

STATE OF MISSOURI

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: **05 2007 - 007**

Project Number: 2006-04-052

Owner: Ag Processing Inc

Owner's Address: P.O. Box 2047, Omaha, NE 68103

Installation Name: Ag Processing Inc

Installation Address: 900 Lower Lake Road, P.O. Box 427, St. Joseph, MO 64502

Location Information: Buchanan County, S30, T57N, R35W

Application for Authority to Construct was made for:

Expansion project at the existing soybean processing plant. The expansion will increase production rate from 80,000 bushels per day to 120,000 bushels per day.

This review was conducted in accordance with Section (8), Missouri State Rule 10 CSR 10-6.060, *Construction Permits Required*.

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

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

MAY 16 2007

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 eighteen months from the effective date of this permit. Permittee should notify the Air Pollution Control Program if construction or modification is not started within eighteen 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 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 with 15 days after the actual start up of this (these) air contaminant source(s).

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

You may appeal this permit or any of the listed special conditions to the Administrative Hearing Commission (AHC), P.O. Box 1557, Jefferson City, Missouri 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 thirty 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 Air Pollution Control Program, P.O. Box 176, Jefferson City, Missouri 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."

Ag Processing, Inc. (AGP)
Buchanan County, S30, T57N, R35W

1. Volatile Organic Compound (VOC) Best Available Control Technology (BACT) Emission Limitation
 - A. The solvent loss ratio, calculated in accordance with 40 CFR Part 63, Subpart GGGG, shall not exceed 0.145 gallons of solvent per ton of oilseed, 12-month rolling average. When accounting for emissions AGP shall equate "actual solvent loss" to VOC emissions and shall calculate "actual solvent loss" in accordance with 40 CFR 63.2853. This emission limitation first comes in to effect at the end of fifteenth month of operation and utilizes data from the fourth month of operation through the fifteenth month of operation for the initial compliance demonstration. This emission limitation does not apply to the first three months of operation of the modified 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 AGP elects to operate under 40 CFR 63.2850(e)(2). At the end of any such malfunction period AGP shall resume compliance with this emission limitation. If AGP elects to operate under the malfunction period requirements of 40 CFR 63.2850(e)(2) AGP shall also comply with the provisions of 10 CSR 10-6.050.
 - B. AGP shall maintain an accurate record of solvent loss and oilseed throughput. These recordkeeping requirements apply under all operating scenarios including startup, shutdown and malfunction. Such records shall be maintained for not less than five (5) years and shall be made available immediately to any Missouri Department of Natural Resources' personnel upon request.
 - C. AGP 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.B. indicate that the source exceeds the limitations of Special Condition 1.A.

2. Leak Detection and Repair (LDAR) Program

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SPECIAL CONDITIONS:

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

- A. AGP shall prepare and implement a leak detection and repair (LDAR) program to control fugitive VOC emissions. The written LDAR program shall be made available immediately to any Missouri Department of Natural Resources' personnel upon request. This requirement is part of the BACT determination for this permit.
 - B. The following are minimum requirements for the detection portion of the LDAR program:
 - 1) Plant personnel shall check equipment that contains hexane on a daily basis for any signs of a leak, based on sight, sound or smell. Equipment to be checked on the daily inspection includes storage tanks, pumps, piping, duct work, enclosed conveyors, valves, flanges, seals, sight glasses and process equipment (including the extractor, desolventizer-toaster, dryer-cooler, distillation equipment, condensers and heat exchangers).
 - 2) AGP 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. AGP shall record a representative reading from each monitor at least once per day when the solvent extraction equipment is in operation.
 - C. The following are minimum requirements for LDAR recordkeeping:
 - 1) Daily inspection observations and representative fixed-location flammable gas monitor readings shall be recorded in writing and shall be signed and dated by the person that conducted the inspection/reading.
 - 2) If leaks are observed, the nature and extent of the observed leak shall be recorded along with documentation regarding corrective actions.
 - 3) LDAR program records shall be maintained for not less than five (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.
3. BACT Control Equipment Requirements
- A. AGP shall control emissions from the extraction process using

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SPECIAL CONDITIONS:

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

- condenser(s) and a mineral oil absorption system as specified in the permit application. AGP 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. The evaporators, condensers and mineral oil absorption system shall be operated and maintained in accordance with the manufacturer's specifications.
- B. AGP shall maintain an operating and maintenance log for the evaporators, condensers and the mineral oil absorption system which shall include the following:
- 1) Incidents of malfunction, with impact on emissions, duration of event, probable cause, and corrective actions; and
 - 2) Maintenance activities, with inspection schedule, repair actions, and replacements, etc.
- C. AGP shall route breathing and working losses from the solvent storage tanks to the solvent recovery system.
- D. AGP shall install and effectively operate a chiller for the mineral oil absorption system. The mineral oil chiller shall be used during the months of April through October. Operation of the mineral oil chiller is not required November through March.
4. Vapor Recovery Tray to Minimize VOC Losses. AGP shall install and effectively operate a vapor recovery tray, to be located below the sparge tray of the desolventizer-toaster (DT).
5. Maximum Achievable Control Technology (MACT) Requirement
AGP shall comply with all appropriate monitoring, testing, reporting, and record keeping requirements of 40 CFR 63, Subpart GGGG—*National Emission Standards for Hazardous Air Pollutants: Solvent Extraction for Vegetable Oil Production*.
6. Standard of Performance for New Stationary Sources (NSPS) Requirement
AGP shall comply with all appropriate monitoring, testing, reporting, and record keeping requirements of 40 CFR Part 60, Subpart DD—*Standards of Performance for Grain Elevators*
7. Control Device Requirement – Baghouses
- A. AGP shall control emissions from the emission units listed in Table 1 using

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SPECIAL CONDITIONS:

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

baghouses as specified in the permit application. The baghouses shall be operated and maintained in accordance with the manufacturer's specifications. The baghouse shall be equipped with a gauge or meter, which indicates the pressure drop across the control device. These gauges or meters shall be located such that the DNR employees may easily observe them. 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).

- B. AGP shall comply with the PM₁₀ emission limits listed in Table 1.
- C. AGP shall monitor and record the operating pressure drop across the baghouses at least once per day. The operating pressure drop shall be maintained within the design conditions specified by the manufacturer's performance warranty.
- D. AGP 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.

Table 1. Baghouse Controlled Emission Units

Emission Unit ID	Emission Point	Emission Unit Description	Anticipated PM ₁₀ Emissions (gr/dscf)	PM ₁₀ Emission Limit (lb/hr)
1007	53	Hot Dehulling	0.004	N/A
1014	57	Rail Loadout	0.003	1.11
1015	58	Pellet Bin	0.005	N/A
1016	59	Meal Bin 5	0.005	N/A
1017	60	Meal Bin 6	0.005	N/A
0030	6	West Truck Receiving	0.004	0.56
0050	8	Receiving Legs	0.004	1.67
0280	30	Meal Grinding	0.004	0.51
0320	31.2	Off Quality Storage Vent	0.005	N/A
0330	31.3	Hipro Meal Storage Vent	0.005	N/A
0340	31.4	Pellet Storage Vent	0.005	N/A

- 8. Control Device Requirement – Cyclones and Wet Scrubber
 - A. AGP shall control emissions from the DC middle dryer deck, DC bottom

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SPECIAL CONDITIONS:

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

dryer deck and DC cooler deck using cyclones (3 cyclones total, one for each deck) and then a wet venturi-type scrubber (for the three cyclone exhaust streams combined) as specified in the permit application.

- B. AGP shall control emissions from the emission units listed in Table 2 using cyclones as specified in the permit application.
- C. AGP shall comply with the PM₁₀ emission limits listed in Table 2.
- D. The wet scrubber 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 DNR employees may easily observe them.
- E. AGP shall monitor and record the operating pressure drop across the wet scrubber at least once per day. The operating pressure drop shall be maintained within the design conditions specified by the manufacturer's performance warranty.
- F. AGP shall inspect all cyclone solids discharge valves at least once per week to ensure proper operation.
- G. AGP shall monitor air flow rate, pressure drop or fan operation at least once per day to ensure proper operation of all cyclones.
- H. AGP shall maintain an operating and maintenance log for the cyclones and the wet scrubber 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.

Table 2. Cyclone Controlled Emission Units

Emission Unit ID	Emission Point	Emission Unit Description	Anticipated PM ₁₀ Emissions (gr/dscf)	PM ₁₀ Emission Limit (lb/hr)
1004	53	Jet Dryer	0.013	1.05
1009	55	DC Top Dryer Deck	0.007	0.94
1010 1011 1012	55	DC Middle Dryer Deck DC Bottom Dryer Deck DC Cooler Deck		2.08, combined*
0080	53	Bean Heater Aspirator	0.013	3.10
0130	19	Flakers	0.006	0.99

*The DC top dryer deck, bottom dryer deck and cooler deck emissions are routed first to their respective cyclone and then to a common wet scrubber. The 2.08 lb/hr PM₁₀ emission limit applies to the exhaust from the common wet scrubber.

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SPECIAL CONDITIONS:

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

9. Performance Testing Requirements

- A. To demonstrate compliance with the PM₁₀ emission limits contained in Tables 1 and 2 AGP shall conduct initial performance testing for emission points 6, 8, 19, 30, 53, 55 and 57. The tests shall be performed according to the NSPS Subpart DD, and the test methods outlined in 40 CFR 60, Appendix A, Method 5 and 201A/202, or any method approved by the Air Pollution Control Program.
- B. AGP shall conduct testing sufficient to demonstrate compliance with any and all applicable new source performance standard(s).
- C. The initial performance tests shall be performed within 60 days of achieving the maximum production rate, but no later than 180 days after initial startup.
- D. The initial performance test date(s) shall be pre-arranged with the Air Pollution Control Program a minimum of 30 days prior to the proposed test date so that a pre-test meeting may be arranged if necessary, and to assure that the test date is acceptable for an observer from the Air Pollution Control Program to be present. A proposed test plan shall be submitted to the Air Pollution Control Program a minimum of 30 days prior to the proposed test date. The test plan must be approved by the Air Pollution control Program prior to the test date.
- E. In the event that visible emissions are observed from the soybean and meal loading/unloading areas, the Air Pollution Control Program may require capture efficiency testing for the associated air handling systems.

10. Post-Construction Ozone Monitoring

- A. AGP shall conduct post-construction ambient air quality monitoring for ozone for at least the first full ozone season (April 1st through October 31st) that the modified plant commences normal operations. Dependent on the concentrations of ozone observed, AGP may be required to continue ozone ambient air quality monitoring for a second full ozone season.
- B. Within 60 days of permit issuance, AGP shall submit a Quality Assurance Project Plan (QAPP) describing the methods and procedures for conducting the required ambient air monitoring.
- C. AGP 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. AGP shall submit the results of the ambient monitoring to the Air Pollution Control Program based on the reporting schedule indicated in the QAPP.

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SPECIAL CONDITIONS:

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

- E. Within 60 days of completion of the first full, post-construction, ozone season AGP shall submit to the Air Pollution Control Program plans for second full season ozone monitoring or a request for discontinuation of ozone monitoring. AGP must receive written authorization from the Air Pollution Control Program to discontinue ozone monitoring.
11. Soybean Throughput Limitation. Total oilseed throughput (measured per 40 CFR 63.2855) shall not AGP exceed 1,314,000 tons for any consecutive 12-month period.

REVIEW OF APPLICATION FOR AUTHORITY TO CONSTRUCT AND OPERATE
SECTION (8) REVIEW

Project Number: 2006-04-052
Installation ID Number: 021-0060
Permit Number:

Ag Processing Inc
900 Lower Lake Road
PO Box 427
St. Joseph, MO 64502

Complete: September 20, 2006
Reviewed: Aug 2006 - Apr 2007

Parent Company:
Ag Processing Inc
PO Box 2047
Omaha, NE 68103

Buchanan County, S30, T57N, R35W

REVIEW SUMMARY

- AGP has applied for authority to expand its existing soybean processing plant. The expansion will increase production rate from 80,000 bushels per day to 120,000 bushels per day.
- Hazardous Air Pollutant (HAP) emissions are expected from the proposed equipment. The HAP of concern from this process is n-hexane.
- Standard of Performance for New Stationary Sources (NSPS), 40 CFR Part 60, Subpart DD—*Standards of Performance for Grain Elevators* applies to emission units EU0030 and EU0050.
- The Maximum Achievable Control Technology (MACT) standard, 40 CFR Part 63, Subpart GGGG, *National Emission Standards for Hazardous Air Pollutants: Solvent Extraction for Vegetable Oil Production* applies to the proposed sources of hexane emissions.
- Baghouses, cyclones and a wet scrubber will be used to control PM₁₀ emissions from the equipment in this permit. Condensers and a mineral oil absorption system are used to control VOC emissions from the extraction process.
- This review was conducted in accordance with Section (8) of Missouri State Rule 10 CSR 10-6.060, *Construction Permits Required*. Potential emissions of VOC are above major source levels. A net emission increase (NEI) for PM and PM₁₀ was conducted for this project for the contemporaneous time period between December of 2001 and August of 2008. The NEI of both PM and PM₁₀ were below de minimis levels.
- This installation is located in Buchanan County, an attainment area for all criteria air pollutants.

- This installation is not on the List of Named Installations [10 CSR 10-6.020(3)(B), Table 2].
- Ambient air quality modeling for VOC was not performed for this review. No model is currently available which can accurately predict ambient ozone concentrations caused by this installation's VOC emissions.
- AGP conducted modeling for n-hexane emissions to evaluate potential human health risks associated with the inhalation pathway, AGP's modeling analysis predicts that ambient air concentrations of n-hexane will be below applicable risk-based levels. The APCP conducted modeling for n-hexane and reached the same conclusion – see incorporated ambient air quality impact analysis memo for further detail.
- Emission testing is required for some of the PM₁₀ sources.
- AGP is required to apply to amend their Part 70 Operating permit within 1 year of equipment startup.
- Approval of this permit is recommended with special conditions.

INSTALLATION DESCRIPTION

The AGP soybean processing facility in St. Joseph, Missouri consists of an oil extraction plant, an oil refinery plant and a hydrogen gas plant. The installation is considered an existing major source of air pollutants for new source review purposes and a Part 70 source for operating permit purposes. The installation has a Part 70 operating permit (permit number OP2002-012) that expired on March 6, 2007. A renewal application for this permit was received on September 6, 2006 and is under technical review.

The soybean processing plant receives soybeans by either truck or rail and handles/processes the soybeans to extract the oil. The plant currently operates one rail and two truck receiving bays.

The typical extraction process for soybeans consists of four (4) steps: oilseed handling/elevator operations, preparation of soybeans for solvent extraction, solvent extraction, oil desolventizing and flake desolventizing. The oil refining plant receives crude oil from both the on-site extraction plant and from off-site sources by either truck or rail. This incoming crude oil is stored in an unrefined oil storage tank. The crude oil is pumped from this storage tank to the degumming surge tank where it is heated and phosphoric acid is added. From the surge tank, caustic is added and the oil is transferred to the centrifuge operation. The centrifuges separate minerals referred to as soap stock. from the oil. The soap stock is sold as an animal feed additive. The oil is then bleached, filtered and either sent to the deodorizing operation where it is designated for salad oil, or to hydrogenation.

Hydrogenation is a batch operation where hydrogen gas and a catalyst are added to, and then filtered from, the oil. Hydrogenated oil is directed to deodorization for final treatment. From deodorization, oil is pumped to finished product storage tanks before being transported off-site.

The following permits have been issued to AGP from the Air Pollution Control Program.

Table 3. Previously Issued Construction Permits

Permit Number	Description
0392-008	A Section (5) permit for a soybean oil refinery and a hydrogen gas plant.
1192.013	A Section (5) permit for modifications to the soybean load-out facility and modifications to the soybean meal storage facility.
0893-004	A Section (5) permit for the replacement of two (2) existing hull grinders with new grinders.
1193-007	A Section (5) permit for a additional grain handling equipment.
1193-016	A Section (5) permit for the replacement of one (1) existing flaking mill with a new flaking mill.
0294-003	A Section (5) permit for new de-hulling equipment and an increase in soybean meal load-out throughput.
0794-006	A Section (5) permit for a new soybean hot dehulling equipment, an additional extractor, an additional de-solventizer toaster/dryer cooler and changes to equipment of Emission Point 14.
0994-001	A Section (6) permit for a new mill feed pelleting operation.
0896-014	A Section (5) permit to add a new pneumatic conveyor and high efficiency cyclone.
092001-004	A Section (8) permit to increase the current maximum allowable daily production from the refinery plant (3,000,000 pounds of soybean oil refined per day) that was established in Air Pollution Control Program Permit No. 0392-008 to the maximum reported capacity associated with the refinery operations.
1192-013A	Amendment to Permit No. 1192-013
102006-002	A Section (6) permit for a biodiesel plant located adjacent to the soybean processing plant. Note: The AGP biodiesel plant is considered a separate installation for permitting purposes. See associated permit review summary for further explanation.

PROJECT DESCRIPTION

AGP is proposing to expand the existing soybean processing plant to increase production capacity from 80,000 bushels per day to 120,000 bushels per day. The expansion will include construction of new equipment and modification and debottlenecking of existing equipment.

Soybeans will continue to be received by truck and rail. The existing truck receiving bays have a combined effective receiving rate of 24,000 bushels per hour (720 tph). They will be debottlenecked by this project to increase the receiving rate to 30,000 bushels per hour (900 tph).

The existing open belt reclaim conveyor(s) used to transfer grain in-house will be replaced with new drag conveyors that will allow all the beans in both north and south elevator houses to go directly to the prep house. Currently beans can only be transferred to the prep building from the north house of the elevator. Beans from the south house have to be transferred to the north house prior to processing.

Three new sixty-foot diameter steel bean bins with a combined capacity of 650,000 bushels will be built. Only one bin will be in the process of being filled at any one time.

As part of this project two new aspirators will be installed to compliment the existing bean aspiration system in order to accommodate the increased production rate.

A fourth dehulling line will be installed and the existing bean heaters modified. Other new pieces of equipment that will be added to the soybean prep include a jet dryer, a cracking mill, an impactor, a cascade conditioner, a cascade cooler and a hull cleanup system.

The beans enter the bean heater, which will condition the beans using a slow heating process that will raise the temperature of the beans. As the bean temperature rises, the moisture of the bean will migrate out the surface, and an aspiration system will remove the moisture, drying the beans and softening the hulls. The conditioned beans then enter a jet dryer that uses recirculated air and injected hot air to shrink the hull, releasing the hull/meat bond. After the jet dryer the beans will be cracked and dehulled. The half beans and loose hulls enter the cascade dryer and cascade downwards releasing more hulls.

A complete new extraction plant that will include an extractor, a desolventizer-toaster, a dryer-cooler, a solvent distillation system, a mineral oil absorption system and a cooling tower will be constructed as part of this project. Hexane that is released during the extraction and desolventizing process will be captured and condensed in a multistage condensation process. Hexane remaining after the final vent condensor will be controlled by use of a mineral oil absorber.

Two new 1,500 ton capacity concrete storage bins will be constructed. The meal from these bins will be conveyed to the rail loadout area at a rate of 500 tons per hour. The existing steel bins will be used for truck meal storage. A new aspiration baghouse will be installed to control emissions from the rail bay. The existing aspiration system and baghouse will be used for truck loadout.

A new steel pellet storage bin will be erected and a dedicated pellet load out system will also be installed to loadout from the new, and existing, pellet storage bins.

Table 4 below provides a summary of new, modified, debottlenecked and associated emission sources for the proposed project.

Table 4. Summary of project emission sources

Emission Unit ID	Emission Point	Description	MHDR	Status
1001	50	New Bean Bin	1140	New
1002	51	New Bean Bin	1140	New
1003	52	New Bean Bin	1140	New
1004	53	Jet Dryer	50	New
1005	53	Cascade Conditioner	50	New
1006	53	Cascade Cooler	50	New
1007	53	Secondary Dehulling	50	New
1008	54	Flake Conveyor	121	New
1009	55	DC Top Dryer Deck	121	New
1010	55	DC Middle Dryer Deck	121	New
1011	55	DC Bottom Dryer Deck	121	New
1012	55	DC Cooler Deck	121	New
1013	56.1	Extraction Cooling Tower	11000	New
1013	56.2	Extraction Cooling Tower	11000	New
1014	57	Rail Loadout	500	New
1014	57F	Rail Loadout – Fugitives	500	New

Emission Unit ID	Emission Point	Description	MHDR	Status
1015	58	Pellet Bin	15	New
1016	59	Meal Bin 5	121	New
1017	60	Meal Bin 6	121	New
0030	6	West Truck Receiving	900	Debottlenecked
0030	6F	West Truck Receiving – Fugitives	900	Debottlenecked
0050	8	Receiving Legs	1980	Debottlenecked
0080	53	Bean Heater Aspirator	165	Modified
0110	14	Hull Grinder Aspirator	100	Modified
0130	19	Flakers	165	Modified
0240	27	Receiving Baghouse (Rejects)	8	Modified
0280	30	Meal Grinding	121	Modified
0290	30.1	Flour Unloading	25	Modified
0300	31	Meal Loadout	250	Modified
0320	31.2	Off Quality Storage Vent	121	Modified
0330	31.3	Hipro Meal Storage Vent	121	Modified
0340	31.4	Pellet Storage Vent	15	Modified
N/A	PHR	Paved Haul Roads	N/A	Associated
N/A	UHR	Unpaved Haul Roads	N/A	Modified
0020	5F	Railcar Receiving – Fugitives	N/A	Associated
0040	7F	South Truck Receiving – Fugitives	N/A	Associated
0300	31F	Meal Loadout – Fugitives	250	Associated

NET EMISSIONS INCREASE ANALYSIS

A net emissions increase analysis examines all the emission increases and decreases that have occurred at the installation for the air pollutants of concern during a contemporaneous time period. The amount of these emission increases and decreases are determined by finding the actual emissions (average of a representative two-year period), if available. Typically, if there are not two years of actual emissions data for an emissions unit, the potential emissions for the unit are used instead.

After the netting analysis has determined the amount of actual or potential emissions for all of the units where increases and decreases have occurred, or will occur during this period, the increases are added together and the decreases are subtracted from this total. If the resulting level of emissions from the netting is below the significance level for that air pollutant, then the project is evaluated as a de minimis review instead of a major (PSD) review.

An increase or decrease in actual emissions is contemporaneous with the increase from the particular change only if it occurs between:

- A. The date five years before construction on the particular change commences; and
- B. The date that the increase from the particular change occurs.

The contemporaneous period for this netting review was determined to be between December 2001 and the commencement of normal operations (projected for August 2008).

An increase or decrease in actual emissions is creditable only if the permitting authority has not relied on it in issuing a permit for the source under this section, which permit is in effect when the increase in actual emissions from the particular change occurs; and

An increase or decrease in actual emissions of sulfur dioxide, particulate matter, or nitrogen oxides that occurs before the applicable minor source baseline date is creditable only if it is required to be considered in calculating the amount of maximum allowable increases remaining available.

An increase in actual emissions is creditable only to the extent that the new level of actual emissions exceeds the old level.

A decrease in actual emissions is creditable only to the extent that:

- A. The old level of actual emissions or the old level of allowable emissions, whichever is lower, exceeds the new level of actual emissions;
- B. It is enforceable as a practical matter at and after the time that actual construction on the particular change begins; and
- C. It has approximately the same qualitative significance for public health and welfare as that attributed to the increase from the particular change.

NET EMISSIONS INCREASE (NEI) ANALYSIS FOR PM₁₀

Table 5 below shows a summary of the PM₁₀ NEI. A comparison of actual emissions before the proposed expansion with potential emissions thereafter showed that PM₁₀ NEI was below PSD significant net increase of 15 tons per year.

Table 5. Summary of PM₁₀ Net Emissions Increase (tons per year)

		PTE	Actual	NEI
New Emission Sources		27.86	-	27.86
Modified Emission Sources		38.52	13.31	25.21
Debottlenecked Emission Sources		9.98	0.49	9.50
Contemporaneous Credits	Shutdown as part of expansion project	-	46.10	(46.10)
	Shut down in last 5 years	-	1.80	(1.80)
	Project 2004-08-034*	-	-	-
TOTAL		76.35	61.69	14.66

- this project was for the installation of 2 new flakers. Even though PTE for the project was 3.24 tpy, upstream processes limited the throughput to the flakers and throughput was not increased.

The soybean plant expansion project will involve modified grain receiving operations, a new soybean hot dehulling line (cleaning, cracking and dehulling), a new solvent extraction plant and a meal loadout facility. AGP will continue to use the existing grain storage elevators, concrete dry soybean storage silo and the receiving bays.

The contemporaneous period for this netting review was determined to be between the dates December 2001 and August 2008.

For the modified, debottlenecked emission units, baseline actual emissions were taken as the average rate, in tons per year, at which the emissions units actually emitted PM₁₀ during the consecutive 24-month period between January 2004 and December 2005. The emission rates were obtained from AGP's 2004 and 2005 EIQ submittals.

AGP received contemporaneous credits of 1.80 tpy for equipment removed in 2003.

The emission calculation methodologies for the new, modified, and associated sources are described below. New emission sources are sources to be constructed that do not currently exist. Modified emission sources are sources that are currently operated with the existing plant which will be physically modified and continue operating after the expansion project. Associated emission sources are sources that are currently operated with the existing soybean plant that will continue to be operated after the expansion project and are expected to have an actual emissions increase due to an increase in the capacity of the expanded plant when compared to the capacity of the existing plant.

New Emission Sources

New emission sources have not realized a period of normal operation. Therefore, the emissions increase for new sources are the future potential emissions.

Modified Emission Sources

Modified emissions sources are existing sources that will be physically modified as part of the expansion project. Modified emission sources have realized a period of normal operation. Therefore, the emissions increase for a modified source is the projected potential emissions for the source minus the average 2-year actual emissions for the source.

Associated or Debottlenecked emission sources

Associated emission sources will experience an emissions increase as a result of the addition of the new soybean plant. Associated emission sources have realized a period of normal operation. Therefore, the emissions increase for an associated source is the projected potential emissions for the source minus the average 2-year (2004/2005) actual emissions for the source.

Table 4 lists all of the new and associated sources that are expected to have an emission increase as a result of the new soybean plant. Where appropriate, past actual emissions have been taken from the installations Emission Inventory Questionnaire (EIQ). The PM₁₀ emissions increase/(decrease) for each emission point affected by the expansion project are shown in Table 6.

Table 6. Emissions Increase/(Decrease) per Emission Point

Emission Unit ID	Emission Point	Emission Unit Description	Status of Emission Unit	Actual Emissions			PTE	Increase
				2004	2005	Average		
1001	50	New Bean Bin	New	0	0	0	0.18	0.18
1002	51	New Bean Bin	New	0	0	0	0.18	0.18
1003	52	New Bean Bin	New	0	0	0	0.18	0.18
1004	53	Jet Dryer	New	0	0	0	4.58	4.58
1005	53	Cascade Conditioner	New	0	0	0	1.34	1.34
1006	53	Cascade Cooler	New	0	0	0	1.35	1.35
1007	53	Secondary Dehulling	New	0	0	0	0.30	0.30
1008	54	Flake Conveyor	New	0	0	0	0.47	0.47
1009	55	DC Top Dryer Deck	New	0	0	0	4.10	4.10
1010	55	DC Middle Dryer Deck	New	0	0	0	3.03	3.03
1011	55	DC Bottom Dryer Deck	New	0	0	0	3.03	3.03
1012	55	DC Cooler Deck	New	0	0	0	3.11	3.11
1013	56.1	Extraction Cooling Tower	New	0	0	0	0.22	0.22
1013	56.2	Extraction Cooling Tower	New	0	0	0	0.22	0.22

Emission Unit ID	Emission Point	Emission Unit Description	Status of Emission Unit	Actual Emissions			PTE	Increase
				2004	2005	Average		
1014	57	Rail Loadout	New	0	0	0	4.88	4.88
1014	57F	Rail Loadout – Fugitives	New	0	0	0	0.14	0.14
1015	58	Pellet Bin	New	0	0	0	0.28	0.28
1016	59	Meal Bin 5	New	0	0	0	0.14	0.14
1017	60	Meal Bin 6	New	0	0	0	0.14	0.14
0030	6	West Truck Receiving	Debottlenecked	0.23	0.31	0.27	2.45	2.18
0030	6F	West Truck Receiving – Fugitives	Debottlenecked	0.01	0.02	0.01	0.22	0.203
0050	8	Receiving Legs	Debottlenecked	0.19	0.22	0.20	7.31	7.11
0080	53	Bean Heater Aspirator	Modified	2.84	2.58	2.71	13.61	10.90
0110	14	Hull Grinder Aspirator	Modified	0.06	0.07	0.06	2.68	2.62
0130	19	Flakers	Modified	2.23	2.43	2.33	4.35	2.02
0240	27	Receiving Baghouse (Rejects)	Modified	0	0	0	0.70	0.70
0280	30	Meal Grinding	Modified	0.67	0.71	0.69	2.23	1.54
0290	30.1	Flour Unloading	Modified	0	0	0	0.18	0.18
0300	31	Meal Loadout	Modified	0.16	0.17	0.16	6.29	6.12
0320	31.2	Off Quality Storage Vent	Modified	0	0	0	0.07	0.07
0330	31.3	Hipro Meal Storage Vent	Modified	0.02	0.02	0.02	0.07	0.05
0340	31.4	Pellet Storage Vent	Modified	0.01	0.01	0.01	0.27	0.27
N/A	PHR	Paved Haul Roads	Associated	6.59	7.90	7.25	7.98	0.73
N/A	UHR	Unpaved Haul Roads	Modified	0.07	0.07	0.07	0.07	0.00
0020	5F	Railcar Receiving – Fugitives	Associated					0
0040	7F	South Truck Receiving – Fugitives	Associated					0
0300	31F	Meal Loadout – Fugitives	Associated	0.01	0.11	0.06	0.037	-0.023
0150	21	Discharge Conveyor	To Be Removed	0.01	0.01	0.01	0	-0.01
0160	22	1600 TPD DC Top Dryer Deck	To Be Removed	6.71	7.18	6.94	0	-6.94
0170	23	1600 tpd Bottom Dryer Deck	To Be Removed	6.71	7.18	6.94	0	-6.94
0180	24	1600 tpd DC Top Cooler Deck	To Be Removed	9.84	10.53	10.18	0	-10.18
0190	25	DC Bottom Cooler Deck	To Be Removed	9.84	10.53	10.18	0	-10.18
0200	25.1	800 tpd DT DC Top Cooler Deck	To Be Removed	3.303	3.54	3.42	0	-3.42
0210	25.2	800 tpd DT DC Bottom Dryer	To Be Removed	3.30	3.54	3.42	0	-3.42
0220	25.3	800 tpd DT DC Cooler Deck	To Be Removed	4.84	5.18	5.01	0	-5.01
0230	26	Receiving from FDS to Soybean Meal	To Be Removed	0	0	0	0	0
Emission Unit ID	Emission Point	Emission Unit Description	Status of Emission Unit	Actual Emissions			PTE	Increase
				2002	2003	Average		
0140	19.1	Pneumatic Flake Conveyor	Removed (2003)	0.74	0.69	0.71	0	-0.71
0250	27.1	Cooling Aspiration for DTS	Removed (2003)	0.47	0.46	0.47	0	-0.47
0350	32	Flour Mill	Removed (2003)	0.35	0.30	0.33	0	-0.33
0360	33	Raymond Grinder System	Removed (2003)	0.23	0.20	0.22	0	-0.22
0370	34	Prater Biermeister Grinding System	Removed (2003)	0.04	0.03	0.03	0	-0.03
0380	35	Tank Building Roof Vent	Removed (2003)	0.05	0.04	0.04	0	-0.04
Net Emissions Increase				2061.49	2066.99	61.69	76.36	14.66

NET EMISSIONS INCREASE (NEI) ANALYSIS FOR PM

A procedure similar to the one used in the PM₁₀ netting analysis was used to determine the net emission increase of PM. Table 7 below shows a summary of the PM NEI. A comparison of actual emissions before the proposed expansion with potential emissions thereafter showed that PM NEI was below PSD significant net increase of 25 tons per year.

Table 7 - Summary of PM Net Emissions Increase (tons per year)

		PTE	Actual	Net
New Emission Sources		45.91	-	45.91
Modified Emission Sources		95.14	54.56	40.58
Debottlenecked Emission Sources		10.18	0.93	9.25
Contemporaneous Credits	Shutdown as part of expansion project	-	76.07	(76.07)
	Shut down in last 5 years	-	3.18	(3.18)
	Project 2004-08-034	-	-	-
TOTAL		151.23	134.74	16.49

EMISSIONS/CONTROLS EVALUATION

The emission factors used in this analysis were obtained from:

1. Environmental Protection Agency (EPA) document AP-42, *Compilation of Air Pollutant Emission Factors*, Fifth Edition,
 - Section 9.9.1 Grain Elevators and Processes (04/2003)
 - Section 9.11.1 Vegetable Oil Processing (11/1995)
 - Section 13.2.4 Aggregate Handling And Storage Piles (01/1995)
 - Section 13.2.1 Paved Roads (12/2003)
 - Section 13.2.2 Unpaved Roads (12/2003)
2. Environmental Protection Agency (EPA) Factor Information Retrieval (FIRE) Data System version 6.25

Control efficiencies used in this analysis for soybean receiving, soybean cleaning, drying, transfer and storage, soybean preparation and meal processing were back calculated as follows:

1. Stack emissions were estimated based on uncontrolled AP-42 and FIRE emission factors.
2. From this estimate a control efficiency for each fabric filter was calculated that yielded emissions consistent with observed grain loadings of stack tests from similar sources.

AGP will continue to receive soybeans via both truck and rail at the existing truck and rail bean receiving bays. Particulate emissions are generated during the unloading of soybeans at the truck and rail unloading bays. Both the truck and rail receiving operations have grated pits to control the dust generated during the soybean unloading. The pits aspirate such that most of the dust generated during the unloading process exhausts through a fabric filter. Since the capture efficiency of the pits will not be 100 percent, there are fugitive particulate emissions generated during the unloading process.

Fugitive emissions from Soybean receiving were estimated using the AP-42 emission factor for fugitive emissions from material handling and a calculated capture efficiency. The capture efficiency of the pits was estimated by calculating the ratio of the actual air flow rate of the baghouse to the air flow rate of the induced air. The induced air flow rate is the control device air flow rate needed for 100% capture. The equation for the induced air flow rate is shown below.

$$Q_{ind} = 10 + A_u + \left(\frac{R \times S^2}{D} \right)^{1/3}$$

where:

Q_{ind} = Volume of Induced Air (ft³/min)

A_u = Enclosure open area at upstream end (point where air is induced into the system by action of the falling material), ft²

R = rate of material flow rate, tph

S = height of free fall of material, ft

D = average material diameter, ft

The AP-42 material handling emission factor is a derived factor based on the wind speed and the moisture content of the material being handled. The equation is included below.

$$E = k(0.0032) \frac{\left(\frac{U}{3} \right)^{1.3}}{\left(\frac{M}{2} \right)^{1.4}}$$

where:

E = Emission Factor (lb/ton)

k = particle size multiplier

U = Mean wind speed (mph)

M = Material moisture content (%)

The paved and unpaved road traffic patterns at AGP will be modified as a result of this expansion project. However, only the paved haul roads will have an emissions increase due to increased traffic. Particulate emissions due to hauling of raw materials and products onsite on the plant's paved roads were calculated using the equation below:

For Paved Roads:

$$E_{ext} = \left[k \left(\frac{sL}{12} \right)^{0.65} \left(\frac{W}{3} \right)^{1.5} - C \right] \times \left(1 - \frac{1.2 \times P}{N} \right)$$

Where:

E_{ext} = Annual or other long-term average emission factor

k = Particle size multiplier for particle size range and units of interest

sL = surface material silt content (%)

W = Mean Truck Capacity (tons)

C = emission factor for 1980's vehicle fleet exhaust, break wear and tire wear

P = number of hours with at least 0.254 mm of precipitation during the averaging period

N = number of hours in the averaging period

For Unpaved Roads:

$$E_{ext} = 1.5 \left(\frac{sL}{12} \right)^{0.9} \left(\frac{W}{3} \right)^{0.45} \left(\frac{365 - P}{365} \right) lbs / VMT$$

Where:

E_{ext} = Annual or other long-term average emission factor

sL = surface material silt content (%)

W = Mean Truck Capacity (tons)

P = number of days with at least 0.254 mm of precipitation during the averaging period

The equations above were used to calculate the PM and PM₁₀ emission factors in pounds per vehicle miles traveled (VMT).

The extraction process will remove the oil from soybean flakes using a solvent that is comprised entirely of VOC. The solvent that is used in the extraction will be recovered in the desolventization processes. VOC will be lost during the extraction and desolventization processes. The VOC emissions were calculated based on the facility-wide VOC solvent loss limit of 0.145 gallons per ton of oilseed.

The extraction cooling tower will provide cooling water for the extraction process. The PM and PM₁₀ emissions from the cooling tower are calculated conservatively by assuming that all of the total dissolved solids (TDS) in the cooling water will be emitted as PM or PM₁₀.

The calculation is based on the following:

$$E = W \times \rho \times S \times D$$

where:

E = Emission rate of PM or PM₁₀ (lb/hr)

W = Cooling Water Rate (gal/min)

S = Total Dissolved Solids (lb solids/10⁶ lbs water)

ρ = Density of Water (lb/min)

D = Drift Rate (%)

Whenever only a PM emission factor was available it was assumed that PM₁₀ was 50% of PM.

Potential emissions of the application represent the potential of the new, modified and debottlenecked equipment, assuming continuous operation (8760 hours per year). The

following table provides an emissions summary for this project.

Table 8. Emissions Summary (tons per year)

Pollutant	PSD Significant Levels	Existing Potential Emissions ¹	Existing Actual Emissions (2005 EIQ)	Actual Emissions Decreases of the Project	Potential Emissions of the Project	Net Emissions Increase from Project
PM ₁₀	15.0	349.45	68.43	47.90	62.56	14.66
Sox	40.0	1.76	0.03	N/A	N/A	N/A
Nox	40.0	293.46	4.30	N/A	N/A	N/A
VOC	40.0	705.34	311.34	N/A	523.96	>>40
CO	100.0	246.51	3.61	N/A	N/A	N/A
HAPs	10.0/25.0	696.74	0.00	N/A	337.95	>>10

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

¹ Existing Potential emissions are from permit # 092001-004

PERMIT RULE APPLICABILITY

This review was conducted in accordance with Section (8) of Missouri State Rule 10 CSR 10-6.060, *Construction Permits Required*. Potential emissions of VOC are above major levels.

APPLICABLE REQUIREMENTS

AGP 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 by June 1st 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 10-2.070

SPECIFIC REQUIREMENTS

- *Restriction of Emission of Particulate Matter From Industrial Processes*, 10 CSR 10-6.400
- *New Source Performance Regulations*, 10 CSR 10-6.070 – *New Source Performance Standards (NSPS) for Standards of Performance for Grain Elevators*, 40 CFR Part 60, Subpart DD
- *Maximum Achievable Control Technology (MACT) Regulations*, 10 CSR 10-6.075, *National Emission Standards for National Emission Standards for Hazardous Air Pollutants: Solvent Extraction for Vegetable Oil Production*, 40 CFR Part 63, Subpart GGGG

BEST AVAILABLE CONTROL TECHNOLOGY (BACT) ANALYSIS

Applicability and Scope

With regard to prevention of significant deterioration (PSD) requirements, AGP's St. Joseph Plant is considered an existing "major stationary source" since existing potential emissions of VOC exceed 250 tons per year. When an existing major stationary source is physically modified the modification is considered a "major modification", triggering BACT requirements, if the "net emissions increase" of a regulated pollutant is equal to or greater than the "significant" emission rate for that pollutant. Significant emission rates are listed at 40 CFR 52.21(b)(23) as incorporated in 10 CSR 10-6.010. In this case, the net emissions increase for VOC is well above the 40 ton per year significant emission rate. Net emissions increases for PM and PM₁₀ are below the 25 and 15 ton per year significant emission rates, respectively. Therefore, the BACT requirements apply to VOC only, not PM, PM₁₀ or any other pollutant.

The VOC BACT requirements apply to the whole soybean processing plant, as modified.

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

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

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

Definition of BACT

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

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

Process Considerations/Emission Sources

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

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 AGP has indicated will be a part of this modification that are translated to specifications in this permit.

Prior to solvent extraction, soybeans are prepared through a series of thermal and mechanical processes, see page 1.2 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. Improved soybean preparation processes can result in lower hexane usage. The application indicates plans for modification of the bean heaters, addition of three new flakers and addition of a new hot de-hulling line. These modifications will

increase capacity and should also improve performance.

AGP intends to install a large capacity (approximately 3600 tons per day) shallow bed continuous loop extractor manufactured by Crown Iron Works to replace the two existing extractors. Hexane is used in the extractor to extract soy oil from the flakes. The Crown Iron Works brochure for this type of extractor (see file) explains how the extraction process works and points out advantages of the shallow bed design as compared to the deep bed design. A desolventizer-toaster (DT) and dryer-cooler (DC), also manufactured by Crown Iron Works, 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. AGP 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 condenser - uncondensed vapors proceed to the mineral oil absorption system. Hexane and residual steam from the DT process is routed to evaporation/condensation/distillation processes - uncondensed vapors proceed to the mineral oil absorption system. The mineral oil absorber is a packed tower that uses mineral to absorb hexane. Utilization of a mineral oil chiller system will increase hexane removal efficiency in the mineral oil absorber. 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 air from the first drying deck passes through a cyclone (for particulate control) prior to discharge. Drying air from the second and third dryer decks, and cooling air from the cooling deck each pass through their respective cyclone and then a venturi scrubber receives the combined exhaust from the three cyclones. There are no VOC control devices utilized prior to discharge of the drying and cooling air.

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

Other Control Devices Considered

In consulting the USEPA RACT/BAC/LAER Clearinghouse (RBLC), recently-issued permits from other states and industry information, the method utilized to control VOC emissions

from the extraction and DT portions of soybean processing plants is, consistently, condensation followed by a mineral oil absorption system. With regard to dryer/cooler emissions, the 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 ($^{\circ}$ 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 $^{\circ}$ F.

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

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

Hexane is highly flammable. One of the reasons that incineration processes are not used at solvent extraction plants is due to fire safety concerns. The National Fire Protection

Association (NFPA) Standard 36 for Solvent Extraction Plants does not appear to prohibit the use of incineration processes, but there are requirements regarding minimum distance from the extraction process to ignition sources, placement of vapor barriers between the extraction area and ignition sources, flashback prevention, etc. AGP has expressed concerns about fire safety and believes that RTO is infeasible due to safety concerns. See NFPA 36, Section 4 of the permit application and AGP's January 8, 2007 letter to the APCP for further detail.

AGP 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)
- Low flow rate from mineral oil absorber.

After considering the safety and technical feasibility concerns mentioned above, AGP's cost analyses and a cost analysis prepared in conjunction with an EPA rulemaking, the APCP has concluded that it is not appropriate to mandate RTO or catalytic incineration as BACT control technology at this point in time. AGP's cost estimates exceed \$30,000 per ton of hexane removed for installation and operation of RTO on the mineral oil absorber vent. See January 8, 2007 AGP letter to the APCP for further detail. 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 PM₁₀ 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/PM₁₀ 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 AGP's proposed new soybean plant. A biofilter system is dynamic since the system continually changes with changes in the microbial growths it contains. Knowledge of the behavior of these dynamic systems over extended operating periods is not available. Thus there is no basis from which the long-term reliability of the system could be established.

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

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.

During the course of the permit review AGP committed to certain hexane monitoring procedures and corrective actions in the event of a leak (see February 20, 2007 letter from AGP to the APCP). The APCP believes that the LDAR program needs to contain additional pro-active, focused inspection and repair provisions and has included a permit condition to require a more detailed BACT LDAR program. The APCP concluded that it would not be appropriate to impose LDAR requirements from another source-category as BACT. AGP will be required to develop an LDAR program specific to this installation/source-category and the minimum elements of the LDAR program are listed in the permit condition.

Control of Storage Tank Emissions

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

Summary of BACT Equipment, Methods, Systems and Techniques

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

Table 9: BACT Equipment, Methods, Systems and Techniques

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

Rationale for BACT Emission Limitation

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 supplied by AGP as part of this permit review.
- Solvent loss ratio data from Iowa, Nebraska and Missouri soybean processing plants.

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

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

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

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

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

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

Table 10 - Recently Permitted VOC Emission Limits

Company	Permit Date	Installation		Process	VOC Limit	
		City	State		lb/ton	gal/ton
ConAgra	08/14/1998	Morristown	IN	Oil Extractor	0.076	
				Meal Dryers	0.228	
				Meal Cooler	0.083	
				Plant-Wide		0.16
Cargill ¹	12/03/2001	Lafayette	IN	Oil Extractor		0.012
				Meal Dryers		0.0042
				Meal Coolers		0
				FDS Cooler Collector		0.391
				Conventional Process		0.2
				Specialty Process		1.5
Minnesota Soybean Processors	12/19/2002	Brewster	MN	Plant-wide		0.2
Central Soya Company	11/29/2001	Bellevue	OH	Plant-Wide		0.2
Cenex Harvest States Coop ²	11/30/2001	Fairmont	MN	Plant-wide		0.2
Cargill	11/28/2003	Sidney	OH	Plant-wide		0.146
Bunge North America (East)	5/14/2004	Morristown	IN	B-Plant Oil Extractor	0.069	
				B-Plant Meal Dryers	0.152	
				B-Plant Meal Coolers	0.152	
				Plants A&B, 1 st Yr.		0.2
				Plants A&B, 2 nd Yr. on		0.19
ADM	06/28/2005	Mankato	MN	Plant-wide		0.15
Louis Dreyfus Agricultural Industries ³	01/24/2006	Claypool	IN	Plant-Wide		0.134
Cargill	08/28/2006	Kansas City	MO	Plant-wide Operating Capacity <90%		0.14
				Plant-wide Operating Capacity >90%		0.165
Prairie Pride ⁴	02/06/2007	Eve	MO	Plant-Wide		0.115

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.

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

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

The Cargill plant in Sydney, Ohio was not expanded to the degree envisioned by the permitting action. The status of the ADM plant in Mankato and the Louis Dreyfus plant in Claypool is unknown; based on the permit dates it is likely they are either under construction or just now starting up. The modification at the Cargill plant in Kansas City is under construction. Prairie Pride has not commenced construction. Also, AGP indicates that the ConAgra plant was never constructed.

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

AGP provided monthly solvent loss ratio data from the St. Joseph plant and 3 other AGP plants. Collectively, these were described as AGP's four largest plants. The data covered the time period January 2003 through January 2006; 12-month rolling averages for the time period December 2003 through December 2006. Average and maximum values are presented in Table 11.

Table 11 – 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 12.

Table 12 – 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

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

Table 13 – Annual, Block Average, SLR from Iowa and Nebraska Emission Inventory Data

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

The Emmetsburg, Iowa plant commenced operation in 1997 and the Hastings, Nebraska plant commenced operation in 1999. These relatively new plants appear to show better performance, as compared to the remaining plants listed above in Tables 11 and 12. This improved performance may be related to advances in extraction plant design, improved soybean preparation processes, etc.

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

Newer plants, such as the AGP plants in Emmetsburg, Iowa and Hastings, Nebraska are operating at or below 0.1 gallons per ton, on an annual average basis. If the variability at these plants is similar to the four largest AGP plants listed in Table 10, the maximum 12 month rolling average for the Emmetsburg and Hastings plants is expected to be approximately 0.125 gallons per ton. The BACT limit of 0.145 is 16 percent greater than 0.125. The APCP believes that a 16 percent factor is reasonable here due to long-term variability related to climatic conditions, oilseed characteristics and other factors.

The maximum solvent loss ratio for the existing equipment at the AGP St. Joseph, Missouri plant for the time period 12/03 through 12/06 was 0.153 gallons per ton. The APCP expects improved performance at the plant after the modification due to extraction plant process design improvements and increased vigilance in terms of monitoring and maintaining the extraction processes to minimize solvent losses. The BACT limit of 0.145 is 5.2 percent less than 0.153.

The maximum 12-month rolling average for the Cargill plant in Kansas City was 0.133 gallons per ton for the time period 12/03 through 12/06. Climatic conditions in St. Joseph are similar to climatic conditions in Kansas City. The BACT limit of 0.145 is 9 percent greater than 0.133.

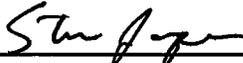
Crown Iron Works guaranteed a solvent loss ratio of less than 0.125 gallons per ton for the Prairie Pride plant in Missouri. The BACT limit of 0.145 is 16 percent greater than 0.125.

The Louis Dreyfus permit has a limit of 0.134 gallons per ton. This is not a BACT limit, but the company must have reasonable assurance that this emission is achievable. The BACT limit of 0.145 is 8.2 percent greater than 0.134.

The BACT emission limitation of 0.145 gallons per ton 12-month rolling average limit was originally envisioned as a limit that would include malfunction periods. In response to comments from AGP and after further consideration of state regulatory requirements (specifically 10 CSR 10-6.050, *Start-Up, Shutdown and Malfunction Conditions*) APCP decided to revise special condition 1.

STAFF RECOMMENDATION

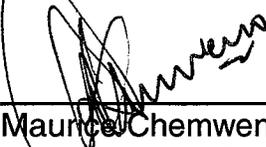
On the basis of this review conducted in accordance with Section (8), Missouri State Rule 10 CSR 10-6.060, *Construction Permits Required*, we recommend permit issuance, with special conditions.



Steve Jaques, P.E.
Environmental Engineer

5/11/07

Date



Maurice Chemweno
Environmental Engineer

5/11/07

Date

PERMIT DOCUMENTS

The following documents are incorporated by reference into this permit:

- The Application for Authority to Construct form, dated April 14, 2006, received April 17, 2006 designating AGP as the owner and operator of the installation.
- APCP internal memorandum dated May 10, 2007 from Dawn Froning to Steve Jaques regarding *Ambient Air Quality Impact Analysis (AAQIA) for the Ag Processing, Incorporated Hexane Risk Analysis*
- U.S. EPA document AP-42, *Compilation of Air Pollutant Emission Factors*, Fifth Edition.
- Kansas City Regional Office Site Survey, dated April 22, 2006

STATE OF MISSOURI
DEPARTMENT OF NATURAL RESOURCES

Matt Blunt, Governor • Doyle Childers, Director

www.dnr.mo.gov

MEMORANDUM

DATE: May 11, 2007

TO: Steve Jaques, Environmental Engineer III
Construction Unit, Permit Section

THROUGH: Kyra L. Moore, Section Chief *KLM*
Permit Section

FROM: Dawn Froning, Environmental Specialist IV
Modeling Unit, Permit Section *DF*

SUBJECT: Ambient Air Quality Impact Analysis (AAQIA) for Ag Processing
Incorporated-Hexane Risk Analysis

I. Introduction

In April 2006, Ag Processing, Incorporated submitted a Prevention of Significant Deterioration permit application for the expansion of the soybean extraction plant at its existing facility located in St. Joseph, Missouri. Initial estimates indicate that the proposed expansion will result in a net increase of n-hexane emissions in excess of the ten ton per year de minimis level defined in 10 CSR 6.060(9).

Trinity Consultants, Inc., the consulting firm representing Ag Processing, Incorporated, submitted a refined ambient air quality impact analysis in an effort to demonstrate compliance with the long- and short-term risk assessment levels (RAL) for n-hexane. N-hexane emissions will be emitted throughout the extraction building in the form of process and fugitive emissions that will be released through various vents and stacks. The original AAQIA characterized the n-hexane emissions as an area source whose dimensions were based upon the size of the extraction building. Staff determined that this characterization did not adequately describe the release of emissions from the extraction building and, as such, assigned volume source release parameters to the n-hexane emissions based upon the information contained within the permit application. This characterization resulted in ambient n-hexane concentrations in excess of the short-term RAL and lead to an n-hexane emission limitation within the permit. Trinity Consultants, Inc., in consultation with staff, determined that the assignment of the emission release parameters remained inadequate and required further investigation.



On May 4, 2007 staff received a revised AAQIA from Trinity Consultants, Inc. that demonstrated compliance with the 24-hour and annual RALs for n-hexane. The following paragraphs describe the scope of the proposed project and the methodology used throughout the modeling study to show attainment.

II. Model Selection

The modeling procedures utilized in this study follow current air quality modeling guidelines. The AERMOD modeling system was used to evaluate 24-hour and annual impacts of n-hexane resulting from the proposed extraction operations at the Ag Processing, Incorporated facility. The AERMOD system was developed through a collaborative effort between the American Meteorological Society and the United States Environmental Protection Agency (EPA). AERMOD is a steady-state plume model that employs Gaussian and Bi-Gaussian probability density functions to characterize the structure of the planetary boundary layer. AERMOD can predict the concentration distribution of pollutants from surface and elevated releases located within simple or complex terrain. The model allows for the input of multiple sources, terrain elevations, structure effects, various grid receptors, wet and dry depletion calculations, urban or rural terrain, and averaging periods ranging from one hour to one year.

III. Source Data

N-hexane emissions will be generated during the extraction and desolventization of soybeans at the Ag Processing, Incorporated facility. Additional sources of n-hexane include the meal coolers, the meal dryers, and equipment leaks. Based upon discussions with facility representatives, a significant portion of the n-hexane emissions will be vented to the atmosphere via the dryer/cooler stack and the mineral oil absorption system stack. The remaining emissions are fugitive and will escape the building from safety exhaust fans located near the base of the extraction building. Email correspondence dated May 4, 2007, indicates that the safety vents will be constructed as a vertical release with point source exhaust parameters based upon the fan specifications provided by the manufacturer. Table 1, entitled “Ag Processing, Incorporated-Point Source Emission Rates and Stack Parameters,” outlines the point source emissions and their associated stack parameters based upon information provided by Trinity Consultants, Inc.

Table 1
Ag Processing Incorporated-Point Source Emission Rates and Stack Parameters

EP I.D.	Description	Easting	Northing	Emission Rate		Stack Release Parameters			
				Grams/Second	Lbs/Hour	Height	Temperature	Exit Velocity	Diameter
EPDC	Dryer/Cooler Stack	339348.4	4399197	7.57	60.06	25.91	328.15	23.01	1.37
EPMOS	Mineral Oil Absorption System	339330.2	4399217	1.89	15.02	22.86	305.37	11.43	0.20
VENTN 20	Fugitive Air Vent	339327.0	4399212	4.06	32.18	1.52	305.37	6.39	0.91

All of the point source emission releases vent vertically and are not covered by rain caps. As such, no restrictions on the vertical flow were applied in the air quality analysis.

IV. Receptors

Trinity Consultants, Inc. implemented a Cartesian grid with variable spacing to determine the area of maximum impact from the proposed extraction plant expansion. Along the property boundary, receptors were placed at 50-meter intervals while the remainder of the grid consisted of variable grid spacing from 100- to 1000-meters. Staff determined that the receptor grid was sufficient to determine the maximum impact from Ag Processing, Incorporated. Figure 1, entitled “[Ag Processing, Incorporated-Receptor Grid](#)” graphically displays the receptor grid utilized in the AAQIA dated May 4, 2007.

It should be noted that AERMOD is capable of calculating air pollutant concentrations in terrain that can be classified as simple, flat, complex, or mountainous land. In order to calculate concentrations in complex or mountainous terrain situations, AERMOD must have information about the surrounding terrain and its features. The EPA developed a pre-processor, AERMAP, to search terrain data for base elevations and features that may influence the dispersion of pollutants within the modeling domain. Outstanding features are assigned an elevation that is referred to as the hill height scale, a value that must be included in the AERMOD input file.

For Ag Processing, Incorporated all elevations within the receptor grid were obtained using the terrain processor, AERMAP. Additionally, all elevations were based upon data contained in 7.5-minute topographic maps obtained from the United States Geological Survey. Ag Processing, Incorporated is located within the Missouri River Valley with no significant terrain features nearby. Rolling hills and higher elevations are apparent to the east and west of the facility as the distance from the river valley increases, refer to Figure 2, entitled “[Ag Processing, Incorporated-Terrain Features.](#)” Overall, elevations range from 324-meters to 241-meters.

V. Meteorological Data

Because AERMOD does not accept raw meteorological data, it must be processed through AERMET, the meteorological data preprocessor for the AERMOD modeling system. AERMET extracts and processes meteorological data in order to calculate the boundary layer parameters that are ultimately necessary for the calculation of pollutant concentrations within the atmosphere.

Five years of meteorological data inputs were created for the AERMOD dispersion model, 2001, 2002, 2003, 2004, and 2005. AERMET produces two files for each year of meteorological data. The first file contains the boundary layer scaling parameters (surface friction velocity, mixing heights, and Monin-Obukhov length), reference height winds and temperature. The second file contains a vertical profile of winds, temperature, and the standard deviation of the fluctuating components of the wind.

To accurately calculate the boundary layer parameters, the user must input three characteristics that describe the surface surrounding the meteorological site, the surface roughness, Albedo and Bowen ratio. Because these surface characteristics can influence the similarity profiles that are utilized by the dispersion model, AERMOD, the user must determine if the surface characteristics at the meteorological site are similar to those at the facility site. A direct comparison between the surface characteristics at the meteorological site and those at the surface site is necessary to determine if the differences that result will significantly impact the overall pollutant concentrations.

For this project, the surface characteristics surrounding the St. Joseph Airport were compared to the surface characteristics surrounding the proposed application site. Figure 3, entitled “[St. Joseph Airport](#)”, displays the location of the airport in relation to the location of the Ag Processing, Incorporated facility. Given the proximity of the airport to the facility, differences between the application site and the measurement site were determined to be minimal. It is important to note that the data capture for 2001 from the ASOS site at the St. Joseph Airport was unacceptable, and as such, data from the Kansas City International Airport was utilized for this period only.

Because the land use surrounding the Kansas City International Airport has a lower density of residential dwellings and industrial infrastructure, a greater percentage of the land use assignment for the application site was urban. The higher percentage of urban land use resulted in larger surface roughness values than would have been assigned if the data had been collected near the Kansas City International Airport. Because surface roughness impacts the meteorological conditions at the surface, emission releases from short stacks or fugitive emissions can be impacted by differences in this parameter. This results because regions with non-uniform surfaces experience greater atmospheric turbulence, which results in greater dispersion and lower predicted concentrations. Because the land use surrounding the airport has fewer obstructions, the atmospheric turbulence is less; therefore, the concentrations that are predicted by the air quality model, for this time period, should be conservative.

VI. Building Downwash

Building downwash was calculated using the Building Profile Input Program (BPIP) with plume rise model enhancements (PRIME). BPIP PRIME was developed in order to calculate enhanced plume dispersion coefficients due to turbulent wakes and to calculate reduced plume rise caused by the combination of the descent of streamlines on the leeward side of buildings and the increased entrainment within the wake. Additionally, PRIME addresses both the near and far field wake zones produced downwind of a building or group of structures. It is important to note that unlike the Industrial Source Complex dispersion model, the use of PRIME in conjunction with AERMOD allows the user to describe the building/stack configurations and to calculate concentrations within cavity wake regions.

The information needed to execute BPIP PRIME are the heights and locations of structures, which may contribute to building downwash, and the stack locations in relation to these structures. Based

upon the facility configuration, the program will determine if a stack is being subjected to wake effects from a surrounding structure or structures. If structure wake effects are evident, flags are set to indicate which stacks are affected by building wake zones. Once it is determined that a stack is influenced by a structure, BPIP will calculate the building heights and widths to be included in the dispersion model so that building downwash effects can be considered.

In order to determine if the building downwash calculations were applied correctly, the coordinates of each building corner are needed. Figure 4 entitled “[Ag Processing, Incorporated-Building Configuration](#)” depicts the proposed building configuration that will exist upon the completion of the modification. No alterations to the BPIP file were deemed necessary for this project. However, because the facility design can impact the results obtained during the AAQIA, significant design changes that occur after the issuance of the permit must be forwarded to the permit authority. This will ensure that compliance with the air quality standards is maintained.

VII. Good Engineering Practice Stack Height

The Clean Air Act states that a stack should be high enough to ensure that its emissions do not result in excessive ground level pollutant concentrations in the area surrounding the stack due to downwash effects caused by the source itself, nearby structures, or complex terrain. The Clean Air Act goes on to state that the stack shall not exceed two and one-half times the height of the obstructing source unless a demonstration can be made that this is necessary. According to 40 CFR 51.1(ii), good engineering practice (GEP) stack height is the greater of 65 meters (measured from base of the stack) or the height of the nearby structure (measured from base of stack) plus 1.5 times the structures lesser dimension. If neither of the above approaches is used to determine GEP stack height, a fluid model study can be conducted. None of the stacks contained within the model input file for Ag Processing, Incorporated exceeds 65 meters, and as such, all of the proposed stacks met GEP stack height requirements.

VIII. RAL Compliance

Under current Air Pollution Control Program guidelines, a facility must submit an air quality analysis for all emission points within a facility when a refined analysis for a hazardous air pollutant (HAP) is required. This requirement was introduced to ensure that any applicable RAL is not violated near a facility since background concentrations are not a required component of a HAPs analysis. It is important to note that background concentrations are not currently required because they are virtually unknown for most HAPs, thereby making a background assessment impossible.

Table 2, entitled “[Ag Processing, Incorporated-RAL Results](#)” summarizes the high first high concentration predicted by the AERMOD modeling system for n-hexane. The worst case 24-hour and annual impacts occurred during the 2003 and 2005 meteorological periods with maximum concentrations of 2143.13 and 315.03 g/m³ respectively. The RAL for n-hexane is being met for all averaging times and meteorological periods, and as such, no further analysis is necessary.

Table 2 Ag Processing, Incorporated-RAL Results					
Meteorological Year	Averaging Time	Concentration	Risk Assessment Level	Risk Level Exceeded?	
		g/m ³	g/m ³	Yes	No
2001	24-Hour	1672.97	4200		X
2002	24-Hour	1759.49	4200		X
2003	24-Hour	2143.13	4200		X
2004	24-Hour	1776.67	4200		X
2005	24-Hour	1972.16	4200		X
2001	Annual	252.97	420		X
2002	Annual	275.26	420		X
2003	Annual	240.37	420		X
2004	Annual	254.88	420		X
2005	Annual	315.03	420		X

The n-hexane output generated from the AERMOD modeling system is graphically displayed in Figure’s 5 and 6 entitled “[Ag Processing, Incorporated-RAL Compliance, Annual Averaging Period](#)” and “[Ag Processing, Incorporated-RAL Compliance, 24-Hour Averaging Period](#).”

XIII. Conclusions

The AAQIA submitted in support of the Ag Processing, Incorporated PSD permit application is complete and not adverse impact on air quality should result. The following recommendations should be incorporated into the construction permit as special conditions. Failure to do so may invalidate the results obtained from the AAQIA.

Attachments

c: Ms. Dawn Froning, Air Modeling Unit, Permit Section

DF/lm

Figure 1
Ag Processing, Incorporated
Receptor Grid



Figure 2
Ag Processing, Incorporated
Terrain Features

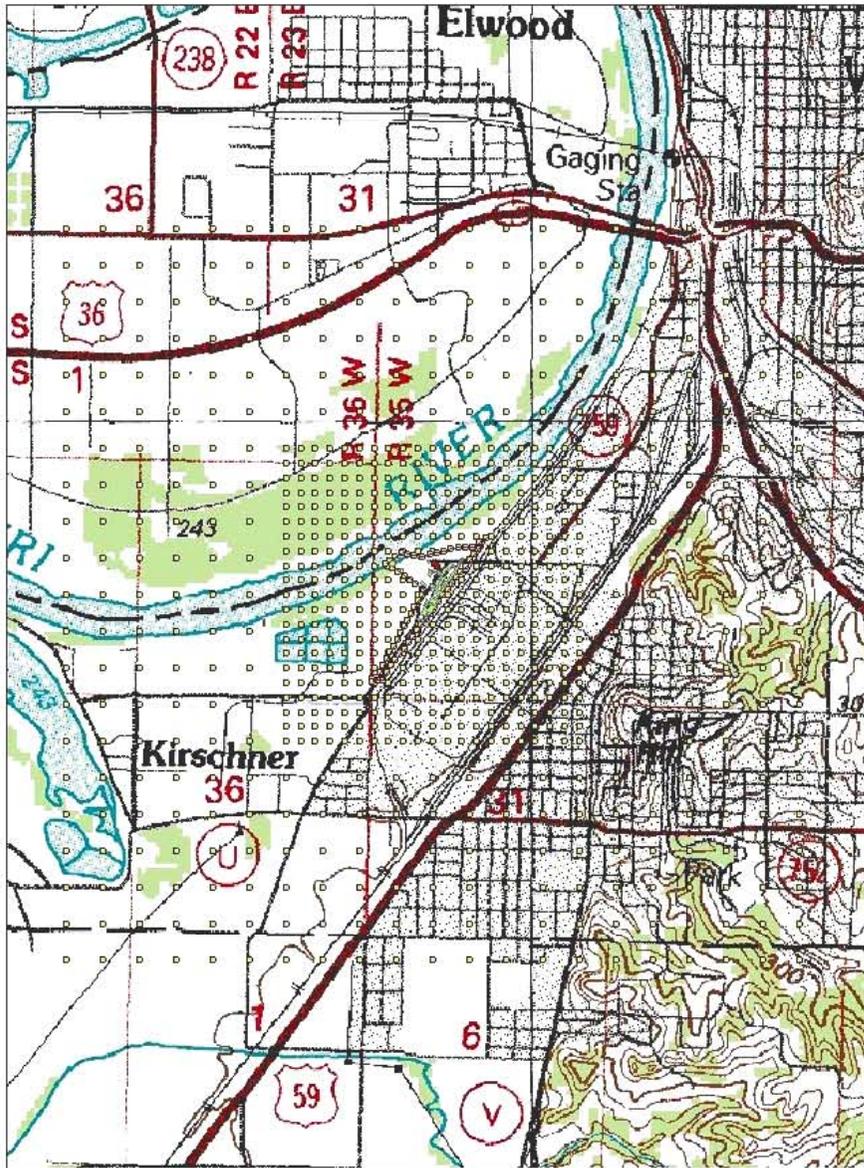


Figure 3
Ag Processing, Incorporated
St. Joseph Airport

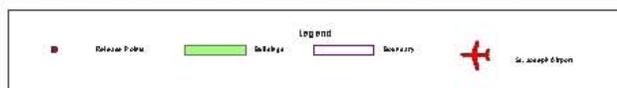


Figure 4
Ag Processing, Incorporated
Building Configuration

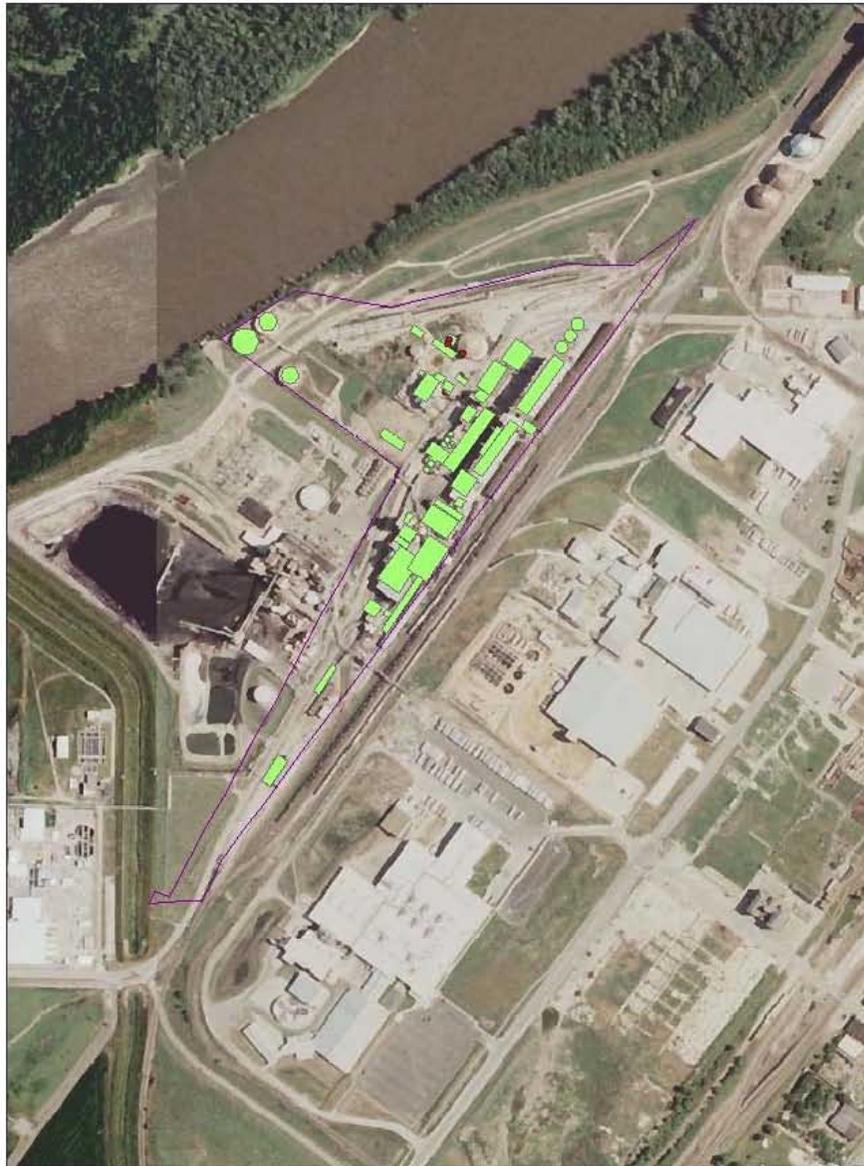


Figure 5
Ag Processing, Incorporated
RAL Compliance, Annual Averaging Period



Figure 6
Ag Processing, Incorporated
RAL Compliance, 24-Hour Averaging Period

