



## 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: 012009-008 Project Number: 2008-08-088

Parent Company: American Energy Producers, Inc.

Parent Company Address: 11 N. Folger St., Carrollton, MO 64633

Installation Name: American Energy Producers, Inc.

Installation Address: 16749 U.S. Highway 65 North, Tina, MO 64682

Location Information: Carroll County, S9, T54N, R23W

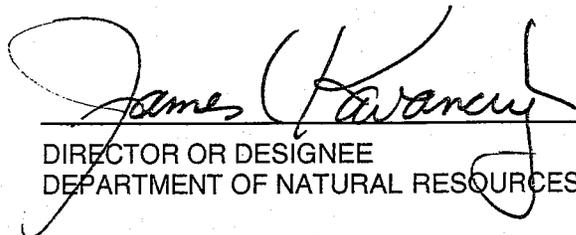
Application for Authority to Construct was made for:  
Installation of a 3,000 ton per day soybean processing facility, with a 60 million gallon per year biodiesel production facility and two 95 MMBTU/hr boilers. This review was conducted in accordance with Sections 6 and 8 of 10 CSR 10-6.060, *Construction Permits Required*.

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

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

JAN 22 2009

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 devices 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 source(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 within 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 source(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.

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## 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."*

American Energy Producers  
Carroll County, S9, T54N, R23W

1. Volatile Organic Compound (VOC) Best Available Control Technology (BACT) Emission Limitations and Operating Requirements for Soybean Processing Operations
  - A. With regard to the solvent that is used to extract oil from soybeans, "actual solvent loss" shall not exceed 0.145 gallons per ton of "oilseed processed", based on a 12-month rolling average. When accounting for extraction solvent emissions American Energy Producers shall equate "actual solvent loss" to VOC emissions and shall calculate "actual solvent loss" in accordance with 40 CFR 63.2853. The quantity of "oilseed processed" shall be calculated in accordance with 40 CFR 63.2855. This emission limitation first comes in to effect at the end of eighteenth month of operation and utilizes data from the seventh month of operation through the eighteenth month of operation for the initial compliance demonstration. This emission limitation does not apply to the first six (6) months of operation of the plant (the initial startup period). This emission limitation applies to subsequent months (i.e., after the initial startup period) that have startup and shutdown events unless a malfunction occurs and American Energy Producers elects to operate under 40 CFR 63.2850(e)(2). At the end of any such malfunction period American Energy Producers shall resume compliance with this emission limitation. If American Energy Producers elects to operate under the malfunction period requirements of 40 CFR 63.2850(e)(2) American Energy Producers shall also comply with the provisions of 10 CSR 10-6.050.
  - B. Actual solvent loss shall not exceed 119,081 gallons during the first six (6) months of operation (initial start-up period).
  - C. American Energy Producers shall maintain an accurate record of actual 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 (5) years and shall be made available immediately to any Missouri Department of Natural Resources' personnel upon request.

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

- D. American Energy Producers shall report to the Air Pollution Control Program's Enforcement Section, P.O. Box 176, Jefferson City, Missouri 65102, no later than forty five (45) days after the end of the month during which the records from Special Condition 1.C. indicate that the source exceeds the limitations of Special Conditions 1.A. or 1.B.
- E. VOC emissions from the mineral oil absorption system vent (EP-12) shall not exceed 0.056 lbs per ton of soybeans processed (or 7 lbs VOC emitted per hour). Compliance with this emission limitation shall be demonstrated initially through EPA Method 25A stack testing; subsequent compliance demonstrations may be based on the results of an organic vapor survey monitor, provided that a correlation between the organic survey monitor and the method 25A stack test results is established during the initial performance test.
- F. American Energy Producers shall control emissions from the extraction process using condenser(s) and a mineral oil absorption system as specified in the permit application. American Energy Producers shall control emissions from the desolventizing-toasting (DT) process using evaporator(s), condenser(s) and a mineral oil absorption system as specified in the permit application. For the purpose of this special condition, condenser(s) shall include the extractor condenser, the stripper condenser, the evaporator condenser, the DT condenser, the vent condenser and the vent gas chiller. The evaporators, condensers and mineral oil absorption system shall be operated and maintained in accordance with the manufacturer's specifications.
- G. American Energy Producers shall maintain an operating and maintenance log for the 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.
- H. American Energy Producers shall continuously monitor and record the temperature of the uncondensed vapors at the exit of the extractor condenser, the DT condenser, the vent condenser and the vent gas chiller.
- I. American Energy Producers shall install and effectively operate a chiller for the mineral oil absorption system. The mineral oil chiller shall be used

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

during the months of April through October. Operation of the mineral oil chiller is optional November through March.

- J. American Energy Producers shall continuously monitor and record the temperature of the mineral oil that enters the top of the absorption column.
  - K. American Energy Producers shall route breathing and working losses from the solvent storage tanks to the solvent recovery system.
2. PM and PM<sub>10</sub> BACT for soybean processing operations
- A. Grain Receiving and Transfer (EP-1)
    - 1) PM<sub>10</sub> emissions from the grain receiving baghouse shall not exceed 0.003 grains per dry standard cubic foot of exhaust (gr/dscf), as demonstrated by performance testing.
    - 2) Grain receiving operations shall be conducted in a controlled manner with partial enclosures and intake hoods, etc. designed to direct particulate emissions to the grain receiving baghouse.
    - 3) In the event that visible emissions are observed from grain receiving operations the Air Pollution Control Program may require certain corrective actions to minimize fugitive emissions.
  - B. Meal and Hull Loadout (EP-2)
    - 1) PM<sub>10</sub> emissions from the meal and hull loadout baghouse shall not exceed 0.003 gr/dscf, as demonstrated by performance testing.
    - 2) Meal and hull loadout operations shall be conducted in a controlled manner with partial enclosures and intake hoods, etc. designed to direct particulate emissions to the meal and hull loadout baghouse.
    - 3) In the event that visible emissions are observed from meal and hull loadout operations the Air Pollution Control Program may require certain corrective actions to minimize fugitive emissions.
  - C. The whole bean aspirator(s), cascade dryer(s), cascade cooler(s), jet dryer(s), hullsperator(s), bean cracker(s), secondary aspirator(s) and hull pellet cooler(s) shall all be controlled by one or more cyclones; the exhaust from these cyclones and the exhaust from the fines aspirator(s) shall be routed to the plant exhaust baghouse (EP-5). PM<sub>10</sub> emissions from the plant exhaust baghouse shall not exceed 0.003 gr/dscf, as demonstrated by performance testing.
  - D. Particulate emissions from the vertical seed conditioner(s) shall be

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

controlled by one or more cyclones. Particulate emissions from flaking operations shall be controlled by a cyclone and then a baghouse, in series. PM<sub>10</sub> emissions from flaker baghouse and the vertical seed conditioner cyclone(s), combined, shall not exceed 0.006 gr/dscf, as demonstrated by performance testing.

- E. Particulate emissions from hull grinding shall be controlled by a baghouse. PM<sub>10</sub> emissions from the hull grinding baghouse (EP-9) shall not exceed 0.003 gr/dscf, as demonstrated by performance testing.
- F. Particulate emissions from meal grinding shall be controlled by a baghouse. PM<sub>10</sub> emissions from the meal grinding baghouse (EP-7) shall not exceed 0.003 gr/dscf, as demonstrated by performance testing.
- G. Particulate emissions from meal each of the three (3) meal drying decks and the meal cooling deck shall be controlled by cyclone(s), with a minimum of one cyclone per deck. PM<sub>10</sub> emissions from the meal drying and cooling deck cyclones, combined, shall not exceed 0.005 gr/dscf, as demonstrated by performance testing.
- H. All baghouses shall be operated and maintained in accordance with the manufacturer's specifications. Each baghouse shall be equipped with a gauge that indicates pressure drop across the control device. Pressure gauges or a visual display of the pressure data (i.e., monitor or chart) shall be located such that the Department of Natural Resources' employees may easily observe them during a site visit. 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).
- I. American Energy Producers. shall monitor and record the operating pressure drop across the baghouses at least once every 24 hours. The operating pressure drop shall be maintained within the design conditions specified by the manufacturer.
- J. American Energy Producers. shall maintain an operating and maintenance log for 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.

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

- K. Bin vent filters, cyclones and other particulate control devices shall be operated in accordance with manufacturer's recommendations and shall receive periodic inspection and maintenance to ensure proper operation.
3. Best Available Control Technology (BACT) Control Equipment and Emission Limitation – Condensation/Scrubbing System for Biodiesel Production Processes
- A. The condensation/scrubbing system must be in use at all times when the biodiesel production equipment is in operation and shall be operated and maintained in accordance with the manufacturer's specifications.
  - B. The condensation/scrubbing system shall consist of a water-cooled shell and tube heat exchanger (condenser number 1), a glycol/water refrigerated shell and tube heat exchanger (condenser number 2), a soy oil scrubber and a water scrubber, in series.
  - C. The vapor outlet of the glycerine methanol stripper and the vapor outlet of the biodiesel methanol stripper shall be ducted to the condensation/scrubbing system described in Special Condition 1.B.
  - D. The vapor outlet of the rectification vent condenser shall be routed to the soy oil scrubber and the water scrubber, in series.
  - E. American Energy Producers shall continuously monitor and record the temperature of the uncondensed vapors at the exit of condenser number 2. The condenser number 2 exit temperature for uncondensed vapors shall not exceed 70 degrees Fahrenheit, or the average temperature associated with a successful performance test, whichever is lesser. A successful performance test is one that demonstrates compliance with the BACT emission limitation stated at Special Condition 1.H.
  - F. American Energy Producers, Inc. shall monitor and record the flow rate of oil and water through the scrubbers at least once per operating shift.
  - G. American Energy Producers shall maintain an operating and maintenance log for the condensation/scrubbing 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.
    - 3) A written record of regular inspection schedule, the date and results

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of all inspections including any actions or maintenance activities that result from that inspection.

- H. Volatile organic compound (VOC) emissions from the biodiesel process vent (EP-14) shall not exceed 0.5 lbs/hr, as demonstrated by an average of three one-hour runs during an initial performance test.
4. Haul Road Fugitive Emissions Control and Hours of Operation Restrictions for Truck Hauling
- A. American Energy Producers shall control fugitive emissions by paving all haul roads. Maintenance and/or repair of the road surface shall be conducted as necessary to ensure that the physical integrity of the pavement is adequate to achieve control of fugitive emissions from these roads. American Energy Producers shall periodically water, wash and/or otherwise clean all of the haul roads as necessary to achieve control of fugitive emissions from these roads.
  - B. Truck hauling of soybeans, soy meal, biodiesel, vegetable oil and glycerin shall be restricted to the hours between 8:00 a.m. to 8:00 p.m.
5. BACT for Cooling Towers
- A. The cooling towers shall be equipped with high efficiency drift eliminators that are designed to reduce drift to less than 0.001 percent. Verification of drift loss shall be by manufacturer's guaranteed drift loss and shall be kept on site and made readily available to Department of Natural Resources' employees upon request.
  - B. The cooling tower(s) shall be operated and maintained in accordance with the manufacturer's specifications. Manufacturer's specifications shall be kept on site and made readily available to Department of Natural Resources' employees.
  - C. The total dissolved solids (TDS) concentration in the circulated cooling water shall not exceed a TDS concentration of 1,050 parts per million (ppm). A TDS sample shall be collected and the results recorded on a monthly basis to verify the TDS concentration.
  - D. The requirement for TDS sample collection may be eliminated or the frequency may be reduced upon written approval by the Air Pollution Control Program if TDS sampling results demonstrate compliance for 24

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consecutive months.

6. Leak Detection and Repair (LDAR) – BACT Work Practice for the Biodiesel Plant

American Energy Producers shall develop and implement a LDAR program for the biodiesel production processes that meets the requirements of 40 CFR Part 60, Subpart VV, *Standards of Performance for Equipment Leaks of VOC in the Synthetic Organic Chemicals Manufacturing Industry*. American Energy Producers shall provide a copy of the LDAR program and documentation regarding observations and/or repairs made in accordance with the LDAR program to Department of Natural Resources employees upon request.

7. Leak Detection and Repair (LDAR) Program for Soybean Processing Operations

A. American Energy Producers shall prepare and implement a leak detection and repair (LDAR) program to control fugitive VOC emissions from soybean processing operations. 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) American Energy Producers shall install, continuously operate and maintain a minimum of four (4) 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. Spare monitors shall be maintained to ensure continuous monitoring. The flammable gas monitors shall be set to audible and visual alarm at 500 parts per million (ppm) hexane. American Energy Producers shall record a representative reading from each monitor at least once per day when the solvent extraction equipment is in operation.

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- 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.
  
- D. LDAR program records shall be maintained for not less than five (5) 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.

**8. Operational and Emission Limits for the Boilers**

The following emission limits apply to each of the two 95 MMBTU/hr boilers. American Energy Producers shall not exceed the following operational and emission limits:

- A. Any fuel oil combusted shall be No. 2 fuel oil with a sulfur content not to exceed 0.05 percent.
- B. When burning fuel oil PM emissions shall be limited to 0.0236 lbs/MMBTU, test method average. (Note: This is a BACT emission limit.)
- C. When burning fuel oil PM<sub>10</sub> emissions shall be limited to 0.0164 lbs/MMBTU, test method average. (Note: This is a BACT emission limit.)
- D. When burning fuel oil VOC emissions shall be limited to 0.001 lbs/MMBTU, test method average. (Note: This is a BACT emission limit.)
- E. When burning natural gas PM<sub>10</sub> emissions shall be limited to 0.0072 lbs/MMBTU, test method average. (Note: This is a BACT emission limit.)
- F. When burning natural gas PM emissions shall be limited to 0.0072 lbs/MMBTU, test method average. (Note: This is a BACT emission limit.)
  
- G. When burning natural gas VOC emissions shall be limited to 0.0055

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lbs/MMBTU, test method average. (Note: This is a BACT emission limit.)

9. Emissions Limitation for Nitrogen Oxides (NO<sub>x</sub>)

NO<sub>x</sub> emissions from the entire installation shall not exceed 40 tons in any consecutive twelve-month period. American Energy Producers shall conduct performance testing to develop NO<sub>x</sub> emission factors for the combustion of natural gas and fuel oil in the boilers. American Energy Producers shall monitor and record natural gas and fuel oil usage for the two boilers. The emission factors and fuel usage records shall be used to calculate actual emissions from the boilers in order to verify compliance with the 12-month rolling emission limitation.

10. Emissions Control for the Methanol Storage Tanks – BACT Work Practice

Breathing losses from the methanol storage tanks (EP-24) shall be controlled by nitrogen blanketing. Working losses from the methanol storage tanks shall be controlled during truck or railcar unloading by use of a vapor balance system.

11. Baghouse Control for EP-16. (Note: This is a BACT emission limit.)

A. American Energy Producers shall control emissions from the diatomaceous earth hopper and silica hopper (EP- 16) using a baghouse as specified in the permit application. The baghouse 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 the Department of Natural Resources' employees may easily observe them. Replacement filters for the baghouses and drum filters 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).

B. American Energy Producers shall monitor and record the operating pressure drop across the baghouses and drum filters at least once every 24 hours. The operating pressure drop shall be maintained within the design conditions specified by the manufacturer's performance warranty.

C. American Energy Producers shall maintain an operating and maintenance

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

log for the baghouse 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.

### 12. Performance Testing

- A. Initial performance testing shall be conducted in order to verify compliance with special conditions 1.E., 2.A. through 2.G., 3.H., 8.B through 8.G. and 9. With regard to special conditions 8.B. through 8.G and 9, testing is required for one boiler only and shall be considered representative of each boiler.
- B. Subsequent performance testing is required to verify compliance with special condition 1.E. at least once every three (3) years. Compliance with special condition 1.E. shall be demonstrated initially through EPA Method 25A stack testing; subsequent compliance demonstrations may be based on the results of an organic vapor survey monitor, provided that a correlation between the organic survey monitor and the method 25A stack test results is established during the initial performance test.
- C. The performance tests conducted in order to verify compliance while utilizing natural gas shall be conducted within 60 days of achieving the maximum production rate, but no later than 180 days after initial startup. The performance tests conducted in order to verify compliance while utilizing fuel oil shall be conducted within 60 days after initial introduction of fuel oil to the boilers. American Energy Producers, Inc. shall provide written notice to the Air Pollution Control Program of the date of initial introduction of fuel oil to the boilers.
- D. The date on which performance tests are conducted shall be pre-arranged with the Air Pollution Control Program a minimum of 30 days prior to the proposed test so that a pretest meeting may be arranged if necessary, and to assure that the test date is acceptable for an observer to be present. A completed Proposed Test Plan form (copy enclosed) may serve the purpose of notification and must be approved by the Air Pollution Control Program prior to conducting the required emission testing.
- E. Two (2) copies of a written report of the performance test results shall be submitted to the Director of the Air Pollution Control Program within 30

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days of completion of any required testing. The report must include legible copies of the raw data sheets, analytical instrument laboratory data, and complete sample calculations from the required EPA method for at least one (1) sample run.

#### 13. Operational Monitoring and Recordkeeping

- A. The fire pump engine shall (EP-21) shall operate less than 500 hours per year. American Energy Producers shall log the hours of operation to demonstrate compliance with this condition.
- B. American Energy Producers shall analyze a representative sample of fuel oil from the fuel oil storage tank for sulfur content at least once per year. As an alternative, American Energy Producers may obtain certified analyses from the fuel oil provider.
- C. All records required by this permit shall be maintained on-site for at least 5 years and shall be provided to Department of Natural Resources employees upon request.

#### 14. Restriction of Public Access – Fencing or Physical Barrier to Restrict Public Access to Property

American Energy Producers shall preclude public access to property that is considered within the non-ambient air zone with respect to the air quality impact analysis conducted for this permit. The precluded area is approximately depicted in Figure 4 of the January 10, 2008 ambient air quality impact analysis memorandum and is further described in a letter dated February 21, 2008 from Aquaterra Environmental Solutions to the APCP regarding “Response to Special Condition 11” (see incorporated documents in the review summary). Installation and maintenance of a fence or other physical barrier shall be the means to preclude public access.

#### 15. Post-Construction Ozone Monitoring

- A. American Energy Producers shall conduct post-construction ambient air quality monitoring for ozone for at least the first full ozone season (April 1<sup>st</sup> through October 31<sup>st</sup>) that the soybean processing plant commences normal operations. Dependent on the concentrations of ozone observed, American Energy Producers may be required to continue ozone ambient air quality monitoring for a second full ozone season.
- B. Within 60 days of permit issuance, American Energy Producers shall submit

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

a Quality Assurance Project Plan (QAPP) describing the methods and procedures for conducting the required ambient air monitoring.

- C. American Energy Producers shall resolve or address, to the Air Pollution Control Program's satisfaction, any Air Pollution Control Program recommendations on the QAPP for the ozone ambient air monitoring within the time frames indicated in any such comments. A completed QAPP must be approved by the Director of the Air Pollution Control Program prior to conduction the required ambient air monitoring.
  - D. American Energy Producers shall submit the results of the ambient monitoring to the Air Pollution Control Program based on the reporting schedule indicated in the QAPP.
  - E. Within 60 days of completion of the first full, post-construction, ozone season American Energy Producers shall submit to the Air Pollution Control Program plans for second full season ozone monitoring or a request for discontinuation of ozone monitoring. American Energy Producers must receive written authorization from the Air Pollution Control Program to discontinue ozone monitoring.
16. Soybean Throughput Limitation. Total oilseed throughput (measured per 40 CFR 63.2855) shall not exceed 1,095,000 tons for any consecutive 12-month period.
17. Vapor Recovery Tray to Minimize VOC Losses. American Energy Producers shall install and effectively operate a vapor recovery tray, to be located below the sparge tray of the desolventizer-toaster (DT).
18. Superseding Condition

The conditions of this permit supersede all special conditions found in the construction permit previously issued by the Air Pollution Control Program (Permit Number 012006-011A).

## REVIEW OF APPLICATION FOR AUTHORITY TO CONSTRUCT AND OPERATE

Project Number: 2008-08-088  
Installation ID Number: 033-0034  
Permit Number:

American Energy Producers, Inc.  
16749 U.S. Highway 65 North  
Tina, MO 64682

Parent Company:  
American Energy Producers, Inc.  
11 N Folger St.  
Carrollton, MO 64633

Carroll County, S9, T54N, R23W

### REVIEW SUMMARY

- American Energy Producers has applied for authority to construct a 3,000 ton per day soybean processing facility with an integrated a 60 million gallon per year biodiesel production plant. Process steam needs for soybean processing and biodiesel production will be met by two dual-fuel boilers, each rated at 95 MMBTU/hr.
- Hazardous Air Pollutant (HAP) emissions are expected from the proposed equipment. The HAP of concern from soybean processing is n-hexane, which is used to extract oil from soybeans. The HAP of concern from the biodiesel production process is methanol.
- New Source Performance Standards (NSPS) apply to this installation. Specifically, 40 CFR Part 60 Subpart Kb, *Standards of Performance for Volatile Organic Liquid Storage Vessels*, applies to some of the storage tanks. NSPS Subpart RRR, for VOC Emissions from SOCM I Reactor Processes, applies to the biodiesel plant. NSPS Subpart DD, *Standards of Performance for Grain Elevators*, applies to the soybean processing operations. NSPS Subpart NNN, for VOC Emissions from SOCM I Reactor Distillation Operations, applies to the biodiesel plant. NSPS Subpart VV, for Equipment Leaks of VOC in the SOCM I, applies to the biodiesel plant. NSPS Subpart Dc for Industrial, Commercial, Institutional Steam Generating Units applies to the boilers.
- The Maximum Achievable Control Technology (MACT) standard, 40 CFR Part 63, Subpart FFFF, *National Emission Standards for Miscellaneous Organic Chemical Production and Processes (MON)* applies to the biodiesel plant since the installation is major for HAPs. 40 CFR Part 63, Subpart GGGG – *National Emission Standards for Hazardous Air Pollutants for Solvent Extraction for Vegetable Oil Production* applies to the soybean processing facility.

- A condensation/scrubbing system is being used to control methanol emissions from biodiesel production. Condensers and a mineral oil absorption system are used to control VOC emissions from the extraction process.
- Baghouses and cyclones will be used to control PM<sub>10</sub> emissions from soybean processing operations.
- This review was conducted in accordance with Sections 6 and 8 of 10 CSR 10-6.060, *Construction Permits Required*. Potential emissions of HAPs are above major source levels; however Section 9 of 10 CSR 10-6.060 does not apply since soybean processing and biodiesel production processes are subject to MACT requirements. Potential emissions of volatile organic compounds (VOC) are greater than 250 tons per year for this installation when considering emissions from the soybean processing operations. This makes the installation a “major” installation with regard to prevention of significant deterioration (PSD) requirements. Potential emissions of particulate matter (PM) and particulate matter with an aerodynamic diameter less than ten microns (PM<sub>10</sub>) are also above PSD significance levels when considering the entire installation (i.e., soybean processing, biodiesel production and steam generation).
- This installation is located in Carroll County, an attainment area for all criteria air pollutants.
- The biodiesel production portion of this installation is in the named source category of “Chemical Processing Plant”; however, the installation as a whole is not considered a named installation. See the installation description and 10 CSR 10-6.020(3) (B), Table 2 for further detail.
- Ambient air quality modeling was performed by the applicant and by the Air Pollution Control Program, to determine the ambient impact of PM<sub>10</sub> and to look at potential risks associated with methanol and hexane emissions. Results of the modeling predict PM<sub>10</sub> ambient impact below the increment standard (see 10 CSR 10-6.060(6) (A) 3 and 10 CSR 10-6.060(11) (A)) and below the national ambient air quality standard (see 10 CSR 10-6.010). Results of the modeling also demonstrate that there is no unacceptable risk related to methanol and hexane emissions.
- Emission testing is required per NSPS standards and the special conditions of this permit.
- A Part 70 Operating Permit application is required for this installation within one year of equipment startup.
- Approval of this permit is recommended with special conditions.

## INSTALLATION DESCRIPTION

This is a new installation to be located along Highway 65, approximately two miles southeast of Tina, Missouri. American Energy Producers plans to focus on biodiesel production initially and then move forward with construction and operation of soybean processing operations.

The American Energy Producers facility will consist of a soybean processing plant, a biodiesel manufacturing plant, two 95 MMBTU/hr boilers and ancillary equipment. The soybean processing plant includes material handling operations (such as unloading, crushing, conveying, pelletization and storage), soy meal conditioning (thermal/mechanical), solvent extraction (with hexane), distillation for solvent recovery and refining and bleaching processes (for oil that is to be used for biodiesel production). The proposed front-end capacity of the soybean processing plant is 3,000 tons of soybeans per day. Products from the soybean processing plant include crude soy oil, refined and bleached soy oil, soy meal and soy hulls.

The biodiesel plant includes chemical reaction vessels, soy oil storage tanks, methanol storage tanks, glycerine storage tanks, biodiesel storage tanks and other process equipment. The primary feedstock for the biodiesel plant is refined and bleached soy oil from the soybean processing plant, but purchased soy oil may also be used as well as other feedstock, such as animal fat and waste cooking oil. Biodiesel is produced from the base-catalyzed transesterification of soy oil with methanol. The by-product of this reaction is glycerine. The proposed capacity for biodiesel production is 164,383 gallons per day.

The two boilers, each rated at 95 MMBTU/hr, will be fired primarily with natural gas, but will also be capable of burning # 2 fuel oil. Ancillary equipment includes cooling towers, a fire pump engine and fuel oil storage tanks.

### **PSD Applicability Discussion**

For the purpose of PSD applicability determination, the biodiesel plant, soybean processing plant and steam generating boilers are all considered as part of the same installation due to support facility and common control issues. Further explanation and discussion of the implications to follow.

Installation is defined at 10 CSR 10-6.020(2) (l) 7. as,

*“All source operations including activities that result in fugitive emissions, that belong to the same industrial grouping (that have the same 2-digit code as described in the Standard Industrial Classification Manual, 1987), and any marine vessels while docked at the installation, located on one (1) or more contiguous or adjacent properties and under the control of the same person (or persons under common control)”*

However, as explained in the Federal Register notice that redefined source:

*“Each source is to be classified according to its primary activity, which is determined by its principal product or group of products produced or distributed, or services rendered. Thus, one source classification encompasses both primary and support facilities, even when the latter includes units with a different two-digit SIC code.”* See 45 FR 52695.

Portions of this installation are described by at least two Standard Industrial Classification (SIC) codes: The appropriate SIC code for a soybean processing plant is 2075. SIC code 2075 is for establishments primarily engaged in manufacturing soybean oil, cake, and meal, and soybean protein isolates and concentrates, or in processing purchased soybean oil other than into edible cooking oils. The appropriate SIC code for a biodiesel plant is 2869. SIC code 2869 is for establishments primarily engaged in manufacturing industrial organic chemicals, not elsewhere classified.

Once the entire installation is constructed and in operation soybean processing operations will more than likely represent the main revenue source and a review of emissions estimates shows that the main pollutant-emitting activity is also soybean processing. Therefore soybean processing is considered the primary activity for the installation as a whole. Soybean processing operations, in turn support the production of biodiesel, since refined and bleached soy oil from soybean processing will be the primary feedstock for the biodiesel plant. The primary activity (soybean processing) is supporting a secondary activity (biodiesel production). Or, another perspective would be to say that a group of products (derived from soybeans) are produced at this installation. The group of products includes crude soy oil, refined and bleached soy oil, soy meal, soy hulls and biodiesel fuel.

The two boilers will provide process steam to the soybean processing and biodiesel plants and will exist solely to support these operations, therefore the boilers must be considered as part of the installation as a whole.

With regard to PSD permitting requirements, potential emissions of VOC are greater than 250 tons per year for this installation when considering emissions from the soybean processing operations. This makes the installation a “major” installation with regard to PSD requirements. Potential emissions of particulate matter (PM) and particulate matter with an aerodynamic diameter less than ten microns (PM<sub>10</sub>) are also above PSD significance levels when considering the entire installation (i.e., soybean processing, biodiesel production and steam generation). Therefore BACT control technology review requirements apply for VOC, PM and PM<sub>10</sub>, for soybean processing, biodiesel production and steam generation.

## PROJECT DESCRIPTION

The initial construction permit (Permit Number 102008-011) was for the biodiesel production processes, two 95 MMBTU/hr boilers, cooling towers, fuel storage tanks and a fire pump engine - emission points 14 through 30 of the application. The soybean processing plant, emission points 1 through 13, is being addressed in this permitting action.

## EMISSIONS/CONTROLS EVALUATION

The emission factors and control efficiencies used in this analysis were obtained from a variety of sources, as follows:

- Potential VOC emissions from soybean processing operations are equivalent to the BACT emission limitation. Potential n-hexane emissions are based on the assumption that 64 percent by weight of the extraction solvent is n-hexane.
- Methanol and VOC emissions from equipment leaks were estimated using the procedures outlined in USEPA's *Protocol for Equipment Leak Emission Estimates*, November 1995.
- Methanol emission from the biodiesel process vent were estimated by considering the thermodynamic properties of the vent stream and assuming 95 percent control through the two scrubbers. Emissions testing is required to quantify the VOC emission rate through the biodiesel process vent.
- PM<sub>10</sub> and VOC emissions from the boilers used in the potential to emit calculations are equivalent to the BACT emission limitations.
- PM<sub>10</sub> emissions from the fire pump engine and cooling towers were estimated in accordance with applicable Sections of USEPA AP-42.

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 1: Emissions Summary (tons per year)

Pollutant	Regulatory <i>De Minimis</i> Levels	Existing Potential Emissions	Existing Actual Emissions	Potential Emissions of the Application
PM <sub>10</sub>	15.0	N/A	N/A	34.34
SO <sub>x</sub>	40.0	N/A	N/A	< 40
NO <sub>x</sub>	40.0	N/A	N/A	< 40
VOC	40.0	N/A	N/A	462.08
CO	100.0	N/A	N/A	62.5
n-hexane	10.0	N/A	N/A	279.42
Methanol	10.0	N/A	N/A	20.58
HAPs	10.0/25.0	N/A	N/A	300

N/A = Not Applicable

## PERMIT RULE APPLICABILITY

This review was conducted in accordance with Sections 6 and 8 of Missouri State Rule 10 CSR 10-6.060, *Construction Permits Required*.

## APPLICABLE REQUIREMENTS

American Energy Producers 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 June 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 Volatile Organic Liquid Storage Vessels*, 40 CFR Part 60, Subpart Kb.
- *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
- *New Source Performance Regulations*, 10 CSR 10-6.070 – *New Source Performance Standards (NSPS) for VOC Emissions from SOCFI Reactor Processes*, 40 CFR Part 60, Subpart RRR.
- *New Source Performance Regulations*, 10 CSR 10-6.070 – *New Source Performance Standards (NSPS) for Equipment Leaks of VOC in the SOCFI*, 40 CFR Part 60, Subpart VV.
- *New Source Performance Regulations*, 10 CSR 10-6.070 – *New Source*

*Performance Standards (NSPS) for Volatile Organic Compound (VOC) Emissions from the Synthetic Organic Chemical Manufacturing Industry (SOCMI) Distillation Operations, 40 CFR Part 60, Subpart NNN.*

- *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*
- *MACT Regulations, 10 CSR 10-6.075 – National Emissions Standards for Hazardous Air Pollutants: Miscellaneous Organic Chemical Manufacturing, 40 CFR Part 63, Subpart FFFF.*
- *Restriction of Emission of Sulfur Compounds, 10 CSR 10-6.260*
- *Maximum Allowable Emissions of Particulate Matter From Fuel Burning Equipment Used for Indirect Heating, 10 CSR 10-3.060*

## BEST AVAILABLE CONTROL TECHNOLOGY (BACT) ANALYSIS

### Applicability and Scope

With regard to PSD requirements this installation is considered a “major stationary source” since potential emissions of VOC exceed 250 tons per year when accounting for emissions from soybean processing. Potential emissions of PM and PM<sub>10</sub> are also above PSD significance levels when considering the entire installation (i.e., soybean processing, biodiesel production and steam generation). Therefore BACT control technology review requirements apply for VOC, PM and PM<sub>10</sub>, for soybean processing, biodiesel production and steam generation.

### 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.

### VOC BACT for Soybean Processing Operations

#### **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.

As a policy, 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 American Energy Producers has indicated will be a part of this plant that are translated to specifications in this permit.

Prior to solvent extraction, soybeans are prepared through a series of thermal and mechanical processes (see Subsection 1.2.2 of the application for further detail.) 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.

American Energy Producers intends to install a 3,000 ton per day shallow-bed continuous loop extractor. 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. There is a design feature associated with the DT that includes an additional "vapor recovery system" tray below the sparge tray. The Crown Iron Works brochure for DTDC systems (see file) claims that the vapor recovery tray results in lower hexane usage and emissions. American Energy Producers has confirmed that they intend to install a vapor recovery tray on the DT and this is a process design feature that became a permit condition.

Hexane vapors from the extractor vent are routed to a series of condensers - uncondensed vapors from the vent gas chiller 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 oil to absorb hexane. Utilization of

a mineral oil chiller system (to cool mineral oil that enters the top of the mineral oil absorber) will increase hexane removal efficiency since the solubility of hexane in mineral oil increases with a decrease in mineral oil temperature. 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, with a chiller, 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 and cooling air is sent through particulate control devices, but there are no additional 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, sight 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/BACT/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 APCP 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 (<sup>o</sup>F) to ensure complete combustion.

Catalytic incinerators are similar to thermal/recuperative incinerators, with the primary difference 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

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 °F.

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

The APCP did not identify any existing soybean processing facility with an RTO or a catalytic incinerator for control of VOC or hexane. Based on review of recently-issued permits in Nebraska, Indiana, Iowa and Illinois the APCP is not aware of any plans for use of RTO or catalytic incineration for control of VOCs at a soybean processing facility.

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. American Energy Producers has expressed concerns about fire safety and believes that RTO is infeasible due to safety concerns. See NFPA 36 and Section (3) of the permit application for further detail.

American Energy Producers also points to other technical feasibility concerns relating to RTO, including:

- Carbonization and degradation of the ceramic beds due to the presence of oil aerosol in the mineral oil absorber vent.
- Plugging/fouling of the ceramic beds due to particulate matter (particularly with regard to emissions from the meal dryer/cooler)
- The exhaust stream will have wide swings in solvent concentration and overall flow rate and this would hamper safe and efficient operation.

After considering the safety and technical feasibility concerns mentioned above and cost analyses prepared in conjunction with an EPA rulemaking and the Ag Processing – St. Joseph BACT review, the APCP 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 technical issues for carbon adsorption are much the same as the RTO/incineration units. The aerosol oil in the mineral oil absorber exhaust and the PM and PM<sub>10</sub> 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<sub>10</sub> 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. Biofiltration has only recently emerged over the last few years as a potentially viable technology for gas phase applications. 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 outside of the bench-scale and pilot plant operations has been limited. There is no methodology or theory established to design for or predict the destruction efficiency that could be achieved for American Energy Producers' 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.

## **Leak Detection and Repair (LDAR)**

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.

The APCP believes that the LDAR program needs to contain pro-active, focused inspection and repair provisions and has included a permit condition to require a BACT LDAR program. The APCP concluded that it would not be appropriate to impose LDAR requirements from another source-category as BACT for a soybean processing plant. American Energy Producers 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 Solvent Storage Tank Emissions**

Solvent storage tank breathing and working losses will be 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.

## **Summary of VOC BACT Equipment, Methods, Systems and Techniques for the Soybean Processing Operations**

The following table provides a summary of BACT equipment, methods, systems and techniques for soybean processing operations:

Table 2: BACT Equipment, Methods, Systems and Techniques for Soybean Processing

Emission Source	BACT Equipment, Method, System or Technique
Extractor	<ul style="list-style-type: none"> <li>• Condensation for solvent recovery.</li> <li>• Uncondensed vapors routed to mineral oil absorber (with chiller system)</li> </ul>
Desolventizer-Toaster	<ul style="list-style-type: none"> <li>• Condensation for solvent recovery.</li> <li>• Uncondensed vapors routed to mineral oil absorber (with chiller system)</li> </ul>
Solvent Storage	<ul style="list-style-type: none"> <li>• Breathing and working losses routed to solvent recovery system.</li> </ul>
Process, Fugitive	<ul style="list-style-type: none"> <li>• Leak detection and repair (LDAR) program.</li> </ul>

### Rationale for BACT Emission Limitations

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 APCP 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 from Iowa, Nebraska, Minnesota and Missouri soybean processing plants.
- Information gathered by contacting equipment suppliers, soybean processing plant operators, consultants to the soybean processing industry and state regulators.
- Professional publications and articles
- Information presented in the permit application, and follow-up correspondence.

The APCP agrees with the approach taken in the solvent extraction MACT to account for overall plant-wide emissions by conducting a material balance. It appears impractical to accurately 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. Typical “commercial 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 (1995 and 1996). 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 APCP referred to the RACT/BACT/LAER clearinghouse and other sources to compile the following table of recently permitted VOC emission limits for soybean processing plants.

Table 3 - Recently Permitted VOC Emission Limits for Soybean Processing Plants

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 <sup>1</sup>	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 <sup>2</sup>	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, 1 <sup>st</sup> Yr.		0.2
				Plants A&B, 2 <sup>nd</sup> Yr. on		0.19
ADM	06/28/2005	Mankato	MN	Plant-wide		0.15
Louis Dreyfus Agricultural Industries <sup>3</sup>	01/24/2006	Claypool	IN	Meal Dryer and Cooler	0.17	
				MOS Vent	0.048	
				Plant-Wide – 1 <sup>st</sup> Yr.		0.2
				Plant-Wide – 2 <sup>nd</sup> Yr. on		0.134
Cargill	08/28/2006	Kansas City	MO	Plant-wide Operating Capacity <90%		0.14
				Plant-wide Operating Capacity >90%		0.165
Bunge	01/29/2007	Council Bluffs	IA	Plant-Wide		0.178
Ag Processing <sup>4</sup>	05/16/2007	St. Joseph	MO	Plant-Wide		0.145
ADM	03/19/2008	Frankfort	IN	Plant-Wide		0.179
ADM	04/09/2008	Des Moines	IA	Plant-Wide		0.1712
Ultra Soy of America	04/14/2008	South Milford	IN	Meal Dryer and Cooler	0.17	
				MOS Vent	0.048	
				Plant-Wide – 1 <sup>st</sup> Yr.		0.2
				Plant-Wide – 2 <sup>nd</sup> Yr. on		0.134
ADM	5/13/2008	Quincy	IL	Plant-Wide		0.175
Prairie Pride <sup>5</sup>	06/12/2008	Deerfield	MO	Plant-Wide		0.125

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 limits resulted in PSD-avoidance with regard to federal regulations, however a VOC BACT analysis was required by state regulations and the limits listed in this table are state-determined BACT limits.
4. The Ag Processing permit is in the process of administrative appeal. In May 2008 the Missouri Administrative Hearing Commission recommended to the Missouri Air Conservation Commission that the VOC BACT emission limit listed above be upheld.
5. The Prairie Pride limit is a PSD-avoidance limit, not a BACT limit. This is an amended permit; the original construction permit was issued in 2007.

With regard to the permit limits listed above it is important to consider specific aspects of each permit and plant. For instance, many of the permits are for plant expansions rather than a brand new plant; and for the plant expansions there are differences with regard to what actual equipment is to be replaced and/or modified. For existing plants there are differences in the type of equipment (for instance ADM Frankfort has a deep-bed extractor, whereas most of the other plants have shallow-bed extractors). The following plants listed above are new “greenfield” plants: Louis Dreyfus Industries, Ultra Soy and Prairie Pride. The Ag Processing – St. Joseph expansion involved replacement of the entire extraction plant (including extractor, DT, DC, condensers, distillation equipment, mineral oil scrubbing system, etc.); Ag Processing was also permitted to expand and modify feed storage and preparation processes. The Bunge Council Bluffs and ADM Quincy expansion projects do not appear to involve any modifications to the extractor or solvent recovery system. New plants, or plant expansions that involve replacement of the extraction plant are in a better position to achieve low solvent losses due to the ability to oversize mass transfer equipment, improvements in equipment design and process control that have occurred over time, stream-lining of unit operations and other factors.

It should be noted that EPA has entered in to several consent agreements with Ag Processing 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.

The Archer Daniels Midland (ADM) consent decree required condenser upgrades at ADM’s plants such that all oilseed plants have a dedicated “extractor condenser” and a “once-through cold water condenser” (to be placed downstream of the vent condenser and upstream of the mineral oil absorption system) by April 2006. The American Energy Producers plant will include a dedicated extractor condenser and a vent gas chiller. The vent gas chiller will be functionally equivalent to a once-through cold water condenser in that it will be placed downstream of the vent condenser and will be used to cool and condense the vapors exiting the vent condenser. The vent gas chiller at American Energy Producers may utilize a refrigerated glycol-water solution rather than just cool water as the heat transfer fluid.

During the process of permit review for the Ag Processing – St. Joseph plant expansion the APCA obtained monthly solvent loss ratio data from the St. Joseph plant and 3 other Ag Processing plants. Collectively, these were described as Ag Processing’s four largest plants. The data covered the time period January 2003 through December 2006; 12-month rolling averages for the time period December 2003 through December 2006. Average and maximum values are presented in Table 4.

Table 4 – 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	0.144	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 5.

Table 5 – 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

In a comment letter submitted to the Kansas City Health Department regarding a PSD permit for the Kansas City plant, Cargill attributed the low solvent losses during this period, in part, to the fact that they were using a low HAP (low n-hexane) solvent blend. The low HAP solvent blend that Cargill used during this time period was primarily iso-hexane. Typical commercial hexane is primarily n-hexane. The physical and chemical properties of iso-hexane differ from the physical and chemical properties of n-hexane; for instance iso-hexane has a lower boiling point than n-hexane. The differing physical and chemical properties affect the unit operations of the extraction process. Since iso-hexane has a lower boiling point than n-hexane it requires less thermal energy remove iso-hexane from the meal. Use of a high iso-hexane blend also results in a higher mass loading to the solvent recovery system. While Cargill maintains that use of a high iso-hexane blend results in lower solvent emissions, APCP’s cursory literature review and discussions with soybean processing plant operators and equipment vendors indicates that use of a high-iso-hexane blend may result in lower solvent losses for a properly designed plant, but APCP was not able to definitively conclude that use of a high iso-hexane blend will result in lower solvent losses. APCP is choosing not to mandate the use of a high iso-hexane blend as BACT. Cargill also noted supply concerns. Conoco Phillips was Cargill’s primary supplier of a less than 1 percent n-hexane blend. Conoco Phillips has discontinued production of the less than 1 percent n-hexane blend, however a less than 3 percent n-hexane blend is still commercially available.

ADM provided APCP with monthly solvent loss ratio data from their Mexico, Missouri and Mankato, Minnesota plants as part of a BACT review for an expansion at the Mexico, Missouri plant. The averages and maximums are listed in Table 6.

Table 6 – 12-MRA SLR ADM's Mexico and Mankato Plants – 12/03 through 12/07

ADM Plant	Average 12-MRA Solvent Loss Ratio (gallons solvent /ton oilseed)	Maximum 12-MRA Solvent Loss Ratio (gallons solvent /ton oilseed)	Max/Avg
Mexico	0.120	0.158	1.32
Mankato	0.116	0.141	1.21

As part of the Ag Processing permit review, the APCP obtained emissions inventory data for Iowa and Nebraska AGP plants. This data presented in Table 7 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 7 – 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
	2006	0.119

The Emmetsburg, Iowa plant commenced operation in 1997 and the Hastings, Nebraska plant commenced operation in 1999. These relatively new plants appear to show better performance, as compared to some of the older plants.

The Louis Dreyfus plant in Claypool, Indiana commenced operations in November 2007. Based on a telephone conversation with a manager who works at the Claypool plant, after start-up issues and training of plant personnel, as of mid-September 2008 the plant has been operating at approximately 0.1 gallons per ton overall solvent loss for several months. Both Louis Dreyfus personnel and a consultant who worked on the Louis Dreyfus permit application indicated that the 0.134 gallon per ton limit is achievable. The APCP contacted the Indiana Department of Environmental Management (IDEM) to see if they were aware of any non-compliance issues at the Louis Dreyfus plant relating to the VOC solvent loss limit. The IDEM records did not indicate any compliance problems related to the VOC solvent loss limit.

The APCP also contacted process engineers for the two major equipment suppliers in the United States for extraction plant equipment (Crown Iron Works and Desmet Ballestra); both process engineers offered the opinion that a 0.145 gallon per ton emission limit is achievable for a new plant. In fact, Crown Iron Works guaranteed a

solvent loss ratio of less than 0.125 gallons per ton for the Prairie Pride plant in Missouri. The APCP has not seen the qualifications, conditions or term for this manufacturer's guarantee, but did confirm that such a guarantee was made by Crown Iron Works.

After considering the information presented above, the APCP believes that a plant-wide VOC BACT emission limitation of 0.145 gallons per ton is challenging, yet achievable.

To ensure efficient operation of the solvent recovery system, which includes condensers and the mineral oil absorption system, APCP is establishing a BACT emission limitation for the mineral oil absorption system vent of 0.056 lbs VOC emitted per ton of soybeans processed. This equates to 7 lbs VOC emitted per hour when operating at full capacity (125 tons of soybeans per hour). This BACT emission limit is slightly higher than the lowest emission limit found in other PSD permits (see Ultra Soy of America permit). This emission limitation is also in close proximity to a calculated safe-practice emission rate (i.e. 25 percent of the lower explosive limit of hexane). For a high-end flow rate through the mineral oil absorption system vent of 200 actual cubic feet per minute (acfm), a lower explosive limit of 1.1 percent by volume and a stack gas temperature of 100 F, the safe-practice emission limitation is calculated as 7 pounds per hour.

#### PM and PM<sub>10</sub> BACT for Soybean Processing Operations

BACT control technologies and emission limitations for particulate matter generated from soybean and meal processing are detailed in Special Conditions 2.A through 2.K. Generally speaking cyclones and/or baghouses are used to control particulate emissions. Many of the cyclones are also used for product recovery. The application indicates that fabric filtration is not suitable for some of the process streams due to excess moisture. The application, and follow-up correspondence, also provides an argument that a wet scrubber should not be considered as BACT control for emissions coming from the Dryer-Cooler cyclones due to economic considerations. APCP's review of the BACT analysis submitted in the application indicates that the emission rates are comparable to BACT emission rates in other recently-issued permits and generally agrees with the conclusions of the BACT analysis submitted in the application. See the permit application for further details.

APCP departed from what was suggested in the application with regard to emissions from the vertical seed conditioner and flaking processes. The application indicates that emissions from these two processes will be routed to a common stack. Vertical seed conditioner emissions are controlled by a cyclone (or cyclones in series): fabric filtration (baghouse) control is not proposed for vertical seed conditioner emissions due to the moisture content of the exhaust. Emissions from the flaking process are controlled first by a flaker aspirator cyclone and then a baghouse. In Table 9 of the permit application a BACT limit of 0.01 grains per dry standard cubic foot (gr/dscf) is suggested. The BACT permit condition is 0.006 gr/dscf. Anticipated emissions based on an evaluation of the AP-42 emission factors and assuming 90 percent of the particulate matter emitted is PM<sub>10</sub> and 99 percent control efficiency for fabric filtration of flaking process emissions yields approximately 0.0057 gr/dscf for the combined exhaust at the EP-06 stack. In addition, at least one other recently-issued PSD permit has a BACT limit less than 0.006 gr/dscf for vertical seed conditioning emissions (Ultra Soy of America, South Milford, IN).

## Biodiesel Production Processes – VOC BACT

The primary pollutant of concern from biodiesel production is methanol. There will also be hexane emissions since residual hexane is present in the vegetable oil that is used as a feedstock for biodiesel production. Methanol and hexane are classified as VOC.

Methanol is used in the transesterification reaction that produces biodeisel. At several points downstream of the transesterification reaction vessels methanol is separated by stripping and distillation processes, the vapors are routed to a series of condensers and two absorption columns. The condensers and absorption columns serve to recover methanol for re-use and to control VOC emissions. VOC that is not recovered through the condensers and absorption columns is emitted through the biodiesel process vent. VOC is also emitted through equipment leaks from equipment such as tanks, pumps valves flanges, piping connections, etc. Emissions estimates indicate that equipment leaks comprise the majority of emissions for biodiesel production.

Additional VOC control technologies were considered by the applicant with relation to the biodiesel process vent: these include thermal processes (regenerative thermal oxidizer, incinerator, flare), carbon adsorption and biofiltration. Carbon adsorption and biofiltration were ruled out as technically infeasible. Thermal processes were ruled out due to economic considerations and collateral environmental impact (i.e., emissions from combustion process). Potential emissions from the biodiesel vent, for the system, as proposed, are approximately 2 tons per year. Annualized control costs for addition of a flare were estimated at \$61,000/ton of VOC removed. See Appendix E of the application for the cost estimate.

The applicant recommended leak detection and repair (LDAR) as a BACT work practice that serves to minimize equipment leaks.

Follow-up correspondence to the application states that the methanol storage tanks will utilize nitrogen blanketing to reduce or eliminate breathing losses. A vapor balance system will be utilized when transferring methanol from a truck or railcar to the methanol storage tanks to reduce or eliminate working losses.

The applicant did not find any other BACT determinations regarding biodiesel production. In lieu of this, the applicant provided information regarding BACT determinations for the chemical process industry. The Air Pollution Control Program is aware of one permit review that examined BACT considerations for a biodiesel plant. This permit was issued to Louis Dreyfus Industries, Claypool, Indiana in January 2006. The state BACT determination for the Louis Dreyfus permit was as follows:

*One soy oil absorber followed by a water scrubber with combined VOC control efficiency of 99% and a VOC emission rate of 0.30 lbs/hr without methanol unloading and 0.63 lbs/hr with methanol unloading.*

The capacity for biodiesel production at the Louis Dreyfus plant is 80 million gallons per year.

With all of the above in mind, the APCP determined that BACT for VOC with regard to biodiesel production as follows:

Table 8: VOC BACT Equipment, Methods, Systems and Techniques for Biodiesel

Emission Source	BACT Equipment, Method, System or Technique
Biodiesel Production (glycerine stripper and biodiesel stripper vapors)	<ul style="list-style-type: none"> <li>• Two-stage condensation for methanol recovery.</li> <li>• Uncondensed vapors routed to soy oil absorber and then water scrubber.</li> </ul>
Methanol Rectification Vent Condenser	<ul style="list-style-type: none"> <li>• Uncondensed vapors routed to soy oil absorber and then water scrubber.</li> </ul>
Methanol Storage	<ul style="list-style-type: none"> <li>• Nitrogen blanketing to reduce or eliminate breathing losses.</li> <li>• Working losses controlled by vapor balance system during filling of tank(s).</li> </ul>
Equipment Leaks	<ul style="list-style-type: none"> <li>• Subpart VV leak detection and repair (LDAR) program.</li> </ul>

The VOC BACT emission rate for the biodiesel process vent is 0.5 lbs/hr and is subject to verification through stack testing.

BACT for the minimal PM and PM<sub>10</sub> sources associated with biodiesel production (i.e., silica and diatomaceous earth hoppers) is baghouse control.

#### BACT for Boilers

Steam is provided for the soybean solvent extraction and biodiesel production processes by two 95 MMBTU/hr boilers. The primary fuel will be natural gas but the boilers will also be permitted to burn fuel oil, up to 1000 hrs for each boiler.

In terms of PM and PM<sub>10</sub> emissions, natural gas is relatively clean burning when compared to solid fuels such as coal. None of the less than 100 MMBTU/hr units in the RACT/BACT/LAER clearinghouse table provided in the application as Table E-7 indicated add-on controls such as a baghouse, cyclone or wet scrubber. For boilers in this size range with limited fuel oil usage, add-on controls such as a baghouse, cyclone or wet scrubber would not be economically feasible.

The BACT emission rates for VOC, PM and PM<sub>10</sub> listed in Special Condition 5. 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.

## BACT for Cooling Towers

Particulate emissions occur from the cooling towers as a result of the solids in the water being entrained in the air stream. These droplets of water are known as drift. The most efficient way to remove drift from cooling towers is by installing drift eliminators. BACT for PM<sub>10</sub> from the cooling towers was determined to be high efficiency drift eliminators with a 0.001 percent drift. A 0.0005 percent drift rate is achievable, but was ruled out due to a consideration of the magnitude of emissions reductions that would be achieved by adding a second tier of drift eliminators, and economic considerations. See the permit file for additional detail.

### STAFF RECOMMENDATION

On the basis of this review conducted in accordance with Sections 6 and 8, Missouri State Rule 10 CSR 10-6.060, *Construction Permits Required*, I recommend permit issuance with special conditions.

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Stephen R. Jaques, P.E.  
Environmental Engineer

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Date

### PERMIT DOCUMENTS

The following documents are incorporated by reference into this permit:

- The Application for Authority to Construct form, dated July 2007, received July 3, 2007, designating American Energy Producers as the owner and operator of the installation.
- U.S. EPA document AP-42, *Compilation of Air Pollutant Emission Factors*, Fifth Edition.
- January 10, 2008, Memorandum from Lance Horn, MDNR to Steve Jaques, MDNR regarding *Ambient Air Quality Impact Analysis for American Energy Producers*
- February 15, 2008, Memorandum from Lance Horn, MDNR to Steve Jaques, MDNR regarding *Updates to Ambient Air Quality Impact Analysis for American Energy Producers*
- Letter dated February 21, 2008 from Mike Van Cleave, Aquaterra Environmental Solutions, Inc. to Steve Jaques, MDNR – ACP, regarding *Response to Special Condition 11*
- Electronic mail initiated on October 2, 2008 by Steve Jaques, MDNR – reply, with attachments, from Mike Van Cleave, Aquaterra, dated October 7, 2008, regarding *AEP VOC BACT Comments*
- Electronic mail initiated on October 30, 2008 by Steve Jaques, MDNR - reply from Mike Van Cleave, Aquaterra, dated October 30, 2008, regarding *Dryer-Cooler Exhaust Controls*
- Electronic Mail Correspondence initiated on October 30, 2008 by Steve Jaques, MDNR - reply from Lina Klein, Aquaterra, dated October 31, 2008, regarding *Dryer-Cooler Exhaust Controls*

Mr. J. David Swearingin  
American Energy Producers  
16749 U.S. Highway 65 North  
Tina, MO 64682

RE: New Source Review Permit - Project Number: 2008-08-088

Dear Mr. Swearingin:

Enclosed with this letter is your permit to construct. Please study it carefully. Also, note the special conditions, if any, on the accompanying pages. The document entitled, "Review of Application for Authority to Construct," is part of the permit and should be kept with this permit in your files.

Operation in accordance with these conditions, your new source review permit application and with your operating permit is necessary for continued compliance.

The reverse side of your permit certificate has important information concerning standard permit conditions and your rights and obligations under the laws and regulations of the State of Missouri.

If you have any questions regarding this permit, please do not hesitate to contact Steve Jaques at the departments' Air Pollution Control Program, P.O. Box 176, Jefferson City, MO 65102 or (573) 751-4817. Thank you for your attention to this matter.

Sincerely,

AIR POLLUTION CONTROL PROGRAM

Kendall B. Hale  
New Source Review Unit Chief

KBH:sjl

Enclosures

c: Northeast Regional Office  
PAMS File 2008-08-088

Permit Number: