstrate compliance. This step is the most complex in the permitting process and will take at least 60-90 days to complete for construction permits.

In drafting the operating permit, the permit writer must make sure that all of the existing construction permit requirements and applicable state and federal requirements are included.

After the operating or construction permit is drafted, the permit will undergo a series of reviews to determine if the emissions were properly evaluated, permit limits are appropriate, and the permit is clear, concise, and consistent. The Air Division staff will review all permit applications received. Additionally, depending on the permit, others may also review the associated documents, including but not limited to, other NDEQ staff not in the Air Division and contracted personnel. The draft permit will also be provided to the facility for review. EPA may also elect to review the draft permit if the facility is subject to PSD review or the Class I operating permit program.

Public Notice

Once the draft permit is reviewed and approved, it is prepared for public notice. The public notice is published in a local newspaper and posted on the NDEQ website. The public notice, along with a copy of the draft permit and fact sheet, is sent to the local library to facilitate public viewing. The public comment period lasts 30 days. The public may also request a hearing during the public notice period. If a hearing is requested and granted by the NDEQ Director, a hearing notice will be published in local newspapers 30 days prior the scheduled hearing.

Once the public comment period has ended, a response document is drafted to address all of the comments received. The response document is shared with all of those who commented and the facility. If the permit requires substantial changes, the permit may have to undergo another public comment period.

After public comments are addressed, the permit will be prepared for signature. Once the permit is signed, copies are distributed to the appropriate parties.

Permit Application Tips

NDEQ understands that there is a significant amount of information that is required in the construction permit and operating permit applications. This is a lengthy process that can often be complicated. Following are some tips that will facilitate the process to help it flow more smoothly for the plant and NDEQ.

Talk with NDEQ as soon as possible. As soon as you begin your plans for a biodiesel production plant, call the NDEQ Environmental Assistance Division at (402) 471-6974 to schedule a project-planning meeting. The project-planning meeting will typically involve staff from the Assistance, Air Quality, and Water Quality Divisions. By talking early in the process, we can avoid some of the questions that may arise while completing the permit applications and complying with the various environmental regulations.

> **"Good communication is the key to a successful permitting process."**

Additionally, schedule and conduct a pre-application meeting with the NDEQ Air Quality Division one to three months prior to submitting the construction permit application. The pre-application meeting will facilitate the submittal of a complete and accurate application and decrease the time it takes NDEQ to prepare the construction permit. A construction permit will take several months to process, depending on the complexity of the permit.

Make sure the permit application is complete, accurate, and signed. Complete the application in blue or black ink. Also, have a responsible official sign the application in ink. Contact the NDEQ for the most current applications available. Be sure to include information for all of the equipment that you plan to install. Not only is it important to tell us what you will install, but also it is very important that you install the equipment that you specified in your permit application. By avoiding "as built" differences, you can avoid potential permit violations and having to wait for a permit modification. If your plans change after you have submitted an application, you have an obligation to submit updated information to NDEQ.

Submit the appropriate construction permit application fee. Each construction permit application must be accompanied with a fee. The application cannot be processed unless the appropriate fee is submitted. Construction permit application fees are based on facility-wide emissions and are divided into three tiers. For more information on the construction permit application fees, refer to the "Construction Permit Application Fees" fact sheet on the NDEQ website.

Address confidentiality issues appropriately. If a facility would like to claim information in the permit application as confidential material, the claim must be made at the time of submittal. In order to claim confidentiality, the facility must certify that the information or record is entitled to protection. In addition, the facility must explain its reasons why confidentiality should be granted. The NDEQ Director will review the request to determine whether the information or record relates to processes or methods entitled to protection. Facilities may not keep plant-wide emissions data confidential. The director may not withhold records as confidential if they have been disclosed in an open court, open administrative proceeding, open meeting or disclosed by the Department in its duties. For further

information on confidentiality, please refer to the "Air Quality Confidentiality Claims" guidance document on the NDEQ website or contact the Air Quality Division.

Include calculations and citations with your permit application. Including emission calculations and emission factor citations with the permit application helps us review your project. Without such citations and calculations, we will have to reproduce the work that you have done to ensure that the facility will meet state and federal requirements. If there are not standard emission factors for a process or processes (eg. vegetable/animal oil refining or production process), utilize the best information available to estimate the emissions such as stack testing data from similar units and/or engineering estimates.

Research. Generally, biodiesel production plants are subject to various federal standards as well as state regulations. The federal requirements could influence your decisions regarding equipment that you install. The federal regulations biodiesel plants may be subject to are discussed in the Permit Content section of this document. You can also request to view air quality permits that NDEQ has issued to similar plants. Reviewing other plant's permits may give you a better idea what to expect in your permit.

Be aware of current regulatory issues. As the biofuels industry continues to expand throughout the nation and more emissions data is gathered, state agencies have to face new and often challenging issues. Some of the current air quality issues that Nebraska and other states are facing are discussed later in this document (Potential Air Quality Issues, Section 5). The issues are best addressed in the early planning stages of the plant. By communicating with the Air Quality Division and being aware of these current issues, you may be able to save time and/or money.

Get help. Although not required, we encourage plants to consult with persons who are familiar with Nebraska's air quality regulations, air quality construction and operating permits, and the plant processes. This not only expedites the permit process but also ensures that the permit application is complete and accurate. A Directory of Environmental Consultants and Engineers is available on the NDEQ website.

Read and make comments to the draft permit. Once the application is reviewed and deemed technically complete by NDEQ, the permit writer will draft the air quality permit. The draft permit will be sent to plant representatives for comment prior to public notice. Make sure the references to equipment are correct and that you will be able to operate under the required conditions. Be sure you understand and are prepared to comply with all of the recordkeeping, reporting and monitoring requirements in the permit. Making changes to the draft permit is easier than having to amend or modify the permit after it is issued.

Permit Content

Construction permits and operating permits consist of the same basic elements. Each permit will contain general conditions and specific conditions.

General Conditions

The general conditions are provisions that will be applied to every facility that obtains a particular type of permit. Construction and operating permit general conditions will reference provisions in Title 129

that apply to all facilities such as general duty clauses and the open burning and fugitive dust regulations.

The general conditions of a construction permit will include provisions such as commencement of continuous construction, notifications of anticipated startup and actual startup, and submittal of facility changes to the NDEQ. The general conditions explain the provisions to reopen, revoke, reissue, terminate, or modify the permit and the permit renewal requirements.

The following reporting requirements are found in the general conditions:

- Notifications of anticipated startup and actual startup dates.
- All sources with a permit must submit an annual emission inventory by March 31st. The emission inventory is documentation of the facility's actual emissions based on production, combustion, and consumption for the previous year.
- Class I sources must submit their air emission fees (based on the annual emission inventory report) by July 1st every year.
- Sources with an operating permit are required to submit an annual certification of compliance by March 31st verifying compliance with their permit conditions for the previous year.
- Class I sources with an operating permit must submit semiannual excess emissions or deviations reports by September 30th and March 31st (submitted with their certification of compliance report) that document if there have been any deviations from their permit conditions.

Specific Conditions

The specific conditions will contain provisions that are specific to a facility. Both construction and operating permits may contain permit limits; emissions testing, monitoring, recordkeeping, and reporting requirements; and applicable federal rules.

The limits contained in the permit will depend on the type of permit and the limits the facility is willing to take. Permits may impose emission limits, production limits, or limits to ensure compliance with the NAAQS. Examples that might be included in a permit are:

- An emission limit - "PM_{10} emissions shall not exceed X lb/hour (and X tons/year if applicable)."
- A limit to restrict the plant emissions below the Class I or PSD emission levels.

It is important facilities understand the permit limits and make sure that they are able to comply with the limits. It is best to address concerns with the permit limits early in the process or at least during the permit draft review. It may be that the permit will have to be altered to better meet the facility's needs. It is much easier to fix the problem before the permit is issued rather than taking the chance of the facility exceeding their permit limits after the permit is issued.

The specific conditions will list any control equipment that the facility is required to install and properly maintain. There will likely be maintenance, monitoring, and recordkeeping provisions associated with the control equipment.

Facilities may also be required to conduct emissions testing at their plants. Whether or not emissions testing is required will depend on the size of the emission unit(s), how close the emission unit is to the PSD or Class I threshold, how good the emission factor rating is, whether the emissions will be controlled, and what efficiencies are being claimed for the control device.

Emission testing is required no later than 180 days after startup or 60 days after reaching maximum capacity. Facilities required to conduct emission testing must give NDEQ the Air Quality Division 30 days notice prior to testing and should submit an emission testing protocol 30 days prior to the test. If VOC/HAP testing is required, facilities should contact the Air Quality Compliance Section at (402) 471-4141 to discuss the appropriate testing methodology. Emission testing is conducted when the facility is operating at its maximum production rate. Facilities need to keep records of production during the test for verification purposes. For more information related to NDEQ's air emission testing procedures, refer to the "Nebraska Stack Testing Guidance Document" on the NDEQ website or contact the Air Quality Division.

The specific conditions will include the facility's monitoring requirements. Some of those requirements may include continuous emission monitors, opacity monitors, Method 9 opacity readings, visual inspections, or leak detection and repair programs.

A list of records that must be kept will be included in the specific conditions. Usually (unless otherwise specified) records must be kept and made available for five years. Records that will typically be required include production records; emission levels and calculations; fuel consumption; material handled or processed; equipment maintenance; monitoring; and startup, shutdowns, and malfunctions. Records kept should correlate to the production or emission limits in the permit to assure compliance with the permit conditions.

In addition to the reports listed in the general conditions, the specific conditions will list reports that the source must submit. The reports that may be required include performance tests; startup, shutdown, and malfunction; and others required by federal regulations.

Federal Regulations

Biodiesel production plants may be subject to several federal regulations and the requirements for those regulations will be found in the specific conditions of the permit. However, it is important to note that a facility may be subject to federal regulations not listed in the permit. This may occur when a new rule is promulgated after permit issuance, or when a source becomes subject to a rule after the permit is issued.

New Source Performance Standards
New Source Performance Standards (NSPS) establish technology-based standards that regulate criteria air pollutants from new or modified sources. These regulations were developed to assure that sources are installing the best-demonstrated technology to reduce emissions.[8]

NSPS regulations contain emission limits; control device or equipment requirements; and work practice, performance testing, monitoring, recordkeeping, notification, and reporting requirements. NSPS regulations can be found in 40 Code of Federal Regulations (CFR) Part 60. The following NSPS rules typically apply to biodiesel production plants.

- Subpart A – General Provisions
    - Sources subject to NSPS requirements may be subject to all or only a portion of the general provisions.

- Subpart Db – Industrial, Commercial, Institutional Steam Generating Units

- Units with a capacity >100 million Btu per hour (MMBtu/hr)
    - Includes boilers and thermal oxidizers/waste-heat recovery boilers
- Built, reconstructed, or modified after June 19, 1984
- Regulated pollutants
    - NO_x, PM, SO_2
    - Opacity

- Subpart Dc - Industrial, Commercial, Institutional Steam Generating Units
    - Units with a capacity ≥10 MMBtu/hr and ≤ 100 MMBtu/hr
        - Includes boilers and thermal oxidizers/waste-heat recovery boilers
    - Built, reconstructed, or modified after June 9, 1989
    - Regulated pollutants
        - PM, SO_2
        - Opacity
- Subpart Kb – Volatile Organic Liquid Storage Vessels
    - Vessels with a capacity ≥ 40 m^3 (approx. 10,000 gallons)
    - Built, reconstructed, or modified after July 23, 1984
    - Regulated pollutant
        - VOCs
- Subpart VV – Synthetic Organic Chemical Manufacturing Industry (SOCMI) Equipment Leaks
    - Glycerol is on the list of regulated SOCMI chemicals.
    - Units built, reconstructed, or modified after January 5, 1981
    - Regulated pollutant
        - VOCs
- Subpart NNN – VOC Emissions from SOCMI Distillation Operations
    - Glycerol is on the list of regulated SOCMI chemicals.
    - Units built, reconstructed, or modified after December 30, 1983
    - Regulated pollutant
        - VOCs
- Subpart RRR – VOC Emissions from SOCMI Reactor Processes
    - Glycerol is on the list of regulated SOCMI chemicals.
    - Units built, reconstructed, or modified after June 29, 1990
    - Regulated pollutant
        - VOCs
- Subpart IIII – Compression Ignition Internal Combustion Engines
    - Fire pumps included
    - Units built, reconstructed, or modified after July 11, 2005
    - Regulated pollutants
        - NO_x, SO_2, CO, PM, non-methane hydrocarbons

Facilities should be cognizant of these rules during the planning stages of a new plant or modification. The NSPS requirements may have influence over the equipment and control devices that will be installed.

National Emission Standards for Hazardous Air Pollutants

National Emission Standards for Hazardous Air Pollutants (NESHAPs) regulate HAP emissions from stationary sources through technology-based standards, known as Maximum Achievable Control Technology (MACT) standards. MACT standards are designed to require that a given type of source

install the best-demonstrated control technology available. New and existing facilities that fall within listed source categories and are major sources of HAP are subject to the MACT standards (although, there are a few MACT standards that include area sources). A major source of HAP has the potential to emit 10 tons per year of a single HAP or 25 tons per year of a combination of HAPs. There are 188 regulated HAPs. The list of HAPs can be found in Appendix II and Appendix III of Title 129.

MACT standards contain emission limits; control device or equipment requirements; and work practice, performance testing, monitoring, recordkeeping, notification, and reporting requirements. MACT standards can be found in 40 CFR Part 63. The following MACT standards may apply to biodiesel production plants.

- Subpart A – General Provisions
  - Sources subject to MACT requirements may be subject to all or portions of the general provisions
- Subpart B – Case-by-Case MACT
  - Major sources of HAP that construct or reconstruct, that are not already covered by a MACT must obtain a construction permit with a case-by-case MACT
- Subpart F – Synthetic Organic Chemical Manufacturing Industry (SOCMI)
  - Major HAP source that operates a SOCMI plant and produces or uses HAPs in the process
  - Promulgation date 4/22/94
  - Compliance date
    - Existing Sources – 5/14/01
    - New Sources – 5/12/98 or upon startup
- Subpart G – Equipment Specific Organic HAP from SOCMI plants
  - Major HAP source that operates a SOCMI plant and produces or uses HAPs in the process
  - Promulgation date 4/22/94
  - Compliance date
    - Existing Sources – 5/14/01
    - New Sources – 5/12/98 or upon startup
- Subpart H - Equipment Leaks of Organic HAP from SOCMI plants
  - Major HAP source that operates a SOCMI plant and produces or uses HAPs in the process
  - Promulgation date 4/22/94
  - Compliance date
    - Existing Sources – 5/12/99
    - New Sources – 5/12/98 or upon startup
- Subpart EEEE – Organic Liquids Distribution
  - Major HAP source that own or operate an organic liquid distribution facility except those at oil and natural gas transmission facilities or natural gas transmission and storage facilities.
  - Organic liquids include:
    - Organic liquids are non-crude oil liquids that contain at least 5 percent by weight of any combination of the 98 HAP listed in Table 1 to Wubpart EEEE of part 63, and have a total liquid vapor pressure of 0.7 kilopascals (0.1 pound per square inch absolute (psia)) or greater, and
    - All crude oils downstream of the first point of custody transfer.

        - Methanol is included in the list of 98 HAPs in Table 1 of Subpart EEEE.
        - Organic liquids do not include gasoline, fuels consumed or dispensed on the plant site, kerosene (No. 1 distillate oil), diesel (No. 2 distillate oil), asphalt, and heavier distillate oils and fuel oils, hazardous waste, wastewater, or ballast water.
    - Promulgation date 2/3/04
    - Compliance date
        - Existing Sources – 2/3/07
        - New Sources – 2/3/04 or upon startup
- Subpart FFFF – Miscellaneous Organic Chemical Production & Processes
    - Major HAP source that operate miscellaneous organic chemical manufacturing process units that uses or produces HAPs.
    - Organic chemicals include:
        - Classified in SIC Code 282, 283, 284, 285, 286, 287, 289 or 386
        - Classified in NAICS Code 3251, 3252, 3253, 3254, 3255, 3256, or 3259
    - Promulgation date 11/10/03
    - Compliance date
        - Existing sources – 11/10/06
        - New sources
            - Startup before 11/10/03 – comply by 11/10/03
            - Startup after 11/10/03 – comply upon startup
- Subpart GGGG – Solvent Extraction for Vegetable Oil Production
    - Major HAP source using n-hexane to extract oil from soybean, corn germ, safflower etc.
    - Promulgation date 4/12/01
    - Compliance date
        - Existing sources – 4/12/04
        - New sources
            - Startup before 4/12/01 – comply by 4/12/01
            - Startup after 4/12/01 – comply upon startup
- Subpart ZZZZ – Reciprocating Internal Combustion Engines
    - Major HAP source operating a reciprocating internal combustion engine greater than 500 horsepower
    - Proposed amendments to the rule to also cover area HAP sources and engines <500 horsepower 7/27/06
    - Promulgation date 6/15/04
    - Compliance date
        - Existing sources – 6/15/07
        - New sources – 8/16/04 or startup
- Subpart DDDDD – Industrial, Institutional, & Commercial Boilers & Process Heaters
    - Major HAP sources that have any size boiler and/or indirect-fired process heaters
        - Units themselves do not have to emit HAP or be major for HAP
    - Promulgation date 9/13/04
    - Compliance date
        - Existing sources – 9/13/07
        - New sources
            - Startup before 11/12/04 – comply by 11/12/04
            - Startup after 11/12/04 – comply upon startup

It is imperative for a facility to be aware of the MACT standards that may apply to its plant prior to construction. Facilities that construct after a rule that they will be subject to has been proposed must be in compliance with that rule by the time they begin operation of the plant.

Potential Air Quality Issues

When Nebraska's ethanol industry began to rapidly expand, NDEQ and other states experienced an increase in issues associated with the permitting of ethanol plants. NDEQ, other states, and the biofuels industry faced a tremendous learning curve associated with air quality permitting and compliance. We hope to avoid some of those same issues with the biodiesel production industry by addressing them in their infancy stage. This section will explain several of those common issues that have been faced with the ethanol industry and provide the industry, the public, and local government officials an understanding of the facts behind the issues to prevent uncertainty and noncompliance in the biodiesel production industry.

Compliance With Ambient Air Quality Standards

NDEQ must ensure that a facility constructing or expanding their plant will comply with the national ambient air quality standards (NAAQS). Those standards are set to protect the public health, welfare, and the environment. Predictive computer modeling is the tool used to demonstrate compliance with the ambient standards. The model will utilize meteorological information (worst case), maximum air emissions, stack heights, and property boundaries in the assessment.

If modeling predicts a violation of the ambient standards, the facility must rectify the violation before a permit can be issued. The violation must be addressed by the facility to reduce emissions sufficiently to prevent noncompliance with the ambient standards. The following options are available to address the predicted violation: install additional controls; take operational limitations; reconfigure emission points (e.g. raise stack heights); delineate the ambient air boundary around the facility; or a combination of these options. It is important to ensure that the modeling matches what is contained in the application. Ultimately, the modeling results will be used as a basis for many permitting conditions.

NDEQ has received several questions regarding how to delineate the ambient air boundary around the facility. For a facility to adequately delineate an ambient air boundary it must own the land or have legal right to exclusive use of the land and the public must be effectively excluded from the land. In theory, by delineating an ambient air boundary, the air inside the boundary is "exempt" from being classified as ambient air. In other words, the area inside the boundary does not have to demonstrate compliance with the NAAQS. A continuous physical or active barrier is required to adequately delineate the boundary and prevent knowing or unknowing trespassers from entering the property.

Examples of adequate physical barriers include: 4.5-foot tall 4-strand barbed wire fence; 6-foot chain link fence; or an equivalent proposal by the facility. Terrain features may also be used as a physical barrier as long as: an extraordinary effort is required to cross the particular terrain feature; it is not traversed by a trail, road, or railroad; and it cannot be traversed by an off-road vehicle.

No matter which option is selected the facility must submit a detailed plan on how it will maintain security and verify the integrity of the fence. The plan must include the following:

- Details about how the property will be posted. At a minimum, “No Trespassing” signs will be posted at an interval of every 250 feet and at every opening in the fence. The signs must be visible and easily read during daylight hours from a distance of 125 feet.
- The facility must submit details about how it will monitor the fence for integrity and trespassers, e.g., cameras posted at locations enabling surveillance staff to see each portion of the fence, security patrols making surveillance rounds, or equivalent.
- All gates must be monitored when not in use, e.g., equipped with cameras, have guards that have an unobstructed view of the opening, or equivalent.
- The facility must submit details on how it will monitor gates when not in use.

Active barriers may also be used to delineate an ambient air boundary. However, this option is used as a last resort and will be approved on a case-by-case basis. Adequate active barriers include a combination of surveillance, signs, and security patrols. The option to use an active barrier may not be allowed for PSD sources, Class I sources, sources located in an area that is not in compliance with an ambient standard, or sources that have a potential-to-emit near the PSD or Class I emission levels.

Haul Road Emissions

Fugitive emissions from haul roads are difficult to address. The emission estimation tools available are difficult to accurately determine unless site-specific parameters are developed, which can be expensive and time consuming. In addition, computer-modeling techniques used to predict the impact caused by plant emissions can overpredict the impact in ambient air caused by low-level emissions such as haul road emissions.

When a facility calculates its potential emissions to determine its permitting status (major or minor), it must include fugitive emissions such as those from roads, storage piles, and evaporative loss from tanks. In addition, the haul roads could be included in the air dispersion modeling for annual averaging periods unless the facility proposes to utilize best management practices (BMPs) to limit emissions. Refer to the modeling guidance on the NDEQ website to determine if your facility should include haul roads in your modeling analysis.

It is the applicant’s responsibility to propose and include in the permit application an appropriate BMP for their facility. The default value used in Nebraska for silt loading on paved roads is 3.0 g/m^3 (assuming best management practices are conducted). The silt loading value used in the permit will dictate if silt loading test will be required in the permit. Typically, facilities using a silt loading value at or above the default value will not be required to conduct silt load testing, unless other factors require testing be conducted.

NDEQ may require additional management practices in the construction permit on a case-by-case basis. BMPs for haul roads include: paving unpaved roads; require covers on haul trucks; utilize wheel washes; speed/traffic reductions; conduct frequent washing/vacuuming of paved roads; improve road surfaces; apply vegetative cover to non-road areas; pave/treat parking areas, driveways, shoulders; and apply water or chemical surfactants to the roads to minimize dust emissions. This list is not exhaustive and the applicant can propose other practices for NDEQ to consider.

Staged Construction

The intent of Title 129, Chapter 17 is to review new sources of air pollution above certain significance thresholds for compliance with the Clean Air Act (CAA), including compliance with the National Ambient Air Quality Standards (NAAQS). The NAAQS are federal air quality standards designed to protect the public health and environment. Circumventing permitting requirements through staged construction results in a situation where the company's true intent for production and, therefore, pollution are not properly evaluated. Without conducting the proper analysis, including predictive air quality modeling, the company, the Department and the public will not know whether compliance with the CAA and the NAAQS can be attained.

Circumvention of state construction permit requirements (Chapter 17) may also constitute circumvention of the federal construction permit requirements (Chapter 19). The Environmental Protection Agency (EPA) is clear in its circumvention guidance stating *"…attempts to expedite construction by securing minor source status through the receipt of operational restrictions from which the source intends to free itself shortly after operation are to be treated as circumvention of the preconstruction review requirements."*

Circumvention of permitting requirements cannot be evaluated until an application for the expanded or larger scale production level is submitted. If NDEQ determines that circumvention did occur, the source could be subject to enforcement action by the State or the EPA.

Each case will be evaluated individually. However, in general, the following outlines criteria we will evaluate to determine whether circumvention occurred.

- Timing of application for full-scale production plant. Was the full-scale production (expansion) application submitted within 12-18 months after the small-scale plant was operational? Applications made shortly after becoming operational may be evidence of circumvention.
- Applications for funding. Has the company filed applications for loans, utilities, etc. which guarantee a certain level of operation by a certain date? Would the project be funded? What is the economic viability of the source if it operated at the lower production level for an extended period of time? If the source cannot be economically viable at the lower production level for an extended period of time, this may be evidence of circumvention.
- Statements made about consumer demand and projected production levels. Has the company filed business permit applications that state projected operation or production levels? What statements have been made in stockholder reports, SEC reports, etc.? Statements made in these reports and documents show the intent of the company.
- Statements of authorized representatives of the source regarding plans for operation. Has the business made statements to NDEQ about their future plans of operation?
- Plans for equipment. What are the company's plans for the equipment used in the small-scale production? Is the equipment permanent? If the equipment is only temporary, then circumvention may not have occurred.

If you have questions about your specific scenario or permitting requirements, contact the Air Quality Division at (402) 471-2189 or call the Air Quality Construction Permit Hotline.

Burning Alternative Fuels

Due to the rising cost of natural gas, several plants are exploring the use of alternative fuels in their boilers such as coal, biomass, vegetable oil, animal fat, tire derived fuel, glycerin and methane. Facilities have approached NDEQ and inquired as to the related requirements. Most frequently the questions revolve around the need to apply for construction permits. The question becomes whether or not the fuel switching will need a construction permit. If the boiler could already burn the alternative fuel without a modification to the unit, it may not need a permit provided any increase in emissions has been properly evaluated. If a physical modification to the existing unit is needed, a construction permit is likely needed. In either case, you will need to determine the net increase in emissions due to the fuel switch and compare the emissions increase to the construction permit thresholds. Additionally, you may have to: apply for a construction permit revision if your current permit(s) stipulates the fuels that can be burned: conduct modeling if there are significant increases in pollutants not considered in previous modeling; and you may have to conduct testing to verify the assumptions made in your calculations.

Fuel switching may also lead to questions related to staged construction, as discussed in the previous section. NDEQ would follow the outline mentioned previously to determine if, in fact, the switching would qualify as staged construction, thereby circumventing the appropriate regulatory review. Some plants have undergone a best available control technology (BACT) review during their initial permit application, even though they had planned to limit their emissions below the level requiring the BACT review. This option may save time and additional regulatory review if fuel switching or expansions occur shortly after the initial construction permit is issued.

Support Facilities

As more plants are built NDEQ will begin answering more questions involving “support facilities” and their role in the construction permit process. Some plants are locating near existing oil extraction plants or ethanol plants instead of extracting on site or purchasing methanol/ethanol for their process. A grain elevator may be a support facility, if the elevator stores soybeans on-site for the biodiesel plant to later extract the oil. Additionally, an ethanol plant may provide corn oil to the biodiesel plant.

The issue becomes how and when the biodiesel plant should be drawn into the permit program with the ethanol or extraction plant and thus, considering these as a single source. The federal regulations generally consider pollutant-emitting activities as a single source when the following criterion are met (1) part of the same industrial grouping (Standard Industrial Classification Code), (2) they are contiguous or adjacent, and (3) under common control. One or more of these criteria can be satisfied when an emissions unit serves in a supporting role for a primary activity at a nearby location.[9]

EPA discussed support facilities in the draft preamble to Part 70 revisions published June 3, 1997. They concluded that the support facility determinations depend on several issues including financial, functional, contractual, and/or other legal factors including: (1) a mutually beneficial arrangement between the two activities; (2) the degrees the primary facility exerts control over the support facility’s operations; (3) the contractual agreements between the facilities; and (4) whether the support activity would exist at that site but for the primary activity.[9]

Thus, there are many factors affecting whether or not a support facility will be drawn into the permitting program with the biodiesel plant. These situations will be evaluated on a case-by-case

basis. The facility should contact the NDEQ Air Quality Division to discuss this very early in the planning process to avoid unnecessary delays with the permit issuance.

Other Permitting and Compliance Issues

One of the situations that NDEQ comes across frequently is when a facility builds the plant differently than they had originally intended and their construction permit does not coincide with the actual plant's emission points. These situations can cause unnecessary confusion for permitting and compliance staff, may be a permit violation, and may require a permit modification. The facility must install the equipment that has been approved in their permit and if there are changes, submit those to NDEQ immediately. Also, a facility must begin continuous construction of the permitted emission unit(s) within 18 months of permit issuance or the permit is no longer valid.

Most violations at facilities result from not reading and understanding the conditions in the construction or operating permit. Once the permit is finalized, the plant representatives will be responsible for compliance with the permit conditions. It is very important for plant staff and managers to understand these requirements to prevent permit violations. Although not required, it is helpful for plants to have at least one full-time person dedicated to maintaining compliance with the environmental regulations and permits.

Some of the common violations include failure to perform testing, testing late, exceeding emission or production limits, failure to keep adequate records, failure to submit required reports on time, and failure to conduct and keep records of control equipment maintenance.

There are a few simple tips that can help a facility maintain compliance:

- Read and reread your permit on a routine basis;
- Understand your permit requirements;
- Keep your records in one place and in a logical order;
- Properly operate and maintain control equipment;
- Designate an "environmental manager" and train a backup;
- Ask the NDEQ questions to avoid misunderstandings and mistakes; and
- Plan ahead!

Nebraska Biodiesel Production Plants

Nebraska is ranked in the top five for soybean production in the United States, producing an estimated 7.5% of the nation's soybean production of 2.77 billion bushels. If Nebraska converted 25% of the 200 million bushels of soybean feedstock produced in the state to biodiesel, Nebraska could yield over 70 million gallons of biodiesel per year.[1] This does not include potential biodiesel production plants utilizing an alternative feedstock (animal fat). Regardless of the feedstock, it is likely that small, non-commercial biodiesel plants will largely outnumber commercial plants in Nebraska.

As of January 2007, Nebraska has one operating commercial biodiesel plant located Arlington. The facility in Oakland, NE is primarily research-based and has been operating since August 2005. One biodiesel plant has obtained an air quality construction permit and another has submitted an application. Table 1 describes the information we have regarding these plants.

The increasing demand for biodiesel and the incentives made available for biodiesel has increased the attractiveness of building new biodiesel production plants. Several prospective plants have spoken with NDEQ representatives or information has been obtained through media contacts discussing planned locations for biodiesel production plants, but none have submitted construction permit applications to NDEQ. To obtain a current list of biodiesel production plants, contact the NDEQ Environmental Assistance Division at (402) 471-6974.

Facility Name	Location	Production Capacity (gallons)	Air Quality Construction Permit Status
Beatrice Biodiesel LLC	Beatrice	60 million	Permit issued 10/12/06
Northeast Nebraska Biodiesel	Scribner	5 million	Application received 5/16/06
Horizon Biofuels, Inc.	Arlington	~ 180,000	No permit required
Nebraska Renewable Energy Systems	Oakland	10,000	No permit required

Table 1 **Nebraska Department of Environmental Quality**

Conclusion

This document is intended to pull the pieces of the air quality "permitting puzzle" together and provide assistance to biodiesel production plants regarding the permitting process. Knowledge of the regulatory processes and requirements is the foundation for environmental compliance.

This document also provides to the public and state and local government officials information regarding the biodiesel production processes and air emissions. An integral part of the permitting process is to provide opportunities for the public to understand and comment on activities that affect their environment.

As the nation becomes more dependent on renewable fuels, such as biodiesel, the industry, the public, and local and state governments must have the knowledge that will prepare them for the future. The public health, welfare, and environment will be protected and economic development will continue if everyone communicates effectively and works together.

For questions and assistance with the air quality regulations, contact the NDEQ Air Quality Division at (402) 471-2189. For general environmental assistance, contact the Environmental Assistance Division at (402) 471-8697. For assistance with the wastewater requirements, contact the Wastewater Section at (402) 471-8830.

The air quality regulations, permit applications, and other helpful air quality fact sheets and guidance documents are located on the agency website at www.deq.state.ne.us. Be advised that the intent of this document is to provide guidance and the reader should contact NDEQ staff for specific information.

APPENDIX A –Available Resources

Nebraska Department of Environmental Quality

PO Box 98922 • 1200 'N' St., Atrium, Suite 400 • Lincoln, NE 68509-8922
Phone: (402) 471-2186; Fax: (402) 471-2909
Air Quality Division – (402) 471-2189 Air Quality Construction Permit Hotline (877) 834-0474
Environmental Assistance Division – (402) 471-6974
Waste Management Division – (402) 471-4210 or 471-3388
Water Quality Division – (402) 471-3098 or 471-4287
www.deq.state.ne.us

Nebraska Department of Economic Development

301 Centennial Mall South • P.O. Box 94666 • Lincoln, NE 68509-4666
Phone: (800) 426-6505; Fax: (402) 471-3778
www.neded.org

Environmental Protection Agency - Region VII

901 N. 5th Street • Kansas City, KS 66101
Air, RCRA, & Toxics Division – (913) 551-7020
www.epa.gov
www.epa.gov/ttn - Technology Transfer Center

National Biodiesel Board

3337a Emerald Lane • PO Box 104898
Jefferson City, MO 65110-4898
Phone: (800) 841-5849; Fax: (573) 635-7913
Email: Info@biodiesel.org
www.biodiesel.org

Nebraska Soybean Board

3815 Touzalin Ave., Suite 101
Lincoln, NE 68507
Phone: (402) 441-3240; Fax: (402) 441-3238
Email: soybean4@alltel.net
www.nesoybeans.unl.edu

Nebraska Renewable Energy Systems

113 N. Charde Ave (Hwy 77)
Oakland, NE 68045
Phone: (402) 685-4848
www.NebraskaREA.org

Industrial Agricultural Products Center

208 L. W. Chase Hall, University of Nebraska,
Lincoln, NE 68583-0730
Phone: 402-472-8187
Fax: 402-472-6338
http://agproducts.unl.edu

Air Quality Documents Available

The following is a list of Air Quality fact sheets, guidance documents, applications, forms, and reports located on NDEQ's website the biofuels industry may find helpful. You can also obtain these documents by contacting the NDEQ Air Quality Division. Be sure to check the website often for updates and additions.

Fact Sheets

Acceptable Pre-construction Dirt Work
Air Pollutant Information
Air Quality Acronyms and Abbreviations
Air Quality Models
Compliance Assurance Monitoring
Construction Permit Application Tips
Construction Permit Application Fees
Construction Permits
Deviations
Establishing Air Quality Regulations in Nebraska
Facts about Federal Air Quality Regulations
Fugitive Dust FAQs
Inspection Tips From NDEQ's Air Quality Division
Maintaining Good Air Quality Through the Increment Rules of the PSD Program
Nebraska's Low Emitter Rule
NDEQ's Compliance Assistance Program
Odor
Open Burning
Operating Permits
Permit Shields
Permit-by-Rules
Recordkeeping for No Permit Required
Redesignation of Air Quality Control Regions

Reports

Air Quality and Ethanol Production
Nebraska Air Quality Reports
Regional Haze Report

Other

Air Waves Bulletin
Air Quality Compliance Calendar
Hazardous Air Pollutant List
Title 129 – Nebraska Air Quality Regulations (under Rules and Regulations)
Potential Emission Calculation Spreadsheets

Guidance Documents

Air Quality Confidentiality Claims
Air Quality Modeling Checklist
Air Quality Permit Process
Atmospheric Dispersion Modeling Guidance for Permits
Certification of Compliance and Deviation Reports
How to Calculate Yearly and Rolling Totals and Rolling Averages
Nebraska's Stack Testing Guidance
Pre-Application Meeting Guidance for Construction Permits
Tax Refund Guidelines for Air and Water Pollution Control Projects

Forms and Applications

Air Emission Inventory Forms
Construction and Operating Permit Applications
Low Emitter Forms
Open Burning Permit Applications

APPENDIX B – Document Acronyms & Abbreviations

BACT	Best Available Control Technology
CFR	Code of Federal Regulations
CO	Carbon Monoxide
EPA	Environmental Protection Agency
HAP	Hazardous Air Pollutant
MACT	Maximum Achievable Control Technology
MmBtu/hr	Million Btu per hour
MTBE	Methyl Tertiary Butyl Ether
NAAQS	National Ambient Air Quality Standards
NAICS	North American Industry Classification System
NDEQ	Nebraska Department of Environmental Quality
NESHAPs	National Emission Standards for Hazardous Air Pollutants
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
NSPS	New Source Performance Standards
Pb	Lead
PM	Particulate Matter
PM_{10}	Particulate Matter with an aerodynamic diameter less than 10 microns
PSD	Prevention of Significant Deterioration
PTE	Potential to Emit
SIC	Standard Industrial Classification
SO_2	Sulfur Dioxide
SO_3	Sulfate
SOCMI	Synthetic Organic Chemical Manufacturing Industry
SO_x	Sulfur Oxides
tpy	Tons per Year
TRS	Total Reduced Sulfur
TSP	Total Suspended Particulate
VOC	Volatile Organic Compound

APPENDIX C – Citations

[1] The Biodiesel Industry: Opportunities & Challenges Loren Isom, University of Nebraska Lincoln. Presentation to Nebraska Department of Environmental Quality. April 10, 2006.

[2] ABC's of Biofuels U.S. Department of Energy – Energy Efficiency and Renewable Energy. February 8, 2006. <http://www1.eere.energy.gov/biomass/abcs_biofuels.html>. December 4, 2006.

[3] Biodiesel Benefits U.S. Department of Energy – Energy Efficiency and Renewable Energy. <http://www.eere.energy.gov/afdc/altfuel/bio_benefits.html> August 4, 2005.

[4] Biodiesel and Air Quality Jake Stewart, Vice President Organic Fuels. Presentation at National Association of Air Agencies Fall Membership Meeting. October 23, 2006.

[5] How is Biodiesel Made? U.S. Department of Energy – Energy Efficiency and Renewable Energy. <http://www.eere.energy.gov/afdc/altfuel/bio_made.html> August 4, 2005.

[6] Biodiesel Production National Biodiesel Board. September 18, 2001. <http://www.biodiesel.org/pdf_files/fuelfactsheets/Production.PDF> November 29, 2006.

[7] Biodiesel Production and Quality National Biodiesel Board. March 11, 2002. <http://www.biodiesel.org/pdf_files/fuelfactsheets/prod_quality.pdf> November 30, 2006.

[8] Aspen Law & Business. *Clean Air Act Step-by-Step Compliance.* Aspen Publishers, Inc. (2003)

[9] Letter from JoAnn Heiman, EPA Region 7, to James Pray, Brown, Winick, Graves, Gross, Baskerville, and Schoenebaum, P.L.C., re support facilities, (December 6, 2004). <http://www.epa.gov/Region7/programs/artd/air/nsr/nsrmemos/lincoln.pdf>

[10] Commercial Biodiesel Production Plants National Biodiesel Board. January 31, 2007. <http://www.biodiesel.org/buyingbiodiesel/producers_marketers/ProducersMap-Existing.pdf> February 5, 2007.

[11] Strategically Locating Soybean And Biodiesel Processing Facilities In Nebraska The Independent Biodiesel Feasability Group. Kearney, MO. September 2005.

[12] Biodiesel. Wikipedia. <http://en.wikipedia.org/wiki/Biodiesel> February 6, 2007.