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January 25, 2016

Brian Wetzel
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Southcentral Regional Office
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Re: **Responses to PADEP's *Technical Deficiency Letter***
Perdue Grain & Oil Seed, LLC
Plan Approval Application No. 36-05158A
APS ID #788415/AUTH ID #938531
Conoy Township, Lancaster County

Environmental Resources Management (ERM) was retained by Perdue Grain & Oilseed, LLC (Perdue) to re-examine certain aspects of Perdue's June 2013, Lowest Achievable Emission Rate (LAER) Evaluation which were highlighted by the Pennsylvania Department of Environmental Protection (PADEP) in its July 8, 2015 Technical Deficiency Letter. In addition to issues raised in the July 8 letter, William Weaver of PADEP also provided Perdue with an e-mail dated August 25, 2015 requesting that Perdue also address comments received from Fred Osman on August 23, 2015.

The responses provided in this document were generally prepared based upon joint efforts of ERM and Perdue, with such joint responses noted herein using the terms "we" or "our". In instances where a response represents or references an opinion or effort that is solely attributable to one or the other, this will be noted by specific reference to ERM or Perdue. ERM and Perdue also consulted with Environ in regards to issues pertaining to the Health Risk Assessment (HRA) performed for the site.

This document is formatted by providing each of PADEP's issues followed by our response. The response to the August 25 e-mail is provided at the end of this response document.

1.) One public commenter has raised numerous reasons why incineration of process air from Perdue at the Lancaster Incinerator may be technically feasible. Some of these reasons may, at least superficially, have merit, and might require further responses from Perdue. Nevertheless, the gateway issue with regard to control at LCSWMA is whether LCSWMA would be willing to participate in such an arrangement. Please obtain a statement from LCSWMA on this topic. Further responses to the public comments about LCSWMA hexane control would only be needed if LCSWMA agrees to consider such an arrangement. [25 Pa. Code Sections 127.201(a), 127.205(1)]

We contacted LCSWMA to determine if it would be willing to accept the exhaust stream from Perdue for the purpose of incinerating VOC emissions in the incinerator. LCSWMA's response is attached, stating that they cannot agree to process this exhaust stream. A copy of the LCSWMA letter is provided as Appendix A

2.) One public commenter has advanced numerous arguments in support of using an RTO to control the exhaust from the meal dryer and meal cooler. Of these, the gateway issue appears to be prefiltration. If, as asserted by Perdue, the sticky particulate in the dryer and cooler exhausts cannot be effectively pre-filtered from the RTO inlet, then the RTO would get clogged, making it technically infeasible. The first hurdle, therefore, in evaluating RTO technical feasibility is to determine if any technology exists which would effectively pre-filter the RTO inlet. The possibilities are as follows [25 Pa. Code Sections 127.201(a), 127.205(1)]:

Responses to each technology approach are provided below:

a.) Baghouse: Perdue has obtained a letter from Airlanco stating that a baghouse is not technically feasible for RTO inlet filtration, due to expected clogging with wet particulate. Nevertheless, Perdue also has a proposal from Nestec for a baghouse/RTO combination which seems to indicate that a baghouse is technically feasible. Perdue has stated on Page 55 of its 6/4/13 LAER analysis that "*Nestec would not guarantee the system would remove all of the fine particulates. Instead, Nestec recommended that Perdue conduct a pilot test of this bag house design and the protein meal particulate to determine the consistency and efficiency of the bag house to work under the difficult constraints of the waste stream.*" DEP is unable to locate written documentation submitted by Perdue to support this assertion. Please provide such documentation, or state why it is not available.

Previous interaction with NESTEC on this issue was based on verbal interactions between NESTEC and Perdue staff. We contacted NESTEC again in regards to control of particulate matter prior to the RTO. NESTEC concluded that a venturi scrubber or wet ESP would be the most feasible approach and has modified their proposal accordingly. We also contacted two other vendors, Adwest and Anguil, which confirmed this approach. These responses are discussed in greater detail in response to issue #17 of this document.

b.) Baghouse: One public commenter has asserted that PTFE bags are hydrophobic, so they do not collect moisture and they have very low co-efficients of friction (0.05-0.1), which means particles have a very difficult time sticking to them. Please investigate/explain specifically whether PTFE bags would be technically feasible for RTO prefiltration.

A letter from Airlanco addressing the feasibility of PTFE bags for this application is attached as Appendix B. This letter indicates that Airlanco would not recommend the use of PTFE bags for this application.

c.) Scrubber: Perdue has asserted that a scrubber is not physically capable of reducing the particulate in the air stream sufficiently to prevent RTO plugging problems. Nevertheless, Perdue has not provided independent verification of this. Please provide a statement from at least one scrubber/RTO manufacturer verifying that a scrubber is physically incapable of prefiltering particulate sufficiently to allow for acceptable RTO operation.

We have discussed our concerns regarding the ability of wet scrubbers to control particulate matter from the Dryer/Cooler exhaust with equipment vendors and believe that vendors have incorporated design features that would allow these units to be used from a technical standpoint. The design characteristics and economics of these systems are discussed in response to issue #17 of this document.

3.) In the event that particulate prefiltration proves technically feasible, the next gateway issue for an RTO is moisture in the exhaust of the dryer/cooler. Perdue seems to argue that, even in the absence of particulate in the exhaust, the presence of excessive water alone would render an RTO infeasible. One public commenter has raised the following arguments as to why this is not a problem, which Perdue needs to answer [25 Pa. Code Sections 127.201(a), 127.205(1)]:

- As long as the RTO is operated above the dew point temperature of the exhaust gas (and this is a component of good operating practices) water will not "plug" an RTO.
- RTOs are demonstrated to work in other industrial applications such as ethanol, biofuels, and food processing, which would have similar high moisture streams.
- Perdue listed a very high moisture loading in their waste stream characterization for the Nestec proposal. Nestec addressed this issue by insulating the inlet manifold, using 304 Stainless Steel, and "designing-in" ease of cleaning of the inlet manifold and the cold-face support grids. Please explain why these modifications would not address the moisture issue.

Based on discussions with equipment vendors, we have concluded that thermal oxidizer control systems can be designed in a manner to address the high moisture content of the exhaust stream. While the high moisture content does not make the use of thermal oxidizer controls technically infeasible it does impact the economics of such systems. These issues are addressed in response to issue #17 of this document.

4.) Perdue has asserted that "*Most RTOs are designed for a waste gas no richer than 25% of the LEL, which would make design of an effective RTO difficult because of the* *variable nature of the solvent recovery processes and exhaust stream.*" One public commenter has stated that *"The data presented in the Perdue application do not support this concern. Based on the flows of the three captured waste streams and the estimated emissions in the revised application, the concentrations of the extraction process final vent, the meal dryer, and the meal cooler would be 0.026%, 0.004% and 0.002%, respectively. The LEL for hexane is 1.1% and the safety factor of 25% of that value yields a level of concern of 0.275%. All of the three streams individually are at the very least, a factor of 10 below that."* Please explain why the commenter's assertion is or is not correct. [25 Pa. Code Sections 127.201(a), 127.205(1)]

The commenter's assertion assumes continuous steady state operations, which is unrealistic. The commenter also has failed to identify the numbers assumed in the comment. As discussed in greater detail in response to issue #10, the potential for malfunctions that would raise hexane concentrations to explosive concentrations has led to our concern regarding the technical ability of RTOs to safely handle waste streams with high concentrations. We have discussed this concern with equipment vendors who have provided proposed approaches to process such waste streams. Equipment vendors have proposed to address potential safety issues in part through system bypass and/or through over-design of control equipment to allow the introduction of dilution air. We remain concerned about the risks associated with the use of RTO control devices at soybean oil extraction plants, which we address in greater detail in response to issue #17.

5.) Please specifically respond to the assertions of one public commenter, made immediately following the assertion in the previous item, that "*Additionally, as is Perdue's approach to issues of control, they focus on the individual stream that is most favorable to their argument and ignore the others. The solvent extraction gas stream represents only 7.2 tons of the 82.9 tons represented by the three captured streams*." [25 Pa. Code Sections 127.201(a), 127.205(1)]

The feasibility of RTO controls is addressed separately for the mineral oil vent and Dryer/Cooler exhaust in response to issue #17 of this document.

6.) Please specifically respond to the assertions of one public commenter, made immediately following the assertion in the previous item, that *"Additionally, if all three streams were combined, the average concentration would be nearly 100 times below the 0.275% level of concern. If Perdue is allowed to throw out incineration based on these data, it would be technically infeasible in any subsequent application ever evaluated."* [25 Pa. Code Sections 127.201(a), 127.205(1)]

We agree with the commenter that under steady state operations, the average concentration would be nearly 100 times below the 0.275% level of concern. We have discussed this with equipment vendors and have obtained quotes for the cost to install and operate such controls on the proposed soybean processing facility. Equipment designs are intended to account for potential fluctuations in hexane concentrations associated with day to day operations at the facility. The economics of such controls and *safety issues associated with such controls are addressed in response to issue #17 of this document.*

7.) Perdue has asserted that "*A less frequent RTO failure mode results from the build-up of condensed organic particles on the cold inlet surfaces of the RTO or incinerator. Build-ups in these areas can result in performance failures due to poor valve sealing or more extreme failure due to uncontrolled fires.*" In response to this, one public commenter has stated "*Indeed. That is why one would 1) control the particulate in the exhaust stream prior to the RTO and 2) bring the RTO up to temperature before starting the process so that organic particles do not condense on cold inlet surfaces. The RTO should operate at 1400 °F or above to minimize these issues. This is just good operating practice.*" Please explain why the commenters two suggestions would or would not address the difficulty raised by Perdue. [25 Pa. Code Sections 127.201(a), 127.205(1)]

We have discussed this with equipment vendors who have recommended that this issue be addressed by: (1) installing a wet scrubber or wet ESP prior to the RTO; and (2) designing the RTO with the ability to perform on-line burnout of particulate matter deposition in the RTO. The impact of these options on economics is discussed in response to issue #17 of this document.

8.) With regard to the use of a wet ESP for particulate control prior to an RTO, one public commenter has asserted that *"Similarly, [Perdue's] argument that they could not transport 239 tons of water per day 6 miles to a treatment plant does not meet the technical infeasibility argument required for LAER. That's 6 tankers a day and that needs to be compared to the 842 trucks a day that Perdue claims would be moving materials to and from the plant during the peak month of operation. The transport of the waste water would be insignificant compared to the transport of feedstock and product. Secondly, there is already a pipeline delivering treated water from the Elizabethtown POTW to the plant and Perdue plans to use 300,000 gallons per day of this water. It would not be technically infeasible to return 60,000 through a parallel pipeline."* Please specifically respond to why these assertions are, or are not correct. As an alternative to addressing these issues, Perdue may choose to refine other arguments it may have advanced in opposition to the use of an wet ESP. If a wet ESP is compellingly shown to be technically infeasible on other grounds, it may not be necessary for Perdue to address the issues noted above. [25 Pa. Code Sections 127.201(a), 127.205(1)]

After further clarification from vendors on the equipment required, the amount of wastewater generated by particulate matter treatment systems would not be significant, and therefore wastewater treatment is not a technical infeasibility issue.

9.) Please specifically respond to the assertion of one public commenter that "*Go back up and look at the list of demonstrated technologies for RTOs. Now convince yourself that the Perdue process is so much less steady state than any of these processes,* *including, as one example, chemical batch processing, that it renders the technology non-transferrable. (Taxing the credulity of the credulous.)"* [25 Pa. Code Sections 127.201(a), 127.205(1)]

Equipment vendors have provided us with assurances that with proper equipment controls and safety devices, an RTO can operate outside of steady-state operations. We remain concerned with the safety of such controls in an industrial environment where they have heretofore never been utilized and where equipment failure could lead to significant risk of fire and/or explosion. Detailed information on the design and economics of such systems in addition to safety concerns are discussed in response to issue #17 of this document.

10.) One public commenter has asserted that "*start-ups and shutdowns should not result in increased VOC emissions. Under the solvent extraction NESHAP, Perdue would be required to implement a start-up, shutdown and malfunction plan to minimize emissions during those events. An expected component of that plan would be that the RTO is brought up to temperature with auxiliary fuel prior to startup of the process and that during a shutdown, auxiliary fuel would be used to keep the RTO at peak operating conditions until the process was safely shut down. With these provisions implemented, increased downtime would actually reduce the amount of VOCs emitted.*" Please explain why the commenter is or is not correct in these assertions. [25 Pa. Code Sections 127.201(a), 127.205(1)]

Perdue will operate the plant consistent with good operating practices in the industry, but, despite this, there are a variety of malfunction events that can occur at a soybean oil extraction plant which may lead to an increase in VOC emissions from plant operations. Depending on the nature and severity of the malfunction, the event could lead to an unplanned shutdown and potentially to a plant startup under conditions contrary to normal startup conditions. Pursuant to 40 CFR Part 63, Subpart GGGG, Perdue will prepare and implement a startup, shutdown, malfunction (SSM) plan to minimize emissions during such events.

Although the SSM plan will be developed and implemented with the primary objective of minimizing VOC emissions during such events, it cannot be relied upon to eliminate entirely excess VOC emissions during SSM events. The comment presupposes that an RTO control device will be utilized to control VOC emissions and that such a control device would be capable of capturing and completely eliminating any excess VOC emissions associated with SSM events. Even if an RTO control device is utilized on the mineral oil vent and/or the Dryer/Cooler vent, many SSM events may still result in excess VOC emissions as the VOC control system may not be capable of capturing excess VOC emissions or situations may arise where the hexane concentration in the exhaust stream reaches such a level that the RTO control system must be bypassed to avoid the potential for a fire or explosion.

In cases where the SSM event results in increases in hexane emissions that are safely below 25% of the LEL for hexane, a RTO control device can provide control of emissions that would result from the event if such emissions are captured and vented to the RTO. Many of the SSM scenarios described, however, result in sudden and rapid increases in the hexane concentration in the exhaust to the point where safety devices must be utilized to avoid the possibility that an explosive mixture would be exposed to the RTO. A brief description of potential SSM events, the nature of excess emissions associated with the event, and the reasons it is not possible to eliminate such emissions entirely follows:

Loss of Cooling Water Pumps *- In the event that cooling water pumps fail (such as the result of a power interruption or physical failure of the pump), cooling water will be lost to heat exchangers associated with the Desolventizer/Toaster (DT). The hexane laden gas stream that is coming from the DT would normally be cooled and hexane condensed as this gas stream passes through the heat exchangers. Without cooling water, the gas stream temperature and hexane content will increase, resulting in elevated pressure in the DT Dome. If the issue cannot be corrected in a short period of time, the plant will need to be shut down until cooling water can be restored.*

Loss of Mineral Oil Flow *- In the event that the plant loses mineral oil flow, such as in connection with the failure of a mineral oil pump, the mineral oil absorber becomes ineffective as a VOC control device. The hexane laden gas stream that enters the absorber will pass through with no removal of hexane. Because the mineral oil absorber removes nearly all of the hexane in the gas stream that enters the device, the loss of mineral oil flow can result in an increase in hexane emissions of roughly two orders of magnitude above the normal mineral oil vent exhaust based on an assumed 99% hexane removal efficiency for the mineral oil absorber.*

Loss of Temperature in the Desolventizer/Toaster *- If temperature is lost in the DT, then hexane will not effectively be removed from the meal, resulting in a shutdown of the process. This can occur as a result of a malfunction of the steam system (such as a loss in steam pressure). At any time when a shutdown of the DT occurs in an unplanned manner, there is a likelihood that hexane emissions will increase due to the increased hexane concentration in meal entering the dryer and cooler.*

Loss of Temperature in the Distillation System *- In the event of low temperature in the distillation system, there will be a reduction in the hexane removal efficiency of the system. This results in a decrease of the temperature leaving the stripper and a malfunction condition because the oil must be recirculated through the system.*

Loss of Chilled Water Flow *- In the event that chilled water flow is interrupted (such as from a chiller malfunction), this will result in an increase in the mineral oil temperature. Although not as serious as losing cooling water as described previously, the loss of chilled water flow creates similar issues. The increase in mineral oil temperature can result in decreased absorber efficiency and increased hexane emissions.*

Loss of Miscella Flow *- If miscella flow is lost (which could result from a failure of the miscella pump), the first stage evaporator will become ineffective, resulting in an increased gas temperature in the exhaust leaving the first stage evaporator. This will* *increase pressure in the DT, resulting in a shutdown of the DT process unless flow can be immediately restored*

Loss of Final Vent Fan *- If the final vent fan fails, pressure will increase in the DT, resulting in the need to shut down the process unless the final vent fan can be brought back on line quickly. Due to the increase of pressure on the DT, increased hexane emissions can result as hexane laden air will not be effectively pulled through the control system.*

RTO Failure *- In the event that an RTO control device was utilized on the mineral oil and/or Dryer/Cooler exhaust stream, there is the potential for a malfunction resulting from the failure of the control device. Such a failure could occur as a result of a power failure or an interruption in the fuel supply to the unit. The failure of an RTO control device, for whatever reason, may result in the need to shut down the plant, creating the potential for excess emissions associated with a shutdown/startup that would not otherwise exist. In addition, there are situations where an RTO control device would need to be bypassed for safety reasons if the hexane concentration in the gas to the RTO approached 25% of the LEL.*

It is important to note that the potential startup, shutdown, and malfunction scenarios above are described as individual, discrete events. It is conceivable that there may be multiple events at the same time. For example, power interruption to the extraction plant may result in the loss of cooling water pumps, miscella pumps, and mineral oil pumps at the same time. This creates a situation that compounds the impacts described for each individual event and could necessitate an immediate shutdown of the plant. Additionally, while the excess emissions scenarios described above are associated with shutdowns, the startup of the plant that occurs following such an unplanned shutdown can also result in excess emissions. Until the plant achieves steady-state operation after such events, solvent losses through increased fugitive emissions and/or through increased stack emission may occur. SSM events, unless excluded, will have a significant impact on the plant's solvent loss ratio because such emissions are not offset by soybean processing tonnage.

11.) In the event that particulate and/or water in the exhaust do not preclude an RTO, Perdue has argued (in the past) that safety concerns alone would still preclude its use. Nevertheless, DEP reads Perdue's 6/4/15 responses to the Osman Environmental comments to concede that safety concerns, although significant, do not definitively preclude installation of an RTO at a soybean processing facility. See, for instance, Perdue's response to Public Comment 126 "*NFPA-36 8.2.8 does allow flares as long as they are outside the controlled area (over 100 feet away) and they have a flash back protection (flame arrestor and automatic valves to divert flow in case of high LEL).*" Nevertheless, Perdue as asserted verbally to DEP since then that safety concerns are still a deciding argument against an RTO. Please clarify how this is so, in light of Perdue's response to Comment 126. [25 Pa. Code Sections 127.201(a), 127.205(1)]

We continue to have safety concerns regarding the use of RTO control systems at the proposed soybean processing facility, particularly on the Mineral Oil Vent. We have discussed these concerns with equipment vendors, who indicate that safeguards can be employed in equipment design to minimize the potential risks associated with open-flame control devices at soybean oil extraction plants. Nevertheless, ERM, Perdue, and Perdue's property loss control consultant, Global Risk Consultants (GRC), believe that the relatively minimal potential environmental benefits that might be achieved through the use of RTOs on the Mineral Oil Vent are overshadowed by the increased risk posed by the use of such a control device at a soybean oil extraction plant.

As noted previously, equipment vendors have expressed their belief that RTO control systems can be designed to address safety concerns associated with the use of open flame control devices at soybean oil extraction plants. We realize, however, that the potential for fires and/or explosions exists at such plants and are evaluating such control devices with the recognition that regardless of the extent of safeguards employed in equipment design, the use of such control devices at a soybean oil extraction plant represents an increased risk that would not otherwise be present.

We have discussed these concerns with Perdue's property loss control consultant, GRC, and requested that they provide a statement regarding their view of the use of such controls at soybean oil extraction plants. The response of Bryan Davis, PE, Senior Consultant with GRC is provided as Appendix C to this document.

In their analysis, GRC points out that the use of an RTO control device on the Mineral Oil Vent or Dryer/Cooler exhaust create a situation where an open flame is provided with a path to the soybean oil extraction process, which is identified in NFPA 36 as having the potential for explosive concentrations of hexane vapors. GRC concludes that the introduction of such controls at a soybean oil extraction plant represents a risk that cannot be completely eliminated through the use of safety control devices. They believe that it is not appropriate to introduce such risks, particularly in relationship to the Mineral Oil Vent where minimal VOC reduction would be achieved.

As has been discussed with PADEP previously, the Prairie Pride facility in Deerfield, Missouri had proposed to install an RTO control system to control VOC emissions from the Mineral Oil Vent at its facility in its original Construction Permit. Prairie Pride subsequently filed a request to amend its Construction Permit to remove the requirement to install an RTO control system, which was approved by the Missouri Department of Natural Resources. In its amendment request, Prairie Pride cited the following as justification for removing the RTO from the design:

> *"After further discussion with current design engineers, National Fire Protection Association (NFPA) board members and experts in the soybean processing industry, PPI has been convinced that the safety hazards presented by the RTO outweigh the minimal VOC reduction that would be achieved through its use on the MOS Vent (approximately 20 tons per year)."*

A copy of this letter is provided as Appendix D to this document. We note that while the potential risk associated with the use of an RTO control system on the Mineral Oil Vent for the proposed Perdue facility is equivalent to that posed at the Prairie Pride facility, the environmental benefit that would be achieved at the proposed Perdue facility is three times less than would have been achieved at the Prairie Pride facility.

In conclusion, we believe that the use of RTO controls at the proposed Perdue soybean processing facility represents an increased safety risk that is not justified by the relatively minimal environmental benefit that would be achieved by such controls. As noted elsewhere, the air quality will benefit in the area through emission offsets secured by Perdue that exceed the proposed emission increases from the facility. The minimal additional environmental benefit achieved by such controls is not warranted given the cost associated with such controls and the increased safety risk that would be created.

12.) Perdue has asserted that in addition to safety concerns, the rapidly varying concentrations of hexane in the inlet will cause RTO operational problems, or may cause the need for temporary bypasses of the RTO. Nevertheless, one public commenter points out that rapidly varying VOC concentrations are routinely controlled by RTO's. A feedback loop is used to monitor RTO temperature and supplementary fuel is fired to maintain that temperature. The commenter further notes that "*We do not mean to minimize the significant issue of explosion hazards in RTO's. This is a real issue. However RTO suppliers are fully capable of evaluating these risks and designing systems to address them. Perdue cannot just raise a concern of explosion and refuse to seriously investigate the issue.*" Please explain why Perdue cannot utilize electronic RTO controls as suggested by the commenter to avoid operational or safety problems or bypasses. [25 Pa. Code Sections 127.201(a), 127.205(1)]

We continue to be concerned about the safety regarding the use of RTO control systems at the proposed soybean processing facility, particularly on the Mineral Oil Vent. We have discussed these concerns with equipment vendors, who indicate that safeguards can be employed in equipment design to minimize the potential risks associated with open-flame control devices at soybean oil extraction plants. Nevertheless, ERM, Perdue, and Perdue's property loss control consultant, Global Risk Consultants, believe that the potential minimal environmental benefits that might be achieved through the use of RTOs on the Mineral Oil Vent are overshadowed by the increased risk posed by the use of such a control devices at a soybean oil extraction plant. Conveying concentrated hexane vapors via ductwork to a RTO located outside the controlled area increases the risk of an extraction process fire and/or explosion even with the use of safeguards and protection measures, such as backflash protection. The RTO would still have to be bypassed to atmosphere during process or RTO malfunctions and associated shutdown/startup events. Additional details pertaining to these concerns, including a statement from Global Risk Consultants, are provided in response to issue #11 above.

13.) Please also explain the specific situations when RTO bypasses might occur, how long the incidents might last, what the expected emissions might be during such incidents, and why such bypasses would be unavoidable. [25 Pa. Code Sections 127.201(a), 127.205(1)]

RTO bypasses would be necessary when concentrations approach 25% of the LEL to maintain safe operation of the RTO. Specific situations where such concentrations might be experienced are identified in the response to issue 10, above. Depending on the specific circumstances, the duration of these incidents can range from several minutes to several hours. The amount of any such emissions will vary depending on the circumstances.

14.) One public commenter asserts that in a September 28, 2000 memo from Alpha- Gamma Technologies submitted to the EPA docket on the NESHAPS and entitled "Final Model Plant Cost Estimates for Above the MACT Floor Control Techniques, the following statement is made: "*When using combustion devices to destroy flammable compounds in an emission stream, it is important to minimize possible fire hazards. Many insurance companies require dilution air to reduce the concentration of flammable vapors in an emission stream to 25 percent of the lower explosive limit (LEL) of the flammable compound. The predominate solvent used in vegetable oil extraction plants is a commercial grade of hexane, which is comprised of n-hexane (64 percent) and isomers of hexane (36 percent). The LEL of n-hexane in air is 1.2 percent by volume. It is assumed the LEL of n-hexane would also apply to the isomers of hexane. The potential concentration of hexane vapors (n-hexane and isomers) in the combined meal dryer and cooler exhaust was determined and compared to the LEL for hexane. Based on the selected model parameters, the hexane vapor concentration in the combined meal dryer and cooler vent exhaust ranged from 0.3 to 1.0 percent of the LEL for hexane. Thus, dilution air is not required for any of the model exhaust streams.*" The commenter goes on to assert that "*Perdue's own data show that their combined exhaust would be at the lower end of this range slightly below 0.3%.*" Please explain why the commenter is, or is not correct in this assertion. [25 Pa. Code Sections 127.201(a), 127.205(1)]

The reference concentrations provided in this comment relate to hexane concentrations that are expected to exist under normal, steady state operations. While hexane concentrations in the mineral oil exhaust and dryer/cooler exhaust are expected to be well below the LEL under normal operating conditions, excess VOC emissions triggered by one or a combination of malfunction events can quickly increase to levels of concern in regard to the potential for fire or explosion. In the response to issue #10 of PADEP's request for additional information, a detailed description of several potential SSM events is provided. Each of the events described may result in increased VOC emissions from the mineral oil and/or dryer/cooler exhaust beyond concentrations experienced during normal, steady-state operations, and, in some instances, the emissions could approach the LEL for hexane. As the September 2000 memorandum from Alpha-Gamma Technologies correctly notes, it is important to design equipment with adequate safety features to address situations where the concentration of hexane in the gas stream reaches 25% of the LEL. While we expect that such situations can be minimized by good *operating practices, we must still account for the possibility of such events in the equipment design for the plant.*

15.) In past responses to comments about safety issues with VOC incineration devices, Perdue has raised concerns that "*Combusting a lot of natural gas to burn hexane vapor in normal vent gas does not decrease emissions: it only changes the emission profile.*" DEP does not perceive this argument to be relevant to safety concerns, or to the determination of LAER. Please either acknowledge that this argument is not relevant to these issues, or else explain why "*changing the emission profile*" would be relevant to 1.) safety concerns or 2.) the establishment of LAER for VOCs. [25 Pa. Code Sections 127.201(a), 127.205(1)]

Based on discussions with PADEP, we understand that PADEP does not consider this issue to be relevant to the determination of LAER for the proposed soybean processing facility.

16.) Even if an RTO is deemed technically feasible, Perdue has argued that it would be economically infeasible, and has provided a detailed cost analysis. Certain issues regarding the cost analysis require further answers from Perdue [25 Pa. Code Sections 127.201(a), 127.205(1)]:

- One public commenter (Osman Environmental) has asserted that the calculated cost per ton of VOC control related to the Nestec proposal should initially be doubled, prior to questioning any of its underlying assumptions, based on a calculation error(s) by Perdue. DEP realizes that the commenter did not clearly specify where the error(s) were. Nevertheless, since the alleged error(s) were in Perdue's favor, DEP requests that Perdue specifically respond, to the extent that Perdue can determine the commenter's intent, as to whether or not they agree with the commenter's assertion. Please revise the cost analysis as needed based on the proposed answer to this question.

We are not able to identify the calculation error referenced in the comment, however we have received updated quotes from RTO vendors that are used in a revised economic assessment discussed in response to issue #17 of this document.

- The cost analysis included $1.2 million to construct a natural gas pipeline to the facility to run the RTO. Please investigate/explain whether any alternative RTO fuels such as propane are available to run the RTO, that would not require a pipeline, and which would therefore potentially reduce the cost. Please revise the cost analysis as needed based on the proposed answer to this question.

Propane fuel is available but at a cost that is roughly twice the cost of natural gas. Propane availability in winter months cannot be guaranteed, which therefore impacts the availability of the RTO. We have concluded that propane would be a reasonable alternative for control options that require a small amount of supplemental fuel, but that *for situations where the supplemental fuel amount is higher, it would be more economical to install a natural gas pipeline to the site. The economics of these alternatives are discussed in greater detail in response to issue #17 of this response.*

- Perdue included in its cost analysis, a line item of $884K for RTO cleaning, based on experience with a problematic RTO at a different, non-soybean facility. DEP preliminarily disagrees with the inclusion of this cost, because the need for expensive RTO cleaning should be addressed as a technical feasibility concern, rather than a cost concern. Please revise the cost analysis accordingly.

The cost analysis has been revised based upon the most recent vendor quotes and is discussed in detail in response to issue #17 of this document.

- One commenter has asserted that the $126,000 maintenance charge assigned from the EPA manual is inappropriate because "*A lost production cost, while important in the overall feasibility of a project, is recognized under the EPA Air Pollution Control Cost Manual only for retrofit facilities and only for shutdown to initially install the facilities, not as an ongoing operational cost.*" Please explain why the commenter is, or is not correct in this assertion, and revise the cost analysis accordingly based on the answer.

The cost analysis has been revised to reflect updated maintenance charges. We agree that lost production costs are not included in maintenance. However, the commenter is incorrect in asserting that the $126,000 maintenance charge in the LAER document is related to lost-production; it is not.

- As an alternative to addressing the above three issues, Perdue may choose to refine other arguments it may have advanced in opposition to the use of an RTO. If an RTO is compellingly shown to be technically infeasible on other grounds, it may not be necessary for Perdue to address the cost issues noted above.

The cost analysis has been revised to reflect new vendor quotes (see response to issue #17 of this document).

17.) In the event that responses to any of the questions noted above (or below) reveal that a particular reason advanced by Perdue for technical infeasibility of any control option is invalid or uncompelling, please review and revise any other remaining arguments against that particular control option to show whether or not the conclusion about technical infeasibility is still valid. If it is not, and if Perdue believes arguments exist showing the economic infeasibility of that particular control option, then please either advance or refine those arguments as needed. [25 Pa. Code Sections 127.201(a), 127.205(1)]

As noted in responses elsewhere in this document, we contacted three equipment vendors regarding the feasibility of controlling VOC emissions from the mineral oil vent, *Dryer/Cooler exhaust, or the two exhaust streams combined. Based on discussions with equipment vendors, we have concluded that it appears to be technically feasible to install RTO control systems on these exhausts, however, incorporation of an RTO control system into the design of the plant increases the risk of fire and/or explosion. These concerns are discussed in Appendix C containing the analysis of Bryan Davis, PE, Senior Consultant with GRC. Our analysis of such controls is discussed in detail in Appendix E to this document. This analysis concludes that such controls are not economically feasible on the Dryer/Cooler exhaust stream and are not appropriate for the Mineral Oil Vent for safety reasons.*

18.) In its responses to comments dated 6/4/15, Perdue raises two objections to biofilters, as follows, which are not sufficiently specific [25 Pa. Code Sections 127.201(a), 127.205(1)]:

- Perdue asserts that the biofilter bed volume required to provide even a few seconds of residence time would be "prohibitively large." Please provide a numeric value for bed volume, and explain why that numeric value is prohibitively large in terms of the specific facility location chosen by Perdue.

- Perdue asserts that optimal biofilter destruction requires a retention time of between 30 seconds to 2 minutes; a period of time that would be far longer than would be available in soybean solvent extraction application. Rather than using the term "far longer", Perdue needs to calculate and provide a numeric value, with justification, for the maximum retention time physically available bed retention in a solvent extraction application.

- As an alternative to addressing the above two issues, Perdue may choose to refine other arguments it may have advanced in opposition to the use of biofilters. If biofilters are compellingly shown to be technically infeasible on other grounds, it may not be necessary for Perdue to address the two biofilter issues noted above.

In order to supplement information provided in its application regarding the feasibility of biofiltration control technology, we performed a search of the EPA RACT/BACT/LAER Clearinghouse (RBLC) to identify any facilities in the United States utilizing biofiltration control systems to meet BACT or LAER emission limitations. Any such systems identified were then evaluated to determine the extent to which the application might be transferable to the exhaust streams expected from the soybean oil extraction facility.

Using the advanced search function of RBLC, ERM performed a search of the database to identify any source using biofilters to control VOC emissions. The search was performed over the entire time period covered by the database – both permits issued or proposed since 2005 and permits issued or proposed prior to 2005. This search identified a single *permit that contained a biofilter control system, which is a permit issued to Louisiana-Pacific Corporation (LP) in Clark County, Alabama (RBLC ID AL-0221). The following statement is contained in the Preliminary Determination prepared by the Alabama Department of Environmental Management (ADEM) in regards to this control system:*

> *"LP contends the most cost effective means for controlling VOC emissions from the OSB [oriented strand board] press would be a biofilter. The biofilter would be required to demonstrate a VOC control efficiency of at least 75%. LP considered utilizing an 80% efficient biofilter, however the retention time required to achieve this level of efficiency would require a biofilter twice as large. Also, approximately 90% of the HAP VOC emissions such as formaldehyde would easily be converted to CO2 and water by a biofilter. The remaining majority of the emissions from the press would be non-HAP VOC emissions and would consist primarily of terpenes. The vendor has expressed reservations about the biofilter being able to control these large compounds at an 80% efficiency level."*[1]

The final permit issued by ADEM was consistent with the analysis provided in its Preliminary Determination. Based on information provided in the Preliminary Determination, the VOC constituents controlled by the biofilter at this facility were principally formaldehyde, with acetaldehyde, methanol, and phenol also present. These VOCs have a chemical make-up that is significantly different than hexane, which is not well-suited for biofiltration.

We also contacted an air pollution control equipment supplier, Bartlett Controls Inc.,[2] *to obtain information from an equipment vendor regarding the feasibility of biofiltration to control hexane emissions from a soybean oil extraction facility. Bartlett provided ERM with the following statement (included as Appendix F) related to the feasibility of biofiltration:*

> *The reference document commonly utilized to assist in biofiltration design, "Biofiltration for Air Pollution Control" written by Devinny, Deshusses, & Webster in 1999, identifies hexane as moderately biodegradable, not good*

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[1] Preliminary Determination, Louisiana-Pacific Corporation, Facility No. 102-0014, Alabama Department of Environmental Management, available at http://app.adem.alabama.gov/efile/.

[2] Bartlett Controls, www.bartlettcontrols.com, is a well-qualified air pollution control system designer with numerous years of experience designing air pollution control systems for a variety of manufacturers and applications.

> *degradability. Based on my experience, I would classify hexane biodegradability as "slight". That means that there is no way to get over 50% destruction removal efficiency (DRE) without extremely long retention time and exorbitant cost – perhaps on the order of $100 to $120/acfm. Even then I wouldn't guarantee more than 70% DRE. That would be with a 90 second, plus, residence time. The size, based on the referenced elimination capacity (i. e. loading and removal capability) would have to be between 12 and 30 times the size of a biofilter used for 90% degradation of methanol and formaldehyde in a comparable airstream. If we were designing a 50,000 acfm unit to remove a mixture of methanol and formaldehyde, the expected capital cost would be on the order of $20-$22 per acfm or about $1MM. Based on this, for a hexane model we would estimate a capital cost of $12MM to $30MM installed, and would provide no guarantee that a control efficiency >50% could be met.*

Based on information provided in its original LAER analysis and on the additional information provided above, we conclude that biofilters are technically infeasible for the proposed facility for the following reasons:

- *Technical data available pertaining to the use of biofilters to control hexane emissions indicates that hexane is not a pollutant that is well suited to control by such systems. Bartlett Controls indicates that were one to design a system to control hexane emissions from a soybean oil extraction facility, a very high retention time would be required to achieve a reasonable DRE. Even with a high retention time, Bartlett would not guarantee that such a system would achieve a specific VOC DRE. Based on this, we have no assurance of the reliability of a biofiltration control system to control hexane emissions to a target control efficiency. It is the opinion of ERM that no competent professional engineer would specify the use of a biofiltration to control VOCs from a soybean solvent extraction plant.*
- *Biofiltration systems have historically been utilized to control odors and not to achieve a high, consistent destruction efficiency as would be required in this application. Based on a search of the EPA RACT/BACT/LAER database, only a single source was identified that utilized a biofilter for VOC controls to achieve a BACT limit. The biofiltration system utilized was applied to an exhaust stream where formaldehyde was the principal VOC constituent of concern. Bartlett Controls and Devinny, Deshusses, & Webster[3] agree that formaldehyde is considerably easier to biodegrade than hexane, which is at best "moderately*

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[3] "Biofiltration for Air Pollution Control", Devinny, Deshusses, & Webster, 1998

biodegradable". In its guidance document on biofiltration[4], USEPA reports that "biofilters have high DREs for certain compounds such as aldehydes, organic acids, nitrous oxide, sulfur dioxide, and hydrogen sulfide". This description would encompass formaldehyde but would not include a paraffin such as hexane. We have not identified any other applications in any industry where biofilters have been utilized to achieve a specific VOC control efficiency or outlet VOC concentration.

- *The variability of the characteristics of the air streams from soybean oil extraction operations further complicates the ability of biofiltration to be utilized as a viable control option in this situation. The microorganisms utilized in biofiltration control systems are highly susceptible to variations in air stream temperature, moisture content, and residence time (which is a function of the air flow rate through the system). In a soybean extraction plant, variations in these parameters occur on an hourly basis based on a variety of factors, including the quality of beans and ambient conditions. This variability can lead to wide fluctuations in the destruction efficiency provided by the system. A biofiltration control system would need to be designed with mechanisms to increase or decrease the temperature of the air stream as circumstances arose to meet the target temperature for microbial growth. Similar mechanisms would be necessary to deal with other fluctuations in air stream characteristics, such as stream moisture content.*

For the reasons outlined above, we conclude that biofiltration is not a technically feasible control option for its proposed soybean oil extraction facility.

19.) Add-on controls such as a biofilter could be evaluated on a source-by-source basis, rather than on combined air streams. In particular, please explain why a biofilter would or would not be technically feasible on the low exhaust volume air stream coming specifically from the mineral oil scrubber. [25 Pa. Code Sections 127.201(a), 127.205(1)]

In response to issue #17, we address the feasibility of RTO controls on a source-by-source basis rather than on a combined air stream. In regards to the specific question related to the technical feasibility of biofilters on the mineral oil scrubber exhaust, we have concluded that biofilters are not technically feasible for this application (see response to issue #18). As a result, we believe that no further response to this issue is required.

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[4] USING BIOREACTORS TO CONTROL AIR POLLUTION, EPA-456/R-03-003, September 2003.

20) Perdue has argued that an exhaust temperature of 140°F from the meal dryer could kill the microbes in a biofilter. Yet one public commenter points out that the data on the combined exhaust streams evaluated for possible control in the Lancaster Incinerator indicate that the three streams together would be no higher than 96°F. Perdue's response to this is that the meal dryer/cooler exhaust temperature varies not only with (internal) process conditions, but also external conditions such as ambient air temperature and humidity. Please clarify how often and for how long 140°F exhaust temperatures would be likely to occur, and in light if this, whether these temperatures would still preclude use of a biofilter. [25 Pa. Code Sections 127.201(a), 127.205(1)]

As noted in response to Technical Deficiency issue #18, we have concluded that biofilters are not technically feasible for this application. As a result, we believe that no further response to this question is necessary.

21.) Perdue has asserted in its LAER analysis (Page 39) that "*Carbon adsorption systems were applied rather widely to the final vent emissions stream from solvent extraction plants in the late 1940s and early 1950s.*" This would appear to show that carbon adsorption is a technically feasible (albeit perhaps inferior) control technology. Please more specifically answer why any or all of the various adsorption technologies, carbon or otherwise, are truly technically infeasible, rather than just technically challenging or undemonstrated. In a related matter, please provide a statement from one or reputable adsorption vendors, potentially for various types of adsorption media, stating that the Perdue gas stream does not lend itself to control by that technology. [25 Pa. Code Sections 127.201(a), 127.205(1)]

Although carbon adsorption control systems were utilized on hexane recovery system vent streams from soybean oil extraction facilities in the 1940s and early 1950s, all such systems have been discontinued and no soybean oil extraction facilities in the United States utilize adsorption control technology to control emissions from these exhausts. These control systems have been replaced by mineral oil absorption control systems. The reasons that adsorption control systems are not utilized to control hexane emissions from soybean processing facilities relate to both technical feasibility and safety concerns.

In its LAER analysis, Perdue provided a description of the mechanics of adsorption control systems to remove VOC emissions from exhaust streams. For the dryer/cooler exhaust stream, the presence of particulate matter in the exhaust stream results in clogging of the surface of the adsorbent to the point where such systems would become ineffective, and the media would need to be replaced. Even with the use of a particulate matter prefilter, such exhausts would still result in significant degradation in performance over time.

For both the mineral oil vent and dryer/cooler vent, the exhaust stream will contain sulfur compounds that naturally occur in soybeans that would attach to the surface of the *adsorbent are not easily removed during bed regeneration. In addition, small amounts of soybean oil will be entrained in the mineral oil and dryer/cooler exhaust stream that will likewise clog the surface of the adsorbent. Based on this, the media adsorption capacity will deteriorate over time and require bed replacement on a more frequent basis than would normally be expected.*

From a safety perspective, the process by which VOCs are adsorbed to the surface of an adsorbent is exothermic, meaning that heat is released during the adsorption process[5]*. While carbon and other adsorbent control systems can be designed to handle the VOC concentration expected during normal process operations, short term increases in the hexane concentration as a consequence of process upsets or malfunctions will cause the bed temperature to rise significantly to the point that auto ignition of the bed can occur*[6]*. This issue has been acknowledged in the technology review of carbon adsorption control technology for soybean oil extraction plants in other states*[7],[8]*.*

While there are design modifications that can be made to address some of the issues addressed above, the potential for fires in the adsorption bed cannot be completely eliminated. Design modifications employed are based on the assumption that the exhaust stream will have a fairly predictable pollutant concentration. Short-term fluctuations in the hexane concentration in the exhaust stream will result in the potential that a spike in the hexane concentration can rapidly result in an increase in the adsorption bed temperature that cannot be easily controlled or avoided. This factor leads us to conclude

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[5] VOC Controls, Section 3.1 VOC Recapture Controls, Carbon Adsorbers, Office of Air Quality Planning and Standards, September 1999, p. 1-3.

[6] Zerbonia, R.; Brockmann, C.; Peterson, P.; Housley, D.; "Carbon Bed Fires and the Use of Carbon Canisters for Air Emissions Control on Fixed-Roof Tanks", Journal of the Air & Waste Management Association, December 2001, p. 1617.

[7] Fact Sheet, Nebraska Department of Environmental Quality, Permit #CP14-007 for Ag Processing, Inc., Hastings, Nebraska, p. 25, available athttp://pubweb.epa.gov/region07/air/nsr/archives/2015/finalpermits/agp_soy_final_psd_permit_2015.pdf.

[8] Memorandum on Evaluation of Permit Application No. 2013-0109-C PSD for Northstar Agri Industries, Enid Oklahoma, Oklahoma Department of Environmental Quality, Air Quality Division, Draft May 20, 2013, p. 17, available at http://www.deq.state.ok.us/aqdnew/permitting/permissue/permissue.html.

that adsorption control technology should be eliminated as a feasible control technology for this application.

In an attempt to corroborate this conclusion we also contacted Bartlett Controls for an opinion on the appropriateness of carbon adsorption as a control technology on the exhaust streams from the proposed soybean oil extraction facility. In an e-mail dated September 14, 2015, Bartlett Controls indicated that they would not recommend carbon adsorption to control VOC emissions from these process streams, citing many of the same reasons as outlined above[9]. This correspondence is provided in Appendix G

It is the opinion of ERM that no competent professional engineer would specify the use of a carbon filtration to control VOCs from a soybean solvent extraction plant.

22.) Please clarify how safety concerns for adsorbers would differ from those for RTOs. This is because, per item 4 above, DEP believes that Perdue has conceded that safety concerns, although significant, do not definitively preclude installation of an RTO at a soybean processing facility. [25 Pa. Code Sections 127.201(a), 127.205(1)]

As described in the response to issue #21 above, safety concerns relate to the potential for fires in the adsorption bed as a result of heat generated during the adsorption process. While an RTO can be designed to handle fluctuations in hexane concentrations up to 25% of the LEL, ERM believes that such hexane concentration fluctuations will result in a rapid increase in the adsorption bed temperature to the point where auto ignition can occur. For this reason, we conclude that safety concerns eliminate adsorption control technology as a feasible control technology option for this application.

23.) One public commenter has asserted that Perdue should implement "enhanced LDAR" as LAER, as modeled in certain EPA consent decrees. Please explain why "enhanced LDAR" is or is not appropriate as LAER for the proposed Perdue facility. [25 Pa. Code Sections 127.201(a), 127.205(1)]

We agree that "enhanced LDAR" is appropriate for the facility in support of LAER, as outlined in Perdue's LAER Evaluation, pp. 60-61. In addition to the specific conditions contained in the draft permit pertaining to LDAR, Perdue proposes the following program: The facility will have numerous gas-detection monitors strategically placed throughout the plant that will be reading/displaying results continuously on the plant's Programmable Logic Controller (PLC). There will be alarms programmed into the PLC – one indicating a warning level and one indicating an immediate action level. The gas monitors' readings will also be logged in trending software so that slight increases can be

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[9] Correspondence from T. Bartlett to D. Jordan dated September 14, 2015.

monitored over time to observe potential leak points that can be addressed proactively. In addition to the information that will be recorded by the PLC, the extraction operator will also log all gas detection readings manually one time per day on a formal report.

The extraction operator will also conduct an extensive Audible, Visual, Olfactory (AVO) inspection around the plant once per day. This inspection will consist of a thorough walk around every level of the plant and AVO surveys of key equipment and related piping. If the operator hears, sees, or smells any signs of a hexane leak at any piece of equipment, he/she will further investigate the equipment/piping. This may include using an infrared camera or certified gas leak detector to further check individual flanges, sight glasses, etc. to identify the exact source of the leak. Once the leak is found, the leak repair protocol will be followed and the leak will be tagged and repaired within the time required by the leak repair protocol.

The LDAR program will also include a complete plant survey with an infrared camera or certified gas leak detector, which will be conducted initially after the plant's startup and annually going forward. During these surveys, the extraction operator will conduct a check of every flange, connection, sight glass, etc. in the facility to identify any leaks that may not have been identified during the daily leak inspections. If any leaks are identified during this survey, the leak repair protocol will be followed and the leak will be tagged and repaired within the time required by the protocol.

Drawing a conclusion based on the white papers researched regarding "consent decrees" and the requirements previously set forth in our draft permit, it is ERM's opinion that the aforementioned proposed LDAR program would be "enhanced".

24.) One public commenter (Osman Environmental) has asserted that Perdue should employ of specific valve/connector design at the facility as LAER to minimize fugitive emissions. Please specifically address the points raised, as follows [25 Pa. Code Sections 127.201(a), 127.205(1)]:

The responses regarding piping, valves, and connections of the proposed plant were prepared with information and guidance from Desmet Ballestra, an industry leader in the design of solvent extraction plants and related equipment. Desmet Ballestra will be responsible for the plant design and the supplier of the equipment for the proposed facility. The proposed piping, valves, and connections will be designed and engineered for optimal efficiency when working with hexane. The proposed equipment described below, when coupled with the enhanced LDAR program, will minimize fugitive emissions and represents LAER.

- Requirement of rupture disk assemblies rather than pressure relief valves

Rupture disk assemblies are utilized only with steam applications, such as the snuff steam line application for fire / explosion suppression prior to the extractor, and are not utilized with solvent extraction applications.. When working with a solvent such as *hexane in an extraction plant, pressure relief valves are the most effective to protect equipment in the event of over-pressurization and eliminate fugitive emissions. Pressure relief valves will be installed for fire emergency venting, thermal expansion protection of heat exchangers, over-pressurization protection of the DT flash tray, mineral oil stripper, and steam supply overpressure. Lines with fluids containing solvent are vented to downstream piping that is always contained in a vessel, so no solvent is released into the atmosphere. In process extraction and recovery operations where solvent (hexane) is utilized, the use of a rupture disk in lieu of a pressure relief valve will actually result in increased solvent emissions. Given the fact that a rupture disk is a one-time failure device; when it relieves, it remains open and results in a continuous release of solvent vapors until the line or equipment can be manually isolated, whereas a pressure relief valve will vent to protect the equipment and re-seat, thus minimizing solvent emissions, and therefore is LAER.*

- Requirement that valves be of the seal less design

The manufacturer of the extraction process has recommended valves equipped with packing or O-rings. Seal less valves generally are utilized in facilities where valves are frequently opened and/or closed. Additionally, the process does not employ high pressure and dirty fluids for which "seal less" applications are most warranted. The valves that will be installed in the plant will be equipped with packing or O-rings that are made of materials that are of inherently leak less design and are compatible with the fluids that will be passing through them. The utilization of compatible packing and elastomeric materials will minimize the potential for solvent leakage from valve stems. The valve specifications, along with the enhanced LDAR program (which will dictate daily AVO reports and more formalized testing), will result in the most optimal arrangement for minimizing fugitive emissions and are, therefore, LAER.

- Requirement that connections be welded rather than flanged, to the extent possible without interfering unreasonably with operation or maintenance

A welded connection ensures the piping is of continuous design with zero tolerance for fugitive leaks, with the exception of line rupture; whereas a flanged connection employs some type of gasket material that is mechanically fastened to join pipe joints. To the extent possible, connections will be welded. All welds will be done in accordance with best engineering practices and pressure tested to process specifications to ensure their integrity. Due to maintenance needs where hot work (work involving spark or flame) is not permitted, there will be areas (pumps, valves, process equipment, etc.) in the plant where flanged connections will be required to properly undertake maintenance/repair operations. This ensures equipment can be removed and replaced within the process without purging the plant of all solvent. The gaskets on flanged connections will be of inherently leak less design and coupled with the enhanced LDAR program, including the required hexane detection monitors and daily AVO inspections, will provide for early detection of leaks, thus minimizing fugitive losses from flanged connections.

- Requirement that any open-ended lines must have a dual valving system with the second valve blinded, capped, or plugged

The installation of an additional valve in any line simply creates two more potential leak points in that the second valve will be introduced in the process by way of flanged piping where the flanges in addition to the valve itself represent the potential for emissions. This adds an unneeded valve and the potential for failure resulting in emissions. Furthermore, dual valving does not provide the reliability of a single valve with a blinded, capped, or plugged line. All open-ended lines will be blinded, capped, or plugged, with properly engineered valves designed to be utilized in solvent extraction processes. The Enhanced LDAR program will be implemented to ensure the reliability of these devices, thus making this LAER.

- Requirement that any sampling connections must employ closed-loop sampling

Closed loop sampling devices are primarily used in applications with gases or fluids at high temperatures and/or pressures experienced during chemical manufacturing; and where acute exposure to materials may present imminent danger. For example, EPA's Standards of Performance for Synthetic Organic Chemical Manufacturers, 40 CFR Part 60.482 / 60.489, Subpart VVa, require affected operations to employ closed-loop sampling devices to reduce fugitive leaks from equipment. Even if Perdue were manufacturing hexane, it would not be subject to 40 CFR Part 63.489. Beyond this, closed loop devices have numerous connectors and valves which are additional, unnecessary potential locations for solvent liquid and vapor emissions. As part of the proposed enhanced LDAR program, all sampling connections will be equipped with valves engineered and designed to be utilized in solvent extraction processes and piping will be blinded, capped, or plugged when not in use to prevent fugitive emissions. The enhanced LDAR, which includes the hexane detection monitors and daily AVO inspections, will provide for early detection of leaks, thus minimizing fugitive losses from any sampling connections.

25.) One public commenter (Osman Environmental) asserts that with certain proposed valve/connection design modifications, Perdue "*should be capable of reducing equipment leaks from the currently unacceptable 16.5 tpy to de minimis amounts.*" Please attempt to specifically explain, to the extent that Perdue can discern the commenter's reasoning, why the commenter is either correct or incorrect in this assertion. [25 Pa. Code Sections 127.201(a), 127.205(1)]

The permit plan approval application was submitted using the best available emissions estimations regarding hexane loss from similar industries. The information submitted was based on interpolation of a memorandum published in 2000 regarding "Emission Characteristics of Vegetable Oil Production Model Plants", in support of the 2001 NESHAP. The industry as a whole has implemented improvements to process design and enhanced solvent recovery since this guidance was published. This plant will be *constructed with "State of the Art" process advances in equipment and solvent recovery. The equipment to be utilized along with the piping/valve design and "Enhanced LDAR", as covered previously should be capable of reducing leaks to a minimum. In regards to the 16.5 tpy that the commenter speaks to, Perdue is confident that the actual emissions resulting from equipment leaks will be well below this amount. Note that the Solvent Loss Ratio (SLR) proposed for the plant will account for any emissions associated with component leaks. We believe that the proposed SLR limit, which is more stringent than the lowest emission limitation ever imposed on a soybean oil extraction plant in the United States, represents the proper mechanism to assure that fugitive hexane emissions from component leaks are minimized to the greatest extent possible. The proposed SLR of 0.125 gal/ton is more stringent than the SLR applicable to the ADM-Deerfield, MO plant, which is authorized to exclude emissions related to SSM events. The proposed permit does not authorize Perdue to exclude SSM-related emissions from the SLR.*

26.) One public commenter asserts that capture and RTO control are technically feasible for the 81.63 tons of hexane fugitives expected to be emitted from Meal Handling, based on Perdue's stated air flow requirement of 28,800 acfm. The same commenter also opines that capture of the air stream would increase the rate of volatilization of the hexane from the meal, and that vacuum evacuation of the meal would even increase this process. In opposition to this, Perdue previously raised 1.) fire/safety concerns, and 2.) a general assertion that fugitives are only released gradually from the meal. Please specifically explain these concerns [25 Pa. Code Sections 127.201(a), 127.205(1)]. In particular:

The comment that 81.63 tons of hexane in meal can be captured and combusted is incorrect, as it assumes that this entire amount is released on-site. The 81.63 tons alluded to is again based on the "Vegetable Oil Model Plants" memorandum, so this too is a best available number based on guidance. It is generally accepted that there will be an amount of "bound" hexane that leaves the site with the meal product, as EPA[10] has concluded. Perdue tested hexane concentrations associated with meal handling at existing operations, both before and after grinding/sifting and associated conveyance. These data indicate that fugitive VOC loss from this activity would be approximately 6.2 tons, with the remainder bound in meal that goes to storage or is shipped from the plant. The 6.2 tons associated with meal handling is generated from multiple emission points through the meal handling process, including meal conveying, meal grinding, meal sifting, and discharge conveying. Particulate matter emissions generated by these air streams are to be controlled by a baghouse collector operating at an air flow rate of 15,000 cfm.

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[10] *EPA Letter to the Governor of Indiana, August 10, 2006.*

The 6.2 tons per year of hexane emissions from meal handling operations (assuming 100% capture of potential emissions from meal handling) equates to approximately 6.8 ppmv hexane in the meal handling baghouse exhaust based on an air flow rate of 15,000 acfm. Based on vendor guarantees provided for RTO control devices discussed in response to issue #17, the projected VOC concentration is less than the guarantee outlet concentration provided by one vendor and at a level near the guarantee outlet concentration provided by the other two vendors. Thus, the application of an RTO air pollution control system to this exhaust stream would result in little or no control of VOC emissions due to the low concentration of organics in the exhaust stream. The commenter also states that "vacuum evacuation of the meal would even increase" volatilization of hexane from the meal. The proposed soybean processing plant will operate in a continuous mode at a daily soybean processing rate of 1,500 to 1,700 tons per day. We are unaware of any technology that currently exists to subject a continuous meal stream to a vacuum for the purpose of recovering a relatively small amount of hexane. We believe that the proposed SLR limit, which is lower than the most stringent emission limitation ever imposed on a soybean oil extraction plant in the United States, represents the proper mechanism to assure that fugitive hexane emissions from meal handling are minimized to the greatest extent possible.

- Why are the fire/safety concerns with capture of the meal fugitives specifically different or more compelling than those for the RTO. Per item 4 above, DEP believes that Perdue has conceded that safety concerns, although significant, do not definitively preclude installation of an RTO at a soybean processing facility?

We do not believe that there will be any fire/safety concerns associated with meal fugitive emissions beyond those experienced in any other operation that involves dust, as the concentration of hexane vapors exceeding 20% of the LEL will not be an issue.

- What is the numeric rate at which hexane is released from the meal, at what locations does this occur, and how specifically does this render RTO (or other) control technically infeasible at any of those locations?

The numeric rate (pounds/hour for example) at which the hexane is released from the meal is impossible to forecast. The loss will vary as it will be dependent on a number of extenuating variables which include meal quality, temperature, exposure to air, etc. We have estimated, based upon the sampling of like processes as discussed in issue #26, the total amount lost in meal grinding and sifting to be approximately 6.2 tons and considering the minimum number of operations prior to shipping/storage; equates to approximately 1.55 tons fugitive emissions/yr/operation based on maximum production rate. While this does not present an argument for technical infeasibility, as discussed above, the 6.2 tons combined or the 1.55 tons/operation from numerous sources of fugitive emissions is not readily captured and is not suitable for add-on controls such as an RTO or other control device. As noted above, the anticipated concentration of hexane vapors in the exhaust stream is at or below the emission rate guarantee provided by RTO *control equipment vendors, indicating that the use of such devices would result in little or no control of VOC emissions on these exhaust streams.*

- If much of the hexane from the meal is not released until the meal is shipped offsite, ought not Perdue revise its application to be reflective of actual hexane emissions at the site? In asking this question, DEP is cognizant that all of the hexane is, and must be, accounted for in the SLR calculations for the facility. But a separate and unrelated question, which may be relevant for other regulatory purposes, is what are the actual expected emissions from the site, unrelated to the SLR issue.

Perdue will exercise the mass balance reporting approach per MACT protocol to arrive at the numerical value of reporting emissions. All emissions for reporting and risk assessment purposes are assumed to be lost at the site. However the 81.63 tons alluded to, is again based on the "Vegetable Oil Model Plants" memorandum, so this too is a best available number based on guidance and does not take into account the efficiency of the process. It is generally accepted that there will be an amount of "bound" hexane that leaves the site with the meal product, as discussed previously. This amount will be dependent on environment conditions; and whether the meal is immediately shipped or stored on site. The expected fugitive hexane emissions at the site associated with soybean meal will be considerably less than the 81.63 tons As noted in PADEP's question, we believe that the appropriate mechanism to limit these emissions is through the proposed SLR limit, which will be the lowest emission limitation imposed on a soybean oil extraction plant in the United States.

27.) Perdue's application lists 26.87 tons per year of fugitive hexane emissions from the crude soy oil after treatment of the oil in the oil stripper, but does not investigate any control options for these residual emissions. Please either do a control technology evaluation for this source, or else (if much of the hexane from the oil is not released until the oil is shipped offsite) then consider revising the application to be reflective of actual hexane emissions at the site. DEP is cognizant that all of the hexane is, and must be, accounted for in the SLR calculations for the facility. But a separate and unrelated question, which may be relevant for other regulatory purposes, is what are the actual expected emissions from the site, unrelated to the SLR issue. [25 Pa. Code Sections 127.201(a), 127.205(1)]

The 26.87 tons alluded to are again an estimation based on the "Vegetable Oil Model Plants" guidance. This number is based on guidance and does not take into account the efficiency of the process and equipment improvements which will be utilized in this plant design. Accounting for plant efficiency and the testing conducted of like processes, the expected actual fugitive emissions from soy oil at the site are expected to be near zero. Any hexane that is "bound" in the oil as it exits the final oil stripper will ultimately *remain in the oil until it is further processed (i.e. refined) and will not be released at the plant site.*

28.) A public comment has questioned whether activities at the existing Perdue Marietta facility will be affected, or will increase, as a result of synergies with the proposed Perdue Bainbridge facility. Please provide information showing whether or not the existing Perdue Marietta facility does or does not meet the regulatory test for aggregation with the proposed Perdue Bainbridge facility. [25 Pa. Code Section 121.1

The proposed Bainbridge facility and the existing facility at Marietta will operate as separate entities. The facilities are separated geographically by approximately 2.3 miles and will not share a common labor force. They will operate under different SIC Codes, with the Bainbridge facility falling under SIC 2075 and the Marietta facility under SIC 5153. Neither facility will be dependent on the other, either to provide raw material or to handle finished product. The Bainbridge facility is designed to operate as an independent receiving and storage facility for soybeans only; it will receive soybeans directly from customers and supply the needs of the processing operations at the facility. The Marietta facility will continue to handle multiple grains, and its annual volume of soybeans will decrease as soybeans are directed to the Bainbridge facility when it is operational to eliminate additional handling.

29.) A public comment has questioned whether stack testing once every five years provides sufficient practical enforceability for the VOC stack emission limits on the main vents for the meal dryer, meal cooler and extraction process. The commenter suggested that DEP require a "VOC CEMS". DEP has not yet concluded that this is appropriate, especially given that no other emission source in PA is currently required to have a VOC CEMS. Please propose a means of making "practically enforceable" the VOC stack emission limits on main vents for the meal dryer, meal cooler and extraction process. [25 Pa. Code Sections 127.201(a), 127.205(1), 127.12(a)(3)]

Per the draft plan approval, once solvent extraction production levels reach a maximum rate the permittee shall perform stack testing within 60 days, but no later than 180 day for compliance demonstration of VOC sources 204, 205A, and 205B against limitations listed in the plan approval. During periods of time between the formal stack tests, Perdue proposes the following compliance demonstration, the permittee (Perdue) shall obtain a portable FID (Flame Ionization Detector) meter or like device, or contract for a third party, to perform a wet sample analysis (wet ppm) for VOCs (hexane) on each listed exhaust air stream. The obtained value coupled with the known volumetric flow rate (ACFM) at the time of the sample shall be calculated to obtain the pounds per hour rate for compliance purposes. This demonstration test shall be performed on sources 204, 205A, and 205B annually with compliance reporting contained in our annual compliance certification due January 31st each year. This requirement is not contained in any other *permit for the industry and provides a true depiction of instantaneous emissions. However if PADEP concludes that add-on controls are applicable for these sources, Perdue proposes that the SLR calculation and parametric monitoring (to be established) of the control device's operation (CAM) be sufficient for compliance demonstration. This would also be reported in Perdue's semi-annual report due January 31st and July 31st each year.*

30.) Please submit the revised PNDI and responses from the regulating authorities. [25 Pa. Code Section 127.12(a)(2)]

Updated PNDI of June 2015 submitted to PADEP on July 23, 2015.

31.) Please submit an updated compliance review form. [25 Pa. Code Section 127.12(a)(2)]

Updated Compliance Review form submitted to PADEP on September 4, 2015.

32.) Please respond specifically to the following public comment received by DEP, especially with regard to the assertion that 0.01 grains/dscf is achievable for the meal dryer and meal cooler vents: "*And let's look at BAT a little further, shall we? Perdue's proposed emissions from the meal cooler and the meal dryers are compared to the original Prairie Pride permit application as follows: Perdue; 1,400 tpd soybeans, 43.12 tpy dryer PM emissions, 45.51 tpy cooler PM emissions; Prairie Pride; 2,000 tpd soybeans, 0.8 tpy dryer PM emissions, 0.85 tpy cooler PM emissions; Perdue; 1,400 tpd soybeans, 43.12 tpy dryer PM emissions, 45.51 tpy cooler PM emissions; Ration Perdue/PP, 0.71 soybeans processed, 44.3 dryer PM emissions, 44.0 cooler PM emissions. The two factors together (Prairie Pride revised PM emissions, and size comparison of the two facilities) suggest that the Perdue request results in nearly eight times higher emissions than does the installed Prairie Pride project and that a BAT emission level of 0.01 gr/dscf is in fact achievable.*" [25 Pa. Code Section 127.12(a)(2)]

BAT refers to technology not emission limits. BAT is the equipment, devices, methods or techniques which will prevent, reduce, or control emissions of air contaminants to the maximum degree possible and which are available and may be made available. It is a source-specific determination which takes into account the design and operating conditions of the air contaminant source and the design and operating conditions of the control technology. It is determined on a case-by-case basis, considering, inter alia, the type of equipment and other control technologies proposed by the applicant, the facility's location, and the source and character of the waste stream. BAT is based upon whether the limitation could be sustained and verified over the life of the facility, recognizing actual operating capabilities and limitations. BAT does not require the imposition of the lowest achievable emission rate and what other facilities in other states achieve is not relevant to the determination of BAT. T.R.A.S.H. v. DER, 1989 EHB 487, 572 (April 28, 1989), affirmed T.R.A.S.H. v. DER, 132 Pa. Commw. 652, 659-662 (1990). Design engineers for the Perdue facility indicate that a particulate matter emission rate of 0.02 *gr/dscf from the Dryer exhaust and the Cooler exhaust is achievable with the use of a cyclone particulate matter control system, the conventional technology used by soybean processing plants. This emission rate is based upon the proposed Dryer/Cooler configuration that will be used at the plant and the use of high efficiency cyclone collectors. Based on the commitment to meet an allowable particulate matter emission rate of 0.02 gr/dscf, we have quantified PM emissions from the Dryer/Cooler stack as 6.48 pounds per hour, or 28.4 tons per year. These values were provided to equipment vendors to obtain a cost estimate for the cost to control particulate matter emissions to levels less than 0.02 gr/dscf through the use of additional add-on control technology. A discussion of this analysis is provided in Appendix H.*

33.) Please specifically explain why DEP should or should not impose as BAT for the meal dryer or meal cooler, the emission limits described in the following public comment received by DEP: "*An additional indication of the total unacceptable level of particulate emissions from the cooler/dryer exhausts in the Perdue plan is found in a PSD permit issued in August 2006 for a soybean processing and oil extraction plant in Kansas City, MO. This permit was for a facility designed to process up to approximately 6600 TPD of soybeans. The facility has 5 meal/dryer cooler cells. The first two cells are controlled by a scrubber with a combined PM-10 emission limit of 0.005 gr/dscf. The three final cells are controlled by cyclones with PM-10 emission limits of 0.007 gr/dscf.*" [25 Pa. Code Section 127.12(a)(2)]

As described in the response to issue #32 above, these values were provided to equipment vendors to obtain a cost estimate for the cost to control particulate matter emissions to levels less than 0.02 gr/dscf through the use of additional add-on control technology. A discussion of this analysis is provided in Appendix H. As noted above, the 0.02 gr/dscf emission rate that we believe is BAT is based on the use of high efficiency cyclone collectors and the equipment configuration proposed for the Pennsylvania facility.

34.) Please specifically explain why DEP should or should not impose as BAT for the meal dryer or meal cooler, the emission limit described in the following public comment received by DEP: "*A draft permit issued by Nebraska DEQ in May 2014 (Permit Number CP14-007) employs wet scrubber technology to limit PM and PM10 emissions to 0.0025 gr/dscf.*" [25 Pa. Code Section 127.12(a)(2)]

As described in the response to issue #32 above, Dryer and Cooler stack exhaust parameters were provided to equipment vendors to obtain cost estimates for the cost to control particulate matter emissions to levels less than 0.02 gr/dscf through the use of additional add-on control technology. A discussion of this analysis is provided in Appendix H. Based on vendor data on the cost for further controls and the design analysis performed by Perdue's equipment vendor, we conclude that an emission rate of 0.02 gr/dscf constitutes BAT.

35.) Please specifically respond to the assertion of one public commenter (Osman Environmental) that *"is absolutely clear from the documents provided by Perdue that* *they gave Nestec the unlawful particulate loadings in their application as inlet design values for the Nestec system."* As background to this comment, the same commenter also asserted that *". . . using the projected emissions in the application of 10.62 lbs/hr and 11.21 lbs/hr, again respectively [for the meal dryer and meal cooler], the emissions are calculated to be 0.072 gr/dscf and 0.064 gr/dscf. For low flows such as these, DEP regulations limit emissions to 0.04 gr/dscf."* [25 Pa. Code Sections 127.201(a), 127.205(1)]

We provided NESTEC with updated particulate loading data of 0.02 gr/dscf, which we have concluded constitutes BAT. This emission rate was derived by design engineers for the plant based on proposed equipment configuration and the use of high efficiency cyclone collectors.

36.) Depending on Perdue's answers to the above issues, please provide a revised version of the Nestec proposal using a more appropriate inlet particulate loading to the RTO and/or particulate control device, or else explain why such a revision is unnecessary. [25 Pa. Code Sections 127.201(a), 127.205(1)]

An updated proposal was obtained from NESTEC, using the particulate loading stated in the response to issue #35. This response is discussed in greater detail in Appendix E and Appendix H.

37.) Please verify the moisture contents & dry standard cubic foot (dscf) airflows for the following sources [25 Pa. Code Section 127.12(a)(2)]:

-Source ID 202, Bean Conditioning

140°, 6.854 lb/min water, 2500 acfm, 2,062 dscfm, not a source

-Source ID 203, Flaking Rolls

140°, 2.28 lb/min water, 18,000 acfm, 15,850 dscfm

-Source ID 204, Extraction Process

75°, 124 acfm, 117 dscfm

-Source ID 205A, Meal Dryer

145°, 104.8 lb/min water, 26,202 acfm, 18,892 dscfm

-Source ID 205B, Meal Cooler

130°, 61.0 lb/min water, 23,482 acfm, 18,892 dscfm

38.) Based on the dscf values provided above for 205A/205B, coupled with whatever grain/dscf limits are finalized for those sources, the facility wide PM limit will be adjusted accordingly. Please propose a revised facility PM limit based on this, keeping in mind issues raised above regarding the grain/dscf limits. [25 Pa. Code Section 127.12(a)(2)]

Based on the commitment to meet an allowable particulate matter emission rate of 0.02 gr/dscf, we have quantified PM emissions from the DC stack as 6.48 pounds per hour, or 28.4 tons per year. This will reduce the proposed facility-wide annual PM limit from 178.3 tons to 146.5 tons.

39.) In response to public comments regarding the hexane risk assessment, DEP has determined that it is necessary to incorporate VOC lb/hr limits into the plan approval for LAER, for the three vents that already are proposed to have VOC lb/ton of soybean limits. The values determined by DEP are based on operating 8,760 hr/yr since this timeframe was used for air modeling, and are as listed below. Please provide Perdue's evaluation regarding the appropriateness and accuracy of these proposed limits [25 Pa. Code Section 127.12(a)(2)]:

We acknowledge the fact that the proposed limits established in the draft permit for these sources were in turn divided by 8,760 hours to reach the pounds per hour numbers that follow.

Source ID 204, Extraction Main Vent = 1.65 lb VOC/hr

7.24 tons / 8760= 1.653/hr

Source ID 205A, Meal Dryer = 11.51 lb VOC/hr

50.42 tons / 8760= 11.511/hr

Source ID 205B, Meal Cooler = 5.76 lb VOC/hr

25.21 tons / 8760= 5.755/hr

40.) Please state whether Perdue believes that the proposed equipment is expected to be physically capable of meeting the proposed lb VOC/hr limits, above, on a continuous basis, including during periods of initial plant shakedown, and/or normal startup, shutdown and/or malfunction (please answer each of these four scenarios separately for each of the three affected vents, 204, 205A and 205B). If Perdue believes there may be time periods when these limits cannot be met, please state their likely duration and the likely magnitude of the emissions during those time periods. Please also respond to the following comment from Osman Environmental in the context of this issue: *"There are also significant issues relative to the practical enforceability of these limits. DEP is requiring a once every 5-year stack test on the three sources for which they have established emission rate limits. Perdue actually requested that LAER be established on a facility-wide basis, contrary to law, based on the "variability of the process." Perdue also stated: The vegetable oil industry has experienced fluctuating facility-wide VOC emission rates over time at existing, well-established facilities, even where there have been no changes in facility equipment, operational staff, or other known parameters impacting VOC emissions. These VOC emission rate fluctuations could be attributed only to soybean shipments of varying quality. Perdue also included a chart in their application showing variations of SLR of as much as a factor of 3.5 from one month to the next, based on (they allege) the quality of the soybeans processed. So Perdue's own data establish, beyond any doubt, that a once every 5-year test does not provide practical enforceability."* [25 Pa. Code Section 127.12(a)(2)]

Perdue responds to this issue by addressing first the question of its ability to meet the proposed VOC limits contained in the permit and then discussing the relationship of these limits to health risk indicators of concern in the Health Risk Assessment.

<u>Ability to Meet Proposed Limits</u>

Perdue expects that it will meet the proposed VOC pound per hour limits for vents 204, 205A, and 205B during normal operations, but SSM events may lead to situations where the allowable VOC pound per hour limits for these vents will be exceeded. A brief discussion of Perdue's anticipated ability to meet these limits during each of the four scenarios is provided below:

- *Initial Plant Shakedown: During initial plant shakedown operations Perdue expects that VOC emissions from vents 204, 205A, and 205B will fluctuate as adjustments are made to optimize unit operations to minimize emissions and maximize product quality. Given the fact that the shakedown process involves operation of equipment that has not been operated previously, it is conceivable that equipment malfunctions may occur leading to increases in emissions. While Perdue will minimize emissions to the extent possible during the shakedown process, there may be periods during initial plant shakedown when the allowable hourly VOC emission rate for vent 204, 205A, and/or 205B are exceeded for short durations. The duration of such events will vary depending on the nature of the event from one hour to several hours.*

- *Startup: During normal plant startups, Perdue expects that VOC emissions from vents 204, 205A, and 205B will be in compliance with the proposed pound per hour emission limits. In situations where a plant startup occurs following a malfunction event, however, it is conceivable that these allowable emission rates may be exceeded until equipment reaches steady-state operation.*

- *Shutdown: As with startups, Perdue anticipates that VOC emissions from vents 204, 205A, and 205B will comply with proposed pound per hour emission limits during scheduled plant shutdowns. In instances where a shutdown occurs as a consequence of a malfunction event (described in detail in response to issue #10 in PADEP's notice of deficiency) it is possible that VOC emissions from vents 204, 205A, and/or 205B will exceed allowable limitations for a short duration until equipment can be safely shut down. The duration of such events will vary from one hour to several hours depending on the nature of the event.*

- *Malfunctions: As described previously, there are a variety of potential malfunction events that can occur at a soybean oil processing facility, many of which will result in excess VOC emissions for short durations. In the event of an equipment malfunction, Perdue will work quickly to either bring equipment back into normal working order or to take plant operations out of service. Whenever a shutdown occurs as a consequence of a malfunction event, Perdue will ensure that equipment is repaired and in proper working order prior to bringing the plant back on line.*

A summary of possible SSM events, the potential duration of these events, and a discussion of the magnitude of emissions during these periods is provided below. The events described are ones in which excess hourly VOC emissions have the potential to occur, although such events will not necessarily result in an exceedance of hourly VOC limits. Pursuant to 40 CFR Part 63, Subpart GGG, Perdue will prepare and implement a startup, shutdown, malfunction (SSM) plan to minimize emissions during such events. Although the SSM plan will be developed and implemented with the primary objective of minimizing VOC emissions, it cannot be relied upon to eliminate entirely excess VOC emissions during such events.

Loss of Cooling Water Pumps

The loss of cooling water pumps could cause the hexane concentration in vent 204 to easily exceed 25% of the LEL. The duration of such events can be as short as minutes, or as long as hours. The time to correct the issue will depend not only on the nature of the malfunction, but also when the event occurs.

Loss of Mineral Oil Flow

Because the mineral oil absorber removes nearly all of the hexane in the gas stream that enters the device, the loss of mineral oil flow can result in an increase in hexane emissions of roughly two orders of magnitude above the normal mineral oil vent exhaust based on an assumed 99% VOC removal efficiency for the mineral oil absorber. The duration of such an event can vary from a few minutes to hours and may result in the need to shut the plant down until repairs can be performed.

Loss of Temperature in the Desolventizer/Toaster

The magnitude of emissions occurring as a result of such an event and the duration of such an event will vary considerably depending on the nature and severity of the problem. This can result in increased emissions from Vent 204, 205A, and/or 205B.

Loss of Temperature in the Distillation System

Hexane emissions from Vent 204 will increase as a result of temperature loss in the distillation system, although emissions would likely remain below 25% of the LEL. The time to correct this condition can vary from minutes to more than an hour, depending on the nature of the problem.

Loss of Chilled Water Flow

Hexane emissions from Vent 204 will increase as a result of lost chilled water flow, although emissions would likely remain below 25% of the LEL for hexane. The time to correct this issue can vary from minutes to more than an hour, depending on the nature of the problem.

Comments on Health Risk Assessment

In accordance with standard practice, PADEP conducted an independent air quality analysis and health risk assessment (HRA) of the Perdue facility and "found no unacceptable risks from the operations."

This finding is consistent with that of the 2013 Perdue HRA[11] and the 2014 Perdue HRA Addendum[12], which concluded that "Because maximum impacts are well within acceptable health limits, hexane emissions from operation of the proposed facility will not create adverse chronic or acute health risks." The risk assessment conducted by Perdue was performed following standard practice as set forth in an HRA protocol that was submitted to PADEP. Comments received from PADEP were addressed and incorporated into the 2013 Perdue HRA and the 2014 Perdue HRA Addendum.

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[11] ENVIRON. 2013. "Air Dispersion Modeling and Health Risk Assessment, Proposed Soybean Processing Facility in Lancaster County, PA." ENVIRON International Corporation, Emeryville and San Francisco, California. June.

[12] ENVIRON. 2014. "Addendum to Air Dispersion Modeling and Health Risk Assessment, Proposed Soybean Processing Facility in Lancaster County, PA." ENVIRON International Corporation, Emeryville and San Francisco, California. April.

Both chronic and acute risks were considered. Chronic risks were calculated at locations where the extended exposures required for chronic effects could occur (e.g., residences, workplace/office locations). Acute risks were calculated at all offsite locations. USEPA's and PADEP's recommended AERMOD dispersion model was used.

AERMOD is known (e.g., see discussion in the 2104 Perdue HRA Addendum) by the scientific community, USEPA, and others to overestimate air concentrations under low-wind stable atmospheric conditions, especially for near-ground level sources, both conditions that will be present at the proposed facility. To address AERMOD's low-wind overestimation bias, USEPA introduced non-default low-wind adjustment options in AERMOD, including a low-wind adjustment option in AERMET, the meteorological preprocessor for AERMOD.

PADEP air quality staff recommended that Perdue consider reprocessing meteorological data for use in the HRA to address concerns regarding AERMOD performance under low-wind conditions. In response, dispersion modeling for the HRA was conducted using meteorological datasets processed by AERMET using both default settings and the low-wind adjustment option.

Default setting results were presented in the 2013 Perdue HRA. In the 2014 Perdue HRA Addendum, results were updated using meteorological data processed using the AERMET low-wind adjustment option. Because they were adjusted to address AERMOD's low-wind overestimation bias, risk results in the 2014 HRA Addendum, which are typically half or less of the risks in the 2013 Perdue HRA, are the most accurate of Perdue's risk assessment results. Note that, in July 2015, USEPA proposed[13] to incorporate AERMOD/AERMET low-wind adjustment methods into the standard default version of the AERMOD modeling system.

With respect to chronic risks, the maximum 5-year average n-hexane exposure concentration calculated in the 2014 HRA Addendum at any residential location was about 1/24th of the USEPA Chronic RfC health benchmark, and was lower at all other residential locations. Similarly, the highest commercial hexane exposure concentration calculated at any residential location was about 1/10th of the USEPA PPRTV, and was lower at all other residential locations. With respect to acute risk, the 5-year maximum 1-hour n-hexane concentration calculated at any offsite location was less than 1/1200th of

[13] USEPA. 2015. "Revision to the Guideline on Air Quality Models: Enhancements to the AERMOD Dispersion Modeling System and Incorporation of Approaches to Address Ozone and Fine Particulate Matter; Proposed Rule." 80 FR 453340. U.S. Environmental Protection Agency, July 29.

the USEPA AEGL-2 and about 1/3rd of the TLV x 3/20 benchmark proposed by PADEP, and was lower at all other offsite locations.

To be health protective, risks calculated by PADEP and Perdue were designed to be conservatively high. For example, acute risks were overestimated by assuming the occurrence of a low-probability combination of adverse circumstances: (a) worst-hour emissions in the 5 years modeled in the HRA occur at the same time for all emission points, (b) worst-hour n-hexane concentrations from each emission point are additive (regardless of whether those maximum concentrations occur during the same hour), (c) worst-hour emissions occur during the hour having the poorest-dispersion conditions in the 5 years modeled, (d) worst-hour concentrations occur at the same location, and (e) an individual is present and exposed at that exact same hour and location.

Such a combination of low-probability circumstances is highly unlikely. Note that the combined probability of 5-year worst-hour meteorological conditions occurring during the same hour as 5-year worst-hour emissions is less than 1 in a billion [= (1 / (5 yrs x 8,760 hrs)) x (1 / (5 yrs x 8,760 hrs))].

Note also that the acute toxicity benchmark proposed by PADEP (TLV x 3/20) and used in the 2014 Perdue HRA Addendum is about 450 times more stringent than employed by USEPA (AEGL-2) in its Clean Air Act acute residual risk assessments. Moreover, none of the four highest-ranked and most authoritative health effects databases recommended by USEPA list any acute toxicity value for n-hexane.

It is not standard practice to include upset/malfunction conditions in an HRA such as that conducted for the Perdue facility. Doing so would require an assumption of non-compliant facility operation and/or prior knowledge of inherently unknowable events. Instead, under the draft permit's Source Group Plan Approval Restrictions #002, upset conditions are required to be addressed in a Startup, Shutdown & Malfunction (SSM) Plan, which is specifically required by the Vegetable Oil NESHAP. The SSM Plan must provide detailed procedures for operating and maintaining the facility to minimize emissions during an SSM event, and must "specify a program of corrective action for malfunctioning process and air pollution control equipment and reflect the best practices now in use by the industry to minimize emissions."

Hexane concentrations calculated in the 2014 Perdue HRA Addendum are sufficiently below health benchmark concentrations to provide "headroom" to accommodate variations in hexane emissions. For example, using the PADEP's acute toxicity value (TLV x 3/20), the 2014 Perdue HRA Addendum calculated that the n-hexane acute HQ for the most exposed individual resident was 0.090, less than 1/10th of the health benchmark HQ of 1 and lower at every other residence. The HQ for the most exposed individual worker at the RRF was 0.23, more than four times lower than an HQ of 1. The HQ for at the highest point along the property line was 0.35, about three times lower than an HQ of 1. That point, however, is located on the common property line with the RRF, and is not accessible to the general public. HQs calculated using USEPA's acute toxicity value (AEGL-2) are all about 450 times lower.

A commenter asserted that data from Perdue show "increases of a factor of 3.5 on a monthly average emission rate." While the commenter did not identify which Perdue data were used to obtain this factor of 3.5, it appears to have been extracted from a document developed for USEPA and provided by Perdue with its plan approval application. An analysis of the data relied on by the commenter shows that those data are from facility operations prior to USEPA's setting of the Vegetable Oil NESHAP with which Perdue must comply. All of the data in the document were collected in 1995 to assist USEPA in developing that emission standard, which was not adopted until 2001 and did not require compliance until 2004, nearly ten years after the data relied on by the commenter were collected.

The commenter's 3.5 factor was the highest such factor by a wide margin among the 17 "best performing" vegetable oil processing facilities examined in that document, including seven soybean processing facilities. In addition, the data relied on by the commenter were not from a soybean processing facility, and the facility was materially smaller than the Perdue facility. In addition, the commenter represents that Perdue claims hexane levels could exceed the upper explosive limit (UEL) of 7.4% (74,000 ppm), compared to what the commenter asserts would be an annual average concentration of 30 ppm. The commenter then states that, if the UEL of 7.4% represents worst-hour emissions, the acute HQ for the most exposed worker at the RFF and at the four highest residences would be unacceptable, that is, greater than 1.

The commenter is incorrect for several reasons. First, the commenter based the comment on the original June 2013 Perdue HRA, and apparently did not consider updated subsequent risk results, which reflected design refinements that included reductions in the facility's n-hexane emissions. Second, by assuming worst-hour emissions could occur at the n-hexane UEL of 7.4%, the commenter assumes that worst-hour emissions could be nearly 2,500 times higher than annual average hourly emissions. This cannot be correct, since it would imply that the facility operated for extended periods of time while exhausting n-hexane at explosive concentrations, that is, between the 1.1% LEL and the 7.4% UEL. No such operations would occur, and in fact, monitoring is required by the permit to ensure that hexane concentrations remain well below those levels.

41.) In a letter dated 4/10/15, Perdue's counsel stated that "*COMMENT 4: Section E, Source Group Plan Approval Restrictions; Group 5, LAER Requirements, Page 72-73, Condition #003 & Condition #007: Pursuant to the LAER determination, the n-hexane concentration of the extraction solvent must not exceed 50%, by weight. Perdue is required by Condition #007(b) to, inter alia, record the n-hexane concentration by weights for each delivery of the solvent: the name and address of the solvent supplier, the type of solvent including the product or vendor identification number, and the n-hexane concentration, by weight. Although Perdue Agribusiness will utilize a 45% n-hexane product for this facility, the typical n-hexane concentration by weight of this solvent can range from 44-52%. To account for variations in the n-hexane concentration, Condition #003 should be modified to provide that a solvent labeled 45% n-hexane must be* *utilized."* DEP is considering to accede to this comment, but also to add a new provision imposing a facility solvent n-hexane content limit of 50% by weight, based on a 12-month rolling average. Please provide Perdue's evaluation regarding the appropriateness and accuracy of this proposed limit [25 Pa. Code Section 127.12(a)(2)].

Perdue has no issues with rolling twelve month average, deemed per our request. N-hexane concentration on product received should be less than or equal to 50% on a twelve month rolling average.

The comment provided to PADEP on August 23 by Fred Osman and our response to the issues raised in this correspondence is provided below.

I realize there are no open comment periods at this time on the Perdue permit but I wanted to provide a clarification on an earlier comment submitted. I think we all agree it would be better to solve issues now than at the EHB to the extent we can. As you may recall, I have been arguing for burning the exhaust in the Lancaster County RRF or installing an RTO, both of which I think are technically and economically feasible. The RRF option represented what I thought was the easiest path to direct thermal oxidation, since the facility was already on site. However, if Lancaster County simply says they won't accept the exhaust stream that is sufficient to eliminate that option as far as the RRF is concerned but it doesn't eliminate the technology approach. I was reminded of this point by a comment on Penn-Live to a letter written by Dr. Evans encouraging DEP to require RTO. The commenter replied with a link to Anguil showing RTOs and the wide range of facilities that use them. The Anguil web page has a tab "industries served" and I reviewed the Anguil page on ethanol/biodiesel, which is a similar type of industry with similar exhaust characteristics. In addition to RTO's for this industry, Anguil also shows direct thermal oxidation as an applicable technology and notes that this technology can accept high organic particulate loading and minimizes explosion risk, the only two issues I am aware of that Perdue is raising as to why RTO is infeasible. So if DEP agrees that RTO is technically infeasible due to these issues, you will also need to explain why direct thermal oxidation cannot be used. I think that is an even higher bar.

We addressed the question concerning the willingness of Lancaster County RRF to accept exhaust streams from Perdue in our response to issue #1 above. Elsewhere in the response document, we discuss the feasibility of RTO control technology to this facility.

In regards to the feasibility of direct thermal incineration, we contacted Anguil Environmental (Anguil) to obtain more detailed information on the feasibility and costs *associated with the use of such controls on the hexane exhaust stream from the dryer/cooler exhaust. In an e-mail dated September 7, 2015, Anguil provided ERM with estimated capital and operating costs for a thermal oxidizer on the dryer/cooler exhaust stream[14] (attached as Appendix I). Based on the proposed operating parameters, Anguil estimated that operating costs for such a system would be approximately $550 per hour, or nearly $5,000,000 per year. In providing his cost estimate, Mr. Kudronowicz points out that costs for a system such as this are not readily available, as such systems are costly to operate and generally less economical than other control technologies. Because the operational costs for such a system are so high (nearly $70,000 per ton of VOC controlled based on operating costs alone), we have focused our technical analysis on the costs to install and operate a RTO control system that can meet technical and safety requirements.*

Please contact me at (317) 706-2006 if you have additional questions regarding any of these responses.

Sincerely,

David R. Jordan

David R. Jordan, P.E.
Partner

Appendix A – Letter from LCSWMA
Appendix B – Letter from Airlanco
Appendix C – Letter from Global Risk Consultants
Appendix D – Prairie Pride Letter to Missouri DNR
Appendix E – Economic analysis of RTO control options
Appendix F – E-mail from Bartlett Controls regarding biofiltration
Appendix G – E-mail from Bartlett Controls regarding carbon adsorption
Appendix H – Economic analysis of PM control options
Appendix I – E-mail from Anguil Environmental regarding thermal oxidizer operating costs

[14] E-mail from Jeff Kudronowicz, Anguil Environmental to David Jordan, ERM dated September 7, 2015

Appendix A
Letter from LCSWMA

Rethink. Recover. Renew.

LCSWMA

1299 HARRISBURG PIKE | PO BOX 4425 | LANCASTER, PA 17604
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www.lcswma.org

September 11, 2015

Mr. Herb Frerichs
Perdue AgriBusiness
PO Box 1537
Salisbury, MD 21802-1537

REF: Request to Process Captured Hexane Emissions Vapor

Dear Mr. Frerichs:

This letter serves as a formal response to your request that LCSWMA consider processing hexane emission vapor generated by the planned soy oil extraction facility at our Lancaster Waste-to-Energy facility. You have estimated that if Perdue could develop an efficient method to actually recover the vapor, the makeup of that vapor is approximately 165,000 pounds per year of hexane-containing air and 119 tons per day of water. Due to numerous operational and contractual concerns with doing so, LCSWMA cannot agree to process this vapor.

We considered the following factors in making our determination:

1. Unknown effects on our facility's emissions profile – LCSWMA cannot determine how processing this vapor would affect our emissions profile. LCSWMA and our contracted facility operator, Covanta, strive for exceptional environmental compliance and adherence to our air emission permit levels as determined by our Title V permit. LCSWMA cannot risk non-compliance with permit levels.
2. Negative impact on electric production - processing 119 tons per day of water will have negative consequences to the electric production of the facility by degrading the higher heating value (HHV). As the HHV is lowered by the introduction of moisture, electric production would become less efficient. More tons of waste would need to be processed to produce the same unit of electric.
3. Contractual Issues - We have a detailed agreement with our facility operator with specific performance, guarantee and payment parameters. Processing this vapor would require re-negotiation of terms in ways which are not feasible at this time.

LCSWMA values our partnership with Perdue and will continue to support the development of the planned soy oil extraction facility. If you have any questions, feel free to contact me at 717-397-9968.

Sincerely,

James D. Warner, CEO

cc: Alexander Henderson III, Thomas F. Adams

Appendix B
Letter from Airlanco

AIRLANCO

8/24/2015

Adam,

Per our conversations, below is our understanding of the baghouse application being considered by Perdue for filtration of soybean meal particles exhausted from its Dryer/Cooler cyclones.

Given your request to filter the exhaust air stream from the soybean meal dryer-cooler cyclones; we understand the discharge air stream to be as follows:

- The baghouse would be used to filter exhaust air discharges of soybean meal particles exiting Dryer/Cooler cyclones
- The baghouse filtration would be located after cyclone separation
- The airstream to be filtered is ~49,700 acfm @ 140F @ humidity ratio of 0.046 lb/lb (or grain/grain)
    - We calculate this to be 52% relative humidity (RH) @ 100 F adjusted basis
- PTFE membrane media would be used for baghouse filtration
- The baghouse would discharge to the atmosphere

This airstream cannot be successfully filtered with a baghouse. The maximum relative humidity we recommend with this type of product airstream is less than 33% RH @ 100 F adjusted basis. Please understand that 33% RH is a maximum, and the RH in the airstream should be below 25%, if feasible.

Secondly, PTFE membranes can provide a high degree of particulate removal under the appropriate circumstances. However, in high humidity applications, such as those with oilseeds, cereal grains, and with other hydrophilic products, the "mudding-film" effect prevents a successful baghouse application.

Although PTFE membranes have a low friction coefficient and are somewhat hydrophobic, we believe that soybean meal dust (small particles) will become saturated in short order and form a mud-film on the PTFE bags and throughout the baghouse. This mud-film will cover every surface inside the baghouse and inlet ductwork and will eventually prevent air from discharging through the filter membranes. In fact, the mud-film formation will be so extensive the baghouse will become inoperable. Given our experience with a plethora of baghouse filtration applications across many industries, we do NOT recommend introducing the above airstream into baghouses with PTFE membrane media filtration.

Please let me know if you have any questions.

Nathan Huning

Senior Sales Engineer

AIRLANCO
312 South Highway 73, PO Box 398
Falls City, Nebraska
USA 68355

P 402.245.2325 | **F** 402.245.5196 | **TF** 800.500.9777 | ***airlanco.com***

AGI
AG GROWTH INTERNATIONAL

Appendix C
Letter from Global Risk Consultants

Global Risk Consultants®

Global Risk Consultants Corp.
100 Walnut Avenue
Suite 501
Clark, NJ 07066
Phone: (732) 827-4400
Fax: (732) 827-4495

January 6, 2016

Mr. Gregory Rowe
Perdue AgriBusiness, LLC
Vice President of Grain Operations and Safety Health & Environment
P.O. Box 1537
Salisbury, MD 21802-1537
greg.rowe@perdue.com

Subject: Proposed Regenerative Thermal Oxidizer
Proposed Pennsylvania Crush Plant
Perdue AgriBusiness, LLC

Dear Mr. Rowe:

In response to the request of Perdue AgriBusiness, I am writing to provide my evaluation of safety considerations in connection with the conceptual proposal to provide a regenerative thermal oxidizer (RTO) for the extraction process mineral oil vent line and the dryer/cooler (DC) vent line at the above referenced facility. I am a professional engineer and certified fire protection specialist with 30 years of experience in loss prevention and control in various flammable liquid industries, including the soybean solvent extraction industry. It is my professional opinion that the installation of an RTO on either the mineral oil vent or DC vent introduces new potential fire & explosion hazards into the process and therefore we recommend against its use for this flammable solvent extraction operation. RTOs are not utilized in this industry group due to the significant quantities of flammable solvent within the process and the necessity of strict protocol to prevent potential ignition sources at or near the extraction process.

The hazard associated with venting the mineral oil and DC vent lines through the RTO is the potential for hexane-laden vapors within the explosive range passing through the natural gas-fired combustion chamber of the RTO. This scenario would result in an explosion damaging the RTO and potentially flashing back through the supply ductwork to the extraction equipment, resulting in an Extraction Building fire and explosion(s). The potential results are disastrous. The utilization of an RTO provides the following new fire/explosion hazards to the site:

- Introduction of ignition source at the extraction process.
- Potential fire/explosion within the RTO.
- Potential fire/explosion flash back via RTO ductwork to the extraction process.
- Dependence upon safety controls & LEL detection to prevent explosions potentially allows such event upon equipment failure.
- Location of RTO a minimum 100 ft. from extraction process could expose other site structures or adjacent landowner property.

In the event you elect to proceed with the RTO installation against our best loss control advice, the following protection measures should be undertaken to help minimize the risk. Please note, however, that despite these measures, it is our view that conveying concentrated hexane vapors to an RTO creates greater risk for plant operations:

1. The RTO should be installed outside the vapor control & restricted areas, a minimum distance $\geq$ 100 ft. from the Extraction Building per NFPA 36.

2. Provide UL Listed continuous combustibles analyzers (hexane gas detection) arranged to sound an alarm at 25% LEL (lower explosive limit) and shut-down the fume source & process burners at 50% LEL.

3. The fumes should be automatically diverted to atmosphere (safe location) upon 50% LEL detection utilizing positive seating, fast-acting slide gates or dampers for isolation. The slide gates & dampers should be fail-safe (dump/bypass mode).

4. The combustibles analyzers should alarm upon loss of signal or power.

5. The combustibles analyzers should be installed according to the manufacturer's instructions and calibrated at least quarterly.

6. The fume supply to the RTO should be provided with high & low pressure switches.

7. A low temperature sensor/switch independent of operation controls should be provided within the RTO combustion chamber. Interlock the switch to ensure the RTO is at operating ("ready") temperature prior to the introduction of the fume supply.

8. Provide a high temperature sensor/switch ($\leq$20% higher than normal temperature) independent of the operating controls in the combustion chamber and the exhaust duct, arranged to shut-down the supply of fuel, fumes, & process.

9. The temperature sensors should be fail-safe.

10. UL Listed flame arresters or explosion protection systems should be provided on the fume supply ductwork to prevent flash back between the RTO and the process equipment (extraction process).

11. Design the interconnecting ductwork between the extraction equipment and the RTO to prevent flammable deposits, vapors, & gases from accumulating. Provide driplegs, traps, knockout pots or scrubbers for the ductwork, and maintain the duct temperature to prevent vapors from condensing on the interior surfaces of the ductwork. An interior ductwork inspection and cleaning program should be developed.

12. Provide proper fuel burner safety controls for the RTO gas-fired burner, including two safety shut-off valves with solenoid vent line, burner flame scanner, high & low gas pressure switches, and automated purge cycle.

13. Provide explosion venting for the RTO (1 ft^2 venting per 100 ft^3 of combustion chamber volume).

The provision of these safety controls and fire protection measures will help mitigate the risks associated with the proposed RTO; however, an extraction process fire and/or explosion is considered a higher probability even with these safeguards and protection measures. It also is important to note that utilizing an RTO will continue to require the fume supply to vent to atmosphere during abnormal process or RTO operation periods and associated shutdowns and start-ups. Finally, because the extraction process may have to be shut down in the event of an RTO malfunction due to permit emission limitations, the addition of an RTO system to the soybean solvent extraction process may cause more frequent SSM events and associated excess hexane losses. Any increase in SSM events, if not excluded from the facility-wide solvent loss ratio (SLR) limitation, will have a deleterious impact on the plant's SLR. Based upon the foregoing, it is my professional opinion that the additional risks associated with the proposed RTO significantly outweigh any potential positive benefits related to emission reductions associated with the installation.

If you have further questions regarding this project, please let me know. I can be reached via e-mail at bryan.davis@globalriskconsultants.com or by phone at (828) 238-6395.

Sincerely,

Bryan Davis, P.E.

Bryan Davis, P.E.
Senior Consultant
Global Risk Consultants

Appendix D
Prairie Pride Letter to MDNR

2007-09-016

September 7, 2007

Mr. Kendall Hale, P.E.
Missouri Department of Natural Resources
Air Pollution Control Program
1659 E. Elm
Jefferson City, MO 65101

Re: **Construction Permit Amendment**
Prairie Pride, Inc.
Permit 022007-004

Dear Mr. Hale:

On behalf of Prairie Pride, Inc. (PPI) Aquaterra Environmental Solutions, Inc. (Aquaterra) is submitting the enclosed application for amendment to Construction Permit 022007-004 for construction of a 2,000 ton per day soybean processing facility with an integrated 33 million gallon per year biodiesel production plant. Enclosed are two copies of the application package and a check for the $100 filing fee.

The application is prompted by several design changes to the soybean processing facility, which is currently under construction. Per previous discussions with your staff, the application package consists of appropriate revisions to the entire application under which permit 022007-004 was issued. The primary design changes are described below:

1. Removal of Regenerative Thermal Oxidizer (RTO) to control VOC emissions from the Mineral Oil Scrubber (MOS) within the soybean oil extraction process. Since the submittal of the last application (November 2006), PPI experienced a change in the engineering firm responsible for plant design. After further discussion with current design engineers, National Fire Protection Association (NFPA) board members and experts in the soybean processing industry, PPI has been convinced that the safety hazards presented by the RTO outweigh the minimal VOC reduction that would be achieved through its use on the MOS vent (approximately 20 tons per year). NFPA standards for extraction plants require that any flame operations be located at least 100 feet away from the processing area. PPI's plant design under which permit 022007-004 was issued met this requirement. However, process upsets and malfunctions, in addition to normal shutdown procedures can result in near lower explosive limit (LEL) conditions at the RTO vent exhaust.

PPI is committed to minimizing hexane emissions from the extraction process as much as possible, and has made this commitment evident to its members. PPI will continue to explore innovative technologies and methods for VOC reduction within a soybean extraction plant. To that end, PPI is also committed to maintaining plant-wide VOC emissions below 250 tons per year (tpy). If necessary, PPI will limit soybean oil production to remain below the 250 tpy cap.

Based on this change, PPI requests removal of special conditions 1B, 2A, 8A and appropriate modification to condition 2C in permit 022007-004.

2. Removal of duct burners associated with HRSG and addition of a backup boiler. PPI has determined that a backup boiler will serve more efficiently than equipping the HRSG with duct burners. Based on this change, PPI requests removal of special conditions 5 and 8C in permit 022007-004.

3. Removal of baghouses to control Dryer/Cooler (DC) discharge emissions (EP-16 & EP-17). PPI has determined that the moisture content of the exhaust streams from the dryer and cooler discharge cyclones prohibits the use of baghouses as control devices. These emissions will be routed to a common stack, now referred to as the DC stack (EP-16).

4. The DC stack change (and various other changes to PM_{10} estimates), altered the PM_{10} emission inventory, requiring additional dispersion modeling to verify compliance with PM_{10} standards. Modeling was conducted using the AERMOD system.

We sincerely appreciate your continued efforts on this project. Please feel free to contact me if you have any questions regarding this submittal.

Sincerely,
Aquaterra Environmental Solutions, Inc.

Mike Van Cleave, P.E.
Project Manager

cc: John Nelson, PPI
Kevin McClayland, A-Lert Construction

Enclosures

Appendix E
Economic Analysis of RTO Control Options

Table of Contents

1.0 INTRODUCTION/BACKGROUND

In June 2013, Perdue submitted a revision to its Lowest Achievable Emission Rate (LAER) Evaluation for the proposed facility ("LAER Evaluation"), which provided a "top-down" analysis of various control options for VOCs. The LAER Evaluation concluded that combustion of hexane emissions from the primary VOC emissions unit—the Dryer/Cooler vent—was not technically feasible due both to safety risks and excessive cost.

On July 8, 2015, the Department issued its TDL, which requested that Perdue re-examine this conclusion. To that end, Perdue retained Environmental Resources Management (ERM), a professional engineering firm with experience in evaluating and permitting pollution control systems for soybean solvent extraction facilities. ERM has undertaken a fresh and comprehensive reevaluation of the feasibility of VOC combustion control at Perdue's proposed soybean oil extraction facility in Conoy Township, Lancaster County, Pennsylvania. The responses provided in this Appendix were generally prepared based upon joint efforts of ERM and Perdue, with such joint responses noted herein using the terms "we" or "our". In instances where a response represents or references an opinion or effort that is solely attributable to one or the other, this will be noted by specific reference to ERM or Perdue.

Our reevaluation of the feasibility of VOC combustion control concludes that such control appears to be technically feasible from an engineering and design perspective based on vendor supplied information, but only at a very substantial cost and at an increased safety risk. The construction and operation of a VOC combustion system at a soybean solvent extraction facility has an annual estimated cost of at least $29,400/ton VOC for the Mineral Oil Vent and $42,200/ton VOC for Dryer/Cooler Vent. The estimated cost of VOC control is five to eight times the cost generally deemed to be reasonable under the New Source Performance Standards of the Clean Air Act ("NSPS"), which Congress directed be applied as a partial guidepost under LAER. At this level of cost burden, neither Perdue nor any other rational soybean processor would construct a soybean oil processing facility. Therefore, in ERM's professional opinion, a VOC emission rate derived from combustion control technology is not "achievable" under the LAER provisions of the Clean Air Act.

1.1 SOYBEAN SOLVENT EXTRACTION INDUSTRY

We have determined that all soybean solvent processing facilities in the United States are located in areas attaining the National Ambient Air Quality Standard ("NAAQS") for ozone. The proposed Perdue facility would be the first in an ozone nonattainment area. To our knowledge, no other facility in this sector in the United States combusts VOCs from either the Mineral Oil Vent or the

Dryer/Cooler vent. Thus, the central issue in the evaluation of LAER for the Perdue soybean processing plant is the extent to which technology utilized in other applications is transferable to the soybean processing industry. The extraction process uses hexane, a flammable substance, which leads to the need to incorporate features to mitigate potential safety hazards that would be created by certain control technology approaches. The process experiences wide fluctuations in VOC concentration, due to variations in soybean quality and other factors that further complicate control equipment design.

1.2 TECHNOLOGY TRANSFER EVALUATION

The Department has requested that Perdue evaluate the potential for technology transfer but Pennsylvania's nonattainment new source review regulations do not require a major new source to assess the potential to transfer control technology from another source category. According to EPA, state permitting authorities are not required to analyze technology transfer under LAER. See EPA, Part 51-—Requirements for Preparation, Adoption and Submittal of Implementation Plans, Emission Offset Interpretive Ruling, 44 Fed. Reg. 3274 (Jan. 16, 1979) ("the reviewing authority may consider transfer of technology from one source type to another where such technology is applicable. Although Congress changed the definition of LAER, EPA continues to believes [sic] that technology transfer may be considered in determining LAER") (emphasis added); EPA, "Draft New Source Review Workshop Manual" (Oct. 1990), p. G.3 ("The reviewing agency also can require consideration of technology transfer.") ("EPA NSR Manual") (emphasis added).

Even if technology transfer is appropriate under Pennsylvania law[i], EPA guidance states that it is not appropriate if the gas streams or the processes generating the gas streams are dissimilar. EPA NSR Manual, p. G.3. As Perdue explained in its 2013 LAER Evaluation, the VOC gas stream generated by soybean solvent extraction is quite different from other manufacturing industries, such as pulp & paper, printing, or particle board. The unique characteristics of the VOC gas stream generated by the soybean solvent extraction process make it unsuitable for the transfer of thermal oxidation technology from other source categories. See e.g., Groce v. Wellington Devel., EHB Docket No. 2005-246-R (Nov. 22, 2006), p. 58 (holding that Selective Catalytic Reduction technology (SCR) could not be the basis for NOx LAER for a

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[i] Whether technology transfer is even part of the Department's nonattainment new source review program is an open question. See Department's Reply Brief in Groce v. Wellington Devel., EHB Docket No. 2005-246-R (Nov. 22, 2006), p. 46, n. 20 ("[Pennsylvania's] LAER definition does not provide for technology transfer…[which only] is found in EPA's NSR Manual.").

circulating fluidized bed boiler burning waste coal because the technology was never applied to this source category, the source category produced a gas stream with significantly greater dust and particulates unsuitable for SCR, and the plan approval already required the source to achieve the lowest NOx emission limitation in the source category), affirmed, Groce v. Department of Environmental Protection, 921 A.2d 567, 575 (Pa. Cmwlth. Ct. 2007).

1.2.1 Safety Risks

There are certain safety risks associated with soybean oil extraction plants that differ from other manufacturing facilities that may utilize hydrocarbon solvents as a part of their processes. The National Fire Protection Association (NFPA) recognizes that such risks exist, and has promulgated standards specific to soybean oil extraction plants in NFPA 36, "Standard for Solvent Extraction Plants". Thus, while the use of air pollution control devices that utilize open flames may be safe in certain industries, such controls pose a risk for fire or explosion at soybean oil extraction plants.

1.2.2 Moisture

The particulate matter and moisture loading characteristics of the meal dryer and cooler vent streams are unique. The combined vent stream contains approximately 10,000 lb/hour of water, as drying and cooling air is used to remove condensed steam from the desolventized meal. The relative humidity of the two vent streams are nearly saturated, indicating the temperature of the vent streams are close to their respective dew points. Further cooling of the meal dryer and cooler vents will result in the water vapor condensing onto the process equipment.

1.2.3 Adhesive Characteristics of Particulate Matter

In addition, the particulate matter contained in the meal dryer and cooler vent streams is unique. The particulates are not a dry, granular inorganic material, such as soot or silica, but a fine particulate matter comprised of stray particles of soybean meal – an organic agricultural product consisting of approximately 50% edible proteins. An unusually high protein content gives soy dust adhesive properties not found in any other form of particulate matter, which poses unique control challenges. In fact, soy meal powder was widely used as an adhesive in a variety of applications before petroleum-based adhesives supplanted it due to lower cost and more durability. When the fine soybean meal particles come in contact with moisture, the proteins in the particles become sticky and glue-like. It is expected that the sticky meal particles will accumulate within process equipment and require periodic removal and cleaning.

1.2.4 Variability

Unlike other VOC gas streams soybean oil solvent extraction is highly variable and this is unique. The key raw material—the soybean—is an agricultural product that is bathed in solvent. The solvent penetrates the membranes of soybean oil cells and is absorbed into their cellular structure. The solvent is then removed by the desolventizer-toaster (DT), the efficiency of which varies significantly depending upon the characteristics of the soybean cells saturated with the solvent. The magnitude of VOC emissions from a soybean solvent extraction facility is directly related to the effectiveness of the DT in removing the solvent at the cellular level. As soybean meal enters the DT, it contains 30% to 35% solvent by weight. As a result of desolventizing efficiencies, the meal exiting the DT contains little residual solvent. By minimizing the residual solvent content in the processed soybean meal, there is a corresponding reduction of VOC emissions resulting from both the meal dryer and cooler vents and fugitive VOC emissions resulting from the release of residual solvent in processed soybean meal during subsequent meal handling operations. But DT efficiency varies with the quality and characteristics of the soybeans. Variations in moisture content and the physical condition of the soybean oil cells have a significant impact on solvent retention at the cellular level and the ultimate efficiency of solvent recovery. The size, moisture content, oil content, age of soybeans, and the amount of debris and fines, vary from year to year and even within a year, depending on soil conditions, weather conditions, and age of the soybeans. Like the grapes used in winemaking, soybeans are influenced by where, when, and how they are grown. Adverse weather conditions during a soybean growing season can adversely change the quality of the soybeans, which directly impacts upon process efficiencies in oil extraction and solvent recovery. Therefore, the quality and characteristics of the soybeans have a significant impact on solvent retention and resulting emissions. For this reason, it is well-documented that even well-run, established soybean solvent extraction facilities operating at "steady-state" experience significant fluctuations in facility-wide VOC emission rates. See, EPA, Office of Air Quality Planning and Standards Emission Factor and Inventory Group, Emission Factor Documentation for AP-42, Section 9.11.1, Vegetable Oil Processing Final Report, p. 4-13; Perdue LAER Evaluation, 2013, pp. 12-13. EPA has acknowledged that the significant particulates in soybean solvent processing gas streams coupled with large fluctuations in VOC concentrations limits the feasibility of thermal treatment.

The EPA issued a CTG in 1978 recommending a control device on the main vent (e.g., mineral oil scrubber) and a control device on the dryer/cooler vent (e.g., carbon adsorber or incinerator). In 1979, the CTG was rescinded pending further information that was to be provided upon completion of the field testing for the New Source Performance Standards (NSPS) project. But in 1980 all work was discontinued on the NSPS for VOC and particulate emissions from soybean oil extraction plants because no demonstrated control technology could be identified.

See EPA, "Control Techniques for Volatile Organic Compound Emissions from Stationary Sources," (Dec. 1992), p. 4-75. "If a given control technology requires 'a series of two or more baghouses or a control system whose cost greatly exceeds that of the base facility...,' such that a typical source could not reasonably be built, then the control technology is not "achievable" for purposes of LAER. See EPA, "Huntsville Incinerator - Determining Best Available Control Technology (BACT)" (Memo from Gary McCutchen to Bruce P. Miller, April 22, 1987) (explaining that if the cost of a control option is so far above the norm that it would objectively prevent the construction of any new source then the control technology is not BACT) and EPA, "Guidance on Determining Lowest Achievable Emission Rate (LAER)" (Memo from John Calcagni to David Kee, Feb.. 28, 1989) (acknowledging that EPA's guidance on marginal cost analysis set forth in its April 22, 1987 memo, "Huntsville Incinerator - Determining Best Available Control Technology (BACT)" also applies to LAER determinations).

1.3 DESIGN FACTORS IMPACTING CONTROL EQUIPMENT COSTS

In application documents previously provided to the Department for the proposed soybean oil extraction plant, several questions were raised regarding the technical feasibility of thermal air pollution control systems to control hexane emissions from such operations. While we conclude based on discussions with vendors that such controls appear to be technically feasible, certain design considerations must be addressed in order for such systems to safely and efficiently operate on such an application, as described in Section 1.2 above. These design considerations translate into increased costs that are reflected in the cost analysis provided in this Appendix. Safety and technical issues that are addressed as a part of equipment design include the following:

- NFPA 36, "Standard for Solvent Extraction Plants", Section 8.2.8 specifies that any open flame must be located a minimum of 100 feet from processing equipment containing flammable materials, including the extractor and Desolventizer-Toaster-Dryer-Cooler (DTDC). This results in increased costs to install necessary ductwork to move exhaust streams to be controlled from the equipment where emissions are generated to the control device.

- Control equipment must be designed in a manner to be physically capable of treating or bypassing an exhaust stream that contains hexane emissions in a concentration above 25% of the lower explosive limit (LEL). Although such concentrations are not expected as a part of normal operations, the potential for equipment malfunctions that can lead to such concentrations must be recognized and factored into equipment design to avoid the possibility of fire or explosion.

- Control equipment must be designed with additional safety features to minimize risks associated with the potential for fire or explosion. In addition to features discussed above, control equipment must be designed using electrical components that are designed to be used in potential explosive environments.

- The presence of residual particulate matter in the Dryer/Cooler exhaust stream must be accounted for in equipment design. Even though high-efficiency cyclone control systems will be utilized on these exhausts, particulate matter from the Dryer/Cooler exhaust will result in the potential for fouling of RTO control devices. Supplemental control systems to limit particulate matter from the Dryer/Cooler exhaust must be included in equipment design to address this issue.

- Soybean oil extraction plants operate most efficiently and most economically if equipment runs continuously for 24 hours per day, 365 days per year. Even though control equipment designs provided by equipment vendors include supplemental particulate matter control systems to minimize the impact of particulate matter deposition on thermal oxidizer control equipment, equipment manufacturers all indicate that periodic burnout of residue will be necessary to maintain proper VOC destruction efficiency. As a consequence, RTO control systems are designed with three beds allowing for continuous burnout of particulate matter deposition on RTO surfaces.

- Because the plant is to be located adjacent to the LCSWMA incinerator for the purpose of utilizing steam available from LCSWMA for energy needs, the Perdue plant site does not have natural gas service. Any equipment design that involves the need for supplemental fuel must include costs necessary to construct propane storage tanks and vaporization systems, or to construct a natural gas pipeline to the site.

2.0 VENDOR QUOTES

In order to evaluate the technical feasibility of VOC combustion controls, we contacted several equipment vendors to evaluate the technical ability of RTO control systems to control VOC emissions from Perdue's proposed soybean oil extraction facility while addressing our safety concerns for such systems. The following vendors were contacted and asked to provide cost estimates as described below:

- NESTEC, Inc. of Douglassville, Pennsylvania was asked to update the cost analysis they had provided previously to address current proposed air flow rates and pollutant loadings, and to clarify the performance guarantee that they would provide as a part of their quote. NESTEC provided their cost estimate under the assumption that the Mineral Oil Vent and Dryer/Cooler Vent were combined into a single exhaust stream and controlled.

- Adwest Technologies, Inc. of Anaheim, California was asked to provide cost estimates for the costs to control VOC emissions from the Mineral Oil Vent exhaust and Dryer/Cooler Vent exhaust as separate control systems.

- Anguil Environmental Systems, Inc. of Milwaukee, Wisconsin was asked to provide cost estimates for the costs to control VOC emissions from the Mineral Oil Vent exhaust and Dryer/Cooler Vent exhaust as separate control systems.

Vendors were asked to identify the recommended method of control based on the characteristics of each of the exhaust streams, the capital costs that would be associated with each control option, the estimated operating costs associated with the recommended control options, the guarantee that the vendor would be willing to provide as a part of each control option, and any assumptions or caveats that would accompany the vendor's proposal. This information was then used to evaluate the feasibility of add-on control technology for these exhaust streams and to estimate the relative costs of such controls.

The economic analysis of the use of an RTO control device on the Mineral Oil Vent and on the Dryer/Cooler exhaust is provided in Section 3.0 of this document. Although equipment vendors believe that RTO control devices may be designed to address potential safety concerns regarding the use of such control devices at soybean oil extraction plants, we do not believe that the benefits of such controls on the Mineral Oil Vent outweigh the risks associated with the use of such controls. This is discussed in greater detail in Section 8.0 of this document.

3.0 DESIGN PARAMETERS UTILIZED IN COST ANALYSES

In order to quantify complete costs associated with each control option, we computed the capital cost of control equipment, annual operating expenses associated with control equipment options, and any other costs that would be incurred as a part of each option. Capital and operating cost estimates provided by equipment vendors were based on stack parameters provided to vendors that were consistent with current design parameters for the plant.

3.1 STACK PARAMETERS UTILIZED

Stack parameters provided to the equipment vendors are summarized below.

3.1.1 VOC Emissions from Mineral Oil Vent

For the Mineral Oil Vent, the design parameters provided were:

- Air flow rate = 500 acfm (max)
- Temperature gases out = 75 F
- Moisture content = 1-2%
- Hexane emission rate (average) = 1.65 lb/hr (based on 365 days/yr.)
- Exhaust stream may have hexane concentrations that reach or exceed 20% of the LEL during upset events.

3.1.2 VOC Emissions from Dryer/Cooler Exhaust

For the Dryer/Cooler exhaust, the design parameters provided were:

- Air flow rate = 49,700 acfm during normal operations; 54,670 acfm during startup
- Temperature gases out = 138° F on average, may be as low as 120° F during the winter
- Water content in exhaust = 9,948 pounds per hour
- Hexane emission rate (average) = 17.27 lb/hr (based on 365 days/yr.)
- Particulate matter emission rate = 0.02 gr/dscf, or 6.2 lb/hr total combined for the exhaust stream. This emission rate represents the expected emission rate at the outlet of high efficiency cyclones. Emissions

from these units may increase on a short term basis as a consequence of equipment malfunction or plugging of cyclones (uncontrolled PM emissions from these units are 693 pounds per hour; vendors were requested to consider the impact of short term particulate matter increases on control equipment operation/maintenance/performance).

- In the event the anticipated particulate matter emission rate from high efficiency cyclones exceeds the level that equipment vendors believe would be necessary to guarantee the ability to achieve VOC control on a continuous basis, equipment vendors were asked to identify the input particulate matter emission parameters that would be necessary.

- We noted to vendors that the exhaust stream may have hexane concentrations that reach or exceed 20% of the LEL during upset events.

Given the description provided above for the Dryer/Cooler vent, vendors were asked to indicate if they would recommend a pre-filter prior to the RTO control system in order to assure that the system would operate properly. In the event a pre-control system was recommended, vendors were asked to provide estimated capital and operating costs for such systems.

3.2 ADDITIONAL COST ESTIMATES

3.2.1 Ductwork

In order to meet National Fire Protection Association (NFPA) requirements, equipment with an open flame, such as the RTO, must be located at least 100 feet from process equipment. A quote was obtained from R&N Welding Fabrications, Inc. (R&N) in Salisbury, Maryland for the cost of ductwork and the ductwork support system to move vapors from hexane processing equipment to a location where a RTO control system could be safely situated (Attachment 1). R&N was asked to provide cost estimates for a 10" duct for the mineral oil vent stream and for a 50" duct for the Dryer/Cooler vent stream.

The cost to insulate ductwork was quantified based on the costs to insulate ductwork on the Dryer/Cooler exhaust at Perdue's Salisbury, Maryland facility (Attachment 2). Actual costs incurred on a dollar per square foot of insulation basis were quantified and utilized to estimate insulation costs.

3.2.2 Fuel System

In the case of both the mineral oil vent control system and a control system for the Dryer/Cooler vent, a fuel source will be required. Because the current site design does not include a supply for natural gas, the cost analysis for both RTO control equipment scenarios must include the cost to add the necessary fuel source to the site. In the case of the mineral oil vent system, the fuel requirement will be relatively minor and would most economically be met through the addition of a propane system. For the mineral oil vent analysis, we included the cost to install a propane system at the site, including propane storage (two 1,000 gallon propane storage tanks), piping, and a 2 million Btu per hour propane vaporizer.

For the Dryer/Cooler vent, the fuel requirement is considerably higher than for the mineral oil vent system due to the fact that the air stream is two orders of magnitude larger. We concluded that it is not practical to rely on a propane combustion system for the Dryer/Cooler vent due to the cost differential between propane and natural gas. We determined that the most cost effective means to provide necessary fuel to a RTO for the Dryer/Cooler vent stream is by installing a natural gas pipeline to the site. The cost to construct the necessary pipeline was included in the capital cost for the Dryer/Cooler vent control analysis and amortized over the life of the project. This cost estimate was provided by UGI Energy Services, Inc. (Attachment 3).

3.2.3 Additional Site-Specific Cost Factors and Adjustments to EPA Standard Cost Assumptions

Additional site-specific cost factors and adjustments were made to standard EPA cost equations in order to provide an accurate projection of estimated capital and operating costs for a RTO control system. These included the following:

- Operating and maintenance labor costs were estimated using a labor cost of $32 per hour.

- Operating and maintenance labor hour requirements for the mineral oil vent were estimated assuming 0.5 hours per shift for operating labor and 0.5 hours per shift for maintenance labor. Operating and maintenance labor hour requirements for the RTO for the Dryer/Cooler vent were estimated as 2.0 hours per shift for operating labor and 1.0 hour per shift for maintenance labor. Operating and maintenance labor hour requirements for the Wet ESP for the Dryer/Cooler vent were estimated as 4.0 hours per shift for operating labor and 1.5 hours per shift for maintenance labor.

- Capital costs were amortized based on an interest rate of 5% and an equipment life of 10 years.

Additional cost figures were computed using standard EPA cost assumptions for thermal oxidizer control systems[ii] and wet ESP control systems[iii].

[ii] EPA AIR POLLUTION CONTROL COST MANUAL - SIXTH EDITION (EPA 452/B-02-001), SECTION 3 - VOC CONTROLS, SECTION 3.2 - VOC DESTRUCTION CONTROLS, CHAPTER 2 – INCINERATORS, SEPTEMBER 2000, AVAILABLE AT HTTP://WWW3.EPA.GOV/TTN/CATC/DIR1/CS3-2CH2.PDF

[iii] EPA AIR POLLUTION CONTROL COST MANUAL – SIXTH EDITION (EPA 452/B-02-001), SECTION 6 – PARTICULATE MATTER CONTROLS, CHAPTER 2 – WET SCRUBBERS FOR PARTICULATE MATTER, JULY 15, 2002, AVAILABLE AT HTTP://WWW3.EPA.GOV/TTN/CATC/DIR1/CS6CH2.PDF

4.0 *MINERAL OIL VENT CONTROL SYSTEM*

Responses provided by equipment vendors were first reviewed to determine the technical feasibility of additional controls on the mineral oil vent system to further control VOC emissions reduced by the mineral oil absorber. To the extent that the addition of such controls was determined to be feasible, capital and operating cost data provided by vendors was combined with site specific cost information to quantify the estimated overall cost to operate such controls on the mineral oil vent exhaust.

4.1 *VENDOR RESPONSES*

Based on responses provided by Adwest and Anguil, we conclude that it is technically feasible to install an RTO control system on the mineral oil vent system to control VOC emissions. We compared capital and operating cost estimates provided by both Adwest and Anguil for the mineral oil vent system as well as control efficiency guarantees provided by both vendors. Based on this review, we concluded that the two quotes were generally comparable in regards to the degree of control that would be achieved. For the purpose of this analysis, we performed our analysis using cost estimates provided by which is the lower of the two responses, and

4.2 *COST SUMMARY*

A summary of estimated capital and operating costs associated with the installation of a RTO to control VOC emissions from the Mineral Oil Vent is summarized in Table 1 below.

Table 1 – RTO FOR THE MINERAL OIL SYSTEM VENT		
Item	**Cost**	**Comments**
Equipment Cost	$142,000	Vendor
Instrumentation	$14,200	10% of Equipment Cost
Taxes	$8,520	PA Sales Tax = 6%
Freight	$7,100	5% of Equipment Cost
Total	$171,820	
Foundations and Supports	$13,746	8% of Total Purchased Equipment Cost
Handling and Erection	$24,055	14% of Total Purchased Equipment Cost
Electrical	$1,718	1% Total Purchased Equipment Cost
Ductwork	$48,000	R&N Welding Fabrications, Inc.
Ductwork Support Bridge	$264,500	R&N Welding Fabrications, Inc.

Item	Cost	Comments
Insulation	$37,700	$60/sq. ft. ductwork (cost for ductwork insulation at Perdue Salisbury, Maryland plant)
Compressed Air System	$19,994	Vendor quote of
Painting	$1,718	1% of Total Purchased Equipment Cost
Security Fence	$10,309	Vendor Quote
Propane System	$15,464	Vendor Quote (Two 1,000 Gal Propane Storage Tanks Plus 2 MMBtu/hr Vaporizer)
Total	$437,204	
Total Direct Costs - DC	$609,024	
Engineering	$17,182	10% of Total Purchased Equipment Cost
Construction Expenses	$8,591	5% of Total Purchased Equipment Cost
Contractors Fees	$17,182	10% of Total Purchased Equipment Cost
Start-up	$16,000	Vendor
Performance Test	$27,000	Vendor quote for VOC testing
Contingency	$5,155	3% of Total Purchased Equipment Cost
Total Indirect Costs	$91,110	
Total Capital Investment	$700,133	
ANNUAL COST		
Operator Labor	$17,520	0.5 hr/shift
Supervision	$2,628	15% of Operating Labor
Maintenance Labor	$17,520	0.5 hr/shift
Maintenance Parts	$17,520	Equal to Maintenance Labor
UTILITIES		
Electricity	$701	Vendor
Propane	$843	Vendor
Total Direct Cost	$56,732	
Overhead	$33,113	60% of O&M
Administrative Charges	$14,003	2% Total Capital Investment
Property Taxes	$7,001	1% Total Capital investment
Insurance	$7,001	1% Total Capital investment
Capital Recovery CRFxTCI	$90,670	5% interest; 10 year equipment life
Total Indirect Cost	$151,789	
Total Annual Cost	$208,521	

It should be noted that the contingency value utilized in Table 1 reflects the standard EPA cost analysis assumption of 3% of the purchased equipment cost. We believe that the underlying assumption made in quantifying this value is that the equipment is to be installed on an application and in a manner consistent with the manner in which this type of control equipment has been used in the past. Given the uncertainties associated with the use of these control units on a source type where they have never been used before, we believe that the standard contingency assumptions underestimate the value that one would use in this situation. The standard contingency assumptions do not account for the fact that there are no comparable systems in operation to evaluate and no systems engineering/design work or bench testing has been conducted to identify system flaws that could result in system malfunction. Further to this point, Perdue's property loss control consultant, Global Risk Consultants (GRC), has identified several safety features that would be necessary should an RTO be utilized at the facility that have not been incorporated in the cost figures provided in Table 1. These features are delineated in a letter from GRC that is included as Appendix C to the Technical Deficiency Letter response document.

The results of this analysis show that the estimated annualized cost to construct and operate a RTO to control VOC emissions from the Mineral Oil Vent is $208,521 per year.

4.3 CONTROL EFFICIENCY

[redacted] provided an equipment guarantee with their cost estimate of [redacted] as [redacted] or [redacted] control of VOC emissions, whichever was less restrictive. Based on the design parameters summarized in Section 2.1.1 above, we determined that the [redacted] control efficiency resulted in the highest emission rate. Based on the typical expected emission rate of 1.65 pounds per hour of hexane emissions, the expected reduction in VOC emissions based on the vendor guarantee is 7.1 tons per year of VOC emissions. This assumes no bypassing events during which high concentrations of hexane associated with equipment malfunctions must be vented directly to atmosphere for safety reasons. Any such events would serve to reduce the quantity of VOC emissions that would be removed by the control system.

Based on the cost data summarized above and the equipment guarantee provided by the vendor (assuming no bypassing events), the control system proposed for the mineral oil vent system would result in a reduction in VOC emissions of 7.1 tons per year, which equates to a cost of approximately $29,400 per ton of VOC controlled. Bypassing events would serve to further reduce the quantity of VOC emissions actually controlled, increasing the cost of controls on a dollar per ton of VOC controlled basis.

5.0 DRYER/COOLER VENT CONTROL SYSTEM

Responses provided by equipment vendors were first reviewed to determine the technical feasibility of add-on controls on the Dryer/Cooler vent system to control VOC emissions in this exhaust. To the extent that such controls were determined to be feasible, capital and operating cost data provided by vendors was combined with site specific cost information to quantify the estimated overall cost to operate such controls on the Dryer/Cooler vent exhaust.

5.1 VENDOR RESPONSES

We first evaluated the equipment design proposed by each vendor to assess the ability of each design to meet the desired VOC control from the Dryer/Cooler exhaust. All three vendors recommended the use of an additional particulate control system prior to the RTO in order to guarantee that target VOC emission reductions could be achieved. All three vendors also recommended the use of a three-bed RTO control device in order to allow for continuous burnout of particulate matter in the device. The prefilter particulate controls proposed by each vendor were:

- Adwest – MicroMist Wet Scrubber with a 20" pressure drop
- Anguil – E-Tube® Wet Electrostatic Precipitator or Sly Venturi Scrubber
- NESTEC – Wet Electrostatic Precipitator or Venturi Wet Scrubber with a 35" differential pressure drop

Because the wet scrubber proposed by Adwest was the lowest cost control option both in regards to capital and operating costs, we performed a more detailed evaluation of this unit to confirm, based on operating experience with this unit, that it would be capable of achieving the desired particulate removal prior to an RTO on an ongoing basis. A summary of the analysis of the capabilities of this wet scrubbing unit by Perdue staff is provided as Attachment 4 to this document. Based on this analysis, we conclude that the wet scrubber included with the Adwest proposal could not be relied upon to provide adequate pre-filtering of particulate matter prior to a RTO on a continuous basis.

Based on responses provided by Anguil for the Dryer/Cooler vent as a stand-alone analysis and by NESTEC for the combined mineral oil/dryer-cooler vent system, we conclude that it appears to be technically feasible to install an RTO control system on the Dryer/Cooler Vent (or combined mineral oil/dryer-cooler vent) to control VOC emissions. We compared capital and operating cost estimates provided by Anguil (Attachment 6) and NESTEC (Attachment 7) for these control equipment options as well as control efficiency guarantees provided by each of the vendors. Based on this review, we concluded that the Anguil and NESTEC quotes were generally comparable in regards to the anticipated capital and operating costs for the respective control systems, however the [redacted] quote provided an equipment VOC control efficiency guarantee that equated to a higher control efficiency, and thus a lower cost on a dollars per ton of pollutant controlled basis. For the purpose of this analysis, we have performed our analysis using cost estimates and performance guarantees provided by [redacted] based on the greater removal efficiency provided.

5.2 *COST SUMMARY*

A summary of estimated capital and operating costs associated with the installation of a RTO to control VOC emissions from the Dryer/Cooler Vent is summarized in Table 2 below.

Table 2 – RTO FOR THE DRYER/COOLER EXHAUST		
Item	**Cost**	**Comments**
Equipment Cost	$1,510,000	Vendor
Instrumentation	$151,000	10% of Equipment Cost
Taxes	$90,600	PA Sales Tax = 6%
Freight	$75,500	5% of Equipment Cost
Total	$1,827,100	
Foundations and Supports	$146,168	8% of Total Purchased Equipment Cost
Handling and Erection	$255,794	14% of Total Purchased Equipment Cost
Electrical	$18,271	1% Total Purchased Equipment Cost
Insulation	$18,271	1% Total Purchased Equipment Cost
Painting	$18,271	1% of Total Purchased Equipment Cost
Electrical Building	$31,250	Building cost estimate provided by [redacted]
Natural Gas Line	$1,455,000	UGI Energy Services, Inc.
Total	$1,943,025	
Total Direct Costs - DC	$3,770,125	
Engineering	$182,710	10% of Total Purchased Equipment Cost
Construction Expenses	$91,355	5% of Total Purchased Equipment Cost
Contractors Fees	$182,710	10% of Total Purchased Equipment Cost
Start-up	$36,542	2% of Total Purchased Equipment Cost
Performance Test	$27,000	Vendor Quote for VOC Testing
Contingency	$54,913	3% of Total Purchased Equipment Cost
Total Indirect Costs	$575,130	

Total Capital Investment	$4,345,255	
ANNUAL COST		
Operator Labor	$70,080	2 hrs./shift
Supervision	$10,512	15% of Operating Labor
Maintenance Labor	$35,040	1 hr/shift
Maintenance Parts	$35,040	Equal to Maintenance Labor
UTILITIES		
Electricity	$112,128	Vendor
Natural Gas	$216,810	Vendor
Total Direct Cost	$479,610	
Overhead	$90,403	60% of O&M
Administrative Charges	$86,731	2% Total Capital Investment
Property Taxes	$43,365	1% Total Capital investment
Insurance	$43,365	1% Total Capital investment
Capital Recovery CRFxTCI	$562,730	5% interest; 10 year equipment life
Total Indirect Cost	$826,944	
Total Annual Cost	$1,306,554	

As noted above, in order to insure that the RTO will be able to operate on a continuous basis, each of the three equipment vendors recommended that a pre-filtration system be installed prior to the RTO. A summary of the estimated capital and operating costs associated with the installation of a to control particulate matter emissions from the Dryer/Cooler exhaust based on the quote provided by is summarized in Table 3 below.

Table 3 – for the Dryer/Cooler Exhaust		
Item	**Cost**	**Comments**
Equipment Cost	$2,045,000	Vendor
Instrumentation	$204,500	10% of Equipment Cost
Taxes	$122,700	PA Sales Tax = 6%
Freight	$102,250	5% of Equipment Cost
Total	$2,474,450	
Foundations and Support	$148,467	6% of Total Purchased Equipment Cost
Handling and Erection	$989,780	40% of Total Purchased Equipment Cost
Electrical	$24,745	1% of Total Purchased Equipment Cost
Ductwork*	$341,850	R&N Welding Fabrications, Inc.
Ductwork Support Bridge*	$264,500	R&N Welding Fabrications, Inc.
Piping	$123,723	5% of Total Purchased Equipment Cost
Insulation	188,500	$60/sq. ft. of ductwork (cost of ductwork insulation at Perdue Salisbury, MD plant)

Painting	$24,745	1% of Total Purchased Equipment Cost
Pump Building	$31,250	
Total	$2,137,559	
Total Direct Costs - DC	$4,612,009	
Engineering	$247,445	10% of Total Purchased Equipment Cost
Construction Expenses	$247,445	10% of Total Purchased Equipment Cost
Contractors Fees	$247,445	10% of Total Purchased Equipment Cost
Start-up	$14,600	Vendor
Performance Test	$6,000	Vendor quote
Contingency	$74,234	3% of Total Purchased Equipment Cost
Total Indirect Costs	$837,169	
Total Capital Investment	$5,449,177	
ANNUAL COST		
Operator Labor	$140,160	4 hours per shift Operating Labor
Supervision	$21,024	15% of Operating Labor
Maintenance Labor	$52,560	1.5 hr/shift
Maintenance Parts	$52,560	Equal to Maintenance Labor
UTILITIES		
Electricity	$77,088	Vendor
Chemicals (NaOH + Defoamer)	$21,330	Vendor
Water	$9,461	Vendor (4 gpm)
Total Direct Cost	$374,183	
Overhead	$178,257	60% of O&M
Administrative Charges	$108,984	2% Total Capital Investment
Property Taxes	$54,492	1% Total Capital investment
Insurance	$54,492	1% Total Capital investment
Capital Recovery CRFxTCI	$705,693	5% interest; 10 year equipment life
Total Indirect Cost	$1,101,917	
Total Annual Cost	$1,476,100	

* Additional cost necessary to move vapors a safe distance from processing equipment pursuant to NFPA requirements.

It should be noted that the contingency value utilized in Table 2 and Table 3 reflect the standard EPA cost analysis assumption of 3% of the purchased equipment cost. We believe that the underlying assumption made in quantifying this value is that the equipment is to be installed on an application and in a manner consistent with the manner in which this type of control equipment has been used in the past. Given the uncertainties associated with the use of these control units on a source type where they have never been used before, we believe that the standard contingency assumptions underestimate the value that one would use in this situation. The standard contingency assumptions do not account for the fact that there are no comparable systems in operation to evaluate and no systems engineering/design work or bench testing has been conducted to identify system flaws that could result system malfunction. Further to this point, Perdue's property loss control consultant, GRC, has identified several safety features that would be necessary should an RTO be utilized at the facility that have not been incorporated in the cost figures provided in Tables 2 and 3. These features are delineated in a letter from GRC that is included as Appendix C to the Technical Deficiency Letter response document.

The results of this analysis show that the estimated annualized cost to construct and operate a wet ESP and RTO to control VOC emissions from the Dryer/Cooler exhaust is $2,782,654.

5.3 CONTROL EFFICIENCY

[redacted] provided an equipment guarantee with their cost estimate of [redacted] ppmv [redacted] or [redacted] control of VOC emissions, whichever was less restrictive. Based on the design parameters summarized in Section 2.1.2 above, we determined that the [redacted] ppmv guarantee resulted in the highest emission rate. Based on the typical expected air flow rate of 49,700 acfm the expected reduction in VOC emissions based on the vendor guarantee is 66.0 tons per year of VOC emissions.

Based on the cost data summarized above and the equipment guarantee provided by the vendor, the control system proposed for the Dryer/Cooler exhaust would result in a reduction in VOC emissions of 66.0 tons per year, which equates to a cost of approximately $42,200 per ton of VOC controlled.

6.0 ANALYSIS OF CONTROL COSTS

A discussion of the estimated cost of controls relative to the requirement to meet LAER for this project is provided below.

6.1 MINERAL OIL VENT CONTROL COSTS

As described in Section 4.0 above, the use of a RTO control device on the mineral oil vent system would achieve a VOC emission reduction of 7.1 tons per year at a cost of approximately $29,400 per ton of VOC controlled.

We note that there are no emission limitations in an implementation plan of any state that impose a limit on VOC emissions from the mineral oil vent for a soybean oil extraction plant that would require the use of a VOC control device nor are there any soybean oil extraction plants in the United States that utilize a control device on the exhaust from the mineral oil vent. Although the $700,000 estimated capital cost of controls for the Mineral Oil Vent is less than one percent of the total plant capital investment of $80,000,000, this investment results in relatively little reduction in overall VOC emissions and increased risk of fire, according to GRC. As discussed more fully in Sections 7.0 and 8.0, below, based on these factors, the cost of such controls on a dollar per ton basis and safety considerations, we conclude that LAER for the mineral oil vent is an emission rate of 1.65 pounds of VOC per hour with no additional control device beyond the use of a mineral oil absorber.

6.2 DRYER/COOLER VENT CONTROL COSTS

As described in Section 5.0 above, the use of a and RTO control device on the Dryer/Cooler exhaust would achieve a VOC emission reduction of 66.0 tons per year at a cost of approximately $42,200 per ton of VOC controlled. As is the case with the potential mineral oil vent system controls above, we note that there are no emission limitations in an implementation plan of any state that impose a limit on VOC emissions from the Dryer/Cooler exhaust for a soybean oil extraction plant that would require the use of a VOC control device nor are there any soybean oil extraction plants in the United States that utilize a control device on the exhaust from the Dryer/Cooler.

The estimated total capital investment of nearly $10,000,000 represents a substantial capital cost that is not borne by other soybean oil extraction plants in the United States. This represents 12.5% of the estimated capital cost for the plant of $80,000,000. As discussed more fully in Section 7.0 and 8.0, below, based on these factors, the cost of such controls on a dollar per ton basis and safety considerations, we conclude that LAER for the Dryer/Cooler Vent is an emission rate of 17.3 pounds of VOC per hour with no required add-on control device.

7.0 CONSIDERATION OF ECONOMICS IN NONATTAINMENT NEW SOURCE REVIEW

It is a popular misconception that states are not to consider cost in determining the "Lowest Achievable Emission Rate" under the Clean Air Act. In fact, the Legislative History of 1977 Clean Air Act Amendments ("CAAA") is absolutely clear in directing states, in making LAER determinations, to consider cost, which is to be given only somewhat less emphasis than under the standard-setting process for the New Source Performance Standards under Section 111 of the CAA. In addition, if the cost of an emission rate premised on the use of a given control technology is so significant as to preclude construction of any new plants on a generic basis in the source class or category, then the emission rate cannot be considered "achievable in practice" and is not LAER. Finally, if a given control technology has never been applied to a source class or category, states are not required to "borrow" or transfer a technology from another source class or category, especially when the gas stream is materially different in composition.

7.1 DEFINITION OF LAER

LAER is defined under the Clean Air Act as:

> *for any source, that rate of emissions which reflects –*
>
> *(A) the most stringent emission limitation for such class or category of source which is contained in the implementation plan of the State, unless the owner or operator of the proposed source demonstrates that such limitations are not* ***achievable****, or*
>
> *(B) the most stringent emission limitation which is* ***achieved*** *in practice by such class or category of source, whichever is more stringent.*
>
> *In no event shall the application of this term permit a proposed new or modified source to emit any pollutant in excess of the amount allowable under applicable new source standards of performance.*

42 U.S.C. § 7501(3) (emphasis added).

LAER is defined under 25 Pa. Code Section 121.1 as:

> *(i) The rate of emissions based on the following, whichever is more stringent:*
>
> *(A) The most stringent emission limitation which is contained in the implementation plan of a state for the class or category of source unless the owner*

or operator of the proposed source demonstrates that the limitations are not achievable.

(B) The most stringent emission limitation which is achieved in practice by the class or category of source.

(ii) The application of the term may not allow a new or proposed modified source to emit a pollutant in excess of the amount allowable under an applicable new source standard of performance.

Neither the Clean Air Act, nor Department regulations, defines what Congress meant by "achievable" or "achieved in practice."

7.1.1 Current EPA Guidance

Given the absence of a definition of "achievable," EPA guidance cites to the legislative history of the LAER provision, which originated under the 1977 Amendments to the Clean Air Act ("1977 CAAA"):

> *Traditionally, little weight has been given to economics in LAER determinations, and this continues to be the case. The extract in your memorandum from the House and Senate discussion of the Clean Air Act (Act) contains the sentence:*
>
> > *"If the cost of a given control strategy is so great that a new major source could not be built or operated, then such a control would not be achievable and could not be required by the Administrator."*
>
> *We interpret this statement in the record to be used in the generic sense. That is, that no new plants could be built in that industry if emission limits were based on levels achievable only with the subject control technology. However, if some other* plant *in the same (or comparable) industry uses that control technology, then such use constitutes de facto evidence that the economic cost to the industry of that technology control is not prohibitive. Thus, for a new source in that same industry, LAER* costs *should be considered only to the degree that they reflect unusual circumstances which, in some manner, differentiate the cost of control for that source from the costs of control for the rest of that industry. These unusual circumstances should be thoroughly analyzed to ensure that they really do represent compelling reasons for not requiring a level of control that similar sources are using. Therefore, when discussing costs, applicants should compare the cost of control for the proposed source to the costs for source(s) already using that level of control.*

Memorandum from John Calcagni, Director Air Quality Management Division to David Kee, Director Air & Radiation Division, Region V "Guidance on Determining Lowest Achievable Emission Rate (LAER)," (Feb. 28, 1989) (emphasis added).

7.1.2 Legislative History of LAER Provision

At the time Congress enacted the 1977 CAAA, many air quality control regions across the United States had failed to attain the National Ambient Air Quality Standard for ozone, including the South Central Pennsylvania region. See H.R. Report No. 95-294, Clean Air Act Amendments of 1977, H.R. 6161, "Report by the Committee on Interstate and Foreign Commerce" (May 12, 1977) ("House Report"). This was a major dilemma because the Clean Air Act Amendments enacted just seven years earlier, in 1970, mandated that states comply with the NAAQS "as expeditiously as practicable" but no later than three years after EPA approved the state's State Implementation Plan ("SIP"), plus an additional two years if the State applied for an extension. See Clean Air Act Amendments of 1970, 42 U.S.C. 7410(a) & (e). Therefore, states had until 1977 to comply with the NAAQS for ozone. States that failed to comply were subject to a ban on the construction of new major sources of ozone pollution. Ibid. The draconian language of the Act widely was perceived to be a significant threat to economic growth in nonattainment regions, which comprised most of the urban areas across the country:

> *a literal enforcement of the Clean Air Act would permit no industrial development in nonattainment areas after the nonattainment date is passed. This means that 88 percent of the nation could not undertake industrial development after May 31 of this year. Perhaps the best way to inject intellectual honesty into the whole question of oxidants would be to attempt to enforce the law as it stands. Adherence to such a policy would probably spur constituents to request a change both in the statute and in their representation in the Congress. But the frying pan of the statue has yielded to the regulatory fire of the EPA.*

House Report at 511 (emphasis added to highlight legislative intent to overturn EPA's Offset Interpretive Ruling, discussed below).

In the year prior to the 1977 CAAA, Congress had sought, unsuccessfully, to fix this defect in the statute. The House and Senate passed competing Clean Air Act amendment bills that went to a Conference Committee which produced "Conference Report on S. 3219 to Amend the Clean Act." See S.3219, 94th Cong., 2d Sess. (1976), 122 Cong. Rec. H11959 (daily ed. Sept. 30, 1976). Had the new legislation not been defeated by a Senate filibuster on the final day of the 94th Congress it would have created a new provision allowing new industrial facilities to be built in nonattainment areas provided they applied "best available control technology" and secured offsetting emission reductions from other sources in their area:

> *Sec. 122.(a)(1) No major emitting facility shall be constructed or modified in any air quality control region or portion thereof in which any national ambient air quality standard is exceeded, if such facility will emit air pollutants subject to such standard so as to prevent the attainment or maintenance of such standard, except that a facility proposed for construction or modification at an existing site*

*or plant owned or controlled by the owner or operator of such facility may be constructed or modified in such region if the owner or operator demonstrates to the satisfaction of the State that (A) the proposed facility will comply with the best available control technology (as defined in section 160(g)(4) of this Act [**note: same definition of BACT which eventually became 42 U.S.C. 7479**]) applicable to such proposed facility before the proposed facility begins operation, (B) all existing sources owned or controlled by the owner or operator of the proposed facility in the same air quality control region as the proposed facility either are in compliance with all applicable emission limitations or are in compliance with an approved schedule and timetable for compliance under a provision of an applicable implementation plan under section 100 of the Act or an enforcement order issue under section 114(d) of this Act, (C) the total cumulative emissions from the existing sources and the proposed facility location and the proposed facilities will at no time, increase, (D) the total allowable emissions from all existing and proposed sources at the proposed facility location will be sufficiently less than the total allowable emissions from the existing sources under the implementation plan or an approved schedule and timetable for compliance applicable, prior to the request to construct or modify so as to represent reasonable further progress toward attainment of the applicable national ambient air quality standard, taking into account progress already made."*

H 11967, H 11972 & H 11986 (emphasis added). Significant confusion followed the defeat of the 1976 legislation. States and the regulated community were uncertain whether industrial growth would be allowed in nonattainment areas. See Rosenberg, Ronald H. and Friedman, Bruce A., "Air Quality and Industrial Growth: The Location of New Industrial Sources of Pollution in Non-Attainment Areas" (1979), Faculty Publications, Paper 673 available here. In Pennsylvania, for example, the planned construction of a new automotive manufacturing plant in New Stanton was nearly terminated by EPA due to Pennsylvania's failure to attain the NAAQS for ozone. See "Pollution law cast cloud on VW Plant," The News-Herald, March 2, 1977, available here.

7.1.2.1 EPA's 1976 Interpretive Ruling

In December 1976, EPA sought to mitigate the harsh economic impacts of the Act by publishing an "Interpretive Ruling" to "address the issue of whether and to what extent national air quality standards established under the Clean Air Act may restrict or prohibit growth of major new or expanded stationary air pollution sources." 41 Fed. Reg. 55524, 55525 (Dec. 21, 1976) ("Offset Interpretive Ruling"). EPA stated that:

[t]he ruling provides in general that a major new source may locate in an area with air quality worse than a national standard only if stringent conditions can be met. These conditions are designed to insure that the new source's emission will be controlled to the greatest degree possible; that more than the equivalent

offsetting emission reductions ("emission offsets") will be obtained from existing sources; and that there will be progress toward achievement of the standards.

For new sources that would be located in a nonattainment area, EPA created the brand-new concept of a "lowest achievable emission rate," which departed from the BACT approach crafted by Congress in the failed bill. EPA described the new LAER approach as:

> *an emission limitation which specifies the lowest achievable emission rate for such type of source. In determining the applicable emission limitation, the reviewing authority must consider the most stringent emission limitation in any SIP and the lowest emission rate which is achieved in practice for such type of source. At a minimum, the lowest emission rate achieved in practice must be specified unless the applicant can sustain the burden of demonstrating that it cannot achieve such a rate. In no event could the specified rate exceed any applicable NSPS.*

Ibid. at 55528 (emphasis). The preamble to the Offset Interpretive Ruling elaborated on EPA's new concept of LAER:

> *This stringent requirement reflects EPA's judgment that a new source should be allowed to emit pollutants into an area violating a NAAQS only if its contribution to the violation is reduced to the greatest degree possible. While cost of achievement may be an important factor in determining an NSPS applicable to all areas of the country (clean as well as dirty) as a minimum, the cost factor must be accorded far less weight in determining an appropriate emission limitation for a source locating in an area violating statutorily-mandated health and welfare standards.*

Ibid. at 55526 (emphasis added). Thus, under EPA's new LAER concept, cost considerations were to be given "far less weight in determining an appropriate emission limitation" in a nonattainment NSR permit than in determining New Source Performance Standards ("NSPSs"). Finally, EPA invited Congress to provide more explicit guidance by amending the Clean Air Act:

> *EPA recognizes that the ruling has profound national policy implications and that even more extensive public debate is needed on the issues of whether (and how) economic growth may be accommodated where ambient air quality standards are being exceeded...EPA believes that these important national issues must ultimately be resolved by Congress through more explicit guidance in the Clean Air Act; hopefully, the publication of the ruling and the resulting public comments will provide a useful focus for legislative deliberations.*

Id. at 55525. In September 1977, EPA touted the ability of its new Offset Interpretive Ruling to allow industrial growth in nonattainment areas by emphasizing that offsets advanced the Clean Air Act's goals. See EPA Journal, "A Tale of Two Cities," September 1977, p. 11. Specifically, EPA praised

Pennsylvania's approval of a new automobile manufacturing plant in New Stanton, despite the addition of 900 tpy of VOCs to the Pittsburgh nonattainment area, because the Department had secured an even greater number of VOC emission offsets, 1,025 tpy, to enable progress toward attainment:

> *This is a tale of two cities-Oklahoma City, Okla. and New Stanton, Penn. — in which EPA has given the go ahead for the construction of new auto assembly plants even though both cities are already suffering from extremely dirty air. Allowing the plants, major contributors of hydrocarbon pollution, to locate in these areas may seemingly contradict EPA's goal of a clean environment. However, EPA's newly evolved "emissions offset" policy is a compromise that allows industrial growth in polluted areas of the country if progress is made toward cleaning the air. Under the policy of "emission offset" new air pollution emissions from new industrial sources-already minimized by available technology-must be more than offset by a reduction in emissions from already existing facilities. The ratio of the trade-off must be more than one to one.*

Ibid. (emphasis added). Therefore, EPA emphasized that the offset component—not the LAER component—was the defining feature of the Offset Interpretive Ruling.

7.1.2.2 1977 House Bill to Amend the Clean Air Act

Early in 1977, Congress accepted EPA's invitation to amend the statute to provide more explicit guidance by again taking-up comprehensive CAA reform legislation. This new effort culminated in the 1977 CAAA, which took a very different approach to LAER than EPA had in its Offset Interpretive Ruling.

First, when a particular class or category of source is not subject to any emission limitation contained in the implementation plan of a state, the new law required permitting agencies to derive LAER based upon "the most stringent emission limitation which is achieved in practice by the class or category of source," not the most stringent "emission rate…achieved in practice." [iv] Second, the new law directed permit agencies to accord cost considerations far more weight in determining whether a LAER emission limitation was "achievable" by instructing them to give "cost" considerations only "somewhat lesser weight" under LAER than under the NSPSs.

[iv] This is consistent with Pennsylvania's definition of LAER. See, Groce v. PADEP and Wellington Devel., 921 A.2d 567 (Pa. Cmwlth Ct. 2007), affirming, Groce v. PADEP and Wellington Devel., EHB Docket No. 2005-246-R (Nov. 26, 2006) ("[i]n order to be a source of an LAER standard, an emission rate must meet three criteria: (1) it must be an emission limitation; (2) it must apply to the same class or category of source as the facility under review; and (3) it must be achievable or achieved in practice.")

The new effort to reform the CAA began in May 1977, when the House passed H.R. 6161, which eventually was adopted by the Conference Committee over the competing Senate Bill sponsored by Senator Muskie. H.R. 6161 made clear that the bill sought to mitigate the competitive harm of a construction ban in nonattainment areas and to give the states more flexibility than what was provided to them under EPA's Interpretive Ruling:

> *a complete prohibition on new growth or expansion in nonattainment regions would pose very serious problems. The economic impact on certain urban areas of such a growth ban could be quite harmful. Similarly, certain industries pointed out in testimony the large cost increases that might be necessary if new plants had to be located in completely new areas rather than expanding existing facilities or locating new plants near existing ones. (H. 682-3). Similarly, in areas of particularly high unemployment complete restriction of growth or expansion possibilities might exaggerate unemployment or at least hinder reemployment efforts. Concern was also expressed about the aggregate impact of such growth restrictions on the general economy's recovery from the recent recession. In order to reconcile these conflicting concerns, the committee adopted section 117 of the bill. <u>The purpose of the provision is to permit States to allow continued growth or expansion in nonattainment areas, so long as this growth or expansion is undertaken in a manner consistent with the goals and objectives of the Clean Air Act</u>.*
>
> *******
>
> *Section 117 of the bill, adopted during full committee markup establishes a new section 127 of the Clean Air Act. The section has two main purposes: (1) to allow reasonable economic growth to continue in an area while making reasonable further progress to assure attainment of the standards by a fixed date; and <u>(2) to allow States greater flexibility for the former purpose than EPA's present interpretive regulations afford</u>.*

House Report at 210-211 (emphasis added). The House Bill added new section 127, subsection (e)(3) of which provided a new definition of LAER, which as stated, eventually became the provision enacted into law:

> *If a State plan contains provisions permitted under subsection (c)(5)(A) providing for an allowance for emissions of pollutants from new or modified stationary sources the emissions from which will cause or contribute to concentrations of any pollutant in a non-attainment area for such pollutant, such plan shall provide that a permit to construct and operate may be issued to any such source if such permit requires the proposed source to comply with the lowest achievable emission rate (as defined in subsection (e)(3))...*
>
> *********

> *(3) the term "lowest achievable emission rate" means for any source that rate of emissions which reflects –*
>
> > *(A) the most stringent emission limitation which is contained in the implementation plan of any State for such class or category of source, unless the owner or operator of the proposed source demonstrates that such limitations are not achievable, or*
> >
> > *(B) the most stringent emission limitation which is achieved in practice by such class or category of source, whichever is more stringent.*
>
> *In no event shall the application of this term permit a proposed new or modified source to emit any pollutant in excess of the amount allowable under applicable new source standards of performance...*

House Bill, Section 127. The Committee explained that not only were state permitting authorities to consider cost in deciding what is an "achievable" emission rate but that cost was to be accorded only "somewhat less weight" than in the setting of NSPSs under Section 111:

> *In allowing new sources to locate, and existing sources to expand, in presently unhealthy air areas, the committee recognizes that some worsening of air quality or delay in actual attainment of the national ambient air quality standards will result. This is inevitable, as a result which the committee had to accept as a consequence of allowing additional economic growth in these areas. However, in light of the adverse air quality and health consequences of this new pollution, the committee concluded that all feasible efforts to reduce or control this new pollution should be mandated. Furthermore, maximum pollution control from new sources is necessary in order to permit room for maximum potential economic growth. This is particularly true in light of the requirement for reasonable further progress and the indications that emissions from many existing sources in nonattainment areas will be increasing (due to fuel switching, natural gas curtailments) or remaining static (due to delayed compliance orders, et cetera). Finally, the technology-forcing purpose of the act is best served by requiring maximum feasible pollution control from these new sources in dirty air areas. For all these reasons, the committee adopted the requirement for proposed new or modified stationary sources in nonattainment areas to meet the lowest achievable emission rate requirement.* ***In the committee's view, this means that the traditional cost constraints on technology for the purpose of 111 of the act should not govern in this situation. This does not mean that the committee does not consider cost a relevant factor. It simply means that in light of the foregoing critical factors cost is of somewhat lesser weight in this context.*** *Of course, if the cost of any given technology or means of compliance is so great that new major stationary sources could not build and operate, then emission reductions which necessitate use of that technology should not and would not be considered achievable, and could not be required by the Administrator.*

Clean Air Act Amendments of 1977, "Report by the Committee on Interstate and Foreign Commerce [to accompany H.R. 6161]," May 12, 1977, at 215 (emphasis added).

Thus, the House Bill changed EPA's Interpretive Ruling in two key respects. First, the bill changed the language in the second prong of EPA's definition of LAER from "lowest emission rate which is achieved in practice for such type of source" to "the most stringent emission limitation which is achieved in practice by such class or category of source..." This change was significant because the House Bill (which became law) also defined an "emission limitation" as "a requirement established by the State or the Administrator which limits the quantity, rate, or concentration of emissions of air pollutants on a continuous basis…" 42 U.S.C. 7602(k). Second, the bill made clear that cost-effectiveness of a control technology under LAER is to be given only "somewhat lesser weight" than under an NSPS issued pursuant to Section 111. The term "standard of performance" means a "standard for emissions of air pollutants which reflects the degree of emission limitation achievable through the application of the best system of emission reduction which (taking into account the cost of achieving such reduction) the Administrator determines has been adequately demonstrated." Section 111(a)(1).

7.1.2.3 1977 House-Senate Conference Report to Amend the Clean Air Act

In May of 1977, the Senate also passed its own bill, which among other things defined LAER as "the lower of (A) the most stringent achievable emissions limitation in any State implementation plan or (B) the lowest emission rate achieved in practice by such type of source." S.B. 252, Clean Air Act Amendments of 1977, Senate Report No. 95-127, Report of the Committee on Environment and Public Works, (May 10, 1977) Section 39, p. 94 (emphasis added). The competing bills went to a Conference Committee which produced the final language that became the 1977 CAAA. The Conference Report adopted the House's version of nonattainment new source review and reiterated that cost considerations under LAER were to be given only "somewhat less weight" than under the NSPSs:

> *The House definition of 'lowest achievable emission rate' is adopted for purposes of this section. In determining whether an emission rate is achievable, cost will have to be taken into account, but cost factors in the nonattainment context will have somewhat less weight than in determining new source performance standards under section 11[1]…. The definition is intended to describe the lowest rate which is actually, not theoretically, possible. If the cost of a given control strategy is so great that a major new source could not be built or operated, then such a control would not be achievable and could not be required by the Administrator.*

****

> *In general, the conference agreement adopts much of the Senate's approach to the nonattainment problem. But, among other provisions from the House Bill, the 'lowest achievable emission rate' definition in the House bill was agreed to. While the conferees believe cost is an appropriate factor to be considered in determining 'achievability,' there was general agreement with the House Committee report's treatment of consideration of cost in nonattainment areas at page 215.*

H.R. Conf. Rep. No. 564, 95th Cong., 1st Sess. 1977, 1977 U.S.C.C.A.N. 1502, 1538 & 1574 (emphasis added).

7.1.2.4 *EPA's 1979 Interpretive Ruling*

Following the passage of the 1977 CAAA, EPA revised its Offset Interpretive Ruling (44 Fed. Reg. 3274, January 16, 1979) to implement Congress's changes and guide state permitting authorities up until the point of adoption of their own new source review SIP provisions. Regarding "technology transfer," EPA's revised Offset Interpretive Ruling made it clear that states could decide whether or not to adopt regulations for consideration of technology transfer in determining LAER:

> *It has been EPA's interpretation that in determining the lowest achievable emission rate (LAER), the reviewing authority may consider transfer of technology from one source type to another where such technology is applicable. Although Congress changed the definition of LAER, EPA continues to believes [sic] that technology transfer may be considered in determining LAER…*

44 Fed. Reg. at 3280 (emphasis added). Therefore, the notion of "technology transfer" is optional for states. In the case of Pennsylvania, ERM is aware of no regulation or guidance requiring technology transfer.

Based upon the foregoing legislative history, an emission rate derived from the application of a control technology significantly more expensive than control required under a NSPS, or that is so expensive as to preclude the construction and operation of any new facilities in that sector in a nonattainment area, is not considered "achievable" and cannot be the basis for LAER.

7.2 *COST-EFFECTIVENESS OF VOC COMBUSTION CONTROL*

As described in Sections 4.0 and 5.0, above, the use of RTO control devices on the mineral oil vent system and the Dryer/Cooler exhaust would achieve VOC emission reductions of 7.1 and 66.0 tons per year, respectively, at an estimated cost of at least $29,400 and $42,200 per ton of VOC controlled. This level of cost is four to seven times the "cost-effectiveness" threshold applied by EPA for VOC emissions from the oil and gas sector under the recent NSPS. Also, this level of additional cost would impose such a significant burden on the construction and operation of a new facility that no new soybean solvent extraction facility would ever be constructed in a nonattainment area. Accordingly, in ERM's professional opinion, an emission rate based upon VOC combustion control is not "achievable," within the meaning of LAER.

7.2.1 *VOC Oxidation is Not Cost-Effective Under LAER*

Thermal oxidation is not a cost-effective option for VOC control under LAER for this application because it is vastly more expensive than what EPA generally regards as "cost-effective" under LAER. EPA generally applies a $10,000/ton cost-effectiveness threshold under LAER. See EPA, "BACT and LAER for Emissions of Nitrogen Oxides and Volatile Organic Compounds at Tier 2/Gasoline Sulfur Refinery Projects" (January 19, 2001) (deriving a NOx LAER of 7 ppmv for refinery heaters based upon application of combination of combustion controls (low-NOx burners with internal flue gas recirculation) and selective catalytic reduction (SCR) based upon a $10,000/ton cost-effectiveness threshold).

Also, based upon the foregoing legislative history, an emission rate derived from the application of a control technology significantly more expensive on a cost/ton basis than the level of cost determined to be reasonable under a NSPS, is not considered "achievable" and cannot be the basis for LAER. EPA's recent NSPSs serve as a guidepost, since cost is given only "somewhat lesser weight" under LAER than under the NSPS provision. 1977 U.S.C.C.A.N. 1502, 1538.

EPA recently proposed New Source Performance Standards for VOC emissions from the Oil and Gas Sector. According to EPA, the oil and gas industry is a significant source of VOCs, which contributes to the formation of ground-level ozone. EPA concluded "that a VOC control option was not cost-effective at a cost of $5,700 per ton." EPA, "Oil and Natural Gas Sector: Emission Standards for New and Modified Sources," 80 Fed. Reg. 56593, 56636 (September 18, 2015); see also EPA, "Background Technical Support Document for Proposed Standards of Performance for Crude Oil and Natural Gas Production, Transmission, and Distribution," (July 2011) (rejecting as not cost-effective VOC control costs of $5,299 for the processing and transmission/storage segments).

Thus, EPA is applying a NSPS cost-effectiveness threshold for VOCs from the oil and gas sector of approximately $5,000/ton VOC. This level of cost is five to eight times less than the projected cost of VOC control associated with an RTO control on a soybean solvent extraction facility. This level of cost burden exceeds what Congress intended when it instructed state permitting agencies to accord cost only "somewhat lesser" weight in determining LAER than under the NSPS provision.

7.2.2 *No New Soybean Solvent Processing Plants would be Constructed in Pennsylvania or in any other Ozone Nonattainment Area if VOC Oxidation is Required*

Based upon the foregoing legislative history, an emission rate derived from the application of a control technology that is so expensive as to preclude the construction and operation in a nonattainment area of any new facilities in that sector, is not considered "achievable" and cannot be the basis for LAER. "If a given control technology requires 'a series of two or more baghouses or a control system whose cost greatly exceeds that of the base facility...,' such that a typical source could not reasonably be built, then the control technology is not "achievable" for purposes of LAER. See EPA, "Huntsville Incinerator - Determining Best Available Control Technology (BACT)" (Memo from Gary McCutchen to Bruce P. Miller, April 22, 1987) (explaining that if the cost of a control option is so far above the norm that it would objectively prevent the construction of any new source then the control technology is not BACT) and EPA, "Guidance on Determining Lowest Achievable Emission Rate (LAER)" (Memo from John Calcagni to David Kee, Feb.. 28, 1989) (acknowledging that EPA's guidance on marginal cost analysis set forth in its April 22, 1987 memo, "Huntsville Incinerator - Determining Best Available Control Technology (BACT)" also applies to LAER determinations).

As previously noted, there are no emission limitations in an implementation plan of any state that impose a limit on VOC emissions from either the Mineral Oil Vent or the Dryer/Cooler exhaust for a soybean oil extraction plant that would require the use of a VOC control device, nor are there any soybean oil extraction plants in the United States that utilize a control device on the exhaust from the Mineral Oil Vent or the Dryer/Cooler. The estimated total capital investment of nearly $10,000,000 represents a substantial capital cost that is not borne by any other soybean oil extraction plants in the United States.

Perdue and an independent consultant analyzed the economic impact of VOC combustion control on a generic soybean solvent facility, as instructed by EPA's "Guidance on Determining Lowest Achievable Emission Rate (LAER)":

> *the House and Senate discussion of the Clean Air Act (Act) contains the sentence: 'If the cost of a given control technology is so great that a new major source could not be built or operated, then such control would not be achievable and could not be required by the Administrator.' We interpret this statement in the record to be used in a generic sense. That is, that no new plants could be built in that industry if emission limits were based on levels achievable only with the subject control technology.*

These evaluations concluded that adding an incremental annual cost of $2.78 million onto a soybean processing operation would materially increase soybean processing cost by 13.6 cents per bushel. At this level of additional cost no rational soybean processor would make the capital investment in the construction of a new soybean solvent extraction plant.

Investment decisions in soybean processing facilities are based mostly on the predicted "gross crush margin" (GCM) for the facility. The GCM is the difference between the price a soybean processor must pay farmers for soybeans and the price the processor can obtain for the soybean meal and soybean oil it produces. GCM is the most important factor in deciding whether to build a new soybean solvent extraction facility. The gross crush margin includes all costs of processing the soybeans into a product and co-products, the return on investment, the risk, normal profits, plus other factors. In turn, the price which farmers receive for soybeans is determined by: (1) the price users will pay processors for soybean oil and soybean meal; (2) the processing margin (i.e. the amount that processors are able to obtain for their services); and (3) transportation and other handling costs on beans and products. Soybeans therefore are worth the value of the oil and meal less all transportation, handling, and processing costs from the local bean market until the oil and meal are processed and sold by the processor. Soy processing margins and competiveness is based on the narrowest of margins, with almost every metric being measured to the narrowest of scope.

Adding 13.6 cents per bushel to the existing cost to process the soybeans would reduce gross crush margin by this same amount. Such a significant increase in soybean processing costs is simply unsustainable given the extreme competition in this industrial sector. A more detailed discussion of Perdue's evaluation and the evaluation of an independent consultant, Richard Galloway, of the impact of the cost to construct and operate a thermal oxidation control system is provided in Attachments 8 and 9. For these reasons, if thermal control of VOCs is mandated by the Department, Perdue would not move forward with the facility.

At this level of additional cost burden, no prudent soybean processor would invest $80 million of capital to build new soybean plant in a nonattainment area. The clear purpose of the nonattainment new source review provisions enacted in 1977 was "(1) to allow reasonable economic growth to continue in an area while making reasonable further progress to assure attainment of the standards by a fixed date; and (2) to allow States greater flexibility for the former purpose than EPA's present interpretive regulations afford." House Report, at 211. Here, there is no question that Pennsylvania will continue its reasonable further progress toward attainment without thermal control of VOCs at an additional annual cost of $2.78 million. Perdue will purchase an ample quantity of emission reduction credits to more than offset any incremental increase in VOCs associated with the new facility. Moreover, the new plant will achieve absolutely the lowest solvent-loss ratio of any soybean solvent processing plant in the United States, given that the only other soybean plant with a solvent-loss ratio as low as the permit limit imposed on Perdue, 0.125 gal/ton, is authorized to exclude startup/shutdown/malfunction emissions from its solvent-loss ratio.

In sum, for the reasons discussed, thermal control of VOCs is not cost-effective within the meaning of LAER and an emission rate based upon on this level of additional control is not achievable.

8.0 SAFETY

As noted previously, equipment vendors have expressed their belief that RTO control systems can be designed to address safety concerns associated with the use of open flame control devices at soybean oil extraction plants. We realize, however, that the potential for fires and/or explosions exists at such plants and are evaluating such control devices with the recognition that regardless of the extent of safeguards employed in equipment design, the use of such control devices at a soybean oil extraction plant represents an increased risk that would not otherwise be present.

We have discussed these concerns with Perdue's property loss control consultant, Global Risk Consultants (GRC), and requested that they provide a statement regarding their view of the use of such controls at soybean oil extraction plants. The response of Bryan Davis, PE, Senior Consultant with GRC, is provided as Appendix C to the Technical Deficiency Letter response document..

In their analysis, GRC points out that the use of a RTO control device on the Mineral Oil Vent or Dryer/Cooler exhaust create a situation where an open flame is provided with a path to the soybean oil extraction process, which is identified in NFPA 36 as having the potential for explosive concentrations of hexane vapors. GRC concludes that the introduction of such controls at a soybean oil extraction plant represents a risk that cannot be completely eliminated through the use of safety control devices. They believe that it is not appropriate to introduce such risks, particularly in relationship to the Mineral Oil Vent where minimal VOC reduction would be achieved.

As has been discussed with PADEP previously, the Prairie Pride facility in Missouri was required to install an RTO control system to control VOC emissions from the Mineral Oil Vent at its facility in its original Construction Permit. Prairie Pride subsequently filed a request to amend its Construction Permit to remove the requirement to install an RTO control system, which was approved by the Missouri Department of Natural Resources. In its amendment request, Prairie Pride cites the following as justification for removing the RTO from the design:

"After further discussion with current design engineers, National Fire Protection Association (NFPA) board members and experts in the soybean processing industry, PPI has been convinced that the safety hazards presented by the RTO outweigh the minimal VOC reduction that would be achieved through its use on the MOS Vent (approximately 20 tons per year)."

A copy of this letter is provided as Appendix D to the Technical Deficiency Letter response document.. We note that while the potential risk associated with the use of an RTO control system on the Mineral Oil Vent for the proposed Perdue facility is equivalent to that posed at the Prairie Pride facility, the environmental benefit that would be achieved at the proposed Perdue facility is three times less than would have been achieved at the Prairie Pride facility.

In conclusion, we believe that the use of RTO controls at the proposed Perdue soybean processing facility represents an increased safety risk that is not justified by the minimal environmental benefit that would be achieved by such controls. As noted elsewhere, the air quality will benefit in the area through emission offsets secured by Perdue that exceed the proposed emission increases from the facility. The minimal additional environmental benefit achieved by such controls is not warranted given the cost associated with such controls and the increased safety risk that would be created.

Attachment 1
R&N Welding Fabrications, Inc.
Quotation for Ductwork and
Ductwork Supports

RN Fabrications
SALISBURY • MARYLAND

PO Box 3161
Salisbury, MD 21802
Phone: 410-546-0811
Fax : 410-546-2413
Email: rnfaboffice@verizon.net

Estimated cost for budgeting purposes:

Item 1.
Supply all materials, labor and equipment to furnish and erect a hot-dipped galvanized Truss and Tower Support System for the ductwork between the Mineral Oil Vent Fan and the Proposed RTO. The cost is based upon a MAXIMUM of 220 lineal feet of Trusses and 4 – 40 foot high support towers.
TOTAL COST $203,500 plus 30% Allowance for foundations and electrical = **$264,500**

Item 2.
Supply all materials, fittings and fixtures for a 10" diameter 304 Stainless Steel duct between the Mineral Oil Vent and the Proposed RTO. The cost is based upon a MAXIMUM of 240 lineal feet of Ductwork, and the installation would occur at the same time as Item 1.
TOTAL COST $32,200 plus 50% Allowance for installation labor = **$48,000**

Item 3.
Supply all materials, labor and equipment to furnish and erect a hot-dipped galvanized Truss and Tower Support System for the ductwork between the discharges of the Dryer-Cooler Cyclones and the Proposed Scrubber. The cost is based upon a MAXIMUM of 220 lineal feet of Trusses and 4 – 40 foot high support towers.
TOTAL COST $203,500 plus 30% Allowance for foundations and electrical = **$264,500**

Item 4.
Supply all materials, labor and equipment to furnish and install a 50" diameter 304 Stainless Steel duct between the discharges of the Dryer-Cooler Cyclones and the inlet of the Scrubber Fan. The cost is based upon a MAXIMUM of 200 lineal feet of duct with 6 Tees and 4 Ells.
TOTAL COST $227,900 plus 50% Allowance for Isolation Valve(s), ductwork supports and hardware, installation labor and equipment = **$341,850**

Attachment 2
Cost for Ductwork Insulation

Tri-State
INSULATION, INC.

Over 50 Years of Service on Delmarva www.tristateinsulation-md.com

08/31/2015

Tri-State Insulation furnished and installed the insulation and metal jacketing on the DC duct work at the Perdue Soybean Plant on Zion Church Road in Salisbury, Maryland. We used elastomeric foam insulation covered with .016 embossed aluminum jacket. There was approximately 1150 square feet covered for a cost of $69,000.

Steve Ashcraft, President

Attachment 3
UGI Energy Services, Inc. Cost Estimate for Natural Gas Pipeline

From: Richard Stahovich [mailto:RStahovich@ugi.com]
Sent: Monday, March 25, 2013 12:24 PM
To: Hudson, Wayne
Subject: RE: Natural Gas

Wayne,

I read about your energy agreement with LCSWMA so I'm not sure if this info is relevant.

A Contribution In Aid of Construction in the amount of $1,180,000 is required for the main extension, service extension and meter sets. A non-refundable fee of $30,000 would be collected to cover engineering, permit and survey fees. In the event the project is completed, the $30k would be credited towards the CIAC. All trenching and backfill on the property of Perdue or the RRF would be required (including restoration).

Perdue would be served under firm rate LFD with a unitized delivery rate estimated at $1.79/Mcf based on the loads provided. UGI would require a 5 year take or pay offer based on 40,000 Mcf. Perdue would require a gas marketer to deliver thecommodity to the site under third party capacity. A Metretek device would also need to be installed at a cost of $1,670. All offers are subject to final approval by senior management.

Please let me know if you have any questions.

Rich

>>> "Hudson, Wayne" <Wayne.Hudson@Perdue.com> 3/5/2013 5:02 PM >>>
We were talking about 40,000 MCF. After reconfirming with our team here, they have indicated it could be up to 50,000MCF in the future, so we should base it on 50,000 MCF annual usage. The required supply pressure is 15-25 psig.

From: Richard Stahovich [mailto:RStahovich@ugi.com]
Sent: Tuesday, March 05, 2013 2:21 PM
To: Hudson, Wayne
Subject: RE: Natural Gas

Wayne,

I have a bunch of gas usage scenarios for this project. Do you have a final load projection? Was it 15,000 Mcf or 40,000 Mcf? Was there an energy analysis done to estimate annual propane usage? I want to make sure I'm working with the correct number.

Thanks,
Rich

>>> "Hudson, Wayne" <Wayne.Hudson@Perdue.com> 2/25/2013 4:10 PM >>>
We are hoping to break ground in April.

From: Richard Stahovich [mailto:RStahovich@ugi.com]
Sent: Monday, February 25, 2013 4:10 PM

To: Hudson, Wayne
Subject: Re: Natural Gas

Wayne,

Thanks for reaching out. Give me a day or two to revisit the numbers and I will get back to you. What is the status of your project? Do you expect to break ground soon?

Thanks,
Rich

>>> "Hudson, Wayne" <Wayne.Hudson@Perdue.com> 2/25/2013 11:51 AM >>>
It's been a while since we talked and just wanted to check and see if the installation cost of natural gas to our proposed facility has adjusted either up or down. It has been a while and it would be good to get a current price quote and breakdown of the CIAC costs associated with our project. The usage and requirements have not changed.

N. Wayne Hudson
Sr. Director of Operations
Perdue AgriBusiness
wayne.hudson @perdue.com
(410) 543-3919 office

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Attachment 4
Analysis of Micromist Wet Scrubber

MEMO OF VISIT TO OCEAN COUNTY UTILITY AUTHORITY IN BAYVILLE, NJ

Representatives of Perdue AgriBusiness, LLC, Adam Zel and Preston Waller, visited the Ocean County Utilities Authority (OCUA) facility on October 22, 2015, to evaluate the performance of an air pollution control system for the treatment of particulate matter (PM) generated by a 30 MM/Gal/Day Wastewater Treatment Plant and an Organic Fertilizer Manufacturing Plant. The PM air pollution control system was identified by one of the air pollution control equipment vendors, Adwest, as an example of a PM control system that would be capable of removing residual PM in an exhaust stream at the proposed Perdue soybean solvent extraction facility prior to a volatile organic compound (VOC) thermal oxidizer.

OCUA Facility

The OCUA facility, 501 Hickory Lane, Bayville, New Jersey, is comprised of three wastewater treatment plants (total design flow 80 mgd) which serve about 600,000 Ocean County and southern Monmouth County residents. All of the wastewater sludge produced at the facility is processed and sold as an organic fertilizer under the brand OCEANGRO®. Digested, screened biosolids are gravity thickened and blended in a storage facility at the Central Wastewater Treatment Plant in Bayville. The biosolids are dewatered and thermally dried to make OCEANGRO® pellets. The fertilizer production facility contains polymer preparation and feed systems, three Andritz 2.0-meter SMX-S14 belt filter presses, and two Andritz model DDS-40 drum drying systems.

OCUA Air Pollution Control System

Facility particulate emissions are approximately 44 tpy and VOC emissions 22 tpy, according to the facility's operating permit. The air pollution control system consists of a cyclone, two MicroMist wet scrubbers and two 3-bed regenerative thermal oxidizers (RTOs). The cyclone and MicroMist wet scrubbers remove dust and small particles from the air while the RTO destroys organic compounds and odors present in the process air prior to discharging clean gasses.

System Maintenance Issues

According to OCUA's Operation and Management staff that provided the plant tour and were interviewed by the Perdue representatives, OCUA must shut-down and clean the wet scrubbers every 3 to 4 months due to build-up of particulates. Reportedly, the wet scrubbers require significant maintenance. OCUA staff also stated that the RTOs have to be shut-down and "washed out" on a similar frequency. Each cleaning of the RTO requires at least 72 hours of down-time. Finally, the RTO's ceramic media has to be replaced every 2 years.

Comparison of OCUA System to Proposed Control System at Perdue's Soybean Processing Plant

Perdue's objective during the site visit was to judge the adequacy of the proposed MicroMist Wet Scrubber to remove PM prior to the VOC control system. Adwest included this unit in its proposal to control VOC emissions from the Dryer/Cooler vent as an additional PM control device to minimize PM buildup in the VOC control device proposed for the Dryer/Cooler exhaust. The control equipment configuration at the OCUA facility is similar to the system that is proposed for Perdue, in that the system is equipped with an initial cyclone control system followed by a more efficient wet scrubber, both of which would serve to remove particulate matter prior to a RTO control system. The RTO control system at the OCUA facility is similar to that proposed for Perdue in that it is a three-bed system.

Conclusions

Perdue plans to operate the soybean processing plant on a continuous basis (24 hours per day, 365 days per year), and anticipates that the plant will only be down for scheduled maintenance once every two years. For this reason, Perdue is seeking an air pollution control system that is capable of operating on a continuous basis without interruption.

Based upon information provided by OCUA representatives, it appears that the MicroMist wet scrubber control system requires frequent maintenance outages for cleaning and that substantial amounts of PM pass through the wet scrubber and impact RTO performance. Perdue representatives conclude that the MicroMist wet scrubber is not an appropriate PM control system prior to an RTO system on the Dryer/Cooler exhaust at the proposed Perdue facility.

Attachment 5
Adwest Cost Estimate

September 18, 2015

Mr. David R. Jordan, P.E.
ERM
Woodfield 3
8425 Woodfield Crossing Blvd.
Suite 560-W
Indianapolis, IN 46420

sent by email: Dave.Jordan@erm.com

Subject: PERDUE Application in Lancaster County, PA
ADWEST Proposal 15-0300-4

Dear Mr. Jordan,

We are pleased to provide this revised budgetary proposal for RTO systems and associated equipment to abate the VOC emissions from the various applications outlined in your correspondence dated 7 August 2015. This changes in this proposal as compared to ur previous proposal are:

is the inclusionof offering includes the modifications necessary to provide for process exhaust blowers that are rated AMCA Standard 99-0401Type A construction and the inclusion of an on-line bake-out feature and .We have included our performance guarantee in Exhibit 1, which accompanies this proposal.

Mineral Oil Vent

Design Criteria

- Air flow rate = 500 acfm (max)
- Temperature gases out = 75 F
- Moisture content = 1-2%
- Hexane emission rate (average) = 1.73 lb/hr (based on 365 days/yr)
- Exhaust stream will be equipped with a bypass to stop flow to the control device and dump to atmosphere if the hexane concentration reaches 20% of the LEL

For this application we would propose a RETOX 1.0 RTO 95 RTO system.

1175 N. VAN HORNE WAY, ANAHEIM CA 92806-2506
TEL: (714) 632-9801- FAX: (714) 632-9268
www.adwestusa.com

EXHIBIT 1

Attachment 6
Anguil Cost Estimate

Anguil Environmental Systems, Inc.
Three Bed Regenerative Thermal Oxidizer

Date: **September 22nd, 2015**
Proposal #: **AES-156610**

Prepared for:

Tom Rarick
ERM

Phone: (317) 706-2006
E-mail: dave.jordan@erm.com

Submitted by:

Rich Grzanka
Vice President
Rich.Grzanka@Anguil.com

Jim Stone
Senior Sales Manager
Jim.Stone@Anguil.com

Jeff Kudronowicz
Applications Engineering Manager
Jeff.Kudronowicz@Anguil.com

Jason Schueler
Applications Engineer
Jason.Schueler@Anguil.com

"Our goal is to provide solutions today which help our customers remain profitable tomorrow"
– Gene Anguil / Founder and CEO

Committed to Cleaner Air.

Background:
- Founded in 1978
- Second generation family owned and operated
- Headquartered in Milwaukee, WI, USA with offices in Asia and Europe
- Over 1,700 oxidizers and countless heat recovery systems installed on six continents in a wide variety of industries

Company Size and Make-up:
- Annual sales in excess of $30 million
- In-house engineering staff consists of chemical, mechanical and electrical engineers
- Highly motivated employees who enjoy profit sharing and a rewarding work environment

What Makes Anguil Unique?
- Regulatory compliance is guaranteed
- Broad range of technology solutions that ensure an unbiased equipment selection
- Quality assurance program with complete factory acceptance testing prior to shipment
- An established safety program with continuous training for Anguil technicians
- Equipment is designed in Solidworks, ensuring accuracy and rapid completion

Products:

Air pollution control systems…
- Regenerative Thermal Oxidizers (RTO)
- Catalytic, Recuperative and Direct-Fired Thermal Oxidizers
- Concentrator systems
- Permanent Total Enclosures

…for VOC, HAP and odor abatement

Heat and energy recovery systems…
- Air-to-air heat exchangers
- Air-to-liquid heat exchangers
- Heat-to-power
- Energy Evaluations

…for improved efficiency and reduced operating costs

Aftermarket:

Service and Maintenance…
- 24/7 Emergency service response
- Operating cost reviews
- System upgrades and retrofits
- Spare parts and component packages
  - Preventive Maintenance Evaluations (PME)

… on any make or model, regardless of original manufacturer

Partial List of Satisfied Customers:

Boeing, Dow Chemical, Northrop Grumman, ExxonMobil, Johnson and Johnson, Peterbilt, Pfizer, Qualcomm, Rexam Beverage, Silgan Containers

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Attachment 7
NESTEC Cost Estimate

NESTEC Inc.
Environmental Products for Industrial Solutions

Corporate Office
21 Unionville Road
P.O. Box 568
Douglassville, PA 19518

Contact Information
Bus: 610-323-7670
Fax: 610-323-7672
www.NESTECInc.com

September 22, 2015

Mr. Preston Waller
Preston Waller & Associates, Inc.
4510 Coulbourn Mill Road
Salisbury, MD 21804
PHN: (410) 546-2861
E-Mail: plwaller@comcast.net

Subject: Proposal No. 015-09RTO-642-R0 for Regenerative Thermal Oxidizer (RTO)

Dear Mr. Waller,

NESTEC, Inc. is pleased to provide you with the enclosed proposal for a Regenerative Thermal Oxidizer (RTO) system to control hexane along with PM10 and PM2.5 emissions within a gas stream containing 10,000 #/Hr water. Total exhaust stream at volume of 45,381 $SCFM_{wet}$ (49,700 ACFM, 110 F)

Our intent in managing this application is a three pronged approach: First, provide upstream to the RTO a wet scrubber to minimize concerns and maintenance associated with the PM loading; second, to minimize concerns associated with both condensation and long term corrosion, all wetted parts of the RTO equipment will be manufactured out of 304 stainless steel. We have also provided an insulated inlet manifold to minimize condensation. Finally, the system has been designed to achieve a 95% thermal energy recovery (TER). The regenerative thermal oxidizer (RTO) system will destroy up to (requires minimum of) of the hexane emissions. Further, for on-line bake-out requirements we will be using a three (3) chamber system. Although the two chamber design will also achieve the desired results we have based our design on a three chamber system as requested. With the 3 chamber system bake out will be accomplished by having one of the chambers in bake-out at a time. The inlet manifold and cold-face support grids will be designed for ease of clean-out and wash down when required. From this perspective, the NESTEC designed equipment offers minimal maintenance, long- term high destruction efficiencies and high thermal efficiencies.

The NESTEC, Inc., RTO is a versatile, reliable and economic system with the capability to treat a variety of flow rates, VOC and organic loadings to a continuous high degree of destruction efficiency. The system operates by alternately passing the gas stream through two heat recovery chambers prior to treatment in the 1,500°F combustion chamber where the hydrocarbons are completely oxidized.

We thank you again for this opportunity and we look forward to meeting with you in the near future to review the project and our proposal.

If we can be of further assistance in your decision process, please do not hesitate to contact us.

Best Regards,
NESTEC, Inc.

Robert B. Hablewitz
Applications Manager

Copy: James L. Nester/NESTEC, Inc.

Attachment 8
Perdue Analysis of Impact of Control Cost on Plant Economics

PERDUE
AgriBusiness

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Attachment 9
Independent Analysis of Impact of Control Cost on Plant Economics

EVALUATION OF THE IMPACT OF THERMAL OXIDATION CONTROL ON THE ECONOMICS OF NEW SOYBEAN SOLVENT EXTRACTION PLANT CONSTRUCTION

RICHARD GALLOWAY, President
Galloway & Associates, LLC
26 Hidden Green Lane
Isle of Palms, SC 29451

January 22, 2016

INTRODUCTION

I was retained by Perdue AgriBusiness LLC ("Perdue") to evaluate the impact of imposing thermal oxidation control of volatile organic compound emissions on the economics of new soybean solvent extraction plant construction. Based upon the cost information provided by Perdue's environmental consultant, Environmental Resources Management (ERM), it is my professional opinion that imposing the additional cost of thermal oxidation control on any new soybean processing plant would place the plant at a distinct cost disadvantage to its competitors and would render the construction of a new plant not economically viable.

PROFESSIONAL EXPERIENCE

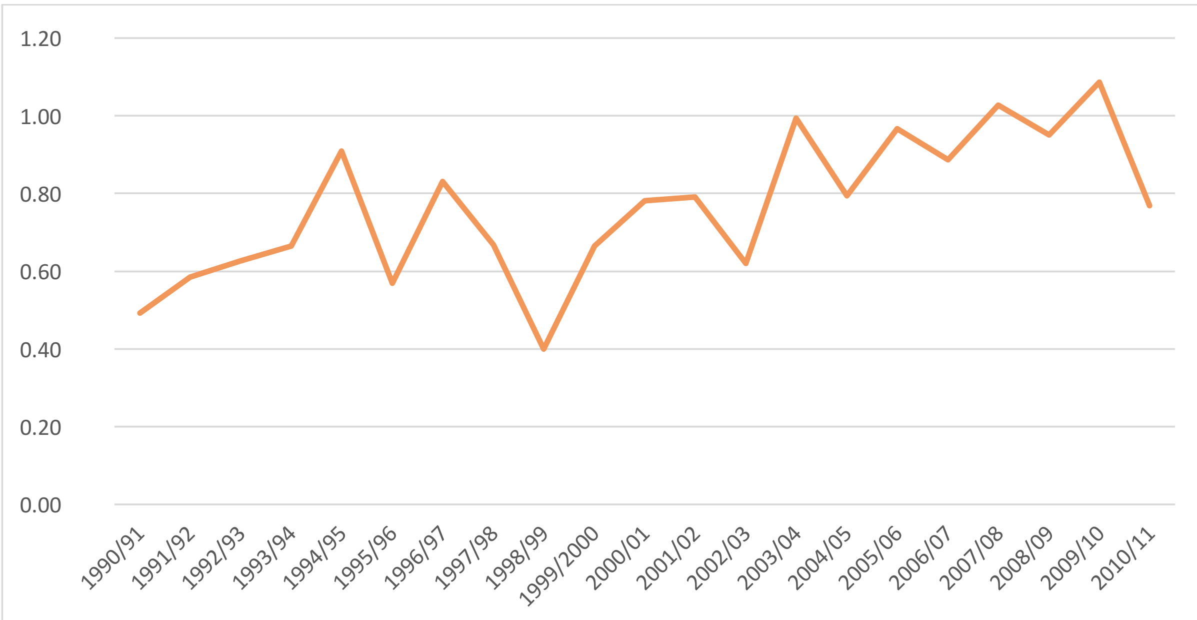
I spent 25 years in the soybean processing industry, serving in numerous capacities from commodity merchandiser to senior executive. At the end of this career, I had profit and loss responsibility for two soybean processing plants with an annual crush of 75 million bu. and annual sales of up to $1 billion. After this career for 18 years, I have been and continue to be a self-employed consultant to the soybean industry and related industries, such as edible oil refining and biodiesel. In this capacity I have served as interim CEO of two soybean processors that included profit and loss responsibility. Besides these direct executive responsibilities, I have consulted with six U.S. processors and one Mexican processor on numerous projects. I continue being active in a consulting capacity and as such I remain well informed about the soybean complex market, cash soybean commodity prices and industry profitability.

I also serve as the lead consultant regarding the market valuation of soybean compositional opportunities and related issues for the United Soybean Board, the U.S. farmer's check off program administered through the United States Department of Agriculture. I am co-editor of *Soybeans: Chemistry, Production, Processing and Utilization*, a highly regarded reference book published by the American Oil Chemists Society. I am the lead market consultant to QUALISOY, a soybean industry collaboration with the goal of creating added value and increasing the global competitiveness of the U.S. soybean industry through assistance in the development, commercialization and promotion of enhanced-quality traits. This organization is currently focused on commercialization of a soybean oil high on monounsaturated fat.

CHARACTERISTICS OF THE SOYBEAN INDUSTRY

The soybean industry is a basic commodity business that acquires fungible soybeans in quantity and processes them, producing soybean meal, soybean oil and byproducts. Both the raw material, soybeans, and the end products, meal and oil, are true commodities, providing virtually no opportunity for product differentiation. Consequently, the industry competes primarily on price. There are standard specifications for the primary products, soybean meal and soybean oil. These specifications are set forth in the trading rules of the National Oilseed Processors Association (http://www.nopa.org/resources/trading-rules/), and while buyer and seller may always agree to different specifications, this rarely occurs. Based on these specifications, processors compete based on the price delivered to a customer.

Highly competitive industries are characterized by narrow margins that require high volume production with a low cost structure for survival. Profitability in the soybean processing industry is measured by a "crushing margin," defined as the value of the end products times the yield of these products per bushel crushed minus the cost of a bushel of soybeans. It is expressed in cents per bushel crushed. The United States Department of Agriculture (USDA) tracks general industry crushing margins, and the following chart depicts this crush margin history based on the latest margin data published by USDA.



Source: USDA, Economic Research Service, Oil Crops Yearbook 2015, Table 9, Spread Between Value of Products and Soybean Prices in U.S.

The simple average of the margins shown above is 77 cents per bushel. Crush margins since 2011 have been both higher and lower than this range, with the current margin at 40 cents per bushel.

For relatively new, well run soybean processing plants, the variable costs of production run around 30 cents per bushel. These are costs that will be incurred any time an additional bushel is crushed and will be avoided if a bushel is not crushed. The primary variable costs are steam (10 cents per bushel) and electricity (5 cents per bushel). The fixed costs of soybean processing businesses when divided by the typical annual crush volume of a plant tend to run about 35 cents per bushel. The primary fixed costs are salaries and wages (10 cents per bushel) and depreciation (typically 10 to 15 cents per bushel). Thus the net profit potential of a typical soybean plant in a typical year is about 12 cents per bushel crushed (77 cents gross crushing margin minus variable costs of 30 cents per bushel minus fixed costs of 35 cents per bushel). This 12 cents per bushel must provide a reasonable return on any investment in plant and equipment.

As with any industry, a manufacturing plant should not operate at all when net margins drop below the variable cost of production, and this is typical in the soybean processing industry. The first threat to the economic viability of a soybean processing plant results from extended periods of margins below variable costs. The extent to which virtually all plants have the same variable cost structure both provides discipline in the industry rate of production in low margin periods and long term protection for the economic viability of plants.

The U.S. soybean processing industry is not considered a highly profitable business; consequently, the large multinational firms that dominate the industry have been concentrating their capital investment abroad (primarily Asia) and deemphasizing expansion within the U.S. industry. In the last 10 years, 6 soybean processing plants have permanently shut down while 3 have been built and 2 have incrementally added production capacity. Industry capacity is deemed to be only moderately greater than it was 10 years ago.

THE ECONOMIC IMPACT OF REQUIRING THERMAL CONTROL ON NEW SOYBEAN PLANTS

Perdue, like any rational soybean processor, must be secure in their expectations for the plant in Lancaster County, PA to be able to operate always above the variable cost of production and usually above their total cost structure. It is my understanding that consideration is being given to compel Perdue to install a thermal oxidizer to compliment an already effective desolventizing system design. This will require a capital cost of $10 million and will result in additional operating costs of $2.78 million annually, or 13.6 cents per bushel crushed.

Based upon the cost information contained in the document prepared by ERM titled "Economic Analysis of RTO Control Options," I have calculated that the capital cost of a thermal oxidizer will add 2.6 cents per bushel to annual fixed costs in the form of depreciation. Direct operating expenses of the thermal oxidizer will run 11 cents per bushel, an increase in variable costs of 36%. Addition of the thermal oxidizer to the Perdue facility or any soybean processing plant for that matter will add a total of 13.6 cents per bushel to the plant's cost structure, putting it at a distinct disadvantage to its competitors. In fact, at current margins, were a plant required to incur these additional costs, it would have to shut down, since its variable cost of production would exceed current margins. And it would be the only plant in the U.S. in that circumstance. No company, regardless to size or capital resources, would make the decision to make this investment under these circumstances.

In my professional opinion, imposing the additional cost of a thermal oxidizer on a new soybean processing plant would put the plant at a distinct cost disadvantage to its competitors and would render the construction of a new plant not economically viable. Should this requirement be placed on the Perdue project, my recommendation to Perdue would be to immediately abandon the project.

Prepared by:

Richard Galloway, President
Galloway& Associates LLC

RICHARD GALLOWAY
26 Hidden Green Lane
Isle of Palms, SC 29451
(843)886-4466
Richard.Galloway@bellsouth.net

Richard Galloway has over 40 years' experience in all aspects of grain merchandising, oilseed processing, vegetable oil refining and biodiesel production and marketing. He has corporate management and executive experience in the United States and consulting experience in the United States, Latin America and Europe.

Galloway & Associates, LLC

Richard is President of Galloway & Associates, LLC, a business consulting firm serving domestic and foreign agricultural processing, vegetable oil refining, biodiesel and grain handling industries, and organizations and businesses that support these industries. Besides work with private clients, he is the lead consultant for the United Soybean Board in soybean composition, primarily focused on improved functionality and nutrition of soybean oil, the feed value of soybean meal and increasing the competitiveness of U.S. soybeans through soy product enhancements and quality improvements. Richard provides consulting services for QUALISOY, a collaborative effort among the soybean industry to help market the development and availability of trait-enhanced soybeans

Richard's work with private clients has included numerous domestic and Latin American companies. A recent project involved providing soybean crushing cost benchmarking on behalf of Ragasa Industrias, S.A. De C.V., Monterey, Mexico. Several years ago, he led Minnesota Soybean Processors, a soybean crusher and biodiesel producer, through a management evaluation and management change, serving as Interim CEO for three years. He is a consultant to Genscape, Inc., the leading global provider of energy information for commodity and financial markets, on their QAP biofuel RIN integrity service. He is co-editor of *Soybeans: Chemistry, Production, Processing, and Utilization*, a widely used reference book published by the American Oil Chemists Society and author of the Foreword to *Designing Soybeans for 21st Century Markets*, also an AOCS publication. Richard has published numerous articles on soybean composition and related issues for trade publications over the last 15 years.

Soybean Industry Corporate Experience

Prior to consulting, Richard spent 25 years in the oilseed processing, edible oil refining and grain industries with Quincy Soybean Co., Quincy, IL and Gold Kist, Inc., Atlanta, GA. Starting his career as a soybean meal merchandiser, he later served in several executive positions that involved all areas of the commercial aspects of soybean processing, including soybean procurement, soybean product sales and marketing, grain merchandising and risk management (hedging/futures trading). At the end of his corporate career, Richard was Executive Vice President at Quincy Soybean Company, responsible for all aspects of the commercial business, strategic planning and three joint ventures: ContiQuincyBunge (an export soybean meal venture), C&T Quincy (an edible oil refining business) and PG Lecithin (a soy lecithin business). He served as Quincy's representative to the National Oilseed Processing Association and served as that industry group's Vice Chairman. Richard served as a guest lecturer at the Harvard School of International Business, London, England.

Education

The Executive Program, University of Michigan, Ann Arbor, MI

M.B.A., Georgia State University, Atlanta, GA

B.S., Business Administration, Presbyterian College, Clinton, SC

Appendix F
E-mail from Bartlett Controls Regarding Biofiltration

Dave Jordan

From: Tommy Bartlett <Tommy@bartlettcontrols.com>
Sent: Tuesday, September 01, 2015 2:12 PM
To: Dave Jordan

Subject: Biofiltration and Hexane

The reference document commonly utilized to assist in biofiltration design, "Biofiltration for Air Pollution Control" written by Devinny, Deshusses, & Webster in **1999**, identifies hexane as moderately biodegradable, not **good degradability**. Based on my experience, I would classify hexane biodegradability as "slight". That means that there is no way to get over 50% distruction removal efficiency (DRE) without extremely long retention time and exorbitant cost – perhaps on the order of $100 to $120/acfm. Even then I wouldn't guarantee more than 70% DRE. That would be with a 90 second, **plus**, residence time. The size, based on the referenced elimination capacity (i. e. loading **and removal capability**) would have to be between 12 and 30 times the size of a biofilter used for 90% degradation of methanol and formaldehyde in a comparable airstream. If we were designing a 50,000 acfm unit to remove a mixture of methanol and formaldehyde, the expected capital cost would be on the order of $20-$22 per acfm or about $1MM. Based on this, for **a** hexane model we would estimate a capital cost of $12MM to $30MM installed, and would provide no guarantee that a control efficiency **>50%** could be met.

Analogous data are/is that biofilters are used for sulfur removal, H2S and other organic sulfur compounds, for methane gas streams from anaerobic digesters and landfills; with no bio-degradation of the methane. Like methane, propane and pentane, hexane is an alkane. Alkanes are very resistant to biological degradation and pass through commercial biofilters without alteration.

Tommy Bartlett
Bartlett Controls
Office 704-843-2299
Cell 704-579-7390

Appendix G
E-mail from Bartlett Controls Regarding Carbon Adsorption

Dave Jordan

From: Tommy Bartlett <Tommy@bartlettcontrols.com>
Sent: Monday, September 14, 2015 2:34 PM
To: Dave Jordan
Subject: Carbon Unit and Hexane

With reference with GAC for the Hexane application, we would not recommend carbon adsorption for this situation for the following reasons.

1. GAC unit will have to carefully controlled and monitored with LEL monitors along with possible Detonation Arresters and other safety related equipment.

2. Activated carbon, will be very costly, needing replacement often because of the hexane concentration in the emissions. Scrubbing will be necessary because of the particulate load. W/O scrubbing, GAC will plug very quickly.

3. Also, with the need to scrub, the saturated airstream will be detrimental to best GAC adsorption/performance. Wet GAC doesn't adsorb VOCs well, therefore destruction/DRE may be an issue.

4. GAC with adsorbed hexane will be a fire hazard! Must be handled carefully, and carbon beds will have to be handled when and if they need replacing . Need to address where to dispose of the contaminated carbon.

Tommy Bartlett
Bartlett Controls
Office 704-843-2299
Cell 704-579-7390

Appendix H
Economic Analysis of PM Control Measures

Table of Contents

1.0 BACKGROUND

Pursuant to 25 Pa. Code Section 127.12(a)(2), PADEP requested that Perdue provide additional information to demonstrate that the proposed particulate matter emission rate of 0.02 gr/dscf constitutes Best Available Technology (BAT) for the control of particulate emissions from the dryer/cooler exhaust. Specific questions have been posed by PADEP regarding the ability of Perdue to achieve an outlet particulate matter emission rate of 0.01 gr/dscf or an outlet PM_{10} emission rate as low as 0.0025 gr/dscf.

The responses provided in this Appendix were generally prepared based upon joint efforts of ERM and Perdue, with such joint responses noted herein using the terms "we" or "our". In instances where a response represents or references an opinion or effort that is solely attributable to one or the other, this will be noted by specific reference to ERM or Perdue.

In its original permit application, Perdue indicated that the Dryer/Cooler exhaust would have a controlled particulate matter emission rate of 0.04 gr/dscf through the use of high efficiency cyclones. In response to questions from PADEP, Perdue asked its equipment design engineer to reevaluate the level of control that could be achieved with high efficiency cyclones on the Dryer/Cooler exhaust stream. Based on information provided by its design engineer, Perdue revised the outlet particulate matter emission rate from the Dryer/Cooler to 0.02 gr/dscf. We do not believe that a more stringent particulate matter emission rate is achievable without the use of additional control equipment.

In response to other questions posed by PADEP, we contacted three equipment vendors regarding the technical feasibility of installing an RTO control system on the Dryer/Cooler exhaust. We asked vendors to describe the design that each would recommend given the physical characteristics of the Dryer/Cooler exhaust and to provide an estimate of the capital and operating costs associated with these control systems. More detailed information on the nature of our request to these vendors is provided in Appendix F.

Each of the three vendors recommended the use of an additional particulate matter control device prior to the RTO in order to minimize particulate matter deposition in the RTO control device. The recommended methods of particulate matter proposed by each vendor were:

- NESTEC recommended the use of a wet venturi scrubber or wet ESP (specific equipment make/model were not provided).
- Adwest Technologies recommended the use of a wet scrubber.
- Anguil Environmental Systems recommended the use of a wet ESP or wet venturi scrubber.

Information provided in these responses was utilized to analyze the feasibility of additional particulate matter controls to achieve BAT.

2.0 *DESIGN PARAMETERS UTILIZED IN COST ANALYSES*

In order to quantify complete costs associated with particulate matter control options, we quantified the capital cost of control equipment, annual operating expenses associated with control equipment options, and any other costs that would be incurred as a part of each vendor's recommended approach. Capital and operating cost estimates provided by equipment vendors were based on stack parameters that were consistent with current design parameters for the plant.

2.1 *STACK PARAMETERS UTILIZED*

Stack parameters provided to the equipment vendors for the Dryer/Cooler exhaust that were utilized by vendors in preparing particulate matter control system cost estimates are summarized below.

- Air flow rate = 49,700 acfm during normal operations; 54,670 acfm during startup

- Temperature gases out = 138° F on average, may be as low as 120° F during the winter

- Water content in exhaust = 9,948 pounds per hour

- Particulate matter emission rate = 0.02 gr/dscf, or 6.2 lb./hr total combined for the exhaust stream. This emission rates represents the outlet particulate matter concentration following high efficiency cyclone controls. Emissions from these units may increase on a short term basis as a consequence of equipment malfunction or plugging of cyclones (uncontrolled PM emissions from these units are 693 pounds per hour; design feasibility should consider the impact of short term particulate matter increases on control equipment operation/maintenance/ performance).

Given the description provided above for the Dryer/Cooler vent, all three vendors recommended particulate matter control systems be installed as an additional prefilter prior to a RTO control system. As a part of their responses, equipment vendors provided estimated capital and operating costs for these particulate matter control systems.

2.2 ADDITIONAL SITE-SPECIFIC COST FACTORS

Additional site-specific cost factors and adjustments were made to standard EPA cost equations in order to provide an accurate projection of estimated capital and operating costs for additional particulate matter control systems. These included the following:

- Operating and maintenance labor costs were estimated using a labor cost of $32 per hour.

- Operating labor hour requirements for particulate matter controls for the Dryer/Cooler vent were estimated based on an assumed labor demand of four hours per shift. Maintenance labor cost estimates were based on an assumed maintenance labor requirement of 1.5 hour per shift. Both of these values are consistent with standard EPA cost equations for wet scrubbers.

- Capital costs were amortized based on an interest rate of 5% and an equipment life of 10 years.

3.0 *PARTICULATE CONTROLS ON DRYER/COOLER EXHAUST*

Responses provided by equipment vendors were first reviewed to determine the technical feasibility of add-on controls on the Dryer/Cooler vent system to control particulate matter emissions in this exhaust. To the extent that such controls were determined to be feasible, capital and operating cost data provided by vendors was combined with site specific cost information to quantify the estimated overall cost to operate such controls on the Dryer/Cooler vent exhaust.

3.1 *VENDOR RESPONSES*

Based on responses provided by all three vendors, we conclude that it is technically feasible to install an additional particulate matter control system on the Dryer/Cooler exhaust to control particulate matter emissions lower than currently proposed. We compared capital and operating cost estimates provided by all three vendors for the Dryer/Cooler exhaust as well as control efficiency guarantees provided by each vendor. Based on this review, we concluded that the three quotes were generally comparable in regards to the degree of control that would be achieved.

- Adwest =
- Anguil = for the wet ESP control option; control efficiency/outlet grain loading for wet venturi scrubber dependent on particle size distribution
- NESTEC =

For the purpose of this evaluation, we performed the economic analysis using cost estimates provided by for which is the lowest of the three responses[i]. The quote is provided as Attachment to Appendix E.

3.2 *COST SUMMARY*

A summary of estimated capital and operating costs associated with the installation of a wet scrubber to control particulate matter emissions from the Dryer/Cooler exhaust is summarized in Table 1 below.

[i] COST ESTIMATE PROVIDED BY

Table 1 – Wet Scrubber for the Dryer/Cooler Exhaust		
Item	**Cost**	**Comments**
Equipment Cost	$550,000	Vendor
Instrumentation	$55,000	10% of Equipment Cost
Taxes	$33,000	PA Sales Tax = 6%
Freight	$27,500	5% of Equipment Cost
Total	$665,500	
Foundations and Support	$39,930	6% of Total Purchased Equipment Cost
Handling and Erection	$266,200	40% of Total Purchased Equipment Cost
Electrical	$6,655	1% of Total Purchased Equipment Cost
Piping	$33,275	5% of Total Purchased Equipment Cost
Insulation	$19,965	3% of Total Purchased Equipment Cost
Painting	$6,655	1% of Total Purchased Equipment Cost
Electrical & Pump Bldgs.	$31,250	Building cost estimate provided by NESTEC
Total	$403,930	
Total Direct Costs - DC	$1,069,430	
Engineering	$66,550	10% of Total Purchased Equipment Cost
Construction Expenses	$66,550	10% of Total Purchased Equipment Cost
Contractors Fees	$66,550	10% of Total Purchased Equipment Cost
Start-up	$6,655	1% of Total Purchased Equipment Cost
Performance Test	$6,000	Vendor quote
Contingency	$19,965	3% of Total Purchased Equipment Cost
Total Indirect Costs	$232,270	
Total Capital Investment	$1,301,700	
ANNUAL COST		
Operator Labor	$140,160	4 hours per shift Operating Labor
Supervision	$21,024	15% of Operating Labor
Maintenance Labor	$52,560	1.5 hr/shift
Maintenance Parts	$52,560	Equal to Maintenance Labor
UTILITIES		
Electricity	$231,264	Vendor
Water	$9,461	Vendor (4 gpm)
Total Direct Cost	$507,029	
Overhead	$165,459	60% of O&M
Administrative Charges	$26,034	2% Total Capital Investment
Property Taxes	$13,017	1% Total Capital investment
Insurance	$13,017	1% Total Capital investment
Capital Recovery CRFxTCI	$168,576	5% interest; 10 year equipment life
Total Indirect Cost	$86,103	
Total Annual Cost	$893,132	

The results of this analysis show that the estimated annualized cost to construct and operate a wet scrubber to further control particulate matter emissions from the Dryer/Cooler exhaust is $893,132 per year.

3.3 CONTROL EFFICIENCY

[redacted] estimated that the particulate matter emission rate from the Dryer/Cooler exhaust could be reduced to of [redacted] Based on the typical expected emission rate of 6.48 pounds per hour of particulate matter emissions at an outlet concentration of 0.02 gr/dscf, the expected reduction in particulate matter emissions based on vendor projections is 25.5 tons per year of particulate matter emissions. Although we are not convinced that the [redacted] proposed by [redacted] can achieve an outlet particulate matter concentration of [redacted] gr/dscf on an ongoing basis, it has assumed this emission rate could be achieved for the basis of this analysis.

Based on the cost data summarized above and the equipment guarantee provided by the vendor, the control system proposed for the Dryer/Cooler exhaust system would result in a reduction in particulate matter emissions of 25.5 tons per year, which equates to a cost of approximately $35,000 per ton of particulate matter controlled.

4.0 ANALYSIS OF BAT

As indicated above, the capital cost of constructing a wet scrubber control device to control particulate matter emissions from the Dryer/Cooler exhaust is approximately $1.3 MM (total capital investment) with additional annual operating expenses of approximately $724,600 per year. Such a control device would reduce particulate matter emissions from the Dryer/Cooler exhaust from 28.4 tons per year to 2.8 tons per year at a cost of approximately $35,000 per ton of particulate matter reduced. Pennsylvania Rule 25 Pa 121.1 defines best available technology as:

> Best available technology—Equipment, devices, methods or techniques as determined by the Department which will prevent, reduce or control emissions of air contaminants to the maximum degree possible and which are available or may be made available.

Given the excessive cost to provide this level of control to particulate matter emissions from the Dryer/Cooler vent, we do not believe that such controls are available as a practical matter, as the costs of such controls are more than three times higher than the level that would be considered reasonable under a Best Available Control Technology (BACT) analysis (approximately $10,000 per ton of particulate matter removed).

Based on this analysis, we conclude that BAT for the Dryer Cooler exhaust is the use of high efficiency cyclones to control particulate matter to an outlet emission rate of 0.02 gr/dscf.

Appendix I
E-mail from Anguil Environmental Regarding Thermal Oxidizer Operating Costs

Dave Jordan

From: Jeff Kudronowicz <jeff.kudronowicz@anguil.com>
Sent: Monday, September 07, 2015 11:20 PM
To: Dave Jordan; Rich Grzanka; Jim Stone
Cc: Fontaine, Peter (PFontaine@cozen.com); Korey Inman
Subject: RE: Anguil Environmental - Perdue

Dave,

It was good to talk to you Friday afternoon. As promised, here is a quick e-mail summary of the options that we discussed.

1. Mineral Oil Vent
   A 500 SCFM Catalytic Recuperative Oxidizer could be used for this stream for hexane removal. These systems are light meaning they can be installed easier than thermal oxidizers. An approximate capital cost for this oxidizer is $150,000 and would cost $1.61/hr to operate based on utilities cost estimates of $7/MMBTU and $0.07/kwh, while processing 1.65 lbs/hr of hexane.

   A small Regenerative Thermal Oxidizer (RTO) could also be used for this vent stream. The RTO offers high heat recovery with the beds of ceramic media. Because of this media, the weight of the RTO is higher than the catalytic oxidizer. This can impact the installation location of the RTO. The approximate capital cost for a RTO like this would be $200,000 - $250,000 depending if we could get a feedforward signal to dilute prior to the process generating 20% LEL, or if the RTO would need to be equipped with a Hot Gas Bypass damper to release excess heat without a feedforward signal. The RTO would require $0.93 of utility cost to operate when handling 1.65 lbs/hr of hexane and assuming the same utility costs as shown above.

2. Dryer / Cooler Exhaust
   If a thermal oxidizer with no heat recovery were used because of the particulate emissions, the system would incur a significant operational cost to heat up all that process exhaust. The total utility cost would be $550/hr to operate this way, assuming the 17.27 lbs/hr of hexane emissions and the same utility costs as above. This would be using a raw gas burner rather than a nozzle mix burner, with the latter burner choice increasing the operational cost even further. The capital cost of such a system would be about $700,000. This is a rough estimate since thermal oxidizers of this size with no heat recovery are extremely rare because of the significant operational cost drives users to other technologies.

   To handle 49,700 ACFM with a process temperature of 138F, this RTO would have a capital cost of approximately $775,000 - $825,000 depending on the feedforward signal again. Processing this airflow with 17.27 lbs/hr of hexane would result in an operational cost of $46.43/hr based on the same utility costs as given above. But using the RTO would require particulate filtration (I know you are concerned about clogging the baghouse filters), so a WESP could be required.

I hope you find this information helpful. We would be happy to formalize any proposals for the options given above.

Kind regards,

From: Dave Jordan [mailto:Dave.Jordan@erm.com]
Sent: Sunday, September 06, 2015 8:09 PM
To: Rich Grzanka <rich.grzanka@anguil.com>
Cc: Jeff Kudronowicz <jeff.kudronowicz@anguil.com>; Fontaine, Peter (PFontaine@cozen.com) <PFontaine@cozen.com>
Subject: RE: Anguil Environmental - Purdue

Rich,

I spoke with Gunnar Peterson several days ago and forwarded stack parameters to him to provide us with cost estimates for exhausts from Perdue's proposed soybean processing plant. Gunnar forwarded the information to Jeff Kudronowicz, who is working on providing us with an evaluation of potential control options and cost estimates. I believe that Jeff has all the information he needs to provide us with an evaluation of potential control options and associated costs, but if there is anything else we can provide to assist, please let me know.

David R. Jordan, P.E.
ERM
317 706 2006

From: Rich Grzanka [mailto:rich.grzanka@anguil.com]
Sent: Saturday, September 05, 2015 9:28 AM
To: Dave Jordan
Subject: Anguil Environmental - Purdue

Dear Dave,

Greg Rowe at Perdue, gave us your name to contact regarding his possible need to abate Hexane emissions form his plant. Greg said they are in a rush to get a quick evaluation of the various oxidizer technologies with operating expenses.

I have attached an application data sheet, which we use to gather data so we can evaluate potential applications.

So far we believe we are looking at the following:

- Approximate airflow: 50,000-55,000 SCFM
- High Moisture Content and Particulate Loading (6.2 Pounds per hour)
- Hexane emissions are not consistent, they can range from 1% to 20% LEL. In their permit they estimate over 200 tons per year.

Please provide what information you can and we will review and advise.

Thank you,

Rich Grzanka Vice President
88 East Main Street, Mendham
Mendham NJ 07945 USA
P&F: +1 (973) 543-8923 Cell: +1 (201) 317-4677
Rich.Grzanka@anguil.com
www.anguil.com

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Dear Mr. Rowe,
I'm writing in regards to the air permit that Perdue Agribusiness is seeking for your soybean crushing operation in Conoy Township, PA. Several of the editorials indicate that Perdue has some hesitation and safety concerns over using a Regenerative Thermal Oxidizer (RTO) on Hexane emissions.

Our company, Anguil Environmental, has successfully supplied RTOs for the destruction of saturated hydrocarbons like Hexane and would not anticipate any concerns applying this technology on your soybean extraction process. If you and your associates would like assistance evaluating your emissions and the possibility of applying an oxidizer on this application we would like to offer our experience and knowledge. With some basic process information, Anguil can provide Perdue with equipment selection and pricing, operating expenses on the various technologies, and options for your specific situation. We can also address any safety concerns you may have about thermal oxidation technologies.

As a background, Anguil Environmental designs, manufactures, installs and services Regenerative Thermal Oxidizers (RTOs), as well as Direct-Fired, Catalytic and Thermal Recuperative oxidizers for the destruction of Volatile Organic Compounds (VOCs), Hazardous Air Pollutants (HAPs), NO_X and odorous air emissions. This broad offering of oxidation technologies ensures an unbiased equipment selection and design for each specific application. Some advantages of working with Anguil:

- Over 35 Years of Experience in Various Industries
- Regulatory Compliance Guaranteed
- Cost-Effective, Energy-Efficient Equipment
- Custom or Standard Designs
- Service Capabilities, Regardless of Original Equipment Manufacturer

Our goal is to provide pollution control and energy solutions today to help our customers remain profitable tomorrow.

Oxidizers are designed around the emission type, concentrations, temperature and airflow. We will need this basic information in order to provide you with equipment selection, pricing and availability. To begin work on your project, please complete the attached application data sheet to the best of your knowledge so we may better understand your needs. Alternatively, you can complete the form via our Online Application Data Sheet.

Attached is some additional information on Anguil Environmental Systems and our solutions for industrial air pollution control. If you have any questions or would like to speak with someone about the application at Conoy, please feel free to contact myself or Rich Grzanka / Vice President of Business Development / rich.grzanka@anguil.com / (973) 543-8923.

We welcome the opportunity to assist you.
Sincerely,

Kevin Summm ***Director of Marketing***
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