STATE OF MISSOURI **PERMIT BOOK**

DEPARTMENT OF NATURAL RESOURCES

MISSOURI AIR CONSERVATION COMMISSION

PERMIT TO CONSTRUCT

Under the authority of RSMo 643 and the Federal Clean Air Act the applicant is authorized to construct the air contaminant source(s) described below, in accordance with the laws, rules and conditions as set forth herein.

Permit Number: 102010-003 Project Number: 2007-05-076

Parent Company: Archer Daniels Midland

Parent Company Address: P.O. Box 1470, Decatur, IL 62525

Installation Name: Archer Daniels Midland-Mexico

Installation Address: 400 East Holt Street, Mexico, MO 65265

Location Information: Audrain County, S26, T51N, R9W

Application for Authority to Construct was made for:
The expansion of the soybean extraction plant to 2100 tons of soybeans per day. This review was conducted in accordance with Section (8), Missouri State Rule 10 CSR 10-6.060, *Construction Permits Required.*

☐ Standard Conditions (on reverse) are applicable to this permit.

☑ Standard Conditions (on reverse) and Special Conditions are applicable to this permit.

OCT - 5 2010

EFFECTIVE DATE

DIRECTOR OR DESIGNEE
DEPARTMENT OF NATURAL RESOURCES

STANDARD CONDITIONS:

Permission to construct may be revoked if you fail to begin construction or modification within 18 months from the effective date of this permit. Permittee should notify the Air Pollution Control Program if construction or modification is not started within 18 months after the effective date of this permit, or if construction or modification is suspended for one year or more.

You will be in violation of 10 CSR 10-6.060 if you fail to adhere to the specifications and conditions listed in your application, this permit and the project review. In the event that there is a discrepancy between the permit application and this permit, the conditions of this permit shall take precedence. Specifically, all air contaminant control devises shall be operated and maintained as specified in the application, associated plans and specifications.

You must notify the department's Air Pollution Control Program of the anticipated date of start up of this (these) air contaminant sources(s). The information must be made available not more than 60 days but at least 30 days in advance of this date. Also, you must notify the Department of Natural Resources Regional office responsible for the area within which you are located with 15 days after the actual start up of this (these) air contaminant source(s).

A copy of this permit and permit review shall be kept at the installation address and shall be made available to Department of Natural Resources' personnel upon request.

You may appeal this permit or any of the listed special conditions to the Administrative Hearing Commission (AHC), P.O. Box 1557, Jefferson City, MO 65102, as provided in RSMo 643.075.6 and 621.250.3. If you choose to appeal, you must file a petition with the AHC within 30 days after the date this decision was mailed or the date it was delivered, whichever date was earlier. If any such petition is sent by registered mail or certified mail, it will be deemed filed on the date it is mailed. If it is sent by any method other than registered mail or certified mail, it will be deemed filed on the date it is received by the AHC.

If you choose not to appeal, this certificate, the project review and your application and associated correspondence constitutes your permit to construct. The permit allows you to construct and operate your air contaminant sources(s), but in no way relieves you of your obligation to comply with all applicable provisions of the Missouri Air Conservation Law, regulations of the Missouri Department of Natural Resources and other applicable federal, state and local laws and ordinances.

The Air Pollution Control Program invites your questions regarding this air pollution permit. Please contact the Construction Permit Unit at (573) 751-4817. If you prefer to write, please address your correspondence to the Missouri Department of Natural Resources, Air Pollution Control Program, P.O. Box 176, Jefferson City, MO 65102-0176, attention: Construction Permit Unit.

SPECIAL CONDITIONS:

The permittee is authorized to construct and operate subject to the following special conditions:

The special conditions listed in this permit were included based on the authority granted the Missouri Air Pollution Control Program by the Missouri Air Conservation Law (specifically 643.075) and by the Missouri Rules listed in Title 10, Division 10 of the Code of State Regulations (specifically 10 CSR 10-6.060). For specific details regarding conditions, see 10 CSR 10-6.060 paragraph (12)(A)10. "Conditions required by permitting authority."

Archer Daniels Midland-Mexico
Audrain County, S26, T51N, R9W

1. Production Limitation During Expansion Related Construction
   - A. The condition of this permit and the initial start-up period begin once Archer Daniels Midland-Mexico (ADM) begins operation. The Air Pollution Control Program considers operation to begin once ADM starts-up the plant after all expansion related construction has been completed.
   - B. During expansion related construction, ADM shall continue to comply with all Missouri State Rules and existing permit conditions.
   - C. During expansion related construction, ADM shall limit their production to less than 1,578,737 bushels per month.
     - (1) ADM shall maintain an accurate record of production.
     - (2) ADM shall maintain these records not less than five years and shall make them available immediately to any Missouri Department of Natural Resources' personnel upon request.

2. Particulate Matter Less Than Ten Microns in Aerodynamic Diameter (PM_{10}) Emission Limitation (Non-BACT)
   - A. ADM shall emit less than 6.68 tons of PM_{10} (filterable and condensable) in any consecutive 12 month period from the boiler #4 (EU0220).
   - B. ADM shall maintain an accurate record of PM_{10} emitted into the atmosphere from the boiler #4.
     - (1) The records shall include at a minimum the following information:
       - (a) The type and volume of fuel combusted monthly.
       - (b) The emission factor and its units used to calculate PM_{10} emissions.
       - (c) The monthly PM_{10} emissions from the boiler in tons.
       - (d) The 12-month rolling total PM_{10} emissions in tons. This total is calculated by adding the current months PM_{10} emissions and the sum of the PM_{10} emissions from the previous 11 months.
     - (2) ADM shall maintain all records required by this permit for not less than five years and shall make them available immediately to any Missouri Department of Natural Resources' personnel upon request.

SPECIAL CONDITIONS:

The permittee is authorized to construct and operate subject to the following special conditions:

C. ADM shall report to the Air Pollution Control Program's Enforcement Section, P.O. Box 176, Jefferson City, MO 65102, no later than ten days after the end of the month during which the records from Special Condition Number 2.B indicate that the source exceeds the limitation of Special Condition Number 2.A.

3. Nitrogen Oxides (NO_X) Emission Limitation (Non-BACT)

A. ADM shall emit less than 40.0 tons of NO_X in any consecutive 12-month period from the boiler #4 (EU0220).

B. ADM shall maintain an accurate record of NO_X emitted into the atmosphere from the boiler #4.

(1) The records shall include at a minimum the following information:
(a) The type and volume of fuel combusted monthly.
(b) The emission factor and its units used to calculate NO_X emissions.
(c) The monthly NO_X emissions from the boiler in tons.
(d) The 12-month rolling total NO_X emissions in tons. This total is calculated by adding the current months NO_X emissions and the sum of the NO_X emissions from the previous 11 months.

(2) ADM shall maintain all records required by this permit for not less than five years and shall make them available immediately to any Missouri Department of Natural Resources' personnel upon request.

C. ADM shall report to the Air Pollution Control Program's Enforcement Section, P.O. Box 176, Jefferson City, MO 65102, no later than ten days after the end of the month during which the records from Special Condition Number 3.B indicate that the source exceeds the limitation of Special Condition Number 3.A.

4. Volatile Organic Compound (VOC) Best Available Control Technology (BACT) Emission Limitation for the entire installation.

A. The solvent loss ratio shall not exceed 0.150 gallons of solvent per ton of oilseed processed, based on a 12-month rolling average. Solvent loss and quantity of oilseed processed shall be determined in accordance with 40 CFR 63, Subpart GGGG. The limit does not apply to malfunction periods as defined in 40 CFR 63.2850(e), if ADM complies with the requirements of 40 CFR 63.2850(e)(2) and special condition 4.A.(3).

SPECIAL CONDITIONS:

The permittee is authorized to construct and operate subject to the following special conditions:

(1) When accounting for emissions ADM shall equate "actual solvent loss" to VOC emissions and shall calculate "actual solvent loss" in accordance with 40 CFR 63.2853.

(2) This emission limitation first comes in to effect at the end of the fifteenth month of operation and utilizes data from the fourth month of operation through the fifteenth month of operation for the initial compliance demonstration.

(3) When choosing to operate under a malfunction period, ADM shall submit a notification of the malfunction containing the information outlined in condition 4.A(3)(a) to the Air Pollution Control Program's Compliance/Enforcement Section, P.O. Box 176, Jefferson City, MO 65102, with ten days of the malfunction. The malfunction period must be approved by the Compliance/Enforcement Section in accordance with the requirements in condition 4.A.(3)(b).

(a) The notification shall contain at a minimum the following information:
  (1) The name of the person who first discovered the malfunction and precise time and date that the malfunction was discovered;
  (2) The equipment causing the excess emissions;
  (3) Time and duration of the period of excess emissions;
  (4) Cause of the excess emissions;
  (5) Estimate of the magnitude of the excess emissions in pounds of VOC and the operating data and calculations used in estimating the magnitude;
  (6) Measures taken to mitigate the extent and duration of the excess emissions;
  (7) Measures taken to remedy the situation which caused the excess emissions and the measures taken or planned to prevent the recurrence of these situations.

(b) Approval shall be based on the following factors:
  (1) Whether the excess emissions occurred as a result of safety, technological or operating constraints of the control equipment, process equipment or process;
  (2) Whether repairs were made as expeditiously as practicable when the operator knew or should have known when excess emissions were occurring;
  (3) Whether the amount and duration of the excess emissions were limited to the maximum extent practical during periods of this emission;
  (4) Whether all practical steps were taken to limit the impact of

SPECIAL CONDITIONS:

The permittee is authorized to construct and operate subject to the following special conditions:

the excess emissions on the ambient air quality;

(5) Whether all emission monitoring systems were kept in operation;

(6) Whether the excess emissions are part of a recurring pattern indicative of inadequate design, operation or maintenance.

B. The solvent loss ratio shall not exceed 0.171 gallons of solvent per ton of oilseed processed, based on a 12-month rolling average. Solvent loss and quantity of oilseed processed shall be determined in accordance with 40 CFR 63, Subpart GGGG. This limit applies during all operations including startups, shutdowns and malfunctions after the initial startup period.

(1) When accounting for emissions ADM shall equate “actual solvent loss” to VOC emissions and shall calculate “actual solvent loss” in accordance with 40 CFR 63.2853.

(2) This emission limitation first comes in to effect at the end of the twelfth month of operation and utilizes data from the fourth month of operation through the fifteenth month of operation for the initial compliance demonstration.

C. ADM shall limit actual solvent loss to less then 42,000 gallons during the first three months of operation (initial start-up period).

D. ADM shall maintain an accurate record of solvent loss and oilseed throughput. These recordkeeping requirements apply under all operating scenarios including startup, shutdown and malfunction. Such records shall be maintained for not less than five years and shall be made available immediately to any Missouri Department of Natural Resources’ personnel upon request.

E. ADM shall report to the Air Pollution Control Program’s Compliance/Enforcement Section, P.O. Box 176, Jefferson City, MO 65102, no later than ten days after the end of the month during which the records from Special Condition 4.D. indicate that the source exceeds the limitations of Special Conditions 4.A, 4.B or 4.C.

5. BACT Emission Limits for Boiler #4 (EU0220)

A. The following emission limits apply to the 85.6 MMBTU/hr boiler. ADM shall not exceed the following emission limits:

(1) When burning natural gas VOC emissions shall be limited to 0.0055 lbs/MMBTU, test method average.

SPECIAL CONDITIONS:

The permittee is authorized to construct and operate subject to the following special conditions:

(2) When burning other fuels, VOC emissions shall be limited to 0.001 lbs/MMBTU, test method average.

B. ADM shall demonstrate compliance with the limits in special condition 5.A by testing in accordance with the requirements of special condition 10.

6. Leak Detection and Repair (LDAR) Program – BACT Requirement

A. ADM shall prepare and implement a leak detection and repair (LDAR) program to control fugitive VOC emissions. The written LDAR program shall be made available immediately to any Missouri Department of Natural Resources' personnel upon request. This requirement is part of the BACT determination for this permit.

B. The following are minimum requirements for the detection portion of the LDAR program:

(1) Plant personnel shall check equipment that contains hexane on a daily basis for any signs of a leak, based on sight, sound or smell. Equipment to be checked on the daily inspection includes storage tanks, pumps, piping, duct work, enclosed conveyors, valves, flanges, seals, sight glasses and process equipment (including the extractor, desolventizer-toaster, dryer-cooler, distillation equipment, condensers and heat exchangers).

(2) ADM shall install four fixed-location flammable gas monitors in the solvent extraction area. The fixed-location monitors shall be placed in low lying areas in close proximity to likely fugitive emission sources. ADM shall maintain an inventory of spare parts for the monitors in order to ensure consistent operation. The flammable gas monitors will be set to audible and visual alarm at 500 parts per million (ppm) hexane.

C. The following are minimum requirements for LDAR recordkeeping:

(1) Daily inspection observations and representative fixed-location flammable gas monitor readings shall be recorded in writing and shall be signed and dated by the person that conducted the inspection/reading.

(2) If leaks are observed, the nature and extent of the observed leak shall be recorded along with documentation regarding corrective actions.

(3) LDAR program records shall be maintained for not less than five years and shall be made available immediately to any Missouri Department of Natural Resources' personnel upon request. Written records may be converted to scanned computer files for the purpose of recordkeeping.

SPECIAL CONDITIONS:

The permittee is authorized to construct and operate subject to the following special conditions:

7. BACT Control Equipment Requirements for the extraction and solvent recovery processes.
   A. ADM shall control emissions from the following equipment/process using evaporators, condensers and a mineral oil absorption system as specified in the permit application.
      (1) The extraction process
      (2) The desolventizing-toasting (DT) process

   B. The evaporators, condensers and mineral oil absorption system shall be operated and maintained in accordance with the manufacturer's specifications.

   C. ADM shall maintain an operating and maintenance log for the evaporators, condensers and the mineral oil absorption system which shall include the following:
      (1) Incidents of malfunction, with impact on emissions, duration of event, probable cause, and corrective actions; and
      (2) Maintenance activities, with inspection schedule, repair actions, and replacements, etc.

   D. ADM shall continuously monitor and record the temperature of the uncondensed vapors at the exit of the cold water condenser.

   E. ADM shall monitor and record the temperature of the uncondensed vapors at the exit of the extractor condenser, the DT condenser and the vent condenser once daily.

   F. ADM shall install and effectively operate a chiller for the mineral oil absorption system. The mineral oil chiller shall be used during the months of April through October. Operation of the mineral oil chiller is optional November through March.

   G. ADM shall continuously monitor and record the temperature of the mineral oil that enters the top of the absorption column.

   H. ADM shall route breathing and working losses from the solvent storage tanks to the solvent recovery system.

8. Maximum Achievable Control Technology (MACT) Requirement
   ADM shall comply with all appropriate monitoring, testing, reporting, and record keeping requirements of 40 CFR 63, Subpart GGGG—*National Emission*

SPECIAL CONDITIONS:

The permittee is authorized to construct and operate subject to the following special conditions:

Standards for Hazardous Air Pollutants: Solvent Extraction for Vegetable Oil Production.

9. Standard of Performance for New Stationary Sources (NSPS) Requirement
ADM shall comply with all appropriate monitoring, testing, reporting, and record keeping requirements of 40 CFR Part 60, Subpart DD—*Standards of Performance for Grain Elevators*

10. Control Device Requirement – Cyclones and Baghouses (non-BACT)

A. ADM shall control emissions from the emission units listed in Table 1 using cyclones and then a baghouse (for the cyclone exhaust streams) as specified in the permit application.

Table 1: Cyclones and Baghouse Controlled Emission Units

Emission Point	Emission Unit ID	Emission Unit Description	Control Device ID (cyclone/ baghouse)
ERP17	EU0160	Meal Storage	CD13/CD14
	EU0170	Truck Meal Loadout	CD13/CD14
ERP18	EU0110	Hull Grinding	CD06/CD12
	EU0120	Bean Cleaning	CD05/CD12
	EU0150	Meal Grinding	CD11/CD12

B. ADM shall control emissions from the emission units listed in Table 2 using cyclones as specified in the permit application.

Table 2: Cyclones Controlled Emission Units

Emission Point	Emission Unit ID	Emission Unit Description	Control Device ID (cyclone/ baghouse)
ERP07	EU0100	Cracking/Dehulling	CD04
ERP13	EU0130	Soybean Flaking	CD08
ERP14	EU0140	Meal Drying/Cooling	CD10*
ERP24	EU0230	Bean Heating	CD15

*Each deck of the Meal Dryer/Cooler is controlled by an individual cyclone.

C. ADM shall control emissions from the emission units listed in Table 3 using baghouses as specified in the permit application.

Table 3: Baghouse Controlled Emission Units

Emission Point	Emission Unit ID	Emission Unit Description	Control Device ID (cyclone/ baghouse)
ERP01	EU0010	Northwest Truck Dump	CD01

SPECIAL CONDITIONS:

The permittee is authorized to construct and operate subject to the following special conditions:

Emission Point	Emission Unit ID	Emission Unit Description	Control Device ID (cyclone/ baghouse)
ERP06	EU0090	Elevator Conveying	CD03
ERP18	EU0180	Rail Meal Loadout	CD12*

*Hull grinding, bean cleaning and meal grinding are vented to CD12.

D. The baghouses shall be operated and maintained in accordance with the manufacturer's specifications. The baghouse shall be equipped with a gauge or meter, which indicates the pressure drop across the control device. These gauges or meters shall be located such that Department of Natural Resources' employees may easily observe them.

E. Replacement filters for the baghouses shall be kept on hand at all times. The bags shall be made of fibers appropriate for operating conditions expected to occur (i.e. temperature limits, acidic and alkali resistance, and abrasion resistance).

F. ADM shall monitor and record the operating pressure drop across the baghouses at least once per day. The operating pressure drop shall be maintained in accordance with the manufacturer's specification.

G. ADM shall inspect all cyclone solids discharge valves at least once per week to ensure proper operation.

H. ADM shall monitor air flow rate, pressure drop or fan operation at least once per day to ensure proper operation of all cyclones.

I. ADM shall maintain an operating and maintenance log for the cyclones and the baghouses which shall include the following:
   1) Incidents of malfunction, with impact on emissions, duration of event, probable cause, and corrective actions; and
   2) Maintenance activities, with inspection schedule, repair actions, and replacements, etc.

11. Performance Testing Requirements

A. ADM shall conduct initial performance testing for emission points ERP01, ERP06, ERP07, ERP13, ERP14, ERP17, ERP18, and ERP24 to develop emission factors in units of pounds of PM_{10} per ton of grain processed by the emission unit for use in tracking their projected actual emissions.

B. ADM shall conduct initial performance testing for emission unit EU0220 to demonstrate compliance with the limit in special condition 2.A.

C. The tests shall be performed according to 10 CSR 10-6.030 Sampling Methods for Air Pollution Sources, or any method approved by the Air Pollution Control Program.

D. ADM shall conduct testing sufficient to demonstrate compliance with any and all applicable new source performance standard(s).

SPECIAL CONDITIONS:

The permittee is authorized to construct and operate subject to the following special conditions:

E. The initial performance tests shall be performed within 60 days of achieving the maximum production rate, but no later than 180 days after initial startup.

F. The initial performance test date(s) shall be pre-arranged with the Air Pollution Control Program a minimum of 30 days prior to the proposed test date so that a pre-test meeting may be arranged if necessary, and to assure that the test date is acceptable for an observer from the Air Pollution Control Program to be present. A proposed test plan shall be submitted to the Air Pollution Control Program a minimum of 30 days prior to the proposed test date. The test plan must be approved by the Air Pollution control Program prior to the test date.

12. Record Retention Requirements

ADM shall maintain all records required as outlined in 40 CFR 52.21 supporting the findings of the actual-to-projected-actual applicability test used in ADM’s analysis. ADM shall maintain records of the baseline, projection and annual emissions information for five years after the modification in this project.

REVIEW OF APPLICATION FOR AUTHORITY TO CONSTRUCT AND OPERATE
SECTION (8) REVIEW
Project Number: 2007-05-076
Installation ID Number: 007-0002
Permit Number:

Archer Daniels Midland-Mexico
400 East Holt Street, Mexico, MO 65265

Complete:

Parent Company:
Archer Daniels Midland
P.O. Box 1470, Decatur, IL 62525

Audrain County, S26, T51N, R9W

REVIEW SUMMARY

- Archer Daniels Midland-Mexico has applied for authority to expand the soybean extraction plant to 2100 tons of soybeans per day.

- Hazardous Air Pollutant (HAP) emissions are expected from the proposed equipment. The HAP of concern from this process is N-hexane.

- Standard of Performance for New Stationary Sources (NSPS), 40 CFR Part 60, Subpart DD—*Standards of Performance for Grain Elevators* applies to emission units.

- The Maximum Achievable Control Technology (MACT) standard, 40 CFR Part 63, Subpart GGGG, *National Emission Standards for Hazardous Air Pollutants: Solvent Extraction for Vegetable Oil Production* applies to the proposed sources of hexane emissions.

- Baghouses and cyclones will be used to control PM_{10} emissions from the equipment in this permit. Condensers and a mineral oil absorption system are used to control VOC emissions from the extraction process.

- This review was conducted in accordance with Section (8) of Missouri State Rule 10 CSR 10-6.060, *Construction Permits Required*. The emissions increase of volatile organic compounds (VOCs), which was calculated using a projected actual minus baseline calculation, is above the major source significance threshold. Emissions of PM, PM_{10} and NO_X are conditioned below major source significance levels.

- This installation is located in Audrain County, an attainment area for all criteria air pollutants.

- This installation is not on the List of Named Installations [10 CSR 10-6.020(3)(B), Table 2].

- Ambient air quality modeling was performed to determine the ambient impact of N-hexane. No model is currently available which can accurately predict ambient ozone concentrations caused by this installation's VOC emissions.

- Emissions testing are required for the equipment.

- A modification of the installation's Part 70 Operating Permit is required within 1 year of equipment startup.

- Approval of this permit is recommended with special conditions.

INSTALLATION DESCRIPTION

The ADM soybean processing facility in Mexico, Missouri consists of an oil extraction plant and a biodiesel plant. The installation is considered an existing major source of air pollutants for new source review purposes and a Part 70 source for operating permit purposes. The installation has a Part 70 operating permit (permit number OP2000-146) that expired on March 6, 2007. A renewal application for this permit was received on September 6, 2006 and is under technical review.

The typical extraction process for soybeans consists of three steps: soybean receiving, preparation and solvent extraction. Soybeans are received by either truck or rail and are unloaded into grain receiving pits. After receiving, the beans are elevated into concrete silos. From the silos, the beans are conveyed to the preparation building. Inside the preparation building beans are cleaned, heated and then dehulled and cracked into small pieces. These pieces are conveyed to flakers that smash the pieces into thin flakes that are ready for extraction. In the extraction process, the flakes are conveyed through a hexane bath that extracts the soybean oil from the flakes. The oil/hexane mixture is driven off the spent flakes in the desolventizer/toaster and sent to condensers to be separated. The spent flakes are then dried, cooled and ground. The ground meal is stored and sold as agricultural feed.

The following permits have been issued to ADM from the Air Pollution Control Program (the Program).

Table 4: Previously Issued Construction Permits

Permit Number	Description
0284-007	Construction of a boiler
0795-002	Construction of a new soybean dehulling system
032006-010	Construction of a 36 million gallon per year biodiesel production plant
102006-015	Amend biodiesel loading
102006-015A	Add storage tanks

PROJECT DESCRIPTION

ADM has applied for authority to expand their oil extraction plant. The expansion will consist of lengthening the extractor to increase the flake residence time, which will also allow ADM to increase the processing capacity of the extractor. In order to increase the extractor's speed, several other pieces of equipment must be modified. On the preparation side, the bean cleaning aspirators will be replaced by a new unit; additional bean heaters coils will be installed; a third dehulling line, which consists of a hulloosenator, aspirator, cracking roll and conditioner will be installed; and three new flaking rolls will be installed. On the extraction side, the solvent recovery system will be modified by replacing the first-effect evaporator with a larger evaporator and adding a vapor contactor. In addition to modifying the vapor recovery system, the dryer/cooler will be modified by adding an additional dryer deck. The capacity of the expanded plant is 2100 tons of soybeans per day.

ADM will also install a new 85.6 million British thermal units per hour (MMBtu/hr) Nebraska Boiler water-tube boiler. The boiler will combust primarily natural gas, but is capable of combusting fuel oil, biodiesel and vegetable oil.

PREVENTION OF SIGNIFICANT DETERIORATION (PSD) APPLICABILITY

ADM is an existing major source of VOCs under the PSD regulations. The PSD regulations found in 40 CFR 52.21, which is incorporated by reference in 10 CSR 10-6.060 section (8), apply to a project at an existing major source if the project results in a significant emissions increase and a significant net emissions increase. The procedure for calculating whether a significant emissions increase occurs depend on the type of units being modified. For a new unit, which is any emissions unit that is (or will be) newly constructed and that has existed for less than 2 years from the date such emissions unit first operated, an actual-to-potential test is used. This test involves calculating the emissions unit's potential emissions based on continuous operations and subtracting the unit's baseline actual emissions. The baseline actual emissions are the average emissions in tons per year for any 24-month period within 10 years of the start of construction. For a newly constructed unit, the baseline emissions are zero. For a unit that has been constructed but has operated for less than 2 years, the baseline actual emissions are the unit's potential emissions. The significant emissions increase for existing units is calculated by finding the difference between the unit's projected actual emissions and baseline actual emissions. The projected actual emissions may be adjusted downward to account for increases in emissions the unit could have accommodated before the project that are not related to the project.

ADM choose to exclude the PM and PM10 emissions the preparation equipment could have accommodated prior to the expansion. ADM calculated these emissions by determining the highest monthly crush rate during the baseline period and extrapolating that rate to an annual rate. This increase over the baseline emissions was subtracted from the projected actual emissions as allowed by 40 CFR 52.21 (b)(41)(ii)(c).

The increases in PM_{10}, NO_X and VOCs are greater than the significant increase levels. ADM has accepted a voluntary limit on the Nebraska Boiler, which will limit the increases of PM_{10} to 6.68 tons per year and NO_X 40.0 tons per year, which limits the project below significant levels for these pollutants. ADM chose not to evaluate the net emissions increase, so the VOC emissions will be evaluated under the PSD regulations.

BEST AVAILABLE CONTROL TECHNOLOGY (BACT) ANALYSIS

Applicability and Scope

The VOC BACT requirements apply to the whole soybean processing plant, as modified. 40 CFR 52.21(j)(3) indicates that, for a major modification, the BACT requirement applies to each proposed emissions unit at which a net emissions increase in the pollutant would occur as a result of a physical change or change in the method of operation. "Emissions unit" is defined broadly at 10 CSR 10-6.020(E)4. as any part or activity of an installation that emits or has the potential to emit any regulated pollutant. In this case there are activities associated with solvent extraction that emit VOC upstream and downstream of the solvent extraction and desolventizing portion of the plant. For instance, there are potential VOC emissions associated with bulk storage of hexane. With an increase in throughput of hexane used for extraction the potential emissions associated with bulk storage of hexane will increase. Another example of an associated potential emissions increase would be downstream fugitive losses from soy meal.

Recent BACT permits from Missouri and other states contain plant-wide solvent loss ratio emission limits due to the impracticality of quantifying fugitive emissions.

VOC BACT requirements apply to fugitive emissions as well as point source emissions.

Definition of BACT

BACT is defined at 10 CSR 10-6.020(2)(B), item 5, as follows:

> An emission limitation (including a visible emission limit) based on the maximum degree of reduction for each pollutant which would be emitted from any proposed installation or major modification which the director on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for the installation or major modification through application of production processes or available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of the pollutant. In no event shall application of BACT result in emissions of any pollutant which would exceed the emissions allowed by any applicable emissions control regulation, including New Source Performance Standards established in 10 CSR 10-6.070 and 40 CFR Part 60 and National Emission Standards for Hazardous Air Pollutants established in 10 CSR 10-6.080 and 40 CFR Part 61. If the director determines that technological or economic limitations on the application of measurement methodology to a particular emissions unit would make the imposition of an emission limitation infeasible, a design, equipment,

work practice, operational standard, or combination thereof, may be prescribed instead to satisfy the requirement for the application of best available control technology. This standard, to the degree possible, shall set forth the emissions reduction achievable by implementation of such design, equipment, work practice or operation and shall provide for compliance by means which achieve equivalent results.

Process Considerations/Emission Sources

There are many process-related design and operation considerations that may affect VOC (in this case, hexane) usage, recovery and emissions. As part of this permit review an effort was made to gain an understanding of vegetable oil manufacturing processes in relation to hexane usage, recovery and emissions. As evident in the definition of BACT, process considerations can enter in to the BACT analysis.

The Department does not want to re-define the source, or prescribe radically different design criteria from the permit application. In this case there are some process design features that ADM has indicated will be a part of this modification that are translated to specifications in this permit.

Prior to solvent extraction, soybeans are prepared through a series of thermal and mechanical processes. Ultimately, the soybeans (minus the hulls) are delivered to the extraction process in the form of flakes that are amenable to extraction. Soybean preparation processes can have a significant impact on hexane usage. Improved soybean preparation processes can result in lower hexane usage. The application indicates plans for modification of the bean heaters, addition of three new flakers and addition of a new hot de-hulling line. These modifications will increase capacity and should also improve performance.

ADM intends to extend their existing extractor to increase its processing capacity while retaining its retention time. Hexane is used in the extractor to extract soy oil from the flakes. A desolventizer-toaster (DT) and dryer-cooler (DC) follow the extractor. The soy flakes leave the extractor and enter the DT with about 30 percent solvent, by weight. The top trays of the DT use indirect steam heat to drive off hexane vapors. The middle trays of the DT use both direct and indirect steam heat to remove more hexane and add moisture to the soy flakes. The bottom tray of the DT is direct sparge steam injection.

Hexane vapors from the extractor vent are routed to a series of condensers - uncondensed vapors proceed to the mineral oil absorption system. Hexane and residual steam from the DT process is routed to evaporation/condensation/distillation processes - uncondensed vapors proceed to the mineral oil absorption system. The mineral oil absorber is a packed tower that uses mineral to absorb hexane. The cleaned vapor stream is exhausted to the atmosphere and the mineral oil-hexane mixture is routed to a steam-stripping column, where hexane is separated from the mineral oil. Hexane from the steam-stripping column is recovered through condensation. The mineral oil absorption system is considered BACT pollution control equipment.

The DT removes most of the hexane from the flakes/meal, but some residual hexane remains in the meal as it enters the DC. Some of this residual hexane is carried off with the drying and cooling air. Drying air from each of the decks passes through a cyclone (for particulate control) prior to discharge. There are no VOC control devices utilized prior to discharge of the drying and cooling air.

Additional hexane may be emitted during meal finishing grinding and storage, wastewater treatment operations, equipment leaks (valves, pumps flanges, site glasses, etc.) and solvent storage. Hexane emissions will also be affected by the efficiency of the condensation and distillation processes. BACT requirements apply to all of these emission sources.

Other Control Devices Considered

In consulting the USEPA RACT/BAC/LAER Clearinghouse (RBLC), recently-issued permits from other states and industry information, the method utilized to control VOC emissions from the extraction and DT portions of soybean processing plants is, consistently, condensation followed by a mineral oil absorption system. With regard to dryer/cooler emissions, the Air Pollution Control Program (The Program) has not identified any installations that have VOC controls.

Consideration was given to additional potential control technologies for the post-absorber VOC emissions and VOC emissions from the meal dryer/cooler. The potential control technologies are:

1. Incineration Processes (Regenerative Thermal Oxidizer (RTO) or Catalytic Oxidizer);
2. Carbon Adsorption; and,
3. Biofiltration

- Incineration Processes -

VOC vapors (such as hexane) can be destroyed by incineration. A regenerative thermal oxidizer (RTO) is an incinerator with a set of refractory beds that store heat. It is common to use three ceramic beds in an RTO. One bed is used to pre-heat the waste gas stream, one bed is used to store heat from the treated gas stream, and one bed is in a purge cycle. Pre-heating the gas stream reduces supplemental fuel requirements, as compared to an incinerator without heat exchangers. Final combustion chamber temperatures are typically in excess of 1300 degrees Fahrenheit (^{O}F) to ensure complete combustion.

Catalytic incinerators are similar to thermal/recuperative incinerators, with the primary difference being that the gas, after passing through the flame area, passes through a catalyst bed. The catalyst has the effect of increasing the oxidation reaction rate enabling oxidation to occur at a lower reaction temperature than normal thermal units. Catalysts typically used for VOC incineration include platinum and palladium. Outlet temperatures for catalytic incinerators are dependent on the concentration of VOC, but are typically below 1000 ^{O}F.

Commercially available RTOs or catalytic incinerators can achieve VOC destruction efficiencies that exceed 95 percent, depending on the particular installation.

ADM indicates that there are currently no RTOs in operation at any soybean extraction plant in the country of which they are aware. The Program did not identify any existing soybean extraction plant with an RTO or a catalytic incinerator for control of VOC or hexane. In February 2007, the Program issued construction permit number 022007-004 to Prairie Pride, Inc. for a soybean processing facility that includes solvent extraction. Potential emissions of VOC for the Prairie Pride facility, as permitted, are below major source levels - therefore BACT analysis was not required. There is a condition in the Prairie Pride permit that requires use of a thermal oxidizer for control of VOCs from the mineral oil scrubber. The decision to use an RTO for VOC control was Prairie Pride's decision, not a BACT determination. The use of an RTO was not mandated by the Program, but the permit condition for use of an RTO restricts potential emissions to below the major source threshold of 250 tons per year VOC. Prairie Pride has not commenced construction.

Hexane is highly flammable. One of the reasons that incineration processes are not used at solvent extraction plants is due to fire safety concerns. The National Fire Protection Association (NFPA) Standard 36 for Solvent Extraction Plants does not appear to prohibit the use of incineration processes, but there are requirements regarding minimum distance from the extraction process to ignition sources, placement of vapor barriers between the extraction area and ignition sources, flashback prevention, etc. ADM has expressed concerns about fire safety and believes that RTO is infeasible due to safety concerns.

After considering the safety and technical feasibility concerns mentioned above the Program has concluded that it is not appropriate to mandate RTO or catalytic incineration as BACT control technology at this point in time.

EPA's *Economic Impact Analysis for the Final Vegetable Oil Processing NESHAP – Final Report*, January 2001 (EPA-452/R-01-005) discussed an above-the-floor-MACT option that consisted of installation and operation of a fabric filter and catalytic incinerator on the combined exhaust from the meal dryer and cooler vents. The estimated cost for this above-the-floor-MACT option was $33,429 per ton of HAP removed.

-Carbon Adsorption-

Adsorption is employed to remove VOC from low to medium concentration gas streams, when a stringent outlet concentration must be met and/or recovery of the VOC is desired. Physical adsorption is a phenomenon where gas molecules passing through a bed of solid particles are selectively held there by attractive forces, which are weaker and less specific than those of chemical bonds. During adsorption, a gas molecule migrates from the gas stream to the surface of the solid where it is held by physical attraction releasing energy—the "heat of adsorption", which typically equals or exceeds the heat of condensation. Adsorptive capacity of the solid for the gas tends to increase with the gas phase concentration, molecular weight, diffusivity, polarity, and boiling point. When gases form chemical bonds with the adsorbent surface this phenomenon is termed "chemisorption". Most gases ("adsorbates") can be removed ("desorbed") from the adsorbent by heating to a sufficiently high temperature, usually via steam or (increasingly) hot combustion gases, or by reducing the pressure to a sufficiently low value (vacuum desorption). The physically adsorbed species in the smallest pores of the solid and the chemisorbed species may require rather high temperatures to be removed, and for all practical purposes cannot be desorbed during regeneration.

For example, approximately 3 to 5 percent of organics adsorbed on virgin activated carbon is either chemisorbed or very strongly physically adsorbed and is difficult to desorb during regeneration.

Adsorbents in large scale use include activated carbon, silica gel, activated alumina, synthetic zeolites, fuller's earth, and other clays. This BACT analysis is oriented toward the use of activated carbon, a commonly used adsorbent for VOCs.

Five types of adsorption equipment are used in collecting gases: (1) fixed regenerable beds; (2) disposable/rechargeable canisters; (3) traveling bed adsorbers; (4) fluid bed adsorbers; and (5) chromatographic baghouses. Of these, the most commonly used in air pollution control are fixed-bed systems and canister types.

Carbon adsorption systems can be designed to be very efficient. However, as design efficiencies increase, the required adsorbent bed depth and pressure drop through the system increases. Typical commercially available carbon adsorption systems can achieve between 95 and 99 percent control efficiency for emission streams.

Carbon adsorption is not used to control VOC emissions in soybean oil extraction facilities for technical and safety reasons. Carbon adsorption systems were applied rather widely to the final vent stream from solvent extraction plants in the late 1940s and early 1950s. In the late 1950s, mineral oil absorption systems began to replace carbon units. The aerosol oil in the mineral oil absorber exhaust and the PM and PM_{10} in the meal dryer/cooler exhaust causes fouling of the carbon bed. Also, soybeans naturally contain small amounts of sulfur compounds, which also cause fouling of the carbon bed. Although the PM/PM_{10} concentration in the meal dryer/cooler exhaust can be reduced by a high efficiency filtration system, the aerosol oils and sulfur compounds cannot be similarly removed.

Carbon adsorbers are not considered a feasible control option for soybean oil extraction facilities from a safety standpoint. The adsorption of hexane onto carbon is an exothermic reaction. Increases in the concentration of the inlet stream will cause additional heat to build up in the carbon bed. Under optimum conditions, the air movement through the bed will remove the heat via convection. However, if channeling occurs in the carbon bed, or if the increase in concentration is too large (as in an upset condition), the bed can over heat to the point of auto-ignition. Good design and control can eliminate overheating of the carbon bed, but during an upset or when the equipment or controls fail, overheating will result. This makes the carbon adsorbers a potential source of ignition.

Because of these technical and safety concerns, carbon adsorption is eliminated from further consideration as BACT for both the mineral oil absorber and the meal dryer/cooler.

-Biofiltration-

Biofiltration technology encompasses a wide variety of pollution control systems that utilize a fixed matrix of biological films to oxidize VOCs in an exhaust stream. These systems have been under development, especially in Europe, for the last ten years but are still maturing as a proven VOC control technology.

The physical and chemical treatment methods that form the basis for conventional methods of VOC control are typically energy intensive. In contrast, biological VOC control systems harness the natural degrading abilities of microorganisms to biochemically oxidize organic contaminants at normal temperatures and pressures. Thus, biological systems typically require a smaller energy input. The key drawback of a biofilter is that it is, in essence, a living control system. As such, the system is vulnerable to changes in the inlet gas stream composition or changes in the physical operating conditions of the system. This vulnerability can lead to wide fluctuations in the destruction efficiency provided by the systems.

All biofilters use some type of material to support a microbial film. The most common types of materials used are soils or a high organic content material such as compost and peat. In either case, the waste gas is drawn through a packed bed arrangement of the support material. Contaminants in the waste gas then diffuse into the microbial films growing on the support material. Given a suitable growth environment, including adequate quantities of dissolved oxygen and inorganic nutrients, organisms in the films can utilize the VOC contaminants as energy sources. End products of the reactor consist of new biological cell mass, carbon dioxide, water, and mineral salts.

The application of biofiltration technology has been limited for hexane removal. There is limited methodology or theory established to design for or predict the destruction efficiency that could be achieved for ADM's proposed new soybean plant. A biofilter system is dynamic since the system continually changes with changes in the microbial growths it contains. Knowledge of the behavior of these dynamic systems over extended operating periods is not available. Thus there is no basis from which the long-term reliability of the system could be established.

Since biofiltration is not a technically proven control method for hexane emissions from solvent extraction plants, this technology is eliminated from further consideration as BACT for both the mineral oil absorber and the meal dryer/cooler.

<u>Leak Detection and Repair (LDAR)</u>

Leak detection and repair (LDAR) programs can have a significant impact on fugitive emissions from soybean processing plants that utilize solvent extraction processes. The leak detection portion of an LDAR program involves routine, systematic inspection of pumps, piping, duct work, enclosed conveyors, valves, flanges, seals, sight glasses and process equipment. Inspections can be conducted visually, by flammable gas monitor, by monitoring process parameters, by listening for audible signs of a leak, etc. By pro-actively finding hexane leaks and promptly completing repairs, fugitive emissions are minimized. In relation to the definition of BACT, LDAR is considered a system, method or technique to control/minimize emissions. There are no energy or economic reasons to discount LDAR as a BACT requirement.

There are specific regulatory requirements for LDAR contained in EPA's new source performance requirements for organic chemical manufacturing plants, petroleum refineries, polymer manufacturing plants and natural gas processing plants. EPA has not promulgated an LDAR rule that specifically applies to soybean solvent extraction processes. LDAR programs should be source-category specific. An LDAR program that is effective for a chemical manufacturing plant may not be as effective for a soybean processing plant, due to process differences.

During the course of the permit review ADM committed to certain hexane monitoring procedures and corrective actions in the event of a leak. The Program believes that the LDAR program needs to contain additional pro-active, focused inspection and repair provisions and has included a permit condition to require a more detailed BACT LDAR program. The Program concluded that it would not be appropriate to impose LDAR requirements from another source-category as BACT. ADM will be required to develop an LDAR program specific to this installation/source-category and the minimum elements of the LDAR program are listed in the permit condition.

Control of Storage Tank Emissions

Solvent storage tank breathing and working losses are currently controlled by routing the vapors to the solvent recovery system. Collection and recovery of solvent storage tank breathing and working losses will be continued as a BACT requirement for the plant, as modified.

BACT for Boilers

Additional steam will be provided for the soybean solvent extraction by an 85.6 MMBtu/hr Nebraska Boiler water-tube boiler. The primary fuel will be natural gas but the boilers will also be permitted to burn a variety of other fuels including diesel, biodiesel and vegetable oil.

The BACT emission rates for VOC listed in Special Condition 4 are based on a review of other recently permitted boilers and consideration of AP-42 emission factors. The use of good combustion practices has been indicated as a BACT work practice to minimize VOC emissions. Good combustion practices include practices such as operating with sufficiently high flame temperatures, adequate combustion air, and proper air/fuel mixing.

Summary of BACT Equipment, Methods, Systems and Techniques

The following table provides a summary of BACT equipment, methods, systems and techniques for this installation, as modified.

Table 5: BACT Equipment, Methods, Systems and Techniques

Emission Source	BACT Equipment, Method, System or Technique
Extractor	• Condensation for solvent recovery. • Uncondensed vapors routed to mineral oil absorber
Desolventizer-Toaster	• Condensation for solvent recovery. • Uncondensed vapors routed to mineral oil absorber
Solvent Storage	• Breathing and working losses routed to solvent recovery system.
Process, Fugitive	• Leak detection and repair (LDAR) program.
Boiler	• Good combustion practices

<u>Rationale for BACT Emission Limitation</u>

After defining the appropriate BACT equipment, methods, systems and techniques the question becomes - What is an achievable emission limitation that represents a maximum degree of reduction? To answer this question, the Program turned to the following sources:

- 40 CFR Part 63, Subpart GGGG – National Emission Standards for Hazardous Air Pollutants– Solvent Extraction for Vegetable Oil Production (Hereinafter referred to as the Solvent Extraction MACT)
- The federal register preamble to the proposed Solvent Extraction MACT (65 FR34252)
- EPA's *Economic Impact Analysis for the Final Vegetable Oil Processing NESHAP – Final Report*, January 2001 (EPA-452/R-01-005)
- EPA's RACT/BACT/LAER clearinghouse
- Recently-issued permits for soybean processing facilities
- Solvent loss ratio data supplied by ADM as part of this permit review
- Solvent loss ratio data from Iowa, Nebraska and Missouri soybean processing plants

The Program agrees with the approach taken in the solvent extraction MACT to account for emissions by conducting a material balance. It appears impractical to quantify fugitive emissions losses. The solvent extraction MACT emission limitation is 0.2 gallons of VOC per ton of oil seed processed for solvent that is 64 percent by volume HAP. 64 percent by volume is the typical (or baseline) percentage of n-hexane (a listed HAP) present in the hexane solvent mixture. The hexane solvent mixture contains approximately 36 percent by volume of non-HAP hexane. The hexane solvent mixture is 100 percent VOC. The BACT emission limitation in this permit applies to VOC, not to HAP.

In developing the MACT emission limitation EPA looked at monthly solvent loss ratio data from various plants over a two-year period. The following excerpt from the proposed rule preamble provides some insight in to how the solvent extraction MACT emission limitation was developed:

> *To address variability in the 2 years of data used in the MACT floor determinations, statistical procedures were applied. Varying climatic patterns from year-to-year affect oilseed quality and solvent retention characteristics which can directly affect facility operations. Two years of emissions and process information is not sufficient to characterize long-term impacts of climatic patterns on oilseed quality. The never-to-be-exceeded format of these proposed MACT standards required us to statistically examine variability over 2 years and make adjustments*

to the HAP loss performance level of each source to reflect long-term achievability.

For existing sources, the MACT floor for each of the 12 oilseed or process operations was determined as the average of the HAP loss performance levels corresponding to the top performing 12 percent of sources (or the top five for oilseeds or operations with fewer than 30 sources). For new sources, the MACT floor was based on the performance level corresponding to the top ranking source. The new source MACT floors are the same or slightly more stringent than the corresponding existing source MACT floors.

The solvent extraction MACT was finalized in April 2001 and became effective in April 2004. The impact of the solvent extraction MACT regulations on actual emissions is evident in the solvent loss ratio data examined as part of this permit review.

The Program referred to the RACT/BACT/LAER clearinghouse, ADM's permit application and several other permits to compile the following table of recently permitted VOC emission limits.

Table 6 - Recently Permitted VOC Emission Limits

Company	Permit Date	Installation		Process	VOC Limit	
		City	State		lb/ton	gal/ton
ConAgra	08/14/1998	Morristown	IN	Oil Extractor	0.076	
				Meal Dryers	0.228	
				Meal Cooler	0.083	
				Plant-Wide		0.16
Cargill[1]	12/03/2001	Lafayette	IN	Oil Extractor		0.012
				Meal Dryers		0.0042
				Meal Coolers		0
				FDS Cooler Collector		0.391
				Conventional Process		0.2
				Specialty Process		1.5
Minnesota Soybean Processors	12/19/2002	Brewster	MN	Plant-wide		0.2
Central Soya Company	11/29/2001	Bellevue	OH	Plant-Wide		0.2
Cenex Harvest States Coop[2]	11/30/2001	Fairmont	MN	Plant-wide		0.2
Cargill	11/28/2003	Sidney	OH	Plant-wide		0.146
Bunge North America (East)	5/14/2004	Morristown	IN	B-Plant Oil Extractor	0.069	
				B-Plant Meal Dryers	0.152	
				B-Plant Meal Coolers	0.152	
				Plants A&B, 1st Yr.		0.2
				Plants A&B, 2nd Yr. on		0.19
ADM	06/28/2005	Mankato	MN	Plant-wide		0.15
Louis Dreyfus Agricultural Industries[3]	01/24/2006	Claypool	IN	Plant-Wide		0.134
Cargill	08/28/2006	Kansas City	MO	Plant-wide Operating Capacity <90%		0.14
				Plant-wide Operating		0.165

Company	Permit Date	Installation		Process	VOC Limit	
		City	State		lb/ton	gal/ton
				Capacity >90%		
Bunge	01/2007	Council Bluffs	IA	Plant-Wide		0.178
Prairie Pride[4]	06/13/2008	Eve	MO	Plant-Wide		0.125
Ag. Processing	5/16/2007	St. Joseph	MO	Plant-Wide		0.145

[1] When the original permit was issued for Cargill's Lafayette Plant, the plant-wide solvent loss emission limit was 0.503 gal/ton. Since the Lafayette Plant is subject to the Solvent Extraction for Vegetable Oil Production NESHAP, the limit was reduced to 0.2 gal/ton and 1.5 gal/ton for the conventional and specialty soybean processes, respectively, after the MACT compliance date of April 12, 2004.

[2] When the original CENEX permit was issued, the emission limit was 0.52 gal/ton for the first six months and 0.30 gal/ton after the first six months. The emission limit was later revised to 0.2 gal/ton.

[3.] The Louis Dreyfus limit is a PSD-avoidance limit, not a BACT limit.

[4.] The Prairie Pride limit is a PSD-avoidance limit, not a BACT limit. The Prairie Pride permit also requires use of a thermal oxidizer for the mineral oil scrubber exhaust. The 0.115 gallon per ton limit reflects a credit taken for VOC destruction in a thermal oxidizer. Prairie Pride indicates that the manufacturer provided a guarantee that solvent loss will not exceed 250 tons per year, without use of the RTO, and will not exceed 230 tons per year, with use of a 90 percent efficient RTO on the mineral oil absorber vent. For the 2,000 ton per day Prairie Pride plant this equates to a solvent loss ratio guarantee of 0.125 gallons per ton, without use of the RTO.

The Cargill plant in Sydney, Ohio was not expanded to the degree envisioned by the permitting action. The status of the Louis Dreyfus plant in Claypool is unknown; based on the permit date it is likely it is either under construction or just now starting up. The modification at the Cargill plant in Kansas City is under construction. Also, the ConAgra plant was never constructed.

It should be noted that EPA has entered in to several consent agreements with ADM and other large soybean processing companies that contain 0.175 gallon per ton solvent loss ratio emission limits, averaged over several facilities across the country, owned by the same company. EPA Region VII has indicated that these limits do not represent site-specific BACT determinations.

Bunge North America (East) has recently entered in to a consent decree with the United States, and the State of Indiana, to reduce VOC emissions from their Morristown, Indiana plant to a 0.16 gallon per ton plant-wide solvent loss ratio. The same consent decree requires Bunge's Decatur, Indiana plant to comply with a 0.15 gallon per ton plant-wide solvent loss ratio.

ADM provided monthly solvent loss ratio data from their Mexico, Mankato and Galesburg plants. The averages and maximums are listed in Table 7.

Table 7 – 12-MRA SLR* ADM's Mexico, Mankato and Galesburg Plants

ADM Plant	Average 12-MRA Solvent Loss Ratio	Maximum 12-MRA Solvent Loss Ratio	Max/Avg

	(gallons solvent /ton oilseed)	(gallons solvent /ton oilseed)	
Mexico	0.121	0.159	1.75
Mankato	0.116	0.141	1.81
Galesburg	0.160	0.204	1.94

*12-MRA SLR–12 month rolling average solvent loss ratio

During the permit review for Ag. Processing (AGP), the company provided monthly solvent loss ratio data from their St. Joseph plant and 3 other AGP plants. Collectively, these were described as AGP's four largest plants. The data covered the time period January 2003 through January 2006; 12-month rolling averages for the time period December 2003 through December 2006. Average and maximum values are presented in Table 8.

Table 8 – 12-MRA SLR from AGP's Four Largest Plants – 12/03 through 12/06

AGP Plant	Average 12-MRA Solvent Loss Ratio (gallons solvent /ton oilseed)	Maximum 12-MRA Solvent Loss Ratio (gallons solvent /ton oilseed)	Max/Avg
St. Joseph	0.124	0.153	1.23
FH	0144	0.153	1.06
EO	0.146	0.173	1.18
TC (modified)*	0.125	0.158	1.26

MRA–month rolling average *For plant TC data associated with a malfunction was left out of this analysis.

The Cargill – Kansas City permit BACT analysis support documentation included 12-month rolling average solvent loss ratio data from January 2003 through March 2006. Average and maximum values for the time period December 2003 through March 2006 are presented in Table 9.

Table 9 – 12-MRA SLR from Cargill's Kansas City Plant – 12/03 through 03/06

Plant	Average 12-MRA Solvent Loss Ratio (gallons solvent /ton oilseed)	Maximum 12-MRA Solvent Loss Ratio (gallons solvent /ton oilseed)
Cargill – Kansas City	0.113	0.133

During the permit review for AGP, the Program obtained emissions inventory data from Iowa and Nebraska AGP plants. This data presented in Table 13 is calendar year average solvent loss ratio data. It does not represent a 12-month rolling average. The maximum 12-month rolling average for any given year will be higher than the annual average.

Table 10 – Annual, Block Average, SLR from Iowa and Nebraska Emission Inventory Data

AGP Plant Location	Year	Calendar Year Solvent Loss Ratio (gallons solvent /ton oilseed)
Sheldon, IA	2002	0.183
	2003	0.122
	2004	0.111
Emmetsburg, IA	2002	0.102
	2003	0.083
Sergeants Bluff, IA	2002	0.218
	2003	0.135
Hastings, NB	2004	0.098
	2005	0.097

The Emmetsburg, Iowa plant commenced operation in 1997and the Hastings, Nebraska plant commenced operation in 1999. These relatively new plants appear to show better performance, as compared to the remaining plants listed above in Tables 8 and 10.

This improved performance may be related to advances in extraction plant design, improved soybean preparation processes, etc.

Newer plants, such as the AGP plants in Emmetsburg, Iowa and Hastings, Nebraska are operating at or below 0.1 gallons per ton, on an annual average basis. If the variability at these plants is similar to the four largest AGP plants listed in Table 10, the maximum 12 month rolling average for the Emmetsburg and Hastings plants is expected to be approximately 0.125 gallons per ton.

ADM presented several arguments which detailed why solvent loss limits proposed at other top performing plants are not achievable at the Mexico plant. ADM stated that newer plants, such as Ag. Processing and Cargill-Kansas City, can streamline their process and oversize their equipment to reduce solvent losses. The Mexico plant is an existing plant and much of the solvent recovery equipment (including the DT) will not be modified, so ADM does not expect the plant to perform as well as these newer operations.

However, ADM's Mankato plant was expanded without replacing the DT and was permitted with a limit of 0.150 gallons per ton. ADM stated that differences in bean quality and ambient temperature between the Mankato plant and the Mexico plant would prevent the Mexico plant from performing as well as the Mankato plant. ADM provided a statistical analysis that showed a significant difference in performance at each of the plants during periods of warmer weather. However ADM provided no data to verify whether bean quality affects emissions.

In an e-mail dated January 22, 2009, ADM proposed a SLR limit of 0.171 gallons per ton. This limit was derived using a statistical analysis of past data from the Mexico plant. In this analysis ADM calculated the 99th percent statistic of the past data from 2004 to 2008 and proposed the upper bound of this calculation, 0.171 gallons per ton, as the SLF BACT limit. ADM agued that this is the appropriate method for setting BACT at the plant, because the plant is currently using BACT controls and that the controls are properly designed to accommodate the increased throughput. The data analyzed contains all emissions at the Mexico facility.

After considering the information presented above, the Program believes that a BACT emission limitation of 0.150 gallons per ton is achievable during normal operation. This limit does not include emissions resulting from malfunctions. The past actual data ADM provided show that the plant's average SLR during the time period from 2004 to 2008 is 0.121 gallons per ton and that there were five months that exceeded this limit. Further analysis of ADM's past data showed that these higher 12-month rolling averages were a result of higher than average emissions during a four month period in 2005. After the five months that exceed 0.150 gallons per ton, the plant operated below that limit for the remaining 26 months for which data was provided. The lowest 12-month rolling SLR during this period was 0.094 gallons per ton and the average SLR for that period was 0.112 gallons per ton. ADM did not provide any information as to why the emissions during this period were higher than average. The program believes a two tiered limit is appropriate for the Mexico plant. The lower limit of 0.150 gallons per ton includes only emissions from startup, shutdown and normal operation. A second higher limit of 0.171 gallons per ton will include all emissions at the plant, including startup shutdown and malfunction. This two tiered limit will force ADM to achieve the lower SLRs already demonstrated while providing a means for ADM to exclude unexpected increases in emissions, which were beyond their control.

The maximum 12-month rolling average for the Cargill plant in Kansas City was 0.133 gallons per ton for the time period December 2003 through December 2006. Climatic conditions in Mexico are similar to climatic conditions in Kansas City. The BACT limit of 0.150 is 12.8 percent greater than 0.133. The Louis Dreyfus permit has a limit of 0.134 gallons per ton. This is not a BACT limit, but the company must have reasonable assurance that this emission is achievable. The BACT limit of 0.150 is 11.9 percent greater than 0.134. These are limits at new plants that are expected to perform better than the Mexico plant.

EMISSIONS/CONTROLS EVALUATION

The emission factors and control efficiencies used in this analysis were obtained from the Environmental Protection Agency (EPA) document AP-42, *Compilation of Air Pollutant Emission Factors*, Fifth Edition. Emissions from grain receiving and storage were calculated using emission factors in AP-42 Section 9.9.1 "Grain Elevators & Processes," May 2003. Emissions from seed preparation were calculated using stack test data from this facility and a similar facility. Emissions from extraction and recovery were calculated using a mass balance approach as described in the BACT section. Emissions from haul roads were calculated using emission factors from AP-42 Section 13.2.1 "Paved Roads," November 2006. The existing potential emissions of the Installation were taken from permit 032006-010. The existing actual emissions of the installation were taken from the 2008 emission inventory questionnaire (EIQ). Baseline actual emissions were calculated using the emission factors described above and the 24-month average throughput for 2005 and 2006. Projected actual emissions were calculated using emission factors and projected throughputs provided by the applicant. Potential emissions of the application represent the potential of the new equipment, assuming continuous operation (8760 hours per year.) The following table provides an emissions summary for this project.

Table 11: Emissions Summary (tons per year)

Pollutant	**Regulatory *De Minimis* Levels**	**Existing Potential Emissions**	**Existing Actual Emissions (2008 EIQ)**	**Baseline Actual Emissions (2005-2006)**	**Projected Actual Emissions**	**Could Have Accom-modated Emissions**	**Emissions Increase**
PM	20.0	> 250	N/D	77.14	103.61	9.23	17.24
PM_{10}	15.0	499.55	52.93	28.34	40.16	3.53	< 15.0
SO_X	40.0	314.02	0.14	N/A	3.57	N/A	3.57
NO_X	40.0	130.05	23.56	N/A	< 40.0	N/A	< 40.0
VOC	40.0	292.72	164.64	162.34	368.97	N/A	206.63
CO	100.0	62.18	19.79	N/A	31.49	N/A	31.49
N-Hexane	10.0	> 10	84.31	N/A	243.89	N/A	N/A
Total HAPs	25.0	> 25	84.31	N/A	243.89	N/A	N/A

*N/A = Not Applicable; N/D = Not Determined

PERMIT RULE APPLICABILITY

This review was conducted in accordance with Section (8) of Missouri State Rule 10 CSR 10-6.060, *Construction Permits Required*. There is a significant emissions increase and a net emissions increase in emissions of VOC.

APPLICABLE REQUIREMENTS

Archer Daniels Midland-Mexico shall comply with the following applicable requirements. The Missouri Air Conservation Laws and Regulations should be consulted for specific record keeping, monitoring, and reporting requirements. Compliance with these emission standards, based on information submitted in the application, has been verified at the time this application was approved. For a complete list of applicable requirements for your installation, please consult your operating permit.

GENERAL REQUIREMENTS

- *Submission of Emission Data, Emission Fees and Process Information,* 10 CSR 10-6.110
  The emission fee is the amount established by the Missouri Air Conservation Commission annually under Missouri Air Law 643.079(1). Submission of an Emissions Inventory Questionnaire (EIQ) is required April 1 for the previous year's emissions.

- *Operating Permits*, 10 CSR 10-6.065

- *Restriction of Particulate Matter to the Ambient Air Beyond the Premises of Origin*, 10 CSR 10-6.170

- *Restriction of Emission of Visible Air Contaminants*, 10 CSR 10-6.220

- *Restriction of Emission of Odors*, 10 CSR 10-3.090

SPECIFIC REQUIREMENTS

- *Restriction of Emission of Particulate Matter From Industrial Processes*, 10 CSR 10-6.400

- *New Source Performance Regulations*, 10 CSR 10-6.070 – *New Source Performance Standards (NSPS) for Standards of Performance for Grain Elevators*, 40 CFR Part 60, Subpart DD

- *Maximum Achievable Control Technology (MACT) Regulations*, 10 CSR 10-6.075, *National Emission Standards for National Emission Standards for Hazardous Air Pollutants: Solvent Extraction for Vegetable Oil Production,* 40 CFR Part 63, Subpart GGGG

AMBIENT AIR QUALITY IMPACT ANALYSIS

Ambient air quality modeling was performed to determine the ambient impact of n-hexane. This air quality analysis was required because the increase in n-hexane emissions exceeds the screening model action level (SMAL), which is 10 tons per year, for n-hexane. The analysis was performed using the AERMOD modeling system. The Program maintains a 24-hour and annual risk assessment level (RAL) for n-hexane. The air quality analysis shows that the expansion project will not cause ADM to exceed these RALs.

Table 12: Ambient Air Quality Impact Analysis Summary

Pollutant	**Modeled Impact μg/m^3**	**RAL μg/m^3**	**Time Period**
n-hexane	2250.30	4200	24-hr
n-hexane	329.56	420	annual

STAFF RECOMMENDATION

On the basis of this review conducted in accordance with Section (8), Missouri State Rule 10 CSR 10-6.060, *Construction Permits Required*, I recommend this permit be granted with special conditions.

________________________________ ____________________

Michael Mittermeyer Date
Environmental Engineer

PERMIT DOCUMENTS

The following documents are incorporated by reference into this permit:

- The Application for Authority to Construct form, dated May 10, 2007, received May 15, 2007, designating Archer Daniels Midland as the owner and operator of the installation.
- U.S. EPA document AP-42, *Compilation of Air Pollutant Emission Factors*, Fifth Edition.
- Northeast Regional Office Site Survey, dated June 6, 2007.