5. BEST AVAILABLE CONTROL TECHNOLOGY

Pursuant to federal PSD regulation 40 CFR 52.21(j) and ADEM Admin. Code r. 335-3-14-.04(9), any new major stationary source subject to PSD review for a NSR regulated pollutant is required to include a Best Available Control Technology (BACT) analysis. As defined under the PSD regulations, ADEM Admin. Code 335-3-14-.04(2), BACT means:

> *... an emission limitation (including a visible emission standard) based on the maximum degree of reduction for each pollutant subject to regulation under [the] Act which would be emitted from any proposed major stationary source or major modification which the Administrator, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such source or modification through application of production processes or available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of such pollutant. In no event shall application of best available control technology result in emissions of any pollutant which would exceed the emissions allowed by any applicable standard under 40 CFR parts 60 and 61. If the Administrator determines that technological or economic limitations on the application of measurement methodology to a particular emissions unit would make the imposition of an emissions standard infeasible, a design, equipment, work practice, operational standard, or combination thereof, may be prescribed instead to satisfy the requirement for the application of best available control technology. Such standard shall, to the degree possible, set forth the emissions reduction achievable by implementation of such design, equipment, work practice or operation, and shall provide for compliance by means which achieve equivalent results.*

A BACT analysis is required for each new emission unit that emits a pollutant that triggers PSD. As VOC is the only NSR regulated pollutant to have emissions exceeding the applicable SER, a BACT analysis is only required the Continuous Drying Kilns (CDK-1, CDK-2, CDK-3), Emergency Fire Pump Engine (FE), and Storage Tanks (LST and TST).

5.1. BACT DETERMINATION FOR CONTINUOUS DRYING KILNS

This analysis is conducted to determine the best available control technology for VOC emissions from the kilns (CDK-1, CDK-2, CDK-3).

5.1.1. Step 1 - Identification of Control Technologies

The first step in the BACT analysis is to identify all available control technologies for each new unit and regulated pollutant required to be evaluated. Potentially applicable emission control technologies were investigated by reviewing U.S. EPA's RACT/BACT/LAER Clearinghouse (RBLC database), technical literature, control equipment vendor information, and by using process knowledge and engineering experience from similar types of units in operation at other GP owned facilities. The RBLC lists control technologies that have been approved as BACT in PSD permits issued by regulatory agencies for numerous process units. Process units in the database are grouped into categories by industry type.

A search of the RBLC database was performed to identify the emission control technologies and emission rates determined by permitting authorities as BACT for the wood products industry, wood lumber drying kilns (Process Code 30.800 in the RBLC). The results of the search indicate that no "add-on" control technologies have been implemented as part of a PSD or Lowest Achievable Emission Rule (LAER) permitting effort to control VOC emissions from lumber drying kilns regardless of drying method (batch, continuous, direct or indirect-fired). A summary of the RBLC findings is included in Table C-10 in Appendix C.

GP operates numerous lumber drying kilns (batch, continuous, direct or indirect-fired) across the United States. None of these lumber drying kilns at any of GP's manufacturing facilities utilize "add-on" pollution controls to remove VOC emissions. In addition, to the best of GP's knowledge, no lumber kilns operating in the U.S. utilize "add-on" pollution controls to remove VOCs.

While "add-on" controls have not been demonstrated for lumber drying kilns, the following control technologies have been demonstrated to reduce VOC emissions from other industrial processes. The exhaust streams generated by direct-fired CDKs would need to be treated for particulate matter emissions (emitted from the direct-fired sawdust burner into the kiln drying chamber) prior to consideration of thermal and catalytic oxidizers.

- Wet Electrostatic Precipitator (WESP) followed by Thermal Oxidation
- WESP followed by Catalytic Oxidation
- Condensation
- Carbon Adsorption
- Wet Scrubbing
- Biofiltration
- Proper Kiln Design and Operation

A brief description of each of the VOC control technologies listed above is provided in the following sections.

5.1.1.1. Thermal Oxidation with Use of Wet Electrostatic Precipitation

Thermal oxidizers work on the principle of reacting VOCs in an industrial process exhaust gas stream with oxygen in air to form carbon dioxide and water vapor as shown in the following chemical reaction:

$$\text{VOCs} + O_2 + \text{heat} \rightarrow H_2O + CO_2$$

This reaction occurs when the exhaust gases from an industrial process are heated to a sufficiently high temperature, typically 1,400-1,600°F with a residence time in the combustion chamber between one-half to one second.

Thermal oxidizers can be designed as conventional thermal units, recuperative units, or regenerative thermal oxidizers (RTOs). A conventional thermal oxidizer does not utilize heat recovery with a heat exchanger. Therefore, the supplemental fuel cost is extremely high and is not suitable for applications with high exhaust gas flow and low VOC concentrations. In a recuperative thermal oxidizer, the VOC-laden inlet gases are preheated by the combustion exhaust gas stream of the oxidizer through the use of a heat exchanger. The heat exchanger will recover as much as 95% of the heat from the exhaust gases and preheat the combustion air, thereby providing significant fuel savings (to heat up the combustion air with supplemental fuel) compared to a system that does not incorporate a heat exchanger. An RTO consists of at least two separate chambers packed with ceramic media. The VOC-laden gas enters one hot ceramic bed where the gas is heated to the desired combustion temperature. Auxiliary fuel may be required in this stage, depending on the heat content of the VOCs contained in the inlet gas stream. The gas stream is directed through the other ceramic bed, where the heat released from combustion is recovered and stored in the ceramic bed. The process gas flow then is switched so that the inlet gas stream can be preheated by the heat recovered in the ceramic bed. The RTO is operated using an alternating cycle for the two ceramic beds, recovering up to 95% of the thermal energy generated by the combustion process during normal operation. RTOs have the potential to remove more than 99% of VOCs from a gas stream, depending on the specific VOCs present in the gas stream. Based on GP's knowledge of lumber kiln exhaust gases (as lower VOC concentrations result in lower destruction values), it is assumed that an RTO could potentially achieve up to 97% VOC destruction, as long as the exhaust gas stream did not contain contaminants or other materials that might interfere with the operation of the control system.

RTO performance is affected by the quality of filterable particulate matter (PM) and condensable PM (CPM) contained in the exhaust gas stream. Therefore, to avoid interference from PM or CPM contained in the exhaust gas stream, as much PM and CPM as possible should be removed prior to the exhaust gas entering the RTO. The placement of a WESP ahead of an RTO has been used in the oriented strand board (OSB) industry to remove PM and some CPM as well as VOC emissions from rotary driers. WESPs are used instead of dry ESPs when wet, sticky, or flammable PM and CPM is contained in the exhaust gas stream, making it a preferred method of PM and CPM removal prior to the exhaust gases entering an RTO. PM removal efficiencies of the WESP range from 90 - 99+%, depending upon the design of the WESP and the specific characteristics of the PM contained in the exhaust gas stream. WESPs are not usually designed to remove CPM with the same high control efficiencies as PM.

5.1.1.2. Regenerative Catalytic Oxidation with Use of Wet Electrostatic Precipitation

Similar to an RTO, a regenerative catalytic oxidizer (RCO) oxidizes VOCs to carbon dioxide and water vapor using a metallic catalyst. An RCO allows the oxidation of VOCs to take place at a much lower temperature compared to an RTO. Oxidation of VOCs in an RCO usually takes place at temperatures ranging from 500-600°F. This creates the opportunity to reduce fuel expenses and materials of construction costs for the RTO (since the materials of construction will be subject to much lower temperatures, thereby reducing the risk of rapid corrosion or deterioration of the materials of construction). The addition of a combustion air preheater will further reduce the fuel costs. These types of oxidizers are just as capable in removing VOCs from a gas stream. VOC destruction efficiencies have the potential to be 95% or greater, depending on the specific VOC compounds present in the exhaust gas stream. Based on GP's knowledge of the exhaust gases from a lumber kiln (as lower VOC concentrations result in lower destruction values), it is assumed that an RCO would achieve a minimum VOC destruction efficiency of 90%.

PM removal is even more critical for RCOs than RTOs as the catalyst may be blinded by PM build-up, and as a result, may operate at much lower conversion efficiencies, or if the PM build-up is significant, the catalyst may not work at all to remove VOC emissions. Additionally, RCOs are sensitive to poisoning from heavy metals present in the exhaust gas stream. As such, it is necessary to remove PM emissions prior to directing the exhaust gases through the RCO. WESPs have the highest PM control efficiency for this type of system, compared to wet scrubbers or high efficiency cyclones. WESPs can have PM removal efficiencies of 90-99+%, depending upon the particle size fraction of the PM material being removed from the exhaust gas stream.

5.1.1.3. Condensation

Condensation systems remove VOC emissions by condensing VOCs within the exhaust gas stream by either increasing pressure or lowering the temperature of the exhaust gases. The condensed VOCs are then destroyed in a separate combustion device or the materials are recovered for sale. Condensation requires that the exhaust stream be cooled to a temperature low enough such that the vapor pressure of the exhaust gases are lower than the VOC concentration of the exhaust gases.

5.1.1.4. Carbon Adsorption

Carbon adsorption systems can potentially be used to remove VOCs from exhaust gas streams. The core component of a carbon adsorption system is an activated carbon bed contained in a steel vessel. The VOC-laden exhaust gases pass through the carbon bed where the VOC is adsorbed on the activated carbon. The cleaned gas is discharged to the atmosphere. The spent carbon is regenerated either at an on-site regeneration facility or by an off-site activated carbon supplier. One method used to regenerate spent activated carbon is by using steam to displace adsorbed organic compounds at high temperatures.[2]

The VOC removal efficiency is dependent upon the absorption capacity for each of the specific organic compounds that make-up the exhaust gas stream. The adsorption capacity for a particular contaminant represents the amount of the contaminant that can be adsorbed on a unit weight of activated carbon consumed at the conditions present in the application. Typical adsorption capacities for moderately adsorbed compounds range from 5 to 30% of the weight of the carbon. In the adsorption process, molecules of a contaminated gas stream are attracted to and accumulate on the surface of the activated carbon. Carbon is a commonly used adsorbent due to its very large surface area. While most organic compounds will adsorb on activated carbon to some degree, the adsorption process is most effective on higher molecular weight and high boiling point compounds. Compounds having a molecular weight over 50 and a boiling point greater than 50°C are good candidates for adsorption.

5.1.1.5. Wet Scrubbing

Scrubbing of VOCs contained in an exhaust gas stream is usually accomplished in a packed column (or other type of column) where the VOCs are absorbed by countercurrent flow of a scrubbing liquid. Scrubbing liquids include water, a caustic solution, or another liquid media that will interact to remove the VOC compounds. Wet scrubbing is most effective for water soluble VOC compounds, such as alcohols. Removal efficiencies for hydrophilic VOCs (VOCs that mix, dissolve or are wetted by water) can exceed 90%, depending upon the specific chemical compounds that make-up the VOCs within the exhaust gas stream. The VOC compounds to be scrubbed from the exhaust gas stream must be soluble in the absorbing liquid and even then, for any given absorbent liquid, only VOCs that are soluble in the scrubbing liquid can be removed.

[2] Shepard, Austin. Activated Carbon Adsorption for Treatment of VOC Emissions. Presented at 13th Annual EnviroExpo, Boston Massachusetts- May 2001. http://www.carbtrol.com/voc.pdf.

5.1.1.6. Biofiltration

Biofiltration is a technology where a VOC-laden exhaust stream is directed through a biologically active media. Biofiltration uses microorganisms to break down organic compounds into carbon dioxide, water, and salts. When the biofilter is built, the microorganisms are already on the material that is used as a filter bed. The filter bed material normally used is peat, soil, or compost, but granulated activated carbon and polystyrene can also be used. The choice of filter bed material is very important because it has to supply the nutrients for the microorganisms, support biological growth, and have good sorption capacity.

The biological process is oxidation by microorganisms and can be written as follows:

$$VOC + O_2 + \text{microorganisms} + \text{nutrients} \rightarrow CO_2 + H_2O + \text{Heat} + \text{microorganisms}$$

The microorganisms live in a thin layer of moisture, or the "biofilm", which is built around the particles of the filter material. The contaminated gas stream is diffused through the biofilter and adsorbed onto the biofilm. The biofilm is the where the oxidation process actually takes place. The VOCs contained in the exhaust gas stream are not permanently transferred to the filter bed material.

Temperature, oxygen level, and pH of the exhaust gas stream affect the level of VOC removal. Microorganisms work best when the temperature is between 85 and 105°F. Gas stream temperatures well above 105°F will kill the bacteria contained in the filter media and thereby negate its effectiveness. Also, since most of the biological degradations are aerobic in nature, the oxygen level is very important in the biofiltration process. In fact, oxygen is not used directly in the gaseous form, but the microorganisms use the oxygen present in the dissolved form in the biofilm. The microorganisms are most efficient at neutral pH values (pH around 7). Thus, the pH level of the contaminated gas stream must be maintained at a neutral level.

Biofilters are most effective in removing water soluble VOC compounds and have demonstrated removal efficiencies for individual hydrophilic compounds such as methanol and formaldehyde that exceed 90%. Vendors claim that this technology has the capability to remove approximately 50-70% of the total VOC emitted from a gas stream (comprised of VOC compounds with varying degrees of water solubility) when used under favorable operating conditions of low temperature, readily available oxygen, and neutral pH conditions. Based on GP's familiarity with the operation of biofiltration units on other process units within the Building Products Industry, the control efficiency is likely much lower than the vendor claims. Stack test data for the Board Press at the Weyerhaeuser Oriented Strand Board facility in Elkin, NC, indicates that the biofilter only achieves approximately 15 percent control of total VOCs. Stack test data for the Board Press at GP's Particleboard facility in Thomson, GA, indicates that the biofilter only achieves approximately 10 percent control of total VOCs (February 12, 2009). The aforementioned control efficiencies are based on total VOC presented on a carbon basis.

5.1.1.7. Proper Kiln Design and Operation

The naturally-occurring VOCs in lumber are driven-off from the heat used to dry the lumber within the kiln. Lumber is dried to specific moisture content for quality control purposes. Proper design and operation of the lumber kilns prevents over drying of the lumber that may release additional VOCs to the atmosphere. As a result, proper operation of the kilns will minimize VOC emissions to the atmosphere.

5.1.2. Step 2 - Technical Feasibility Analysis

The second step in the BACT assessment is the elimination of any technically infeasible control technologies discussed in Step 1. Each control technology presented in Step 1 is considered and those that are clearly technically infeasible are eliminated. If a control technology has been installed and operated successfully on a similar emission source, then it is assumed to have been demonstrated in practice and is considered technically feasible. If a control technology has not been demonstrated on a similar source, then the applicant must determine if the technology is applicable to the emission source under consideration. A control technology is eliminated from further consideration if it is shown that the technology has not been demonstrated on similar emission sources and that it also is not commercially available or it cannot be applied to the emissions source under consideration.

To the best of GP's knowledge, no control technologies for the removal of VOC emissions have been applied to, or demonstrated for lumber kilns (batch or continuous), or upon exhaust gas streams with a similar characteristics to the exhaust gases from lumber kilns. There are a number of inherent difficulties in designing a technically feasible control system for a lumber kiln. Because no emission control technologies have been applied to lumber kilns, actual operational and maintenance problems are not fully understood. Basic technical challenges identified with controlling lumber kilns with the use of several potential control technologies, are categorized as follows:

- Exhaust gas collection, and
- Collection and treatment of condensate.

Sections 5.1.2.1 and 5.1.2.2 address the technical challenges listed above and how these challenges affect the ability of applying emission controls to lumber kilns. Sections 5.1.2.3 – 5.1.2.8 provide detailed discussions for each control technology with regards to technical challenges to control VOC emissions from the lumber kilns.

5.1.2.1. Exhaust Gas Collection

Drying within continuous lumber kilns is facilitated by combustion air from a natural gas-fired burner mixed with circulating air in a blend chamber. A centrifugal blower forces the heated air through a duct into a plenum that distributes the air to circulating fans inside of the kiln. The heated air transfers moisture from the lumber to the air that is circulated throughout the kiln. Heated air from the process is directed through openings at both ends of the kiln. The doorway openings at the ends of continuous kilns must remain open at all times to facilitate the continuous loading and unloading of lumber. The process exhaust air (including products of combustion from the direct-fired burner and VOCs from lumber drying) are vented through these openings and through one or more powered vent exhaust stacks located just inside of and above the doorway openings of the continuous kiln. Powered exhaust vents are a technology that Georgia-Pacific has employed on continuous kilns. This technology results in an estimated 80% of the exhaust air being directed through the powered vent exhaust stacks, and the remaining 20% exhausted through the doorway openings of the kiln.

5.1.2.2. Collection and Treatment of Condensation

The process air both within and exhausted from the kiln has a relative humidity of 100%. While the drying section within the kiln may reach temperatures up to 250°F, the temperature of the exhaust gases from both of the doorway openings on both ends of the kiln, as well as the exhaust stacks, is typically between 110°F and 150°F. If the temperature of the process exhaust gas stream is not maintained, the exhaust gases will cool as they flow from the exhaust stack through the ductwork to a selected VOC control device. As the temperature of the process exhaust gas is reduced, water and VOC constituents from the process air will condense and be deposited on the inside of the ductwork. Condensation of material inside of the walls of the ductwork poses several problems including the quantity generated, the weight of the water buildup, and the buildup of "stickies" from the condensation of VOC-containing compounds. The lumber enters the kiln with a moisture content of approximately 48% and is dried to a moisture content of approximately 13%. An estimated 0.23 gallons of water per board foot is removed from southern yellow pine during the drying process[3]. For kilns that processes 320,000 thousand board feet per year (MBF/yr), a total of 73.6 million gallons of water per year will be removed. The weight of the condensate generated could cause the exhaust ductwork to collapse without extensive design and support and a drainage system to capture and discharge the condensate to a wastewater treatment system. Handling, treating and discharging this quantity of condensate is considered technically infeasible for many of the lumber kilns GP operates for several reasons. First, all of the facilities are designated as zero wastewater discharge facilities. Secondly, most do not have an onsite wastewater treatment facility to treat the condensate or access to a publicly-owned treatment works to treat the condensate.

In addition to the quantity and weight of condensate buildup in the exhaust ductwork, kiln condensate is very "sticky" due to the presence of resinous compounds in the exhaust gases, and points of condensation will, over time, build-up and could cause severe blockages and malfunctions of dampers and ductwork connections. The quantity of "stickies" that might build-up is unknown, but severe control system malfunctions are likely as well as a large amount of time and labor expended to clean out the build-up of sticky material, based on previous and current experience within our wood products facilities. Also, stickies are very flammable and would require a robust fire detection and suppression system within the ductwork to prevent fires and/or explosions that could be caused by a spark from the direct fired kiln.

To avoid generating a large quantity of condensate (containing both water and stickies), that would otherwise be considered technically infeasible to manage, GP proposes to heat the process air exiting the kiln exhaust stacks to a temperature above the point of condensation. Based on previous experience with condensation within GP plywood, OSB and particleboard capture and control systems, GP concludes the process air captured from the kiln exhaust stacks would need to be heated to a minimum of 200°F in order to capture and treat VOCs in the exhaust gas stream and without any condensation taking place.

5.1.2.3. Wet Electrostatic Precipitator (WESP) followed by Thermal Oxidation

As previously mentioned, RTO performance can be affected by PM contained in the exhaust gas stream. Therefore, PM emissions must be removed from the exhaust gas stream prior to entering the RTO. PM emissions from the lumber drying process could lead to ceramic bed fouling, performance degradation or even fires as the PM becomes entrained on the ceramic media bed. Depending on the design of the ceramic media contained in the bed, PM buildup could lead to plugging or blocked airflow of the bed resulting in an increase in the pressure drop across the bed. This in turn will require the exhaust fan to work harder and consume more energy to overcome the pressure drop. Fouling of the ceramic media bed with PM reduces the effectiveness of the ceramic media's ability to transfer heat. At the same time, the

[3] (USDA Agricultural Handbook AH-188: Dry Kiln Operator's Manual) http://www.fpl.fs.fed.us/products/publications/several_pubs.php?grouping_id=101&header_id=p

buildup of PM presents a serious fire hazard (especially in the presence of "stickies" generated by heating the wood).

To minimize the PM build-up on the ceramic media bed, WESPs placed ahead of the RTO is one method currently being used in several GP OSB facilities to control VOC and PM emissions from rotary dryers. GP has determined through experience at other facilities that ceramic media bed fouling is still an issue, even with a WESP situated ahead of the RTO on a direct fired dryer. The bed fouling can lead to a reduced life span of the ceramic media that required complete replacement of the media more frequently than expected. While ceramic media bed fouling over the life of an RTO does not render the operation of a WESP/RTO control system technically infeasible, it does add to the operating cost of the control system unit, which will be addressed under Step 4 of this BACT analysis.

5.1.2.4. Wet Electrostatic Precipitation & Catalytic Oxidation

PM removal is even more critical for RCOs than RTOs as the catalyst may be blinded by the build-up of PM. RCOs are also sensitive to poisoning by heavy metals that may be contained in the exhaust gas stream. As such, PM removal is necessary in order to prevent blinding of the catalyst inside of the RCO. Blinding of the catalyst occurs when PM coats the catalyst, thereby preventing the coated sections of the catalyst from oxidizing the VOCs contained in the exhaust gas stream. The RCO catalyst is also sensitive to poisoning with exhaust gas streams that contain silicon, phosphorous, arsenic, and many other heavy metals. While the build-up of PM on the catalyst may be reversed by burning away the PM, metallic poisoning requires replacement of the catalyst as the metals become chemically bound to the active surface which reduces the total surface area capable of promoting oxidation. GP has placed RCO media baskets within OSB control systems including a system utilizing a WESP and RTO. After a three month period of operation, the sample baskets were removed and analyzed. The control systems not utilizing a WESP were blinded or poisoned by PM build-up to the point that the exhaust gases were unable to come into intimate contact with the catalyst. Catalyst removed from the OSB dryer employing a WESP showed some blinding and significant poisoning. Discussions with the catalyst vendor indicated that catalytic oxidation using an RCO is not a viable control technology for this type of exhaust gas stream due to the PM, metals, and acidic content of the exhaust gases, even with the use of a WESP. Based on this analysis, this control technology is considered technically infeasible and will not be discussed any further.

5.1.2.5. Condensation

Condensation requires that the exhaust stream be cooled to a temperature low enough such that the vapor pressure of the exhaust gases are lower than the VOC concentration of the exhaust gases. The primary constituent of the VOC in the exhaust gas stream from the lumber kilns is terpenes, which would require the temperature of the exhaust stream to be lowered to well below 32°F in order to have a vapor pressure low enough to use condensation. A temperature of 32°F would cause the water vapor in the stream to freeze, and the resulting ice particles would clog the condensation unit. As such, condensation is not technically feasible to control VOC emissions from a lumber kiln.

5.1.2.6. Carbon Adsorption

Carbon adsorption systems work on the principle that VOCs within the exhaust gases condense on the surface of the adsorbent, which is usually activated carbon. Once the activated carbon surface has adsorbed all the VOCs possible, the VOC is desorbed, usually with steam, to regenerate the activated carbon. Humidity within an exhaust gas has a noticeable effect on the absorption of VOCs using activated carbon, as the water vapor will condense on the adsorbent in addition to the VOC. One study reported desorbing of VOC from the carbon as water displaced the VOC[4]. The presence of water in exhaust gases will decrease the ability of VOCs to be absorbed. As previously mentioned, exhaust gases from lumber drying kilns have a relative humidity of 100%; therefore the humidity of the exhaust gas will compete with VOC adsorption and greatly reduce the VOC control efficiency of the unit.

Although some VOCs can be desorbed with the use of a chemical treatment, terpenes, the primary VOC constituent in kiln exhaust gases, must be thermally desorbed. As a result, the temperature necessary for desorption are excessively high and would likely damage any commercially-available adsorption media.[5] The adsorption capacity of an activated carbon system is higher with lower exhaust gas temperatures since desorption takes place near the boiling point of the VOC within the exhaust gas. As previously mentioned, GP proposes to heat the exhaust gas above 200°F to prevent any condensation of the exhaust gas stream taking place in the ductwork. This temperature is above the boiling point for some of the VOC components within the exhaust gas (e.g. formaldehyde and methanol). Therefore, VOC control is expected to be greatly reduced at this high exhaust temperature. It is also likely that the "stickies" contained in the kiln exhaust gas stream would plug the activated carbon bed with a build-up of condensable PM. Based on all of these reasons, this control technology is considered technically infeasible and will not be discussed further.

5.1.2.7. Wet Scrubbing

Wet scrubbing is most effective for exhaust gas streams that contain water soluble VOC compounds, such as methanol. However, the primary VOC constituents of kiln exhaust gases, pinenes and terpenes, are not water soluble. Therefore, these constituents would not be easily adsorbed in a wet scrubber, and the VOC removal efficiency would be quite low, on the order of 10-20%. In addition, the viscous nature of the "stickies" within the exhaust gas will easily plug the scrubber absorption media. Therefore, this control technology is considered technically infeasible and will not be discussed further.

5.1.2.8. Biofiltration

To the best of our knowledge, no vendor has designed a biofiltration system to remove VOC emissions from an exhaust gas stream with characteristics similar to those from a lumber kiln. As previously discussed, to prevent condensation and the buildup of "stickies" inside of the exhaust ductwork between the kiln and control equipment, GP believes it would be necessary to heat the kiln exhaust gases to temperatures above that which condensation would occur, or above 200°F. Exhaust gas stream temperatures well above 105°F would kill the bacteria contained in the filter media of the biofilter and thereby render the system ineffective.

As previously mentioned, the primary constituents in the exhaust gas are pinenes and terpenes, which are insoluble in water. The biofilter will be ineffective at breaking down pinenes and terpenes. Additionally, due to the highly viscous nature ("sticky") of these compounds, VOCs are expected to build-up within the biofilter bed, plugging the media, and reducing its effectiveness.

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[4] U.S. EPA, "Technical Bulletin - Choosing an adsorption System for VOC", EPA 456/F-99-004, May 1999 http://www.epa.gov/ttn/catc/dir1/fadsorb.pdf

[5] Georgia EPD, "Prevention of Significant Air Quality Deterioration Review of the Langdale Forest Products Co. Valdosta, Georgia (Lowndes County)." Preliminary Determination, Permit Application No. 18039 October 7, 2008. http://www.georgiaair.org/airpermit/downloads/permits/18500009/psd18039/1850009pd.pdf

GP has looked at biofiltration in depth with a vendor that utilizes newer technology compared to the traditional control systems that utilize bioactive media such as soil, peat or compost. However, the company has not yet constructed a commercial system, or even a pilot plant, that had demonstrated effective removal of VOCs from lumber kiln exhaust gases, or anything similar. The use of biofiltration to remove VOCs from a lumber kiln exhaust gas stream is therefore deemed technically infeasible and will not be discussed further.

5.1.3. Step 3 - Ranking of Control Technologies by Control Efficiency

Although the technical feasibility of capturing and transporting kiln exhaust gases to a pollution control system is questionable for the reasons outlined in Sections 5.1.2.1 and 5.1.2.2, GP is considering the use of a WESP followed by an RTO in more detail to assure that all possible control technologies have been thoroughly examined as part of this BACT analysis. A summary of the VOC control efficiencies of the remaining technically feasible control technologies, ranked in order of control effectiveness, is presented below.

- WESP/RTO = 95[6]%
- Work Practices = base case, no additional reduction

5.1.4. Step 4 – Cost Effectiveness Evaluation of Control Technologies

The fourth step in the top-down BACT assessment procedure is to evaluate the cost effectiveness of the control technologies that are were not eliminated in Step 2 and document the results.

5.1.4.1. Economic Costs

The control technologies considered in the analysis result in significant capital and operating costs. It is also likely that the costs included in this BACT analysis are underestimated due to difficulty of accurately estimating a system that has not been demonstrated in practice. Unknown maintenance, operational, and engineering problems due to the unique characteristics of lumber kiln exhaust gases could result in higher costs than those presented in this step of the BACT analysis.

Based on engineering estimates, the cost estimate analysis assumes the Talladega Sawmill would install two WESP followed by an RTO (one WESP/RTO to control CDK-1 and the other WESP/RTO to control CDK-2 and CDK-3). The cost of controlling VOC emissions with a WESP followed by an RTO is estimated at approximately $12,303 per ton of VOC as carbon (C) ($9,591 per ton of VOC as WPP1) removed from CDK-1 and $12,142 per ton of VOC as C ($9,466 per ton of VOC as WPP1) from CDK-2 and CDK-3 based on the results shown in the detailed cost effectiveness spreadsheet provided in Appendix C.[7] This cost effectiveness value is largely due to the cost of heating the lumber kiln exhaust air to a temperature of approximately 200°F to prevent condensation and the formation of "stickies" in the exhaust ductwork exiting the kiln, leading into the control system. Based on the high cost effectiveness

[6] Higher RTO VOC control values have been demonstrated for some applications, but high control is not expected for low concentration high flow applications like those at the CDKs.
[7] Note that the cost per ton was calculated based on both an as carbon basis and WPP1 basis. The as carbon basis was used for comparison to the other RBLC entries which typically use as carbon. In addition, GP has received guidance from other states to calculate cost per ton on an as carbon basis.

value for removing VOCs from the lumber kilns using a WESP followed by an RTO, GP does not believe it is economically feasible to use this control technology.

5.1.4.2. Environmental Impacts

There are energy and environmental impacts associated with the use and combustion of natural gas in the RTO. The combustion of natural gas as an RTO fuel would create additional NO_X, CO, and CO_2 emissions. The generation of these emissions simply to reduce VOC emissions may result in a net negative environmental effect.

The reduction of VOC emissions from a lumber kiln, and the very small quantities of HAPs and toxic air pollutants (TAPs), would have a negligible impact on air quality in the vicinity of the facility. Under the PSD program, VOCs are regulated to prevent significant deterioration of air quality due to ozone formation. Ozone is formed in the atmosphere due to atmospheric chemical reactions of NO_X and VOCs that are oxidized in the presence of sunlight excessive concentrations of ozone in the lower atmosphere can be injurious to human health and damage vegetation. The facility is located in a lightly populated and developed area of Alabama and ambient concentrations of ozone in this area are in attainment with the NAAQS for this pollutant. Moreover, it should also be noted that VOC emissions from the lumber kilns are small compared to the biogenic (naturally occurring) VOC emissions generated by the forested areas in the vicinity of the facility and, consequently, any reduction of VOC emissions from the lumber kilns will have a negligible effect upon ozone formation and ozone concentrations in the area.

The southeast is NO_X limited with respect to ozone formation. Therefore, small increases in NO_X (i.e., generated from natural gas combustion of an RTO) could result in increased ozone, while relatively larger increases in VOC will likely not result in ozone increases.

5.1.4.3. Energy Impacts

The control technologies require energy to operate fans to move the exhaust gases through a significant amount of ductwork, requiring significant electricity for a WESP/RTO control system. The indirect heated ducting and the RTO also require the use of supplemental fuel to heat the ductwork and maintain the appropriate combustion temperature within the RTO.

5.1.4.4. Proper Kiln Design and Operation

The only economically cost effective control technology for removing VOC emissions from a continuous lumber kiln is the use of "proper design and operating practices". Since this control option is the top remaining BACT control technology, after showing that other "add-on" control systems were not technically or economically feasible, a cost effectiveness evaluation is not required.

5.1.5. Step 5 - Select BACT

Results of the top-down BACT analysis indicate that there are no demonstrated control techniques in practice, numerous technical challenges, and no cost-effective add-on control technologies for removing VOC emissions from lumber drying kilns and, consequently, the BACT proposed for the lumber kilns is "no control" with the use of "proper design and operating practices" as BACT. GP proposes a VOC emission limit of 5.49 lb/MBf as WPP1 as BACT. This BACT limit applies during all operating conditions as there are no significant changes to the VOC emissions generated by the kilns during startup and shutdown compared to normal operation.

The proposed BACT work practices for the continuous lumber kilns consist of (1) proper kiln maintenance and (2) minimizing over-drying while meeting the relevant lumber moisture specifications.

Limiting over-drying has a direct impact on the minimization of VOC emissions. The VOCs emitted from southern pine lumber drying consist of approximately 80-90% terpenes and pinenes which are native compounds in the wood. Emissions of these compounds are largely proportional to the amount of moisture removed from the lumber as it is dried inside the kilns.

GP proposes to demonstrate compliance with these work practices by measuring the moisture content of the kiln dried lumber. Due to seasonal variability of wood moisture content and drying times, GP proposes a rolling 12-month average for comparison to the established moisture content target. In addition to monitoring moisture content, following a preventative maintenance plan will assist in minimizing VOC emissions. Proper maintenance of kiln equipment ensures optimal drying conditions which minimizes the possibility of over-drying. Due to the relatively new nature of continuous kilns, best performance and maintenance parameters may need to be updated as experience is gained through kiln operation, thus GP proposes to develop and implement an operating and maintenance plan within 180 days of start-up of the continuous kiln. The development of site specific plans for proper kiln operation and maintenance is consistent with recent BACT determinations in EPA Region 4.

5.2. BACT DETERMINATION FOR EMERGENCY FIRE PUMP ENGINE

This analysis is being conducted to determine the best available control technology for VOC emissions. An emergency fire pump engine (FE) is proposed for the Talladega Sawmill. Combustion of ultra-low sulfur diesel (ULSD) in the units will result in emissions of VOC. The engine will be subject to the requirements of NESHAP Subpart ZZZZ.

5.2.1. Step 1 - Identification of Control Technologies

A RBLC search was completed for small (<500 bhp) internal combustion engines (process type 17.21 – fuel oil). The search was further refined to exclude entries without sufficient information to determine a VOC limit. Additionally, the search was refined to exclude engine sizes outside of the range set by 40 CFR 60 Subpart IIII for engines with the same emission limitations (≥130 bkW and ≤560 bkW). The results of this search are included in Table C-11 in Appendix C. The emission limits in the database were converted into lb/hp-hr for comparison purposes. All units indicate no control or good design and/or combustions practices for VOC. Though not historically used for BACT, a list of possible control technologies for an engine is provided below.

- Diesel Oxidation Catalyst
- Good Combustion Practices and Maintenance

5.2.2. Step 2 - Technical Feasibility Analysis

Reduction of non-methane hydrocarbon or VOC emissions from engines can be achieved from add on control such as exhaust treatment catalyst or through good combustion practices and proper maintenance. These options have variable control efficiency depending on engine size, design, and age.

5.2.3. Step 3 - Ranking of Control Technologies by Control Efficiency

All add on control and good combustion practices control technologies are technically feasible. Engine control technologies are primarily directed at limiting NO_X and CO emissions, since they are the primary pollutants emitted. As a result, there is little information on the control efficiency of VOC for each technology. However, there is information on the control efficiency of petroleum hydrocarbon (HC)[8], which can be used as a surrogate control of VOC. The level of control for HCs is expected to be greater than the actual control of total VOCs. A summary of the VOC control efficiencies of the technically feasible control technologies, ranked in order of HC control effectiveness, is presented below.

- Diesel Oxidation Catalyst = 40-75% of HC
- Good Combustion Practices and Maintenance = base case, no additional reduction

5.2.4. Step 4 – Cost Effectiveness Evaluation of Control Technologies

The engine is for emergency use only; the use of the engine and resulting potential emissions of 0.2 tpy (based on 500 hrs/yr operation). The actual use of the engine will be well below potential as the engine is only used in the event of a fire (and periodic testing for unit readiness). GP does not believe that the cost per ton of VOC emission reduction through any of the above add on control technologies for this engine are economically feasible.

5.2.5. Step 5 - Select BACT

Results of the top-down BACT analysis indicate that there are no cost-effective add-on control technologies for removing VOC emission from an emergency fire pump engine, and consequently, the BACT proposed for the emergency fire pump engine is "no control" with the use of "good combustion practices including proper engine maintenance and operation" as BACT. There are no applicable NSPS or NESHAP limits on VOC emissions for a 1984 model year emergency fire pump engine. NESHAP Subpart ZZZZ contains total hydrocarbon (THC) limits for some engines, however these limits only apply to non-emergency engines and are not applicable to emergency engines. NSPS Subpart IIII contains some hydrocarbon (HC) or HC + NOx limits, but pre-2006 model engines are not subject to NSPS Subpart IIII. Therefore, GP proposes an emission limit of 0.00251 lb/hp-hr TOC. This BACT limit applies during all operating conditions as there are no significant changes to the VOC emissions generated by the engine during startup and shutdown compared to normal operation. (Note that the given the engine is a 1984 model year, the emission limit is expected to be achievable based on the emission factors within AP-42 Section 3.3 Gasoline And Diesel Industrial Engines, Table 3.3-1).

5.3. BACT DETERMINATION FOR PETROLEUM PRODUCT STORAGE TANKS

This analysis is being conducted to determine the best available control technology for VOC emissions. GP will have diesel and oil storage tanks with capacities ranging from 250 gallons to 6,000 gallons (LST-

[8] U.S. EPA, "Technical Bulletin - Diesel Oxidation Catalyst General Information", https://www.epa.gov/sites/production/files/2016-03/documents/420f10029.pdf

2, LST-3, and TST). Emissions result from evaporative loss of the stored liquid and from changes in the liquid level.

5.3.1. Step 1 - Identification of Control Technologies

A RBLC search was completed for tanks (process type 42.005 – petroleum liquid storage in fixed roof tanks). The results of this search are included in Table C-12 in Appendix C. General control of tank emission of VOC is provided below.

- Vapor collection and add on control
- Submerged fill/bottom loading
- Tank color

5.3.2. Step 2 - Technical Feasibility Analysis

All options listed above are technically feasible for the reduction of VOC off the petroleum product storage tanks. The add-on controls (such as carbon adsorption, RTO, RCO, condensation, biofiltration, and scrubbing) would require collection of the vapors through vapor recovery. Vapor recovery captures the organic vapors generated or displaced. Submerged fill and tank color are process equipment design parameters.

5.3.3. Step 3 - Ranking of Control Technologies by Control Efficiency

The color of a tank color can impact the solar absorption to various degrees and its actual control of VOCs depending on many factors. A summary of the VOC control efficiencies of the technically feasible control technologies, ranked in order of HC control effectiveness, is presented below.

- Vapor collection and add on control = 99%
- Submerged fill/bottom loading = 40%
- Tank color = Varies

5.3.4. Step 4 – Cost Effectiveness Evaluation of Control Technologies

The tanks are located throughout the facility and vapor collection with add on control would require a significant amount of ductwork in addition to the add on control system. In addition, as many add on controls require adverse energy use and generate other pollutants by their operation, control equipment does not support the possible reduction of VOC emissions, which are currently less than 0.01 tpy. GP does not believe that the cost per ton of VOC emission reduction through any vapor recover with add on control, or submerged fill/bottom loading technologies are economically feasible.

5.3.5. Step 5 - Select BACT

As the only remaining reduction option, GP proposes using tank color as BACT for VOC from storage tanks, ensuring all tanks storing organic liquids are light in color. The emission limit proposed for these tanks include this control factor, therefore BACT is proposed as the calculated hourly potential emissions.

5.4. BACT DETERMINATION FOR GASOLINE STORAGE TANK

This analysis is being conducted to determine the best available control technology for VOC emissions. GP will have a gasoline tank (LST-1) with capacity of 1,000 gallons. Emissions result from evaporative loss of the stored liquid and from changes in the liquid level.

5.4.1. Step 1 - Identification of Control Technologies

A RBLC search was completed for tanks (process type 42.005 – petroleum liquid storage in fixed roof tanks). The results of this search are included in Table C-12 in Appendix C. General control of tank emission of VOC is provided below.

- Vapor collection and add on control
- Submerged fill/bottom loading
- Tank color

5.4.2. Step 2 - Technical Feasibility Analysis

All options listed above are technically feasible for the reduction of VOC off the petroleum product storage tanks. The add-on controls (such as carbon adsorption, RTO, RCO, condensation, biofiltration, and scrubbing) would require collection of the vapors through vapor recovery. Vapor recovery captures the organic vapors generated or displaced. Submerged fill and tank color are process equipment design parameters.

5.4.3. Step 3 - Ranking of Control Technologies by Control Efficiency

The color of a tank color can impact the solar absorption to various degrees and its actual control of VOCs depending on many factors. A summary of the VOC control efficiencies of the technically feasible control technologies, ranked in order of HC control effectiveness, is presented below.

- Vapor collection and add on control = 99%
- Submerged fill/bottom loading = 40%
- Tank color = Varies

5.4.4. Step 4 – Cost Effectiveness Evaluation of Control Technologies

Many add on controls require adverse energy use and generate other pollutants by the operation of control equipment do not support the possible reduction of VOC emissions, which are currently less than 0.32 tpy. GP does not believe that the cost per ton of VOC emission reduction through any vapor recover with add on control are economically feasible. The ranked cost effectiveness of each remaining control technology, is presented below.

- Submerged fill/bottom loading
- Tank color

5.4.5. Step 5 - Select BACT

GP proposes to use submerged fill/bottom loading as BACT for VOC from the gasoline storage tank. GP proposes an emission limit of 21.2 lb/hr.

APPENDIX C

BACT SUPPORTING DOCUMENTATION

Table C-1. Emission Unit Subject to BACT

Unit	Max. Throughput Capacity
CDK No 1	20 MBf/hr 120 MMBf/yr 40 MMBtu/hr
CDK No 2	20 MBf/hr 120 MMBf/yr 40 MMBtu/hr
CDK No 3	13.2 MBf/hr 80 MMBf/yr 30 MMBtu/hr
CDK No 2 and 3	33.2 MBf/hr 200 MMBF/yr 70 MMBtu/hr

Table C-2. Potential Control Scenario Summary

Emission Unit	Pollutant	Control Basis	Current Potential Emissions (VOC as WWP1) [1]	Current Potential Emissions (VOC as C)	Capture Efficiency [2]
CDK No 1	VOC	RTO	5.49 lb/MBF	4.28 lb/MBF	80.0%
CDK No 2 and 3	VOC	RTO	5.49 lb/MBF	4.28 lb/MBF	80.0%

Table C-2 Notes:

1. Engineering estimate based design characteristics of continuous kiln.
2. VOC (WPP1) calculated using the Interim VOC Measurement Protocol for the Wood Products Industry – July 2007.

Table C-3. Cost Summary

Emission Unit	Capture Efficiency (%)	Technology	Control Efficiency [1] (%)	Pollutant	Potential Emissions (tpy)	Pollutant Removed (tpy)	Cost Effectiveness ($/ton removed)
CDK No 1	80.0%	RTO	95%	VOC as WPP1	329.40	250.34	$ 9,591
				VOC as C	256.80	195.17	$ 12,303
CDK No 2 and 3	80.0%	RTO	95%	VOC as WPP1	549.00	417.24	$ 9,466
				VOC as C	428.00	325.28	$ 12,142

Table C-3 Notes:

1. RTO control efficiency per Air Pollution Control Technology Fact Sheet - EPA-452/F-03-021. Higher RTO VOC control values have been demonstrated for some applications, but high control is not expected for low concentration high flow applications like those at the CDKs.

Table C-4. Cost Analysis Supporting Information for CDK 1 WESP

Parameter	CDK	Units	Note(s)
Maximum Production Capacity	120	MMBf/yr	1
Airflow Capture Efficiency	80	%	1
PM Control Efficiency	95	%	2
Airflow	40,000	acfm	1
Pressure Drop	1.50	inches of H_2O	3
Fan Motor Efficiency	55	%	4
Fan Electricity Usage	52.0	kW-hr	5
Water Requirement	2.7	gal/min	3
	160	gal/hr	
Water Consumption Cost	0.0053	$/gal	6
Cost to Treat Water	0.375	$/1000 gal	6
Solid Material to be Disposed (PM Collected)	0.84	ton/yr	7
Landfill Fees	320	$/ton	6
Operating Labor Cost	18.2	$/hr	6
Maintenance Labor Cost	26.0	$/hr	6
Electricity Cost	0.06	$/kW-hr	6
WESP Equipment Life	20	years	8
Interest Rate	7%	%	8
January 2017 Chemical Engineering Index	553.1	n/a	9
June 2017 Chemical Engineering Index	567.1	n/a	9

Table C-4 Notes:

1. Engineering estimate based on design characteristics of a continuous lumber kiln.
2. U.S. EPA OAQPS, EPA Air Pollution Control Cost Manual (6th Edition), January 2002, Table 3.14 (highest efficiency value),Page 3-41 of Section 6(Particulate Matter Controls), Chapter 3 (Electrostatic Precipitators).
3. Based on vendor discussions for previous installations.
4. U.S. EPA OAQPS, EPA Air Pollution Control Cost Manual (6th Edition), January 2002, Page 2-41 of Section 3.2 (VOC Destruction Controls), Chapter 2 (Incinerators). Fan efficiency vary from 40 to 70%. Average value of 55% was chosen
5. Per WESP Vendor quote, B&W MEGTEC, January 13, 2017.
6. Based on cost data from similar facility.
7. PM Collected = (PM (filt))*% Capture * 95% Control on captured PM
8. U.S. EPA OAQPS, EPA Air Pollution Control Cost Manual (6th Edition), January 2002, Page 3-50 of Section 6 (Particulate Matter Controls), Chapter 2 (Electrostatic Precipitators). The typical equipment life of 20 years chosen.
9. Chemical Engineering Index

Table C-5. Capital Cost Evaluation for Wet ESP for the CDK 1

Capital Cost	CDK	OAQPS Notation[1]
Purchased Equipment Costs		
Total Equipment Cost[2]	1,797,372	A
Instrumentation[2]	---	
Freight	89,869	0.05 × A
Total Purchased Equipment Costs	*1,887,240*	B
Direct Installation Costs		
Foundations and Supports	75,490	0.04 × B
Handling and Erection	943,620	0.50 × B
Electrical	150,979	0.08 × B
Piping	18,872	0.01 × B
Insulation	37,745	0.02 × B
Painting	37,745	0.02 × B
Total Direct Installation Costs	*1,264,451*	*C*
Indirect Installation Costs		
Engineering[2]	---	---
Construction and Field Expense	377,448	0.20 × B
Contractor Fees	188,724	0.10 × B
Start-up	18,872	0.01 × B
Performance Test	18,872	0.01 × B
Process Contingencies	56,617	0.03 × B
Total Indirect Installation Costs	*660,534*	*D*
Total Capital Investment ($)	**3,812,225**	**TCI = B + C + D**

Table C-5 Notes:

1. U.S. EPA OAQPS, EPA Air Pollution Control Cost Manual (6th Edition), January 2002, Table 3.16,Page 3-46 of Section 6 (Particulate Matter Controls), Chapter 3 (Electrostatic Precipitators).

2. Capital Costs are based the budgetary quote from B&W for a SonicKleen WESP (the pricing is for design, engineering and supply of equipment, drawings and flow sheets). Quote provided January 2017.

B&W Cost Estimate for 40,000 acfm flow	**$1,753,000**
January 2017 Chemical Engineering Index	553.1
June 2017 Chemical Engineering Index	567.1
Ratio of indices	1.03
Cost for airflow at design acfm CDK	$1,797,372

Table C-6. Annualized Cost Evaluation for Wet ESP for the CDK 1

Operating Cost	CDK	
Direct Annual Costs, $ [1]		
Operating Labor (0.5-hr/day, 365 days/yr) [3]	3,312	E
Supervisory Labor	497	F = 0.15 × E
Maintenance Labor (0.5 hr, per 8-hr shift)	14,251	G
Maintenance Materials	14,251	H = G
Electricity	27,331	I
Water	7,428	J
Water Treatment	526	J
Waste Disposal (solid material)	270	J
Total Direct Annual Costs, $	*67,867*	*DAC = E + F + G + H + I + J*
Indirect Annual Costs, $ [1]		
Overhead	19,387	K = 0.60 × (E + F + G + H)
Administrative Charges	76,245	L = 0.02 × TCI
Property Tax	38,122	M = 0.01 × TCI
Insurance	38,122	N = 0.01 × TCI
Capital Recovery Factor (CRF) [2]	0.0944	Based on 7% interest rate and 20 yr control equip. life
Capital Recovery	359,847	O = CRF*TCI
Total Indirect Annual Costs, $	*531,723*	*IDAC = K + L + M + N + O*
Total Annual Cost, $	**599,590**	*TAC = DAC + IDAC*

Table C-6 Notes:
1. U.S. EPA OAQPS, *EPA Air Pollution Control Cost Manual (6th Edition)*, January 2002, Table 2.10, Page 2-45 of Section 3.2 (VOC Destruction Controls), Chapter 2 (Incinerators).
2. U.S. EPA OAQPS, EPA Air Pollution Control Cost Manual (6th Edition), January 2002, Equation 2.8a, Page 2-21 of Section 1, Chapter 2
3. Based on operating experience at GP's OSB Plants

Table C-7. Cost Analysis Supporting Information for CDK 1 RTO

Parameter	CDKs	Units	Note(s)
Maximum Production Capacity	120	MMBf/yr	1
Uncontrolled Stack Inlet Emissions (VOC as WPP1)	329.40	tpy	2
Uncontrolled Stack Inlet Emissions (VOC as C)	256.80	tpy	2
Airflow Capture Efficiency	80	%	1
Removal Efficiency	95	%	3
VOC as WPP1 Removed	250.34	tpy	4
VOC as C Removed	195.17	tpy	4
Combustion Chamber Temperature (°F)	1600	° F	5
Airflow at stack conditions	40,000	acfm	1
Electricity Usage	120.0	kW-hr	6
Energy Required From Fuel	41,820	MMBtu/yr	6
Operating Labor Cost	18.2	$/hr	7
Maintenance Labor Cost	26.0	$/hr	7
Electricity Cost	0.060	$/kW-hr	7
Natural Gas	4.0	$/mmbtu	7
RTO Equipment Life	20	years	8
Interest Rate	7%		8
February 2007 Chemical Engineering Index	525.4	n/a	
2015 Chemical Engineering Index	556.8	n/a	
January 2017 Chemical Engineering Index	553.1	n/a	
June 2017 Chemical Engineering Index	567.1	n/a	

Table C-7 Notes:

1. Engineering estimate based on design characteristics of a continuous lumber kiln.
2. Potential inlet emissions based on maximum capacity and emission factor of 5.49 lb/MBf (VOC as WPP1) or 4.28 lb/MBf (VOC as C).
3. RTO control efficiency per Air Pollution Control Technology Fact Sheet - EPA-452/F-03-021. Higher RTO VOC control values have been demonstrated for some applications, but high control is not expected for low concentration high flow applications like those at the CDKs.
4. VOC Removed (tpy) = Capture efficiency (%) * Removal Efficiency (%) × Uncontrolled Stack Inlet Emissions (tpy).
5. Based on design specifications for similar unit. Assumes 1,600 °F combustion chamber temperature and 200 °F exhaust temperature
6. Per RTO Vendor quote, B&W MEGTEC, January 13, 2017.
7. Based on cost data from similar facility.
8. U.S. EPA OAQPS, EPA Air Pollution Control Cost Manual (6th Edition), January 2002, Table 2.10, Page 2-45 of Section 3.2 (VOC Destruction Controls), (Incinerators). Equipment life of 20 years chosen in lieu of 10 years for conservatism

Table C-8. Cost Evaluation for CDK 1 RTO

	Capital Cost	CDKs	OAQPS Notation[1]
Purchased Equipment Costs			
	Total RTO Equipment Cost[2]	920,525	A
	Duct Fire Protection ($350/ft)[3]	113,750	
Total Purchased Equipment Costs		*1,034,275*	B
Direct Installation Costs			
	Foundations and Supports	0.08 B	
	Handling and Erection	0.14 B	
	Electrical	0.04 B	
	Insulation	0.01 B	
	Painting	0.01 B	
	Instrumentation, including Control Devices, Parametric Monitoring, Communication, Spare Parts	included in quote	
	Site Development[4]	96,280	
	Buildings[4]	50,514	
Total Direct Installation Costs		*436,391*	
Indirect Installation Costs[2]			
	Engineering[4]	341,944	
	Construction and Field Expense	0.05 B	
	Contractor Fees	0.10 B	
	Start-up	0.02 B	
	Performance Test	0.01 B	
	Process Contingencies	0.03 B	
Total Indirect Installation Costs		*559,142*	
Additional Scoped Equipment Costs[4]			
	Ductwork[5]	2,730,849	C
	Ductwork Heater[6]	4,411,117	D
Total Capital Investment ($)		**9,171,774**	**TCI = B+C+D**

Table C-8 Notes:

1. U.S. EPA OAQPS, *EPA Air Pollution Control Cost Manual (6th Edition)*, January 2002, Table 2.8, Page 2-42 of Section 3.2 (VOC Destruction Controls), Chapter 2 (Incinerators).
2. RTO & Media Cost from Quote from B&W MEGTEC for 40,000 acfm lumber kiln, provided January 31, 2017.

Total RTO Equipment Cost Estimate for 40,000 acfm flow	**$897,800**
January 2017 Chemical Engineering Index	553.1
June 2017 Chemical Engineering Index	567.1
Ratio of Indices	1.025
Total RTO Equipment Cost Estimate for 40,000 acfm flow (Indice Cost Ratio Adjusted)	$920,525

3. Cost estimate based on spark detection and suppression system at GP Hosford Plant and distance from unit to control device. Of 325.00 feet.
4. RTO & Media Cost from Quote submitted to GP Thorsby by Pro-Environmental, Inc, for a 40,000 acfm plywood veneer dryer, provided December 22, 2007 (revised February 1, 2008).

Site Development Cost Estimate	**$89,200**
Building Cost Estimate	$46,800
Engineering Cost Estimate	$316,800
February 2007 Chemical Engineering Index	525.4
June 2017 Chemical Engineering Index	567.1
Ratio of Indices	1.079
Site Development Cost Estimate (Indice Cost Ratio Adjusted)	$96,280
Building Cost Estimate (Indice Cost Ratio Adjusted)	$50,514
Engineering Cost Estimate (Indice Cost Ratio Adjusted)	$341,944

5. +/- 30% Cost estimate of design, equipment and installation of 36" stainless steel ductwork for 1000 feet with insulation, heat tracing, and duct heaters to prevent condensation within ductwork. Ratioed quoted system to project duct length of 325 ft based on distance to nearest area for control device.

Ductwork Cost Estimate for 1,000 ft	$8,250,000
2015 Chemical Engineering Index	556.8
June 2017 Chemical Engineering Index	567.1
Ratio of Indices	1.018
Ductwork Cost Estimate for 325 ft (Indice Cost Ratio Adjusted)	$2,730,849

6. Provided by AECOM estimator, February 2015 for ~40,000 cfm flow.

Ductwork Heater Cost Estimate for 40,000 acfm flow	$4,331,000
2015 Chemical Engineering Index	556.8
June 2017 Chemical Engineering Index	567.1
Ratio of Indices	1.018
Ductwork Heater Cost Estimate for 40,000 acfm flow (Indice Cost Ratio Adjusted)	$4,411,117

Table C-9. Total Cost Evaluation for CDK 1 RTO & WESP

	Operating Cost	CDKs	OAQPS Notation[1]
Direct Annual Costs, $			
	Replacement of Media every 4 years	29,412	Based on experience at other Bldg Product facilities
	Operating Labor (0.5 hr, per 8-hr shift)	9,937	E
	Supervisory Labor	1,491	F = 0.15 × E
	Maintenance Labor (0.5 hr, per 8-hr shift)	14,251	G
	Maintenance Materials	14,251	H = G
	Electricity Usage	63,072	I
	Natural Gas - RTO	167,281	J
	Natural Gas - Duct Heater	245,280	duct heaters at 7 mmbtu/hr
Total Direct Annual Costs, $		*544,975*	*DAC = E + F + G + H + I + J*
Indirect Annual Costs, $			
	Overhead	23,958	K = 0.60 × (E + F + G + H)
	Administrative Charges	183,435	L = 0.02 × TCI
	Property Tax	91,718	M = 0.01 × TCI
	Insurance	91,718	N = 0.01 × TCI
	Capital Recovery Factor[2]	0.0944	Based on 7% interest and 20-yr control equipment life
	Capital Recovery	865,751	O = CRF*TCI
Total Indirect Annual Costs, $		*1,256,580*	*IDAC = K + L + M + N + O*
Total Annual Cost RTO($/yr)		**1,801,555**	*TAC = DAC + IDAC*
Total Annual Cost WESP ($/yr)		**599,590**	*TAC = DAC + IDAC*
VOC as WPP1 Removed from Natural Gas-Fired Kiln (tpy)		250.34	VOC as WPP1
VOC as C Removed from Natural Gas-Fired Kiln (tpy)		195.17	VOC as C
Cost per ton of VOC as WPP1 Removed from Natural Gas-Fired Kiln ($/ton)		**$9,591**	*$/ton = TAC / Pollutant Removed*
Cost per ton of VOC as C Removed from Natural Gas-Fired Kiln ($/ton)		**$12,303**	*$/ton = TAC / Pollutant Removed*

Table C-9 Notes:

1. U.S. EPA OAQPS, *EPA Air Pollution Control Cost Manual (6th Edition)*, January 2002, Table 2.10, Page 2-45 of Section 3.2 (VOC Destruction Controls), Chapter 2 (Incinerators).
2. U.S. EPA OAQPS, EPA Air Pollution Control Cost Manual (6th Edition), January 2002, Equation 2.8a, Page 2-21 of Section 1, Chapter 2

Table C-10. Cost Analysis Supporting Information for CDK 2 & 3 WESP

Parameter	CDK	Units	Note(s)
Maximum Production Capacity	200	MMBf/yr	1
Airflow Capture Efficiency	80	%	1
PM Control Efficiency	95	%	2
Airflow	70,000	acfm	1
Pressure Drop	1.50	inches of H_2O	3
Fan Motor Efficiency	55	%	4
Fan Electricity Usage	91.0	kW-hr	5
Water Requirement	5	gal/min	3
	280	gal/hr	
Water Consumption Cost	0.0053	$/gal	6
Cost to Treat Water	0.375	$/1000 gal	6
Solid Material to be Disposed (PM Collected)	1.42	ton/yr	7
Landfill Fees	320	$/ton	6
Operating Labor Cost	18.2	$/hr	6
Maintenance Labor Cost	26.0	$/hr	6
Electricity Cost	0.06	$/kW-hr	6
WESP Equipment Life	20	years	8
Interest Rate	7%	%	8
January 2017 Chemical Engineering Index	553.1	n/a	9
June 2017 Chemical Engineering Index	567.1	n/a	9

Table C-10 Notes:

1. Engineering estimate based on design characteristics of a continuous lumber kiln.

2. U.S. EPA OAQPS, EPA Air Pollution Control Cost Manual (6th Edition), January 2002, Table 3.14 (highest efficiency value),Page 3-41 of Section 6(Particulate Matter Controls), Chapter 3 (Electrostatic Precipitators).

3. Based on vendor discussions for previous installations.

4. U.S. EPA OAQPS, EPA Air Pollution Control Cost Manual (6th Edition), January 2002, Page 2-41 of Section 3.2 (VOC Destruction Controls), Chapter 2 (Incinerators). Fan efficiency vary from 40 to 70%. Average value of 55% was chosen

5. Per WESP Vendor quote, B&W MEGTEC, January 13, 2017.

6. Based on cost data from similar facility.

7. PM Collected = (PM (filt))*% Capture * 95% Control on captured PM

8. U.S. EPA OAQPS, EPA Air Pollution Control Cost Manual (6th Edition), January 2002, Page 3-50 of Section 6 (Particulate Matter Controls), Chapter 2 (Electrostatic Precipitators). The typical equipment life of 20 years chosen.

9. Chemical Engineering Index

Table C-11. Capital Cost Evaluation for Wet ESP for CDK 2 & 3

Capital Cost	CDK	OAQPS Notation[1]
Purchased Equipment Costs		
Total Equipment Cost[2]	3,145,401	A
Instrumentation[2]	---	
Freight	157,270	0.05 × A
Total Purchased Equipment Costs	*3,302,671*	B
Direct Installation Costs		
Foundations and Supports	132,107	0.04 × B
Handling and Erection	1,651,335	0.50 × B
Electrical	264,214	0.08 × B
Piping	33,027	0.01 × B
Insulation	66,053	0.02 × B
Painting	66,053	0.02 × B
Total Direct Installation Costs	*2,212,789*	*C*
Indirect Installation Costs		
Engineering[2]	---	---
Construction and Field Expense	660,534	0.20 × B
Contractor Fees	330,267	0.10 × B
Start-up	33,027	0.01 × B
Performance Test	33,027	0.01 × B
Process Contingencies	99,080	0.03 × B
Total Indirect Installation Costs	*1,155,935*	*D*
Total Capital Investment ($)	**6,671,394**	**TCI = B + C + D**

Table C-11 Notes:

1. U.S. EPA OAQPS, EPA Air Pollution Control Cost Manual (6th Edition), January 2002, Table 3.16,Page 3-46 of Section 6(Particulate Matter Controls), Chapter 3 (Electrostatic Precipitators).

2. Capital Costs are based the budgetary quote from B&W for a SonicKleen WESP (the pricing is for design, engineering and supply of equipment, drawings and flow sheets). Quote provided January 2017.

B&W Cost Estimate for 40,000 acfm flow	**$1,753,000**
January 2017 Chemical Engineering Index	553.1
June 2017 Chemical Engineering Index	567.1
Ratio of indices	1.03
Cost for airflow at design acfm CDK	$3,145,401

Table C-12. Annualized Cost Evaluation for Wet ESP for CDK 2 & 3

Operating Cost	CDK	
Direct Annual Costs, $ [1]		
Operating Labor (0.5-hr/day, 365 days/yr) [3]	3,312	E
Supervisory Labor	497	F = 0.15 × E
Maintenance Labor (0.5 hr, per 8-hr shift)	14,251	G
Maintenance Materials	14,251	H = G
Electricity	47,830	I
Water	13,000	J
Water Treatment	920	J
Waste Disposal (solid material)	454	J
Total Direct Annual Costs, $	*94,515*	*DAC = E + F + G + H + I + J*
Indirect Annual Costs, $ [1]		
Overhead	19,387	K = 0.60 × (E + F + G + H)
Administrative Charges	133,428	L = 0.02 × TCI
Property Tax	66,714	M = 0.01 × TCI
Insurance	66,714	N = 0.01 × TCI
Capital Recovery Factor (CRF) [2]	0.0944	Based on 7% interest rate and 20 yr control equip. life
Capital Recovery	629,732	O = CRF*TCI
Total Indirect Annual Costs, $	*915,975*	*IDAC = K + L + M + N + O*
Total Annual Cost, $	**1,010,491**	*TAC = DAC + IDAC*

Table C-12 Notes:

1. U.S. EPA OAQPS, *EPA Air Pollution Control Cost Manual (6th Edition)*, January 2002, Table 2.10, Page 2-45 of Section 3.2 (VOC Destruction Controls), Chapter 2 (Incinerators).
2. U.S. EPA OAQPS, EPA Air Pollution Control Cost Manual (6th Edition), January 2002, Equation 2.8a, Page 2-21 of Section 1, Chapter 2
3. Based on operating experience at GP's OSB Plants

Table C-13. Cost Analysis Supporting Information for CDK 2 & 3 RTO

Parameter	CDKs	Units	Note(s)
Maximum Production Capacity	200	MMBf/yr	1
Uncontrolled Stack Inlet Emissions (VOC as WPP1)	549.00	tpy	2
Uncontrolled Stack Inlet Emissions (VOC as C)	428.00	tpy	2
Airflow Capture Efficiency	80	%	1
Removal Efficiency	95	%	3
VOC as WPP1 Removed	417.24	tpy	4
VOC as C Removed	325.28	tpy	4
Combustion Chamber Temperature (°F)	1600	° F	5
Airflow at stack conditions	70,000	acfm	1
Electricity Usage	210.0	kW-hr	6
Energy Required From Fuel	73,185	MMBtu/yr	6
Operating Labor Cost	18.2	$/hr	7
Maintenance Labor Cost	26.0	$/hr	7
Electricity Cost	0.060	$/kW-hr	7
Natural Gas	4.0	$/mmbtu	7
RTO Equipment Life	20	years	8
Interest Rate	7%	%	8
February 2007 Chemical Engineering Index	525.4	n/a	
2015 Chemical Engineering Index	556.8	n/a	
January 2017 Chemical Engineering Index	553.1	n/a	
June 2017 Chemical Engineering Index	567.1	n/a	

Table C-13 Notes:

1. Engineering estimate based on design characteristics of a continuous lumber kiln.
2. Potential inlet emissions based on maximum capacity and emission factor of 5.49 lb/MBf (VOC as WPP1) or 4.28 lb/MBf (VOC as C).
3. RTO control efficiency per Air Pollution Control Technology Fact Sheet - EPA-452/F-03-021. Higher RTO VOC control values have been demonstrated for some applications, but high control is not expected for low concentration high flow applications like those at the CDKs.
4. VOC Removed (tpy) = Capture efficiency (%) * Removal Efficiency (%) × Uncontrolled Stack Inlet Emissions (tpy).
5. Based on design specifications for similar unit. Assumes 1,600 °F combustion chamber temperature and 200 °F exhaust temperature
6. Per RTO Vendor quote, B&W MEGTEC, January 13, 2017. Adjusted for proposed 70,000 cfm airflow from the 40,000 cfm airflow in vender quote.
7. Based on cost data from similar facility.
8. U.S. EPA OAQPS, EPA Air Pollution Control Cost Manual (6th Edition), January 2002, Table 2.10, Page 2-45 of Section 3.2 (VOC Destruction Controls), Chapter 2 (Incinerators). Equipment life of 20 years chosen in lieu of 10 years for conservatism

Table C-14. Cost Evaluation for CDK 2 & 3 RTO

	Capital Cost	CDKs	OAQPS Notation[1]
Purchased Equipment Costs			
	Total RTO Equipment Cost[2]	$1,610,919	A
	Duct Fire Protection ($350/ft)[3]	218,750	
Total Purchased Equipment Costs		*1,829,669*	B
Direct Installation Costs			
	Foundations and Supports	0.08 B	
	Handling and Erection	0.14 B	
	Electrical	0.04 B	
	Insulation	0.01 B	
	Painting	0.01 B	
	Instrumentation, including Control Devices, Parametric Monitoring, Communication, Spare Parts	included in quote	
	Site Development[4]	96,280	
	Buildings[4]	50,514	
Total Direct Installation Costs		*659,101*	
Indirect Installation Costs[2]			
	Engineering[4]	341,944	
	Construction and Field Expense	0.05 B	
	Contractor Fees	0.10 B	
	Start-up	0.02 B	
	Performance Test	0.01 B	
	Process Contingencies	0.03 B	
Total Indirect Installation Costs		*726,174*	
Additional Scoped Equipment Costs[4]			
	Ductwork[5]	5,251,633	C
	Ductwork Heater[6]	7,719,455	D
Total Capital Investment ($)		**16,186,033**	**TCI = B+C+D**

Table C-14 Notes:

1. U.S. EPA OAQPS, *EPA Air Pollution Control Cost Manual (6th Edition)*, January 2002, Table 2.8, Page 2-42 of Section 3.2 (VOC Destruction Controls), Chapter 2 (Incinerators).
2. RTO & Media Cost from Quote from B&W MEGTEC for 40,000 acfm lumber kiln, provided January 31, 2017.

Total RTO Equipment Cost Estimate for 40,000 acfm flow	**$897,800**
January 2017 Chemical Engineering Index	553.1
June 2017 Chemical Engineering Index	567.1
Ratio of Indices	1.025
Total RTO Equipment Cost Estimate for 70,000 acfm flow (Indice Cost Ratio Adjusted)	$1,610,919

3. Cost estimate based on spark detection and suppression system at GP Hosford Plant and distance from unit to control device. Of 625.00 feet.

4. RTO & Media Cost from Quote submitted to GP Thorsby by Pro-Environmental, Inc. for a 40,000 acfm plywood veneer dryer, provided December 22, 2007 (revised February 1, 2008).

Site Development Cost Estimate	**$89,200**
Building Cost Estimate	$46,800
Engineering Cost Estimate	$316,800
February 2007 Chemical Engineering Index	525.4
June 2017 Chemical Engineering Index	567.1
Ratio of Indices	1.079
Site Development Cost Estimate (Indice Cost Ratio Adjusted)	$96,280
Building Cost Estimate (Indice Cost Ratio Adjusted)	$50,514
Engineering Cost Estimate (Indice Cost Ratio Adjusted)	$341,944

4. +/- 30% Cost estimate of design, equipment and installation of 36" stainless steel ductwork for 1000 feet with insulation, heat tracing, and duct heaters to prevent condensation within ductwork. Ratioed quoted system to project duct length of 625 ft based on distance to nearest area for control device.

Ductwork Cost Estimate for 1,000 ft	$8,250,000
2015 Chemical Engineering Index	556.8
June 2017 Chemical Engineering Index	567.1
Ratio of Indices	1.018
Ductwork Cost Estimate for 625 ft (Indice Cost Ratio Adjusted)	$5,251,633

6. Provided by AECOM estimator, February 2015 for ~40,000 cfm flow.

Ductwork Heater Cost Estimate for 40,000 acfm flow	$4,331,000
2015 Chemical Engineering Index	556.8
June 2017 Chemical Engineering Index	567.1
Ratio of Indices	1.018
Ductwork Heater Cost Estimate for 70,000 acfm flow (Indice Cost Ratio Adjusted)	$7,719,455

Table C-15. Total Cost Evaluation for CDK 2 & 3 RTO & WESP

	Operating Cost	CDKs	OAQPS Notation[1]
Direct Annual Costs, $			
	Replacement of Media every 4 years	51,471	Based on experience at other Bldg Product facilities
	Operating Labor (0.5 hr, per 8-hr shift)	9,937	E
	Supervisory Labor	1,491	F = 0.15 × E
	Maintenance Labor (0.5 hr, per 8-hr shift)	14,251	G
	Maintenance Materials	14,251	H = G
	Electricity Usage	110,376	I
	Natural Gas - RTO	292,742	J
	Natural Gas - Duct Heater	245,280	duct heaters at 7 mmbtu/hr
Total Direct Annual Costs, $		*739,799*	*DAC = E + F + G + H + I + J*
Indirect Annual Costs, $			
	Overhead	23,958	K = 0.60 × (E + F + G + H)
	Administrative Charges	323,721	L = 0.02 × TCI
	Property Tax	161,860	M = 0.01 × TCI
	Insurance	161,860	N = 0.01 × TCI
	Capital Recovery Factor[2]	0.0944	Based on 7% interest and 20-yr control equipment life
	Capital Recovery	1,527,847	O = CRF*TCI
Total Indirect Annual Costs, $		*2,199,247*	*IDAC = K + L + M + N + O*
Total Annual Cost RTO($/yr)		**2,939,045**	*TAC = DAC + IDAC*
Total Annual Cost WESP ($/yr)		**1,010,491**	*TAC = DAC + IDAC*
VOC as WPP1 Removed from Natural Gas-Fired Kilns 2 & 3 (tpy)		417.24	
VOC as C Removed from Natural Gas-Fired Kilns 2 & 3 (tpy)		325.28	
Cost per ton of VOC as WPP1 Removed from Natural Gas-Fired Kilns 2 & 3 ($/ton)		**$9,466**	*$/ton = TAC / Pollutant Removed*
Cost per ton of VOC as C Removed from Natural Gas-Fired Kilns 2 & 3 ($/ton)		**$12,142**	*$/ton = TAC / Pollutant Removed*

Table C-15 Notes:

1. U.S. EPA OAQPS, *EPA Air Pollution Control Cost Manual (6th Edition)*, January 2002, Table 2.10, Page 2-45 of Section 3.2 (VOC Destruction Controls), Chapter 2 (Incinerators).
2. U.S. EPA OAQPS, EPA Air Pollution Control Cost Manual (6th Edition), January 2002, Equation 2.8a, Page 2-21 of Section 1, Chapter 2

Table C-16. RESULTS OF RBLC SEARCH FOR LUMBER KILN VOC BACT

RBLCID	Facility Name	State	Permit Issuance Date	Process Name	Primary Fuel	Throughput	Control Method Description	Emission Limit
AL-0235	ALBERTVILLE SAWMILL	AL	4/9/2008	TWO 182.14 MBF, STEAM-HEADED LUMBER DRY KILNS (NORTH & SOUTH - K100/K101)		182.14 MBF	OPERATE W/ WET BULB SET POINT DRYING SCHEDULE OF LESS THAN OR EQUAL TO 185F; DAILY AND MONTHLY KILN I/M PROCEDURES	7 LB/MBF
AL-0257	WEST FRASER-OPELIKA LUMBER MILL	AL	11/1/2013	Two(2) 87.5 MMBF/YR Continuous kilns with a 35 MMBtu/hr direct-fired wood burner	Wood Shavings	175 MMBF/YR		3.76 LB/MBF
AL-0258	WEST FRASER, INC. - MAPLESVILE MILL	AL	4/15/2013	Two(2) 100 MMBF/Y Continuous direct fired kiln	Wood Residuals	200 MMBF/YR		3.76 LB/MBF
AL-0259	THE WESTERVELT COMPANY	AL	8/21/2013	Three (3) 93 MMBF/Y Continous, Dual path, indirect fired kilns	Steam (Indirect heat)	0		4.57 LB/MMBF
AL-0260	THE WESTERVELT COMPANY	AL	1/4/2011	Two (2) 125 MMBtu/Hr. Wood-fired Boilers	Wood Residuals	125 MMBTU/H each		0.5 LB/MMBTU
AL-0273	MILLPORT WOOD PRODUCTS FACILITY	AL	12/30/2014	Continuous direct-lumber dry kiln	Green sawdust	140000 mbf/yr	Proper maintenance & operating practice requirements. Test method information: Method 18/25.	4.7 LB
*AL-0305	RESOLUTE FOREST PRODUCTS - ALABAMA SAWMILL	AL	6/24/2015	Continuous Direct-Fired Lumber Dry Kilns with 35 mmbtu/hr Wood Fired Burner	Wood	108.33 mmbf/yr - each		3.76 LB/MBF
AR-0101	BIBLER BROTHERS LUMBER COMPANY	AR	8/25/2008	SN-07G AND SN-13G CONTINOUS OPERATING KILNS	WOOD RESIDUE	25 MMBTU/H		3.8 LB/MBF
AR-0102	ANTHONY TIMBERLANDS, INC.	AR	9/16/2009	KILN #3 INDIRECT-FIRED	NONE	200 MMBF/YR		3.5 LB/MBF
AR-0102	ANTHONY TIMBERLANDS, INC.	AR	9/16/2009	KILN #4 INDIRECT-FIRED	NONE	200 MMBF/YR		3.5 LB/MBF
AR-0102	ANTHONY TIMBERLANDS, INC.	AR	9/16/2009	KILN #5 INDIRECT-FIRED	NONE	200 MMBF/YR		3.5 LB/MBF
AR-0120	OLA	AR	2/11/2015	Dry Kiln No. 3 (SN-06)	None	105 MMBF/yr		33.3 LB/H
AR-0120	OLA	AR	2/11/2015	Drying Kiln No. 4 (SN-12)	None	105 MMBF/yr		33.2 LB/H
AR-0120	OLA	AR	2/11/2015	Drying Kiln No. 5 (SN-21)	wood residue	60 MMBF/yr		23.5 LB/H
AR-0122	GEORGIA-PACIFIC WOOD PRODUCTS SOUTH LLC (GURDON PLYWOOD AND	AR	2/6/2015	SN-09 #4 LUMBER KILN	NATURAL GAS	130 MILLION BOARD FEET		3.8 LB/MBF
AR-0123	DELTIC TIMBER CORPORATION WALDO	AR	10/18/2013	KILN NO. 3		0	PROPER KILN OPERATION	27 LB/H
AR-0123	DELTIC TIMBER CORPORATION WALDO	AR	10/18/2013	KILN NO. 4		0		46.2 LB/H
AR-0123	DELTIC TIMBER CORPORATION WALDO	AR	10/18/2013	KILN NO. 5		0		27 LB/H
AR-0124	EL DORADO SAWMILL	AR	8/3/2015	LUMBER DRYING KILN SN-01	NATURAL GAS	45 MMBTU/H	PROPER MAINTENANCE AND OPERATION	3.8 LB/MBF
AR-0124	EL DORADO SAWMILL	AR	8/3/2015	LUMBER DRYING KILN SN-02	NATURAL GAS	45 MMBTU/H		3.8 LB/MBF
AR-0124	EL DORADO SAWMILL	AR	8/3/2015	LUMBER DRYING KILN SN-03	NATURAL GAS	45 MMBTU/H		3.8 LB/MBF
AR-0127	DELTIC TIMBER CORPORATION - OLA	AR	10/13/2015	STEAM HEATED CONTINUOUS KILN NO. 3		79000 MBF/YR	PROPER DRYING SCHEDULE AND A TEMPERATURE BASED ON MOISTURE CONTENT OF THE LUMBER TO BE DRIED AND THE MANUFACTURER'S SPECIFICATIONS	33.3 LB/H
AR-0127	DELTIC TIMBER CORPORATION - OLA	AR	10/13/2015	STEAM HEATED CONTINUOUS KILN NO. 4		79000 MBF/YR	PROPER DRYING SCHEDULE AND A TEMPERATURE BASED ON MOISTURE CONTENT OF THE LUMBER TO BE DRIED AND THE MANUFACTURER'S SPECIFICATIONS	33.3 LB/H
AR-0127	DELTIC TIMBER CORPORATION - OLA	AR	10/13/2015	DIRECT-FIRED CONTINUOUS KILN NO. 5		79000 MBF/YR	PROPER DRYING SCHEDULE AND A TEMPERATURE BASED ON MOISTURE CONTENT OF THE LUMBER TO BE DRIED AND THE MANUFACTURER'S SPECIFICATIONS	38.2 LB/H
AR-0135	WEST FRASER, INC. (LEOLA LUMBER MILL)	AR	8/5/2013	LUMBER KILN, CONTINUOUS, INDIRECT		275 MMBF/YR		3.5 LB/MBF
AR-0143	CADDO RIVER LLC	AR	2/8/2017	CONTINUOUS LUMBER DRYING KILNS	WOOD	1.16E+08 BOARD FEET		53.2 LB/H
FL-0315	NORTH FLORIDA LUMBER/BRISTOL SAW MILL	FL	8/4/2009	Wood lumber kiln	steam heated	92000000 board-f lumber/yr	Best operating practices: 1) minimize over-drying lumber; 2) maintain consistent moisture content for processed lumber charge; and 3) dry at the minimum temperature.	116.93 T/YR
FL-0340	PERRY MILL	FL	4/1/2014	Direct-fired lumber drying kiln	Waste wood	90 million board ft/yr	At a minimum, the permittee shall operate the kiln in accordance with the following best operating practices (BMP). a.Minimize over-drying the lumber; b.Maintain consistent moisture content for the processing lumber charge; and c.Dry at the minimum temperature. The permittee shall develop and operate in accordance with a written plan to implement the above BMP and any others required by the kiln manufacturer. Ninety days before the initial startup of the kiln, the permitted shall submit to the Compliance Authority the BMP plan. The Title V air operation permit shall include the submitted BMP plan.	3.5 LB/MBF

Table C-16. RESULTS OF RBLC SEARCH FOR LUMBER KILN VOC BACT

RBLCID	Facility Name	State	Permit Issuance Date	Process Name	Primary Fuel	Throughput	Control Method Description	Emission Limit
FL-0343	WHITEHOUSE LUMBER MILL	FL	9/9/2014	Direct-Fired Continuous Kilns	Wood waste	40 MMBTU/H	Proper Maintenance and Operating Procedures: â€¢Minimize over-drying the lumber. â€¢Maintain consistent moisture content for the processing lumber charge. â€¢Dry the lumber at the minimum temperature. â€¢Develop a written Operation and Maintenance (O&M) plan identifying the above practices and the operation and maintenance requirements from the kiln manufacturer. â€¢Record and monitor the total monthly amount and 12-month annual total of wood dried in each kiln (board-feet). â€¢Record the calculated monthly and 12-month annual total emissions of VOC to demonstrate compliance with the process and emissions limits.	3.76 LB/MBF
FL-0358	GRACEVILLE LUMBER MILL	FL	7/14/2016	Direct-fired continuous lumber drying Kiln No. 5	Sawdust	110000 Thousand bf/yr	Lumber moisture used as proxy for VOC emissions -- product that is over dried likely means more VOC driven off and emitted	3.5 LB/MBF
GA-0146	SIMPSON LUMBER CO, LLC MELDRIM OPERATIONS	GA	4/25/2012	KILN 3	WASTE WOOD	65000000 BF/YR	PROPER MAINTENANCE AND OPERATION	3.83 LB/MBF
GA-0146	SIMPSON LUMBER CO, LLC MELDRIM OPERATIONS	GA	4/25/2012	KILN 4	WASTE WOOD	73000000 BF/YR	PROPER MAINTENANCE AND OPERATION	3.93 LB/MBF
LA-0252	JOYCE MILL	LA	8/16/2011	Lumber kilns		300 million board feet/yr	properly design and operation	930 T/YR
LA-0281	SOUTHWEST LOUISIANA LUMBER OPERATIONS	LA	1/31/2014	EP-3K -Wood-Fired Dry Kiln No. 1	Wood	60000 MBF/YR	Proper kiln design & operation; annual production limit	29.27 LB/H
LA-0281	SOUTHWEST LOUISIANA LUMBER OPERATIONS	LA	1/31/2014	EP-4K â€" Wood-Fired Dry Kiln No. 2	Wood	60000 MBF/YR	Proper kiln design & operation; annual production limit	29.27 LB/H
LA-0281	SOUTHWEST LOUISIANA LUMBER OPERATIONS	LA	1/31/2014	EP-5K â€" Wood-Fired Dry Kiln No. 3	Wood	60000 MBF/YR	Proper kiln design & operation; annual production limit	29.27 LB/H
LA-0281	SOUTHWEST LOUISIANA LUMBER OPERATIONS	LA	1/31/2014	EP-6K â€" Wood-Fired Dry Kiln No. 4	Wood	60000 MBF/YR	Proper kiln design & operation; annual production limit	29.27 LB/H
LA-0293	CHOPIN MILL	LA	3/18/2014	Lumber Dry Kilns Nos. 1 & 2 (EQT 37 & 38)		25000 M BD-FT/YR	Good operating practices to limit VOC emissions to 4.29 lb/M bd-ft (12-month rolling average).	24.51 LB/MBF
LA-0294	DODSON DIVISION	LA	12/30/2013	Dry Kiln 1 (033, EQT 15)		14 M BD-FT/H	Good operating practices, including proper design, operation, and maintenance	79.4 LB/H
LA-0294	DODSON DIVISION	LA	12/30/2013	Dry Kiln 2 (034, EQT 16)		14 M BD-FT/H	Good operating practices, including proper design, operation, and maintenance	79.4 LB/H
LA-0294	DODSON DIVISION	LA	12/30/2013	Dry Kiln 3 (035, EQT 17)		16 M BD-FT/H	Good operating practices, including proper design, operation, and maintenance	90.74 LB/H
LA-0294	DODSON DIVISION	LA	12/30/2013	Dry Kiln 4 (051, EQT 32)		16 M BD-FT/H	Good operating practices, including proper design, operation, and maintenance	90.74 LB/H
SC-0135	NEW SOUTH COMPANIES, INC. - CONWAY PLANT	SC	9/24/2012	LUMBER KILNS		380.56 MMBD-FT/YR	PROPER MAINTENANCE AND OPERATION	799.18 T/YR
SC-0136	SIMPSON LUMBER COMPANY, LLC	SC	8/29/2012	DIRECT-FIRED LUMBER DRYING KILN NO. 4	DRY WOOD WASTE	34 MMBTU/H	WORK PRACTICE STANDARDS	104 T/YR
SC-0138	ELLIOTT SAWMILLING COMPANY	SC	4/14/2009	DIRECT FIRED LUMBER DRYING KILN NO.5	SAWDUST	35 MMBTU/H	WORK PRACTICE STANDARDS	119 T/YR
SC-0149	KLAUSNER HOLDING USA, INC	SC	1/3/2013	LUMBER DRYING KILNS EU007		700 million board feet/yr		3.5 LB/MBF
SC-0151	WEST FRASER - NEWBERRY LUMBER MILL	SC	4/30/2013	TWO - 35 MMBTU/H DUAL PATH, DIRECT FIRED, CONTINUOUS LUMBER KILNS, 15 THOUSAND BF/H, EACH	SAWDUST	0	PROPER OPERATION AND GOOD OPERATING PRACTICES	3.76 LB/MBF
*SC-0162	NEW SOUTH LUMBER COMPANY, INC. DARLINGTON PLANT	SC	6/18/2013	DKN1	STEAM HEATED	60 MMBF/YR	PROPER OPERATION AND MAINTENANCE	343.98 T/YR
*SC-0162	NEW SOUTH LUMBER COMPANY, INC. DARLINGTON PLANT	SC	6/18/2013	DKN4	STEAM HEATED	60 MMBF/YR	MAINTENACE AND OPERATING PRACTICES	343.98 T/YR
*SC-0162	NEW SOUTH LUMBER COMPANY, INC. DARLINGTON PLANT	SC	6/18/2013	DKN5	WOOD WASTE	75 MMBF/YR	PROPER MAINTENANCE AND OPERATION	141 T/YR
SC-0163	KAPSTONE CHARLESTON KRAFT LLC-SUMMERVILLE	SC	1/20/2015	LUMBER KILNS		194.83 MMBF/YR	PROPER MAINTENANCE AND OPERATION	225.6 T/YR
SC-0164	SIMPSON LUMBER COMPANY, LLC	SC	6/20/2014	LUMBER KILNS		166 MMBF/YR	PROPER OPERATION AND MAINTENANCE	156 T/YR
SC-0165	NEW SOUTH COMPANIES, INC. - CONWAY PLANT	SC	10/15/2014	LUMBER KILNS		295.6 MMBF/YR	PROPER MAINTENANCE AND OPERATION	602 T/YR
*SC-0166	NEW SOUTH LUMBER COMPANY - DARLINGTON INC.	SC	1/26/2016	TWO KILNS - KLN5 AND KLN6	GREEN SAWDUST	85 MILLION BD-FT/YR	PROPER OPERATION AND MAINTENANCE	0
*SC-0169	CAMDEN PLANT	SC	6/18/2014	DKN6 - DIRECT FIRED CONTINUOUS LUMBER DRYING KILN	WOOD	80 MMBD-FT/YR		150.4 T/YR

Table C-16. RESULTS OF RBLC SEARCH FOR LUMBER KILN VOC BACT

RBLCID	Facility Name	State	Permit Issuance Date	Process Name	Primary Fuel	Throughput	Control Method Description	Emission Limit
*SC-0172	NEW SOUTH COMPANIES, INC. - CONWAY PLANT	SC	10/15/2014	LUMBER KILNS		295.6 MMBD-FT/YR	PROPER MAINTENANCE AND OPERATION	602 T/YR
*SC-0176	GEORGIA PACIFIC - MCCORMICK SAWMILL	SC	10/27/2016	Direct fired continuous lumber kiln	Wood Fired	26 MMBTU/HR		0
TX-0584	TEMPLE INLAND PINELAND MANUFACTURING COMPLEX	TX	8/12/2011	Dry studmill kilns 1 and 2	wood	156000 boardfeet per charge	good operating practice and maintenance	2.49 LB/MBF
TX-0607	LUMBER MILL	TX	12/15/2011	Continuous lumber kilns (2)	wood	275 MMBF/YR	proper temperature and process management; drying to appropriate moisture content	3.5 LB/MBF

Table C-17. RESULTS OF RBLC SEARCH FOR ENGINE VOC BACT

RBLCID	Facility Name	State	Permit Issuance Date	Process Name	Primary Fuel	Throughput	Control Method Description	Emission Limit	Emission Limit (converted)
*WI-0261	ENBRIDGE ENERGY - SUPERIOR TERMINAL	WI	6/12/2014	EG7 - Diesel Emergency Electric Generator w/ tank	Diesel	197 BHP	NSPS engine [Tier 3 emergency engine]. EG7 Storage tank, conventional fuel oil storage tank, good operating practices; limiting leakage, spills. (FT01). Engine limited to 200 hours / year (total) and NSPS requirements.	3.75 GRAM / HP-HR	8.267E-03 LB/HP-H
LA-0313	ST. CHARLES POWER STATION	LA	8/31/2016	SCPS Emergency Diesel Firewater Pump 1	Diesel	282 HP	Good combustion practices	1.87 LB/H	6.631E-03 LB/HP-H
MD-0044	COVE POINT LNG TERMINAL	MD	6/9/2014	5 EMERGENCY FIRE WATER PUMP ENGINES	ULSD	350 HP	USE ONLY ULSD, GOOD COMBUSTION PRACTICES, AND DESIGNED TO ACHIEVE EMISSION LIMIT	3 G/HP-H	6.614E-03 LB/HP-H
SC-0113	PYRAMAX CERAMICS, LLC	SC	2/8/2012	FIRE PUMP	Diesel	500 HP	CERTIFIED ENGINES THAT COMPLY WITH NSPS, SUBPART IIII. HOURS OF OPERATION LIMITED TO 100 HOURS PER YEAR FOR MAINTENANCE AND TESTING.	4 GR/KW-H	6.533E-03 LB/HP-H
ID-0018	LANGLEY GULCH POWER PLANT	ID	6/25/2010	FIRE PUMP ENGINE	Diesel	235 KW	TIER 3 ENGINE-BASED, GOOD COMBUSTION PRACTICES (GCP)	4 G/KW-H	6.533E-03 LB/HP-H
SC-0159	US10 FACILITY	SC	7/9/2012	FIRE PUMPS, FIRE1, FIRE2, FIRE3	Diesel	211 KW	BACT HAS BEEN DETERMINED TO BE COMPLIANCE WITH NSPS, SUBPART IIII, 40 CFR60.4202 AND 40 CFR60.4205.	4 GKW-H	6.533E-03 LB/HP-H
*KS-0030	MID-KANSAS ELECTRIC COMPANY, LLC - RUBART STATION	KS	3/31/2016	Compression ignition RICE emergency fire pump	ULSD	197 HP		1.14 G/HP-HR	2.513E-03 LB/HP-H
AK-0082	POINT THOMSON PRODUCTION FACILITY	AK	1/23/2015	Airstrip Generator Engine	ULSD	490 hp		0.0025 LB/HP-H	2.500E-03 LB/HP-H
LA-0224	ARSENAL HILL POWER PLANT	LA	3/20/2008	DFP DIESEL FIRE PUMP	Diesel	310 HP	USE OF LOW-SULFUR FUELS, LIMITING OPERATING HOURS AND PROPER ENGINE MAINTENANCE	0.77 LB/H	2.484E-03 LB/HP-H
OK-0129	CHOUTEAU POWER PLANT	OK	1/23/2009	EMERGENCY FIRE PUMP (267-HP DIESEL)	LSD	267 HP	GOOD COMBUSTION	0.66 LB/H	2.472E-03 LB/HP-H
LA-0254	NINEMILE POINT ELECTRIC GENERATING PLANT	LA	8/16/2011	EMERGENCY FIRE PUMP	Diesel	350 HP	ULTRA LOW SULFUR DIESEL AND GOOD COMBUSTION PRACTICES	1 G/HP-H	2.205E-03 LB/HP-H
*KS-0036	WESTAR ENERGY - EMPORIA ENERGY CENTER	KS	3/18/2013	Cummins 6BTA 5.9F-1 Diesel Engine Fire Pump	Diesel	182 BHP	utilize efficient combustion/design technology	0.77 G/BHP-H	1.698E-03 LB/HP-H
OH-0317	OHIO RIVER CLEAN FUELS, LLC	OH	11/20/2008	FIRE PUMP ENGINES (2)	Diesel	300 HP	GOOD COMBUSTION PRACTICES AND GOOD ENGINE DESIGN	0.26 LB/H	8.667E-04 LB/HP-H
OH-0352	OREGON CLEAN ENERGY CENTER	OH	6/18/2013	Emergency fire pump engine	Diesel	300 HP	Purchased certified to the standards in NSPS Subpart IIII	0.25 LB/H	8.333E-04 LB/HP-H
*WV-0025	MOUNDSVILLE COMBINED CYCLE POWER PLANT	WV	11/21/2014	Fire Pump Engine	Diesel	251 HP		0.17 LB/H	6.773E-04 LB/HP-H
IL-0114	CRONUS CHEMICALS, LLC	IL	9/5/2014	Firewater Pump Engine	Diesel	373 hp	Tier IV standards for non-road engines at 40 CFR 1039.102, Table 7.	0.4 G/KW-H	6.533E-04 LB/HP-H
IN-0158	ST. JOSEPH ENEGRY CENTER, LLC	IN	12/3/2012	TWO (2) FIREWATER PUMP DIESEL ENGINES	Diesel	371 BHP	COMBUSTION DESIGN CONTROLS AND USAGE LIMITS	0.16 LB/H	4.313E-04 LB/HP-H
IA-0105	IOWA FERTILIZER COMPANY	IA	10/26/2012	Fire Pump	Diesel	290 HP	good combustion practices	0.25 G/KW-H	4.083E-04 LB/HP-H
OK-0164	MIDWEST CITY AIR DEPOT	OK	1/8/2015	Diesel-Fueled Fire Pump Engines	ULSD	300 HP	1. Good Combustion Practices.	0.15 GRAMS PER HP-HR	3.307E-04 LB/HP-H
IN-0173	MIDWEST FERTILIZER CORPORATION	IN	6/4/2014	FIRE PUMP		500 HP	GOOD COMBUSTION PRACTICES	0.141 G/BHP-H	3.109E-04 LB/HP-H
IN-0173	MIDWEST FERTILIZER CORPORATION	IN	6/4/2014	RAW WATER PUMP	Diesel	500 HP	GOOD COMBUSTION PRACTICES	0.141 G/BHP-H	3.109E-04 LB/HP-H
IN-0180	MIDWEST FERTILIZER CORPORATION	IN	6/4/2014	FIRE PUMP		500 HP	GOOD COMBUSTION PRACTICES	0.141 G/B-HP-H	3.109E-04 LB/HP-H
IN-0180	MIDWEST FERTILIZER CORPORATION	IN	6/4/2014	RAW WATER PUMP	Diesel	500 HP	GOOD COMBUSTION PRACTICES	0.141 G/B-HP-H	3.109E-04 LB/HP-H
IN-0179	OHIO VALLEY RESOURCES, LLC	IN	9/25/2013	DIESEL-FIRED EMERGENCY WATER PUMP	Diesel	481 BHP	GOOD COMBUSTION PRACTICES	0.141 G/B-HP-H	3.109E-04 LB/HP-H
*PA-0309	LACKAWANNA ENERGY CTR/JESSUP	PA	12/23/2015	Fire pump engine	ULSD	290 HP		0.12 GM/HP-HR	2.646E-04 LB/HP-H
LA-0301	LAKE CHARLES CHEMICAL COMPLEX ETHYLENE 2 UNIT	LA	5/23/2014	Firewater Pump Nos. 1-3 (EQTs 997, 998, & 999)	Diesel	500 HP	Compliance with 40 CFR 60 Subpart IIII and operating the engine in accordance with the engine manufacturer's instructions and/or written procedures (consistent with safe operation) designed to maximize combustion efficiency and minimize fuel usage	0.1 LB/HR	2.000E-04 LB/HP-H

Table C-18. RESULTS OF RBLC SEARCH FOR TANKS VOC BACT

RBLCID	Facility Name	State	Permit Issuance Date	Process Name	Primary Fuel	Throughput	Control Method Description	Emission Limit
FL-0285	PROGRESS BARTOW POWER PLANT	FL	01/26/2007	TWO NOMINAL 3.5 MILLION GALLON DISTILLATE FUEL OIL STORAGE TANKS	FUEL OIL			N/A
FL-0286	FPL WEST COUNTY ENERGY CENTER	FL	01/10/2007	TWO NOMINAL 6.3 MILLION GALLON DISTILLATE FUEL OIL STORAGE TANKS	DISTILLATE FUEL OIL			N/A
FL-0346	LAUDERDALE PLANT	FL	04/22/2014	Three ULSD fuel oil storage tanks		N/A	The Department sets BACT for these storage tanks to minimize VOC emissions as the use of pressure relief valves/vapor condensers. In lieu of pressure relief valves/vapor condensers, FPL as an alternative, can use tanks with internal floating roofs or the equivalent to minimize VOC emissions.	N/A
FL-0354	LAUDERDALE PLANT	FL	08/25/2015	Two 3-million gallon ULSD storage tanks		N/A	Low vapor pressure prevents evaporative losses	N/A
IA-0088	ADM CORN PROCESSING - CEDAR RAPIDS	IA	06/29/2007	CORROSION INHIBITOR STORAGE TANK		8500 GALLON STORAGE		0.85 T/YR
IA-0089	HOMELAND ENERGY SOLUTIONS, LLC, PN 06-672	IA	08/08/2007	ADDITIVE (CORROSION INHIBITOR) TANK, T66 (07-A-977P)		2300 GAL		0.05 T/YR
IL-0119	PHILLIPS 66 PIPELINE LLC	IL	01/23/2015	Distillate Storage Tank (Tank 2001)		200000 bbl	low vapor pressure material	0.1 PSIA
IN-0158	ST. JOSEPH ENEGRY CENTER, LLC	IN	12/03/2012	EMERGENCY GENERATOR ULSD TANKS		550 GALLONS EA	GOOD DESIGN AND OPERATING PRACTICES	N/A
IN-0158	ST. JOSEPH ENEGRY CENTER, LLC	IN	12/03/2012	FIRE PUMP ENGINE ULSD TANKS		70 GALLONS EA	GOOD COMBUSTION PRACTICE AND FUEL SPECIFICATION	N/A
IN-0158	ST. JOSEPH ENEGRY CENTER, LLC	IN	12/03/2012	VEHICLE GASOLINE DISPENSING TANK		650 GALLONS	SUBMERGED FILL PIPES AND STAGE 1 VAPOR CONTROL	N/A
IN-0158	ST. JOSEPH ENEGRY CENTER, LLC	IN	12/03/2012	VEHICLE DIESEL TANK		650 GALLONS	GOOD COMBUSTION PRACTICE AND FUEL SPECIFICATION	N/A
IN-0158	ST. JOSEPH ENEGRY CENTER, LLC	IN	12/03/2012	EMERGENCY GENERATOR ULSD TANK		300 GALLONS	GOOD COMBUSTION PRACTICE AND FUEL SPECIFICATION	N/A
LA-0213	ST. CHARLES REFINERY	LA	11/17/2009	TANKS - FOR HEAVY MATERIALS			EQUIPPED WITH FIXED ROOF AND COMPLY WITH 40 CFR 63 SUBPART CC	N/A
LA-0228	BATON ROUGE JUNCTION FACILITY	LA	11/02/2009	EQT031-EQT035 FIVE DISTILLATE TANKS (T006-T010)		240000 BBL (EACH)	SUBMERGED FILL PIPES AND PRESSURE/VACUUM VENTS	45 T/YR
LA-0232	STERLINGTON COMPRESSOR STATION	LA	06/24/2008	CONDENSATE STORAGE TANK		5760 BBL/YR	SUBMERGED FILL PIPE	1.28 LB/H
LA-0237	ST. ROSE TERMINAL	LA	05/20/2010	HEAVY FUEL OIL STORAGE TANKS (18)		N/A	FIXED ROOF	67.53 T/YR
LA-0265	ST. CHARLES REFINERY	LA	10/02/2012	FR Storage Tanks EQT0087 and EQT0088		N/A	Comply with 40 CFR 63 Subpart CC (Group 2)	N/A
LA-0276	BATON ROUGE JUNCTION FACILITY	LA	12/15/2016	Vertical Fixed Roof Tanks 174, 175, 176		N/A	Submerged fill pipes and pressure/vacuum vents	N/A
LA-0309	BENTELER STEEL TUBE FACILITY	LA	06/04/2015	Gasoline Tank S16		600 gallons	Submerged fill pipe	N/A
LA-0314	INDORAMA LAKE CHARLES FACILITY	LA	08/03/2016	Unleaded Gasoline Tank TK-33		1000 gallons	Submerged fill pipe and LAC 33:III.2103	N/A
LA-0320	ST. CHARLES REFINERY	LA	03/05/2014	Equilization Tank 2013-16		N/A	Comply with 40 CFR 63 Subpart CC	N/A
MA-0040	CHELSEA TERMINAL	MA	08/20/2008	Heated Residual Oil Storage Tanks		N/A	Regenerative Thermal Oxidizer with 99% destruction efficiency	7.7 TONS
NV-0047	NELLIS AIR FORCE BASE	NV	02/26/2008	FUEL TANKS/LOADING RACKS/FUEL DISPENSING	GASOLINE		STAGE 1 AND STAGE 2 VAPOR RECOVERY SYSTEMS AND LIMIT OF REID VAPOR PRESSURE TO 10 PSI	0.0033 LB/GAL. THROUGHPUT
OH-0317	OHIO RIVER CLEAN FUELS, LLC	OH	11/20/2008	FIXED ROOF TANKS (8)	DIESEL FUEL OIL	262500 GAL/D	SUBMERGED FILL	0.8 T/YR
*OK-0148	BUFFALO CREEK PROCESSING PLANT	OK	09/12/2012	Condensate Tanks (Petroleum Storage-Fixed Roof Tanks)	N/A	1.46 MMBPY	Flare.	N/A
OK-0153	ROSE VALLEY PLANT	OK	03/01/2013	CONDENSATE TANKS	NA	9198000 GAL/YR	FLARE	0.82 TPY
OK-0154	MOORELAND GENERATING STA	OK	07/02/2013	DIESEL TANK (2800 GALLON)	NA	2800 GALLONS	FIXED-ROOF TANK	N/A
OR-0050	TROUTDALE ENERGY CENTER, LLC	OR	03/05/2014	Storage tank	ULSD	N/A	Submerged fill line; Vapor balancing during tank filling.	N/A
TX-0656	GAS TO GASOLINE PLANT	TX	05/16/2014	Fixed Roof Tanks (3)		800000 GAL/YR	WATER SCRUBBER	1.65 T/YR
TX-0728	PEONY CHEMICAL MANUFACTURING FACILITY	TX	04/01/2015	Diesel and lube oil tanks		10708 gallons/yr	low vapor pressure fuel, submerged fill, white tank	0.02 LB/H
TX-0731	CORPUS CHRISTI TERMINAL CONDENSATE SPLITTER	TX	04/10/2015	Petroleum Liquids Storage in Fixed Roof Tanks		3.4 MMBbl/yr/t	Temperature reduced to maintain volatile organic compound (VOC) vapor pressure < 0.5 pounds per square inch actual (psia) at all times.	15.78 TONS/YR/TANK
TX-0756	CCI CORPUS CHRISTI CONDENSATE SPLITTER FACILITY	TX	06/19/2015	Storage Tanks, TK-110, TK-111, TK-112		57960 gal/hr	Tanks are required to be painted white and be equipped with submerged fill pipes	3.07 LB/HR
TX-0756	CCI CORPUS CHRISTI CONDENSATE SPLITTER FACILITY	TX	06/19/2015	Storage Tanks, TK-113, TK-114, and TK-115		47000000 gal/yr/tank	Tanks are required to be painted white and be equipped with submerged fill pipes	0.85 LB/HR
TX-0772	PORT OF BEAUMONT PETROLEUM TRANSLOAD TERMINAL (PBPTT)	TX	11/06/2015	Petroleum Liquids Storage in Fixed Roof Tanks		47.62 BBL/YR	Tank uses submerged fill and is aluminum in color.	0.01 T/YR
TX-0799	BEAUMONT TERMINAL	TX	06/08/2016	Storage Tanks - fixed roof		N/A	Fixed-roof tanks (EPNs 168, 222, 225, 227,229, 254, 256, 257, 258, 259, 475, and 476) will use submerged fill and have white exterior surfaces. Fuel tanks (EPN DTK01 and GTK01) are horizontal fixed-roof design and will use submerged fill and have white or aluminum exterior surfaces.	72.5 T/YR
*TX-0808	HOUSTON FUEL OIL TERMINAL	TX	09/02/2016	Storage Tank		N/A	Insulated, submerged fill, painted white	0.1 T/YR
*TX-0813	ODESSA PETROCHEMICAL PLANT	TX	11/22/2016	Petroleum Liquid Storage in Fixed Roof tanks		N/A	Submerged fill pipe, reflective or white exterior paint.	0.01 T/YR
*TX-0825	PASADENA TERMINAL	TX	07/14/2017	Horizontal fixed roof storage tanks		N/A	painted white, has submerged fill	0.37 T/YR
*TX-0825	PASADENA TERMINAL	TX	07/14/2017	Horizontal fixed roof storage tanks maintenance, start up, and shutdown		N/A	Degassing and refilling losses will be controlled by vapor combustor with a 99.5% destruction efficiency.	26.28 T/YR