McDAVID LUMBER MILL MAXIMUM ACHIEVABLE CONTROL TECHNOLOGY PERMIT APPLICATION

Prepared for:

Champion
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1.0 INTRODUCTION AND SUMMARY

1.1 INTRODUCTION

Champion International Corporation (Champion), a wholly owned subsidiary of International Paper Company, is presently constructing a new lumber mill in Escambia County, Florida, approximately 30 kilometers (km) (19 miles) north of Pensacola. The McDavid Lumber Mill will process southern yellow pine (SYP) logs and produce up to 225 million board feet per year (MMBF/yr) of lumber.

A permit is required prior to the beginning of facility construction, per Rule 62-212.300(1)(a), Florida Administrative Code (F.A.C.). Champion submitted an air construction permit application to the Florida Department of Environmental Protection (FDEP) in June 1999. In response, FDEP issued Final Permit No. 0330260-001-AC authorizing construction and initial operation of the McDavid Lumber Mill. Final Permit No. 0330260-001-AC initially expired on September 6, 2000. In response to a request by Champion, FDEP recently extended this expiration date to September 6, 2001 (reference FDEP correspondence to Champion dated April 12, 2000).

The results of recent emissions testing of lumber drying kilns was presented at the 1999 International Environmental Conference of the Technical Association of the Pulp and Paper Industry (TAPPI). This conference paper, *Lumber Kiln VOC Testing Using the Water Balance Approach*, provides the results of hazardous air pollutant (HAP) tests conducted at lumber drying kilns by the Temple-Inland Forest Products Corporation; a copy of the TAPPI conference paper is provided in Attachment C. These HAP test results indicate that methanol emissions may be greater than previously estimated. Specifically, the TAPPI conference paper data show a maximum methanol emission factor of 0.28 pound per thousand board feet (lb/Mbf) dried for steam-heated kilns versus the prior estimate of 0.037 lb/Mbf developed by the National Council for Air and Stream Improvement (NCASI). This preliminary estimate in the drying kiln emissions factor for methanol results estimates McDavid Lumber Mill methanol emissions at 31.5 tons per year (tpy) versus the previous estimate of 4.2 tpy. Estimated total HAPs (i.e., methanol and formaldehyde emissions) for the McDavid Lumber Mill lumber kilns would increase to 34.3 tpy versus the previous estimate of 4.5 tpy. Because estimated McDavid Lumber Mill total HAP emissions exceed 25 tpy, a case-by-case maximum achievable control technology (MACT) determination is required pursuant to Section 112(g)(2)(B) of the 1990 Clean Air Act Amendments (CAAA). The implemen[illegible]tions for these CAAA requirements are contained in the f[illegible] of Federal Regulations (CFR), 63, Subpart B. FDEP has adc[illegible]3 requirements by reference in Rule 62-204.800(10)(d)2., F.[illegible] requirements of 40 CFR 63, Subpart B apply to major sour[illegible]ine 29, 1998.

This report, including revised permit application forms and supporting documentation included in the attachments, constitutes Champion's application for a case-by-case MACT determination in accordance with the FDEP permitting rules contained in Chapters 62-4 and 62-212, F.A.C.

This report is organized as follows:

- Section 1.2 provides an overview and a summary of the key regulatory determinations.
- Section 2.0 provides an analysis of MACT.

Attachments A through F provide the specific MACT permit application information required by 40 CFR 63.43, revisions to the previously submitted FDEP Application for Air Permit—Title V Source, the TAPPI conference paper, emission rate calculations, control device vendor information, and information on existing kiln controls, respectively.

1.2 SUMMARY

Principal McDavid Lumber Mill processes will include SYP log storage and processing (debarking and sawing); log chipping and sawing; green lumber drying using indirect, steam-heated kilns; dried lumber finishing (planermill); and sorting, storage, and shipping of the final lumber product. Ancillary operations and equipment will include the storage and handling of wood by-products including bark, sawdust, chips, and planermill shavings and two natural gas-fired package boilers to provide steam for the lumber kilns.

Based on the TAPPI conference paper, methanol and formaldehyde emission factors for steam-heated lumber drying kilns, the McDavid Lumber Mill lumber drying kilns would have the potential to emit 31.5 tpy of methanol and 34.3 tpy of total HAPs. Based on these annual potential emission rates for all three lumber kilns, the facility would be a major source under Title III and would be subject to a case-by-case MACT review. As presented in this report, the analyses required for this permit application resulted in the following conclusion:

- Good operating practice and maintenance are proposed as MACT for the indirect, steam-heated lumber drying kilns. Due to the complexity of the kiln drying cycle, installation of exhaust control systems to reduce HAP emissions presents many technical challenges. There are no lumber kilns in the United States that are equipped with controls for reducing HAP emissions. The U.S. Environmental Protection Agency (EPA) contractor (Midwest Research Institute) tasked with the responsibility of developing background information for the future EPA National Emission Standards for Hazardous Air Pollutants (NESHAPs) rule for the plywood and composite wood products category conducted an extensive survey and concluded that there are no existing lumber kilns with air pollution controls. Best available control technology (BACT) for volatile organic compounds (VOCs) for two recent (1997 and 1998) lumber kiln installations in Texas and North Carolina, as well as the McDavid Lumber Mill in Florida in 1999, was determined to be no add-on controls. Cost effectiveness of regenerative thermal oxidation (RTO) and regenerative catalytic oxidizer (RCO) control systems to control HAP emissions was determined to be \$77,733 and \$65,634 per ton of HAP, respectively. Accordingly, the installation of either an RTO or an RCO control system to control HAP emissions is considered to be economically infeasible.

- In addition to the three lumber drying kilns, planing and sawing operations will generate minor amounts of HAPs; primarily methanol and formaldehyde. Combustion of natural gas in the two package steam boilers will also generate minor quantities of organic and metallic HAPs. Due to the low level of HAP emissions generated by the planing, sawing, and natural gas combustion processes, the installation of HAP controls for these emission sources would be economically prohibitive. Accordingly, good operating practice and maintenance are proposed as MACT for the planing, sawing, and steam boiler natural gas combustion processes.

2.0 MACT ANALYSIS

2.1 REGULATORY REQUIREMENTS

Pursuant to Rule 62-204.800(10)(d)2., F.A.C., an analysis of MACT would be required if HAPs emitted by the proposed McDavid Lumber Mill are equal to or greater than the "major source" or "Title V" source emission rates defined by Rule 62-210.200(178), F.A.C. These major source emission rate thresholds are 10 tpy or more for any individual HAP, 25 tpy or more of any combination of HAPs, or any lesser quantity of a HAP as established through EPA rulemaking. Based on the TAPPI conference paper methanol and formaldehyde emission factors for steam-heated lumber drying kilns, the McDavid Lumber Mill lumber drying kilns would have the potential to emit 31.5 tpy of methanol and 34.3 tpy of total HAPs. Therefore, the McDavid Lumber Mill will be a major source under Title III and is subject to a case-by-case MACT review.

As defined by 40 CFR 63.41, MACT for new sources means:

> "the emission limitation which is not less stringent than the emission limitation achieved in practice by the best controlled similar source, and which reflects the maximum degree of reduction in emissions that the permitting authority, taking into consideration the cost of achieving such emission reduction, and any non-air quality health and environmental impacts and energy requirements, determines if achievable by the constructed or reconstructed major source."

MACT determinations are made on a case-by-case basis as part of the FDEP new source review (NSR) process and apply to each pollutant that exceeds the *major source* emission rate thresholds. The four principals of MACT determinations are specified in 40 CFR 63.43(d):

1. MACT requirements must be no less stringent than the emission control which is achieved in practice by the best controlled similar source.
2. MACT emission limits shall achieve the maximum degree of reduction in HAP emissions, taking into consideration control technology costs and any non-air quality health and environmental impacts and energy requirements.

3. If it is not feasible to prescribe an emission limitation, the MACT requirement may be a specific design, equipment, work practice, or operational standard, or a combination of these standards.
4. MACT requirements shall consider any proposed relevant emission standard pursuant to section 112(d) (categorical NESHAPs) or 112 (h) (work practice standards) of the CAAA or a presumptive MACT determination for the source category.

2.2 METHODOLOGY

The MACT analysis was performed in accordance with the four MACT principals previously described in Section 2.1. The first step in the MACT procedure is the identification of the emission control achieved in practice by the best controlled similar source. The second step is to identify all available control technologies, which could be used to control HAP emissions. Because methanol (common name methyl alcohol with a formula of CH_3OH) and formaldehyde (formula HCHO) are also VOCs, control technologies applicable to the control of VOCs would also be applicable to the abatement of methanol and formaldehyde emissions. Alternatives considered included process designs and operating practices that reduce the formation of emissions, post-process stack controls that reduce emissions after they are formed, and combinations of these two control categories. Sources of information that were used to identify control alternatives include:

- EPA reasonably available control technology (RACT)/BACT/lowest achievable emission rate (LAER) Clearinghouse (RBLC) via the RBLC Information System database.
- EPA NSR web site.
- EPA Control Technology Center (CTC) web site.
- Recent state case-by-case MACT determinations for similar facilities.
- Process equipment and control system vendor information.
- Discussions with NCASI personnel familiar with lumber kiln operations.

Following the identification of available control technologies, the next step in the analysis is to determine which technologies are feasible for the processes under review. Technical feasibility was evaluated using the criteria contained in Chapter B of the draft *EPA NSR Workshop Manual* (EPA, 1990).

An assessment of energy, non-air health and environmental, and economic impacts is then performed. The economic analysis employed the procedures found in the Office of Air Quality Planning and Standards (OAQPS) *Control Cost Manual* (EPA, 1996). Specific factors used in estimating capital and annual operating costs are summarized in Table 2-1.

The final step is the selection of a MACT emission limitation or a design, equipment, work practice, operational standard or combination thereof, corresponding to the maximum degree of HAP reduction with consideration of energy, non-air quality health and environmental, and economic impacts.

As noted previously, projected annual emission rates of total HAPs for the McDavid Lumber Mill would exceed the major source emission threshold of 25 tpy. Operations at the McDavid Lumber Mill, which generate HAPs, would be, therefore, subject to a case-by-case MACT analysis. The principal emission sources at the McDavid Lumber Mill, that will emit HAPs, are the three steam-heated lumber drying kilns. In addition to the three lumber drying kilns, planing and sawing operations will generate minor amounts of HAPs—primarily methanol and formaldehyde. Combustion of natural gas in the two package steam boilers will also generate minor quantities of organic and metallic HAPs. HAP control technology analysis using the four principals of MACT determination is provided in the following sections.

2.3 BEST CONTROLLED SIMILAR SOURCE

The EPA contractor (Midwest Research Institute [MRI]) developing background information for the future EPA plywood and composite woods product category Section

Table 2-1. Capital and Annual Operating Cost Factors

Cost Item	Factor
Direct Capital Costs	
Sales tax	0.06 × purchased equipment cost
Freight	0.05 × purchased equipment cost
Foundations and supports	0.08 × purchased equipment cost
Handling and erection	0.14 × purchased equipment cost
Electrical	0.04 × purchased equipment cost
Piping	0.02 × purchased equipment cost
Insulation	0.01 × purchased equipment cost
Painting	0.01 × purchased equipment cost
Indirect Capital Costs	
Engineering	0.10 × purchased equipment cost
Construction and field expenses	0.05 × purchased equipment cost
Contractor fees	0.10 × purchased equipment cost
Start-up	0.02 × purchased equipment cost
Performance testing	0.01 × purchased equipment cost
Contingencies	0.03 × purchased equipment cost
Direct Annual Operating Costs	
Supervisor labor	0.15 × total operator labor cost
Maintenance labor	1.10 × operator labor direct wage
Maintenance materials	1.00 × total maintenance labor cost
Indirect Annual Operating Costs	
Overhead	0.60 × total of operating, supervisory, and maintenance labor and maintenance materials
Administrative charges	0.02 × total capital investment
Property taxes	0.01 × total capital investment
Insurance	0.01 × total capital investment

Source: EPA, 1996.

112(d) NESHAPs was contacted to ascertain the extent of VOC/HAP controls for existing lumber drying kilns. MRI conducted an extensive survey in 1998 requesting information on existing lumber kilns. Survey forms were sent to approximately 500 wood products plants and information was collected on 330 lumber kilns. Following evaluation of this information, MRI determined that none of the kilns surveyed were equipped with air pollution controls. MRI also searched the RBLC and did not identify any controlled lumber kilns. A copy of the MRI response (i.e., e-mail) on the issue of existing lumber kiln controls is included in Attachment E. NCASI was also contacted and confirmed that there are no known lumber drying kilns that are equipped with air pollution control systems. Accordingly, it is concluded that the best controlled similar source is a lumber drying kiln that is not equipped with any VOC/HAP control systems.

There are also no known sawmill planing, sawing, and package natural gas-fired steam boilers that are equipped with HAP control systems. Accordingly, it is concluded that the best controlled similar sources are sawmill planing, sawing, and package natural gas-fired steam boilers that are not equipped with any VOC/HAP control systems.

2.4 MACT ANALYSIS

2.4.1 POTENTIAL CONTROL TECHNOLOGIES

HAP emissions from the lumber drying kilns and planing and sawing operations are primarily due to losses of naturally occurring organic compounds, primarily terpenes, contained in the SYP logs. The minor amounts of HAP emissions from the natural gas-fired steam boilers are due to incomplete combustion of the natural gas fuel. As noted previously, because methanol and formaldehyde are VOCs, control technologies applicable to the control of VOCs would also be applicable to the abatement of methanol and formaldehyde emissions. Because there are no known control technologies that would *only* apply to HAP emissions, the following discussion of potential VOC control technologies is also applicable to the control of HAP emissions.

VOC control technologies potentially available for the lumber kilns and planing and sawing operations include:

- RTO.
- RCO.
- Biofiltration.

The RTO and RCO thermal oxidation control technologies would also potentially be available for the natural gas-fired steam boilers. Each of these technologies is discussed in the following sections.

Thermal Oxidation Systems

Thermal oxidation control systems are employed to control a wide variety of continuous emission streams containing VOCs. The basic process involved in thermal oxidation is the chemical combustion of the VOC-containing waste gas stream at a sufficient temperature and residence time to oxidize the VOCs to carbon dioxide (CO_2) and water (H_2O). The percent conversion of VOC to CO_2 and H_2O depends on the oxidizer design (i.e., specific design combustion temperature, residence time, and extent of gas stream mixing within the oxidizer).

Thermal oxidation is typically applied to exhaust streams containing dilute mixtures of VOC and air. To satisfy insurance requirements, waste gas stream VOC concentrations are normally no more than 25 percent of the lower explosive limit (LEV). Due to the dilute nature of the waste gas stream, these streams also have a low heat content. Accordingly, thermal oxidizers usually require the addition of supplemental fuel to sustain the combustion process.

The main component of a thermal oxidation system is the combustion chamber in which the VOC-containing waste stream is burned. Within the combustion chamber, a nozzle-stabilized flame is maintained by a combination of waste gas VOC compounds, auxiliary fuel, and supplemental air, if necessary. The waste gas stream is heated from its inlet temperature to its ignition temperature. The ignition temperature varies depending on the VOC species being combusted and normally is determined empirically. Ignition will occur for any concentration of VOCs providing the combustion chamber temperature is sufficiently elevated. The extent of VOC destruction depends on the three "Ts" of combustion: time, temperature, and turbulence. The waste gas stream must be oxidized at a sufficiently high temperature, an adequate residence time, and with proper mixing to achieve acceptable VOC destruction efficiencies. The shorter the residence time, the higher the combustion reactor temperature must be and vice versa. Most thermal oxidation units are designed to provide no more than one second of residence time within a temperature range of 1,200 to 2,000 degrees Fahrenheit (°F).

A number of heat recovery schemes are used to reduce the amount of supplemental fuel required; these heat recovery designs serve to define the various types of thermal oxidation systems. A thermal recuperative oxidizer uses a conventional heat exchanger to preheat the inlet VOC waste gas stream using the hot, outlet oxidizer gas stream as the heat exchange medium. Additional heat recovery and fuel savings can be achieved by using direct contact heat exchangers composed of ceramic material in a regenerative type oxidation system. In a regenerative system, the inlet waste gas stream first passes through a hot ceramic bed, thereby increasing the gas stream temperature and cooling the ceramic bed. The heated gas stream then flows to a combustion chamber where supplemental fuel is added to bring the gas stream to its ignition temperature. Following oxidation in the combustion chamber (with the appropriate residence time), the hot combustion gases flow through a second ceramic bed to raise the second bed to the outlet gas temperature prior to discharging to the atmosphere. The process flows are then switched by means of a damper system such that the inlet waste gas stream first passes through the hot ceramic bed, to the combustion chamber, and then to the cooled ceramic bed before exiting to the atmosphere. Thus, the two ceramic heat exchanger beds switch duty depending on the oxidizer cycle (i.e., first to transfer heat to the incoming gas stream and then to recover heat from the hot, combustion chamber outlet exhaust stream). Ceramic media is used in the oxidizer heat exchangers due to its ability to tolerate high temperatures. Thermal energy efficiencies up to 95 percent can be achieved with RTO systems.

RCOs function in a similar fashion to RTOs (i.e., use ceramic heat exchange media in a cycling mode of operation). To further reduce operating costs, RCOs include a catalyst bed located within the combustion chamber. The catalyst bed serves to increase the reaction rate allowing for combustion to occur at a lower temperature than a conventional RTO. The savings in combustion chamber supplemental fuel costs is somewhat offset by the increased capital cost of an RCO system.

Biofiltration

Biofiltration uses microorganisms to naturally biodegrade VOC exhaust streams to CO_2 and H_2O. The VOC-containing gas stream is passed through one or more beds of biomedia containing microorganisms selected to biodegrade the specific VOC compounds present in the waste gas stream. The VOCs are degraded to lower level compounds and eventually to CO_2 and H_2O as the exhaust stream passes through the biofilter beds. In turn, the microorganisms receive energy and nutrients from the biodegradation process. Accordingly, the biofilter must be designed to have an adequate exhaust gas residence time and be populated with microorganisms, which can be acclimated to effectively biodegrade a specific VOC waste stream. Waste VOC exhaust gas streams typically require conditioning, principally for temperature, prior to being treated by a biofilter.

2.4.2 TECHNICAL FEASIBILITY

The nature of lumber kiln operation presents a number of technical challenges with respect to add-on thermal oxidation control systems. Each kiln employs ten separate vents to supply fresh inlet air and to exhaust moisture-laden air. These vents periodically switch service (approximately every 2 hours) such that the fresh air intake vents become wet-air exhausts and vice versa. The lumber kilns are operated under carefully controlled temperature and humidity conditions to properly dry the green lumber. Any control system design would need to be able to function in conjunction with this complex intake/exhaust kiln ventilation system and, at the same time, not adversely affect proper operation of the kilns.

The lumber kiln drying cycle is also highly variable with respect to exhaust flow rates and exhaust stream HAP content. The quantity of exhaust gas generated at any time during the drying cycle will depend on the various kiln operating parameters including internal kiln temperature and desired moisture removal rates. Advanced instrumentation and automatic controls are employed to operate the kiln vents to achieve the required drying cycle. Accordingly, routine operation of the kilns will result in a variable exhaust stream, both with respect to flow rates as well as HAP concentrations. Variations in exhaust gas temperatures and moisture contents will also occur. Varying flow rates and HAP concentration presents design challenges to RTO and RCO vendors (e.g., specifying the appropriate oxidizer combustion chamber volume to achieve the required temperature and residence time).

As noted previously, the VOCs and HAPs present in the lumber kiln exhaust are primarily due to naturally occurring (i.e., biogenic) organic compounds, principally terpenes, that are contained in the SYP logs. Condensation of these viscous, resinous compounds in any downstream control system will, over time, result in accumulation of "sticky" deposits that will adversely affect control system operations (e.g., ductwork and oxidizer dampers and controls). For this reason, maintenance requirements would be expected to be significantly higher for a lumber kiln control system than for a control system without the potential for such condensation. Exhaust stream condensation and deposition of solids will particularly affect the operation of RCOs and biofilters because these control technologies are susceptible to plugging.

There are no known applications of biolfiltration to reduce HAP emissions from lumber kiln exhaust streams. There would, therefore, need to be a considerable amount of research and "up front" engineering necessary to properly design a biofiltration system to treat a lumber kiln exhaust stream. This effort would include fully characterizing the exhaust stream (i.e., range of flow rates, temperatures, HAP concentrations, etc.), identify potential microorganisms capable of biodegrading HAPs, and determining exhaust stream conditioning requirements (e.g., lowering the exhaust stream temperature). The volume of kiln exhaust requiring treatment, approximately 138,000 actual cubic feet per minute (acfm) for the three kilns, would require a relatively long biofilter contact period for effective biodegradation. This, in turn, would result in a large biofilter volume to obtain a suitable velocity and residence time in the biofilter media bed. As noted previously, condensation of the kiln exhaust stream raises the issue of potential plugging of the bio-filter media and resulting operational problems (i.e., excessive back-pressure would adversely affect proper kiln operation).

Due to these many technical problems, there are no lumber kilns operating with thermal oxidation or biofiltration control systems. For two recent lumber kiln installations subject to prevention of significant deterioration (PSD) permitting review (one in North Carolina in mid 1997 and another in Texas in late 1998), the state regulatory agencies concluded in each case that "no controls" represents BACT for VOC for lumber kilns. This was also the determination made by FDEP for the McDavid Lumber Mill in 1999. Biofiltration is not considered to be a technically feasible control technology due to the many uncertainties regarding the design of such a system for a lumber kiln exhaust stream and the fact that it has not been demonstrated in practice for application to lumber kilns. Although unproven for lumber kilns, the RTO and RCO technologies were further evaluated for energy, non-air quality environmental, and economic impacts.

The previous discussion of the technical feasibility of thermal oxidation controls is also generally applicable to the sawmill planing and sawing operations and the natural gas-fired steam boilers. Due to the low level of HAP emissions from these sawmill processes, there are no known sawmill planing and sawing and natural gas-fired steam boilers that are equipped with HAP control systems.

2.4.3 ENERGY AND NON-AIR QUALITY ENVIRONMENTAL IMPACTS

For the lumber kilns, application of RTO or RCO control technology will result in an energy penalty due to the use of supplemental fuel in the oxidizer combustion chamber. For RTO technology, the energy penalty is 18.0 million British thermal units per hour (MMBtu/hr), equivalent to the use of 150.2 million cubic feet (ft^3) of natural gas annually based on a natural gas heating value of 1,050 British thermal units per cubic foot (Btu/ft^3). For RCO technology, the energy penalty is 3.6 MMBtu/hr, equivalent to the use of 30.0 million ft^3 of natural gas annually based on a natural gas heating value of 1,050 Btu/ft^3. In addition, both control technologies will impose additional electricity demand due to the power needed to run the control system exhaust gas fans. For RTO technology, this electrical energy penalty is 5,479,380 kilowatt-hours per year (kWh/yr). The electrical energy penalty for RCO technology is 2,838,240 kWh/yr. The installation of thermal oxidation controls on the sawmill planing and sawing processes and the natural gas-fired steam boilers would also result in energy penalties due to the use of supplemental fuel and additional electricity.

There are no significant non-air quality environmental impacts associated with the RTO and RCO control technologies

2.4.4 ECONOMIC IMPACTS

An economic evaluation of RTO and RCO control technologies for the lumber kilns were performed using the OAQPS factors previously summarized in Table 2-1 and project-specific economic factors provided in Table 2-2. Specific capital and annual operating costs for RTO control technology are summarized in Tables 2-3 and 2-4. Specific capital and annual operating costs for RCO control technology are summarized in Tables 2-5 and 2-6.

The base case (i.e., uncontrolled rate for all three lumber kilns) annual HAP emission rate would be 34.3 tpy. For both RTO and RCO technologies, the controlled annual HAP emission rate was based on a capture efficiency of 85 percent and a HAP destruction efficiency

Table 2-2. Economic Cost Factors

Factor	Units	Value
Interest rate	%	8.0
Control system life	Years	10
RCO Catalyst life	Years	2
Electricity cost	$/kWh	0.045
Natural Gas Cost	$MMBtu	2.58
Labor costs (base rates)	$/hour	
Operator		10.55
Maintenance		13.12

Sources: Champion, 2000.
ECT, 2000.

Table 2-3. Capital Costs for RTO Control System (Three Oxidizers)

Item	Dollars	OAQPS Factor	Comments
Direct Costs			
Purchased Equipment			
RTO Control System	2,050,000		
Ductwork	501,000		
Total Control System	2,551,000	A	
Instrumentation	0	0.01 × A	Included in A
Sales Tax	123,000	0.06 × A	
Freight	25,050	0.05 × A	Ductwork only
Total Purchased Equipment	**2,699,050**	B	
Installation			
Foundations and supports	175,844	0.08 × B	Excluding ductwork
Handling and erection	307,727	0.14 × B	Excluding ductwork
Electrical	87,922	0.04 × B	Excluding ductwork
Piping	53,981	0.02 × B	
Insulation for ductwork	26,991	0.01 × B	
Painting	0	0.01 × B	Included in A
Subtotal Installation Cost	**652,465**		
Subtotal Direct Costs	**3,351,515**	TDC	
Indirect Costs			
Engineering	539,810	0.10 × B	× 2, custom built
Construction & Field Expenses	134,953	0.05 × B	
Contractor Fees	269,905	0.10 × B	
Start-up	53,981	0.02 × B	
Performance Test	107,962	0.01 × B	× 4, multiple tests
Contingency	1,349,525	0.03 × B	50%, first application on kilns
Subtotal Indirect Cost	**2,456,136**	TIC	
TOTAL CAPITAL INVESTMENT	**5,807,650**	TCI	

Sources: Eisenmann Corporation, 1999.
ECT, 2000.

Table 2-4. Annual Operating Costs for RTO Control System (Three Oxidizers)

Item	Dollars	OAQPS Factor	Comments
Direct Costs			
Labor and material costs			
Operator	69,314	6.0 hr/shift (A)	Operator labor @ $10.55/hr
Supervisor	10,397	0.15 × A	(3 Oxidizers, complex system)
Maintenance			
Labor	86,198	6.0 hr/shift (B)	Operator labor @ $13.12/hr
Material	86,198	1.0 × B	(3 Oxidizers, complex system)
Subtotal Labor & Material Costs	**252,107**	C	
Utilities			
Natural Gas	406,814	18.0 MMBtu/hr	Natural gas @ $2.58/MMBtu
Electricity	246,572	625.5 kW	Electricity @ $0.045/kWh
Subtotal Utilities	**653,387**		
Subtotal Direct Costs	**905,494**	TDC	
Indirect Costs			
Overhead	151,264	0.60 × C	
Administrative Charges	116,153	0.02 × TCI	
Property Taxes	58,077	0.01 × TCI	
Insurance	58,077	0.01 × TCI	
Capital Recovery	865,511		10 Years @ 8.0 percent
Subtotal Indirect Costs	**1,249,082**		
TOTAL ANNUAL COST	**2,154,575**		

Sources: Champion, 2000.
ECT, 2000.

Table 2-5. Capital Costs for RCO Control System (Three Oxidizers)

Item	Dollars	OAQPS Factor	Comments
Direct Costs			
Purchased equipment			
RCO control system	2,055,000		
Ductwork	501,000		
Total control system	2,556,000	A	
Instrumentation	0	0.01 × A	Included in A
Sales tax	123,300	0.06 × A	
Freight	0	0.05 × A	Included in A
Total Purchased Equipment	**2,679,300**	B	
Installation			
Foundations and supports	174,264	0.08 × B	Excluding ductwork
Handling and erection	304,962	0.14 × B	Excluding ductwork
Electrical	87,132	0.04 × B	Excluding ductwork
Piping	53,586	0.02 × B	
Insulation for ductwork	26,793	0.01 × B	
Painting	0	0.01 × B	Included in A
Subtotal Installation Cost	**646,737**		
Subtotal Direct Costs	**3,326,037**	TDC	
Indirect Costs			
Engineering	535,860	0.10 × B	× 2, custom built
Construction and field expenses	133,965	0.05 × B	
Contractor fees	267,930	0.10 × B	
Start-up	53,586	0.02 × B	
Performance test	107,172	0.01 × B	× 4, multiple tests
Contingency	1,339,650	0.03 × B	50%, first application on kilns
Total Indirect Cost	**2,438,163**	TIC	
TOTAL CAPITAL INVESTMENT	**5,764,200**	TCI	

Sources: Geoenergy, 1999.
ECT, 2000.

Table 2-6. Annual Operating Costs for RCO Control System (Three Oxidizers)

Item	Dollars	OAQPS Factor	Comments
Direct Costs			
Labor and material costs			
Operator	69,314	6.0 hr/shift (A)	Operator labor @ $10.55/hr
Supervisor	10,397	0.15 × A	(3 Oxidizers, complex system)
Maintenance			
Labor	86,198	6.0 hr/shift (B)	Operator labor @ $13.12/hr
Material	86,198	1.0 × B	(3 Oxidizers, complex system)
Subtotal Labor & Material Costs	**252,107**	C	
Catalyst Costs			
Replacement (materials + labor)	285,000		
Annualized Catalyst Cost	159,819		2 Years @ 8.0%
Subtotal Catalyst Costs	**159,819**		
Utilities			
Natural gas	81,363	3.6 MMBtu/hr	Natural gas @ $2.58/MMBtu
Electricity	130,086	330 kW	Electricity @ $0.045/kWh
Subtotal Utilities	**211,449**		
Subtotal Direct Costs	**623,375**	TDC	
Indirect Costs			
Overhead	151,264	0.60 × C	
Administrative Charges	115,284	0.02 × TCI	
Property Taxes	57,642	0.01 × TCI	
Insurance	57,642	0.01 × TCI	
Capital Recovery	814,014		10 Years @ 8.0%
Subtotal Indirect Costs	**1,195,846**		
TOTAL ANNUAL COST	**1,819,222**		

Sources: Champion, 1999.
ECT, 2000.

of 95 percent (for an overall HAP removal of 80.8 percent), resulting in a controlled annual HAP emission rate of 6.6 tpy. Base case and controlled HAP emission rates are summarized in Table 2-7.

The cost effectiveness of RTO and RCO control technologies to control HAP emissions from the lumber kilns was determined to be $77,733 and $65,634 per ton of HAP removed, respectively. Based on these high control costs, use of RTO or RCO control technology to control HAP emissions is not considered to be economically feasible. Results of the RTO and RCO economic analyses are summarized in Table 2-7.

Due to the minor amounts of HAPs generated by the sawmill planing and sawing processes and the natural gas-fired steam boilers, application of thermal oxidation technology to control HAP emissions from these minor sources would also be economically prohibitive.

2.4.5 PROPOSED MACT DESIGN/OPERATIONAL STANDARDS

For the lumber kilns, MACT is considered to be the proper installation, operation, and maintenance of the kilns. As noted previously, there are no known installations of HAP controls on existing lumber kilns. Recent (mid-1997, late-1998, and mid-1999) regulatory agency BACT determinations for new lumber kilns located in Texas, North Carolina, and Florida concluded that "no controls" represents BACT for VOCs. The unique and complex manner in which lumber kilns are operated (e.g., use of a series of vents which periodically switch mode from inlet to outlet service, wide variation in exhaust flow rates and HAP concentrations, and potential for condensation of viscous substances and concomitant fouling and plugging of control system components) presents daunting technical challenges for RTO and RCO control technologies.

The proper installation, operation, and maintenance of the sawmill planing and sawing processes and the natural gas-fired steam boilers is considered to be MACT for these HAP emission sources. There are no known installations of HAP controls for these sawmill processes. Due to the low levels of HAP emissions from these emission units, the

Table 2-7. Summary of Lumber Kiln MACT Analysis

Control Option	HAP Emission Impacts* — Emission Rates lb/hr	HAP Emission Impacts* — Emission Rates tpy	HAP Emission Impacts* — Emission Reduction (tpy)	Economic Impacts — Installed Capital Cost ($)	Economic Impacts — Total Annualized Cost ($/yr)	Economic Impacts — Cost Effectiveness Over Baseline ($/ton)	Energy Impacts — Increase Over Baseline (MMBtu/yr)	Environmental Impacts — Toxic Impact (Y/N)	Environmental Impacts — Adverse Environmental Impact (Y/N)
RTO	1.5	6.6	27.7	5,807,650	2,154,575	77,733	5,528	Y	Y
RCO	1.5	6.6	27.7	5,764,200	1,819,222	65,634	5,528	Y	Y
Baseline	7.8	34.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*RTO and RCO emission rates based on 85-percent capture efficiency and 95-percent HAP destruction efficiency.

Source: ECT, 2000.

installation of thermal oxidation control technology is considered to be economically prohibitive.

Table 2-8 summarizes the MACT design/operational standards proposed for the McDavid Lumber Mill.

Table 2-8. Proposed MACT Design/Operational Standards

Emission Source	Proposed MACT Design/Operational Standards
Lumber Kilns	Proper installation, operation, and maintenance
Planing and Sawing	Proper installation, operation, and maintenance
Steam Boilers	Proper installation, operation, and maintenance

Sources: Champion, 2000.
ECT, 2000.

ATTACHMENT A

MACT PERMIT APPLICATION DATA

ATTACHMENT A

MACT PERMIT APPLICATION DATA

(1) Name and address of the major source

McDavid Lumber Mill
Champion International Corporation
401 Champion Drive
McDavid, FL 32568

(2) Brief description of the major source

Principal McDavid Lumber Mill processes will include SYP log storage and processing (debarking and sawing); log chipping and sawing; green lumber drying using indirect, steam heated kilns; dried lumber finishing (planer-mill); and sorting, storage, and shipping of the final lumber product. Ancillary operations and equipment will include the storage and handling of wood by-products including bark, sawdust, chips, and planermill shavings and two natural gas-fired package boilers to provide steam for the lumber kilns.

(3) Expected commencement and completion dates of construction

Construction of the McDavid Lumber Mill commenced in September 1999. The proposed sawmill is scheduled to complete construction in the fourth quarter of 2000.

(4) Anticipated date of start-up

The McDavid Lumber Mill is scheduled to commence operation in the fourth quarter of 2000.

(5) Type and quantities of HAPs emitted

HAPs emitted from the lumber drying kilns include methanol and formaldehyde. Emissions of methanol and formaldehyde from the three McDavid Lumber Mill lumber drying kilns, based on the TAPPI conference paper test data, are estimated to total 31.5 and 2.8 tpy, respectively. There will also be

minor amounts of HAPs emitted due to the combustion of natural gas by the two package steam boilers and the sawmill planing and sawing operations.

(6) Any federally enforceable emission limits applicable to the major source

Federally enforceable emission limits are contained in FDEP Final Permit No. 0330260-001-AC. Specific Condition No. 5 limits CO emissions from each of the natural gas-fired steam boilers to no more than 0.18 lb/MMBtu of heat input (LHV basis). Specific Condition No. 6 limits visible emissions from each of the natural gas-fired steam boilers to no more than 5 percent opacity. Specific Condition No. 10 limits visible emissions from each of the lumber drying kilns to no more than 5 percent opacity. Specific Condition No. 17 limits visible emissions from the planermill operations to no more than 5 percent opacity.

(7) Maximum and expected utilization (i.e., production rates) of the major source and associated uncontrolled HAP emission rates

The McDavid Lumber Mill will process SYP logs and produce up to 225 MMBF/yr of lumber. Uncontrolled emissions of methanol and formaldehyde from the three McDavid Lumber Mill lumber drying kilns, based on the TAPPI conference paper, are estimated to total 31.5 and 2.8 tpy, respectively. There will also be minor amounts of HAPs emitted due to the combustion of natural gas by the two package steam boilers and the sawmill planing and sawing operations.

(8) The controlled HAP emission rates in tpy at the maximum and expected utilization rates

Controlled emissions of methanol and formaldehyde from the three McDavid Lumber Mill lumber drying kilns, based on the TAPPI conference paper test

data, are estimated to total 31.5 and 2.8 tpy, respectively. There will also be minor amounts of HAPs emitted due to the combustion of natural gas by the two package steam boilers and the sawmill planing and sawing operations.

(9) Recommended case-by-case MACT emission limitation

For the lumber kilns, MACT is considered to be the proper installation, operation, and maintenance of the kilns. There are no known installations of HAP controls on existing lumber kilns. Recent (mid 1997, late 1998, and mid 1999) regulatory agency BACT determinations for new lumber kilns located in Texas, North Carolina, and Florida concluded that "no controls" represents BACT for VOCs.

The unique and complex manner in which lumber kilns are operated (e.g., use of a series of vents which periodically switch mode from inlet to outlet service, wide variation in exhaust flow rates and HAP concentrations, and potential for condensation of viscous substances and concomitant fouling and plugging of control system components) presents daunting technical challenges for RTO and RCO control technologies. The cost effectiveness of RTO and RCO control technologies for HAP emissions was determined to be $77,733 and $65,634 per ton of HAP removed, respectively. Based on these high control costs, use of RTO or RCO control technology to control HAP emissions is not considered to be economically feasible.

The proper installation, operation, and maintenance of the sawmill planing and sawing processes and the natural gas-fired steam boilers is considered to be MACT for these HAP emission sources. There are no known installations of HAP controls for these sawmill processes. Due to the low levels of HAP

emissions from these emission units, the installation of thermal oxidation control technology is considered to be economically prohibitive.

(10) Documentation of the control technology currently being used.

Control technology currently being used for the lumber kilns is the proper installation, operation, and maintenance of the kilns.

Control technology currently being used for the sawmill planing and sawing processes and the natural gas-fired steam boilers is the proper installation, operation, and maintenance of these emission units.

ATTACHMENT B

**APPLICATION FOR AIR PERMIT—
TITLE V SOURCE**

Department of Environmental Protection

Division of Air Resources Management

APPLICATION FOR AIR PERMIT - TITLE V SOURCE

See Instructions for Form No. 62-210.900(1)

I. APPLICATION INFORMATION

Identification of Facility

1. Facility Owner/Company Name: **Champion International Corporation**	
2. Site Name: **McDavid Lumber Mill**	
3. Facility Identification Number: **0330260** [ ] Unknown	
4. Facility Location: Street Address or Other Locator: **401 Champion Drive** City: **McDavid** County: **Escambia** Zip Code: **32568**	
5. Relocatable Facility? [ ] Yes [✔] No	6. Existing Permitted Facility? [✔] Yes [ ] No

Application Contact

1. Name and Title of Application Contact: **Randy Elgin** **Wood Products Regional Environmental, Health and Safety (EHS) Manager**
2. Application Contact Mailing Address: Organization/Firm: **Champion International Corporation** **(a wholly owned subsidiary of International Paper Company)** Street Address: **4231 Mike Padgett Highway** City: **Augusta** State: **GA** Zip Code: **30906**
3. Application Contact Telephone Numbers: Telephone: **(706) 796 – 5707** Fax: **(706) 796 – 5716**

Application Processing Information (DEP Use)

1. Date of Receipt of Application:	
2. Permit Number:	
3. PSD Number (if applicable):	
4. Siting Number (if applicable):	

Purpose of Application

Air Operation Permit Application

This Application for Air Permit is submitted to obtain: (Check one)

[ ] Initial Title V air operation permit for an existing facility which is classified as a Title V source.

[ ] Initial Title V air operation permit for a facility which, upon start up of one or more newly constructed or modified emissions units addressed in this application, would become classified as a Title V source.

Current construction permit number:__________________________________

[ ] Title V air operation permit revision to address one or more newly constructed or modified emissions units addressed in this application.

Current construction permit number:__________________________________

Operation permit number to be revised:________________________________

[ ] Title V air operation permit revision or administrative correction to address one or more proposed new or modified emissions units and to be processed concurrently with the air construction permit application. (Also check Air Construction Permit Application below.)

Operation permit number to be revised/corrected: _________________________

[ ] Title V air operation permit revision for reasons other than construction or modification of an emissions unit. Give reason for the revision; e.g., to comply with a new applicable requirement or to request approval of an "Early Reductions" proposal.

Operation permit number to be revised:________________________________

Reason for revision:____

Air Construction Permit Application

This Application for Air Permit is submitted to obtain: (Check one)

[✔] Air construction permit to construct or modify one or more emissions units.

[ ] Air construction permit to make federally enforceable an assumed restriction on the potential emissions of one or more existing, permitted emissions units.

[ ] Air construction permit for one or more existing, but unpermitted, emissions units.

Owner/Authorized Representative or Responsible Official

1. Name and Title of Owner/Authorized Representative or Responsible Official:
   Dave Stevens – Plant Manager

2. Application Contact Mailing Address:
   Organization/Firm: **Champion International Corporation**
   Street Address: **401 Champion Drive**
   City: **McDavid** State: **FL** Zip Code: **32568**

3. Owner/Authorized Representative or Responsible Official Telephone Numbers:
   Telephone: **(850) 587-1002** Fax: **(850) 968-3027**

4. Owner/Authorized Representative or Responsible Official Statement:

   I, the undersigned, am the owner or authorized representative(check here [ ] if so) or the responsible official (check here [✔], if so) of the Title V source addressed in this application, whichever is applicable. I hereby certify, based on information and belief formed after reasonable inquiry, that the statements made in this application are true, accurate and complete and that, to the best of my knowledge, any estimates of emissions reported in this application are based upon reasonable techniques for calculating emissions. The air pollutant emissions units and air pollution control equipment described in this application will be operated and maintained so as to comply with all applicable standards for control of air pollutant emissions found in the statutes of the State of Florida and rules of the Department of Environmental Protection and revisions thereof. I understand that a permit, if granted by the Department, cannot be transferred without authorization from the Department, and I will promptly notify the Department upon sale or legal transfer of any permitted emissions unit.*

   David Stevens   Dec 11 2000
   Signature   Date

* Attach letter of authorization if not currently on file.

Professional Engineer Certification

1. Professional Engineer Name: **Thomas W. Davis**
   Registration Number: **36777**

2. Professional Engineer Mailing Address:
   Organization/Firm: **Environmental Consulting & Technology, Inc.**
   Street Address: **3701 Northwest 98th Street**
   City: **Gainesville** State: **FL** Zip Code: **32606**

3. Professional Engineer Telephone Numbers:
   Telephone: **(352) 332-0444** Fax: **(352) 332-6722**

4. Professional Engineer Statement:

I, the undersigned, hereby certify, except as particularly noted herein, that:*

(1) To the best of my knowledge, there is reasonable assurance that the air pollutant emissions unit(s) and the air pollution control equipment described in this Application for Air Permit, when properly operated and maintained, will comply with all applicable standards for control of air pollutant emissions found in the Florida Statutes and rules of the Department of Environmental Protection; and

(2) To the best of my knowledge, any emission estimates reported or relied on in this application are true, accurate, and complete and are either based upon reasonable techniques available for calculating emissions or, for emission estimates of hazardous air pollutants not regulated for an emissions unit addressed in this application, based solely upon the materials, information and calculations submitted with this application.

If the purpose of this application is to obtain a Title V source air operation permit (check here [ ], if so), I further certify that each emissions unit described in this Application for Air Permit, when properly operated and maintained, will comply with the applicable requirements identified in this application to which the unit is subject, except those emissions units for which a compliance schedule is submitted with this application.

If the purpose of this application is to obtain an air construction permit for one or more proposed new or modified emissions units (check here [✔], if so), I further certify that the engineering features of each such emissions unit described in this application have been ~~designed or~~ examined by me or individuals under my direct supervision and found to be in conformity with sound engineering principles applicable to the control of emissions of the air pollutants characterized in this application.

If the purpose of this application is to obtain an initial air operation permit or operation permit revision for one or more newly constructed or modified emissions units (check here [ ], if so), I further certify that, with the exception of any changes detailed as part of this application, each such emissions unit has been constructed or modified in substantial accordance with the information given in the corresponding application for air construction permit and with all provisions contained in such permit.

Thomas W. Davis — 12/6/00

Signature — Date

(seal)

* Attach any exception to certification statement.

Scope of Application

Emissions Unit ID	Description of Emissions Unit	Permit Type	Processing Fee
001	Natural Gas-Fired Package Boiler No. 1	ACM1	$250
002	Natural Gas-Fired Package Boiler No. 2	ACM1	N/A
003	Lumber Drying Kilns Nos. 1 – 3	ACM1	N/A
004	Planermill Operations	ACM1	N/A
005	Facility Fugitive Emissions	ACM1	N/A

Application Processing Fee

Check one: [✔] Attached - Amount: **$ 250** [ ] Not Applicable

Fee for minor technical changes per Rule 62-4.050(4)(r)5., F.A.C.

Construction/Modification Information

1. Description of Proposed Project or Alterations: **Champion International Corporation (Champion), a wholly owned subsidiary of International Paper Company, is presently constructing a new lumber mill in Escambia County, Florida approximately 30 kilometers (km) [19 miles (mi)] north of Pensacola.** **Recent HAP test results for lumber drying kilns indicate that methanol emissions may be greater than previously estimated. A revision in the drying kiln emission factor for methanol results in estimated McDavid Lumber Mill methanol emissions of 31.5 tons per year (tpy) vs. the previous estimate of 4.2 tpy. Total HAPs (i.e., methanol and formaldehyde emissions) for the McDavid Lumber Mill lumber kilns are estimated to be 34.3 tpy vs. the previous estimate of 4.5 tpy. Because estimated McDavid Lumber Mill total HAP emissions may exceed 25 tpy, a case-by-case Maximum Achievable Control Technology (MACT) determination is required pursuant to Section 112(g)(2)(B) of the 1990 Clean Air Act Amendments (CAAA).** **These revised permit application forms, and supporting documentation included in the attachments, constitutes Champion's application for a case-by-case MACT determination in accordance with the Florida Department of Environmental Protection (FDEP) permitting rules contained in Chapters 62-4 and 62-212, F.A.C.** **Champion also requests approval for the installation of an insignificant emission source. During the drying and steam generation processes, kiln condensate (i.e. water liberated from the lumber), steam condensate, and boiler blowdown streams are generated. To dispose of these streams, Champion proposes to evaporate them in the boiler blowdown pit. Written concurrence from the Department that this is an insignificant emission source and that Champion may proceed with the installation of the boiler blowdown pit steam coils that will be used to evaporate the water streams is requested.**
2. Projected or Actual Date of Commencement of Construction: **September, 1999**
3. Projected Date of Completion of Construction: **4th Quarter 2000**

Application Comment

II. FACILITY INFORMATION

A. GENERAL FACILITY INFORMATION

Facility Location and Type

1. Facility UTM Coordinates: Zone: **16**	East (km): **468.74**	North (km): **3,406.5**	
2. Facility Latitude/Longitude: Latitude (DD/MM/SS):		Longitude (DD/MM/SS):	
3. Governmental Facility Code: **0**	4. Facility Status Code: **C**	5. Facility Major Group SIC Code: **24**	6. Facility SIC(s): **2421**
7. Facility Comment (limit to 500 characters):			

Facility Contact

1. Name and Title of Facility Contact:
Dave Stevens – Plant Manager

2. Facility Contact Mailing Address:
Organization/Firm: **Champion International Corporation**
Street Address: **401 Champion Drive**
City: **McDavid** State: **FL** Zip Code: **32568**

3. Facility Contact Telephone Numbers:
Telephone: **(850) 587-1002** Fax: **(850) 968-3027**

Facility Regulatory Classifications

Check all that apply:

1. [ ] Small Business Stationary Source?	[ ] Unknown
2. [✔] Major Source of Pollutants Other than Hazardous Air Pollutants (HAPs)?	
3. [ ] Synthetic Minor Source of Pollutants Other than HAPs?	
4. [✔] Major Source of Hazardous Air Pollutants (HAPs)?	
5. [ ] Synthetic Minor Source of HAPs?	
6. [✔] One or More Emissions Units Subject to NSPS?	
7. [ ] One or More Emission Units Subject to NESHAP?	
8. [ ] Title V Source by EPA Designation?	
9. Facility Regulatory Classifications Comment (limit to 200 characters):	

List of Applicable Regulations

N/A – previously submitted	

B. FACILITY POLLUTANTS

List of Pollutants Emitted

1. Pollutant Emitted	2. Pollutant Classif.	3. Requested Emissions Cap lb/hour	tons/year	4. Basis for Emissions Cap	5. Pollutant Comment
VOC	**A**	**N/A**	**N/A**	**N/A**	
H115 (Methanol)	**A**	**N/A**	**N/A**	**N/A**	
HAPS	**A**	**N/A**	**N/A**	**N/A**	

C. FACILITY SUPPLEMENTAL INFORMATION

Supplemental Requirements

1. Area Map Showing Facility Location: [ ] Attached, Document ID: [ ] Not Applicable [✔] Waiver Requested **Previously submitted; see PSD permit application dated June 1999.**
2. Facility Plot Plan: [ ] Attached, Document ID: [ ] Not Applicable [✔] Waiver Requested **Previously submitted; see PSD permit application dated June 1999.**
3. Process Flow Diagram(s): [ ] Attached, Document ID: [ ] Not Applicable [✔] Waiver Requested **Previously submitted; see PSD permit application dated June 1999.**
4. Precautions to Prevent Emissions of Unconfined Particulate Matter: [ ] Attached, Document ID: [ ] Not Applicable [✔] Waiver Requested **Previously submitted; see PSD permit application dated June 1999.**
5. Fugitive Emissions Identification: [ ] Attached, Document ID: [ ] Not Applicable [✔] Waiver Requested **Previously submitted; see PSD permit application dated June 1999.**
6. Supplemental Information for Construction Permit Application: [✔] Attached, Document ID: **MACT App.** [ ] Not Applicable
7. Supplemental Requirements Comment:

III. EMISSIONS UNIT INFORMATION

A separate Emissions Unit Information Section (including subsections A through J as required) must be completed for each emissions unit addressed in this Application for Air Permit. If submitting the application form in hard copy, indicate, in the space provided at the top of each page, the number of this Emissions Unit Information Section and the total number of Emissions Unit Information Sections submitted as part of this application.

A. GENERAL EMISSIONS UNIT INFORMATION
(All Emissions Units)

Emissions Unit Description and Status

1. Type of Emissions Unit Addressed in This Section: (Check one)

[ ] This Emissions Unit Information Section addresses, as a single emissions unit, a single process or production unit, or activity, which produces one or more air pollutants and which has at least one definable emission point (stack or vent).

[✔] This Emissions Unit Information Section addresses, as a single emissions unit, a group of process or production units and activities which has at least one definable emission point (stack or vent) but may also produce fugitive emissions.

[ ] This Emissions Unit Information Section addresses, as a single emissions unit, one or more process or production units and activities which produce fugitive emissions only.

2. Regulated or Unregulated Emissions Unit? (Check one)

[✔] The emissions unit addressed in this Emissions Unit Information Section is a regulated emissions unit.

[ ] The emissions unit addressed in this Emissions Unit Information Section is an unregulated emissions unit.

3. Description of Emissions Unit Addressed in This Section (limit to 60 characters):
Emission unit consists of three indirect, heated steam lumber drying kilns.

4. Emissions Unit Identification Number: [ ] No ID
ID: **003 (K-1 through K-3)** [ ] ID Unknown

5. Emissions Unit Status Code:	6. Initial Startup Date:	7. Emissions Unit Major Group SIC Code:	8. Acid Rain Unit?
C		**24**	[ ]

9. Emissions Unit Comment: (Limit to 500 Characters)

Only those sections of the application form which have been revised from the original June 1999 PSD permit application are included for this emission unit.

F. EMISSIONS UNIT POLLUTANTS
(All Emissions Units)

1. Pollutant Emitted	2. Primary Control Device Code	3. Secondary Control Device Code	4. Pollutant Regulatory Code
1 – VOC			**EL**
2 – PM			**EL**
3 – PM10			**EL**
4 – H115			**EL**
5 – HAPS			**EL**

G. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units - Emissions-Limited and Preconstruction Review Pollutants Only)

Potential/Fugitive Emissions

1. Pollutant Emitted: **H115 (methanol)**	2. Total Percent Efficiency of Control:
3. Potential Emissions: **7.2** lb/hour **31.5** tons/year	4. Synthetically Limited? [ ]
5. Range of Estimated Fugitive Emissions: [ ] 1 [ ] 2 [ ] 3 ______ to ______ tons/year	
6. Emission Factor: **0.28 lb/MBF** Reference: **TAPPI Conference Paper**	7. Emissions Method Code: **5**

8. Calculation of Emissions (limit to 600 characters):

Hourly emission rate = 0.28 lb/MBF x 25.68 MBF = 7.2 lb/hr

Annual emission rate = 0.28 lb/MBF x 225,000 MBF/yr x (1 ton / 2,000 lb) = 31.5 tpy

9. Pollutant Potential/Fugitive Emissions Comment (limit to 200 characters):

Allowable Emissions Allowable Emissions 1 of 1

1. Basis for Allowable Emissions Code: **OTHER**	2. Future Effective Date of Allowable Emissions:
4. Requested Allowable Emissions and Units: **Proper Operating and Maintenance Practices**	4. Equivalent Allowable Emissions: **7.2** lb/hour **31.5** tons/year

5. Method of Compliance (limit to 60 characters):

Implementation of proper operating and maintenance practices.

6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters):

FDEP Rule 62-204.800(10(d)2, F.A.C. (Case-By-Case MACT)

G. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units - Emissions-Limited and Preconstruction Review Pollutants Only)

Potential/Fugitive Emissions

1. Pollutant Emitted: **HAPS**	2. Total Percent Efficiency of Control:
3. Potential Emissions: **7.8** lb/hour **34.3** tons/year	4. Synthetically Limited? [ ]
5. Range of Estimated Fugitive Emissions: [ ] 1 [ ] 2 [ ] 3 ______ to ______ tons/year	
6. Emission Factor: **0.305 lb/MBF** Reference: **TAPPI Conference Paper**	7. Emissions Method Code: **5**
8. Calculation of Emissions (limit to 600 characters): **Hourly emission rate = 0.305 lb/MBF x 25.68 MBF = 7.8 lb/hr** **Annual emission rate = 0.305 lb/MBF x 225,000 MBF/yr x (1 ton / 2,000 lb) = 34.3 tpy**	
9. Pollutant Potential/Fugitive Emissions Comment (limit to 200 characters): **HAP emission factor is the sum of methanol (0.28 lb/MBF) and formaldehyde (0.025 lb/MBF) emission factors.**	

Allowable Emissions Allowable Emissions 1 of 1

1. Basis for Allowable Emissions Code: **OTHER**	2. Future Effective Date of Allowable Emissions:
5. Requested Allowable Emissions and Units: **Proper Operating and Maintenance Practices**	4. Equivalent Allowable Emissions: **7.8** lb/hour **34.3** tons/year
5. Method of Compliance (limit to 60 characters): **Implementation of proper operating and maintenance practices.**	
6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters): **FDEP Rule 62-204.800(10(d)2, F.A.C. (Case-By-Case MACT)**	

J. EMISSIONS UNIT SUPPLEMENTAL INFORMATION
(Regulated Emissions Units Only)

Supplemental Requirements

1. Process Flow Diagram [ ] Attached, Document ID: [ ] Not Applicable [✔] Waiver Requested **Previously submitted; see PSD permit application dated June 1999.**
2. Fuel Analysis or Specification [ ] Attached, Document ID:_______ [✔] Not Applicable [ ] Waiver Requested
3. Detailed Description of Control Equipment [ ] Attached, Document ID:_______ [✔] Not Applicable [ ] Waiver Requested
4. Description of Stack Sampling Facilities [ ] Attached, Document ID:_______ [✔] Not Applicable [ ] Waiver Requested
5. Compliance Test Report [ ] Attached, Document ID:_______ [ ] Previously submitted, Date:____________ [✔] Not Applicable
6. Procedures for Startup and Shutdown [ ] Attached, Document ID:_______ [✔] Not Applicable [ ] Waiver Requested
7. Operation and Maintenance Plan [ ] Attached, Document ID:_______ [✔] Not Applicable [ ] Waiver Requested
8. Supplemental Information for Construction Permit Application **See MACT application** [ ] Attached, Document ID:_______ [ ] Not Applicable
9. Other Information Required by Rule or Statute [ ] Attached, Document ID:_______ [✔] Not Applicable
10. Supplemental Requirements Comment:

ATTACHMENT C

TAPPI CONFERENCE PAPER

IMBER KILN VOC TESTING USING THE WATER MASS BALANCE APPROACH

nry McLaurine
vironmental Engineer
en e-Inland Forest Products Corporation
ib , TX 75941

Bruce Ferguson
Principal Scientist
Roy F. Weston, Inc.
Auburn, AL 36832

Scott Slocum
Project Scientist
Roy F. Weston, Inc.
Auburn, AL 36832

BSTRACT

w lumber drying kilns (one direct-fired and one steam-heated) were tested for volatile organic compounds using e water mass balance (WMB) approach. The objective of the testing was to measure the emission factor lb Mbf) for total hydrocarbons (by flame ionization analyzer), methanol, and formaldehyde from Southern (w Pine dimensional lumber during the drying cycle. The WMB approach was selected as the most appropriate nethod due to the kiln construction and operation.

Th WMB approach relates parameter emission rates to the moisture content of the vented gas. The approach theory an calculations are described. Reference test methodology was used for all measurements. The WMB approach provides a viable procedure to measure lumber drying kiln VOC emissions. The greatest variability is in measuring th lumber moisture loss during drying (which directly affects the results).

The testing produced results comparable to those reported in the open literature for similar wood species. Results from the water mass balance approach (~ 2 lb THC/MMbf) compared favorably with the carbon mass balance a roach on the direct-fired kiln. The moisture loss measurements were more variable than expected.

TRODUCTION

During the last few years, significant effort has been expended to measure the volatile organic compound (VOC) ission rates during the lumber drying process. The need to quantify hazardous air pollutants has resulted from the ssage of the Clean Air Act Amendments of 1990. In addition, total VOC emission rates are needed for air permitting and emission fee calculation.

easurement of emissions from lumber drying kilns is an extremely difficult effort due to the following:

- Emissions do not vent through a stack or at specific locations.
- Lumber drying kilns were not designed nor constructed for testing emissions.
- Fugitive emissions (leaks at doors and crevices) cannot be quantified (or estimated) in relation to the overall emissions.
- The lumber drying cycle is a batch operation requiring 24 to 72 hours to complete.
- Volumetric flow rate measurements are difficult to obtain from kilns.
- Measurement of representative VOC concentrations is difficult.

A number of methods have been developed to address the foregoing challenges. Each method has both advantages and disadvantages. No single method has been established as "standard" because kiln configurations and operations vary significantly. The two most common methods involve either ducting all vents together into a single duct (stack) or by testing each vent separately for volumetric flow rate and analyte concentration. Each method has numerous technical disadvantages and each is costly to set up for testing.

The "common duct" method requires construction of multiple ducts from the kiln vents leading to an induced draft fan and a single vent. This construction of a temporary collection system is costly and sometimes not feasible due to the kiln design. Technical concerns include the possibility of changing kiln operational characteristics as a result of the ducting and the possibility of water-soluble VOCs condensing in the ductwork as the vent gas cools. The need to "reheat" the vent gas or insulate the ductwork only increases cost without assuring the problem is solved. This method does not account for fugitive emissions from the kiln which do not go through the vents.

The "octopus" method is so named because each kiln vent is sampled for analyte concentration and volumetric flow rate throughout the drying cycle. A typical kiln may have 8 to 12 vents with dampers that open and close independently based on the humidity and air temperature inside the kiln. The vents are ambient draft, and because the vent gas velocity at each vent is variable (and low), a calibrated flow measuring device must be used at each vent. Therefore, this method requires sampling all vents continuously for concentration and flow throughout the lumber drying cycle. The sampling can turn into a logistical nightmare; and the method has only been applied to measuring total VOC.

The Corporation wanted to measure the mass of total hydrocarbons and hazardous air pollutants (HAPs)—specifically formaldehyde and methanol—emitted from lumber kilns drying Southern Yellow Pine during typical operations. Two East Texas facilities were identified as representative. The kilns are located less than 100 miles apart, and the operations of both were similar. Both mills process only Southern Yellow Pine into dimensional lumber. The wood source is similar because it all comes from the southeastern Texas geographical area.

Fresh-cut Southern Yellow Pine typically has 60 to 65 percent moisture depending on the season, cut, where cut, and a number of other factors. The logs are rough-sawed then dried to a moisture content of 12 to 15 percent during a 18- to 24-hour drying cycle. The moisture driven from the lumber is released untreated into the atmosphere.

Two types of kilns were to be tested - one indirectly heated by steam and the other directly heated by combustion air from wood shavings. As a result of a preliminary visit to each mill to understand each kiln's operation and configuration, the water mass balance (WMB) approach was selected as the basis for measuring the emissions from both types of kiln. The WMB approach relates the VOC emissions to the total mass of water emitted from a kiln during a complete drying cycle. The WMB approach is based on the concept that the mass of water introduced into the kiln during the drying cycle (lumber and ambient) must equal the water mass exiting the kiln. This paper describes the theory of the WMB approach, discusses the methodology, and presents the results obtained.

THEORY

The WMB approach is based on the concept that the mass of water introduced into the kiln during the drying cycle must equal the water mass exiting the kiln. Figure 1 schematically represents this concept for a lumber drying kiln. The figure represents both the direct-fired and the indirect-heated kilns. The shaded portion of the sketch is associated with the direct-fired kiln.

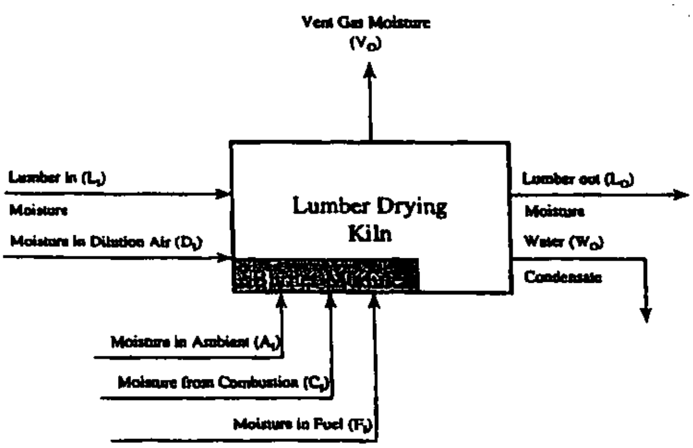


Figure 1. Schematic of Kiln Water Mass Balance Approach

The WMB approach is based on the concept that "water in equals water out". Using the terminology of Figure 1, $L_I + D_I + A_I + C_I + F_I = L_O + V_O + W_O$. The following paragraphs outline the measurement concept, and calculations and equations are presented in Appendix A.

The moisture released from the lumber (L_I - L_O) is calculated from the moisture content of the wet lumber before drying and the dry lumber after drying. Appendix B describes the procedure used to make that measurement. This value by far represents the largest amount of water introduced into the kiln.

The moisture introduced with ambient air (A_I) into the burner is calculated from the temperature and relative humidity of the ambient air throughout the drying cycle. The mean moisture content throughout the drying cycle was used, with the total volume of ambient air introduced, to calculate the mass of water introduced from the ambient air (A_I). The volume ambient (combustion) air was measured or calculated form combustion stoichiometry.

The amount of moisture in ambient air introduced into the kiln as dilution (D_I) is extremely small when compared to moisture introduced from other sources (primarily L_I). Therefore, this small amount (D_I) was ignored for the purposes of these tests.

The amount of water generated from combustion (C_I) was only relevant to the direct-fired kiln. This value was calculated from the combustion products of the wood shavings being used to heat the kiln. The mass of wood burned, the carbon content of the fuel and the heat content of the fuel was used to calculate the amount of water introduced into the kiln from combustion (C_I). A natural gas-fired pilot also burns in the firing chamber. The volume of natural gas burned was used to calculate the water generated from combustion of the natural gas.

The amount of water introduced with the fuel (F_I) was calculated from the mass of fuel (wood shavings) burned during the drying cycle and the moisture content of the wood shavings. One sample of shavings was composited throughout each drying cycle and analyzed for moisture content. This water input value fuel (F_I) was relevant only for the direct-fired kiln.

The water which condensed during kiln heat-up (W_O) was collected and measured. This amount was insignificant when compared to the water vapor emitted into the atmosphere.

The mass of water (V_O) emitted from the kiln through the vents and fugitive sources was calculated from the difference of the water introduced and lost during the drying cycle. That is

$$V_O = [L_I - L_O] + A_I + D_I + F_I + C_I - W_O$$

By knowing the concentration of VOCs with respect to moisture content of gas emitted from the kiln, the mass of VOC emitted from the kiln was calculated. A key assumption of the WMB approach is that the moisture and VOC concentration of the vent gas and the fugitive gas are the same.

All results were normalized to the volume of lumber dried. The number of board feet (bf) was used as the basis of all measurements. The volume of lumber in thousands of board feet (Mbf) dried in each cycle is known. The mass of VOC emissions was divided by the lumber volume dried to produce results in units of lb pollutant per million board feet of lumber (lb/MMbf).

The results from the WMB approach were compared to those obtained from a carbon mass balance (CMB) on the direct-fired kiln. This concept is based on the fact that the carbon in the combustion wood is converted to carbon dioxide (CO_2) by combustion. The amount of carbon in the fuel (wood shavings) was measured for each drying cycle. The CO_2 generated will also be measured throughout the drying cycle. The VOC concentrations were related to the measured CO_2 concentrations.

METHODOLOGY

Standard (Reference) Methods were used to obtain all test results. Table I summarizes the methodology used to conduct the emission testing. Appendix B provides a summary of the lumber moisture loss procedure used, and Appendices C and D describe the application of the methodology on each kiln type.

Table I. Sampling and Analysis Methodology

Parameter	Test Method[a]	Remarks
Lumber Moisture Loss	USDA	Gravimetric determination
Total Hydrocarbon	25A	Continuous sample with dilution
Methanol	308	No silica gel tube analysis
Formaldehyde	NCASI	Acetyl-acetone method
Carbon dioxide/oxygen	3A	Continuous sample
Moisture	4	From methanol/formaldehyde sample

[a]EPA Reference Method unless otherwise noted.

RESULTS AND DISCUSSION

VOC Measurements

Tables II and III summarize the results from each mill. Emission factors for all compounds were based on nominal lumber dimensions, i.e., assuming full thickness and width of the lumber. The mean total VOC emission rates (1.9 and 2.5 lb/MMbf) compare favorably with each other and with other data reported in the open literature. The moisture loss data (0.95 and 0.76 kg/bf) do not compare as well. The following subsection discusses the moisture loss data.

Table II. Emission Testing Results - Steam-Heated Kiln

Kiln No. 4	Cycle Tested[a]			
	2	3	4	Mean
Date Began, January 1998	20	21	22	----
Volume of Lumber Dried, Mbf (Nominal)	143	146	143	----
Lumber Dimension Mix				
2x6, % of total	18	46	59	----
2x8, % of total	36	30	24	----
2x10, % of total	25	17	17	----
2x12, % of total	22	9	0	----
Lumber Moisture Loss, kg/bf	1.16	0.88	0.80	0.95
Total Hydrocarbon Emission Factor, lb as C/Mbf	1.88	1.64	2.11	1.88
Formaldehyde Emission Factor, lb/Mbf	0.029	0.024	0.022	0.025
Methanol Emission Factor, lb/Mbf	0.28	0.23	0.26	0.26

[a]Cycle 1 testing was aborted due to analytical instrumental malfunction.

Table III. Emission Testing Results - Direct-Fired Kiln

Kiln No. 4	Cycle Tested			
	1	2	3	Mean
Date Began, January 1998	26	27	28	----
Volume of Lumber Dried, Mbf (Nominal)	126	127	122	----
Lumber Dimension Mix				
2x6, % of total	78	72	59	----
2x8, % of total	22	28	41	----
Lumber Moisture Loss, kg/bf	0.75	0.84	0.70	0.76
Total Hydrocarbon Emission Factor, lb as C/Mbf	2.59	2.82	2.07	2.49

Moisture Loss Measurements

The moisture lost by the lumber varied significantly from cycle-to-cycle and mill-to-mill. Figure 2 summarizes the results. For each cycle, 16 to 24 samples of lumber (two per kiln car) were cut and weighed before and after drying in the kiln. The lumber moisture loss measurements are seemingly one of the greatest variables of measurement process.

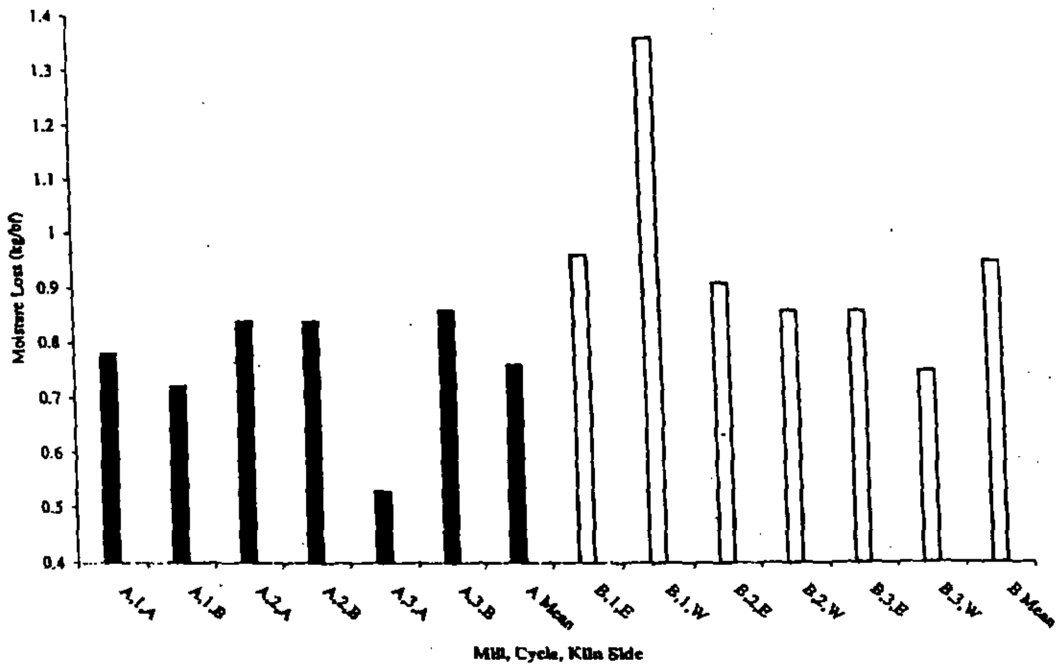
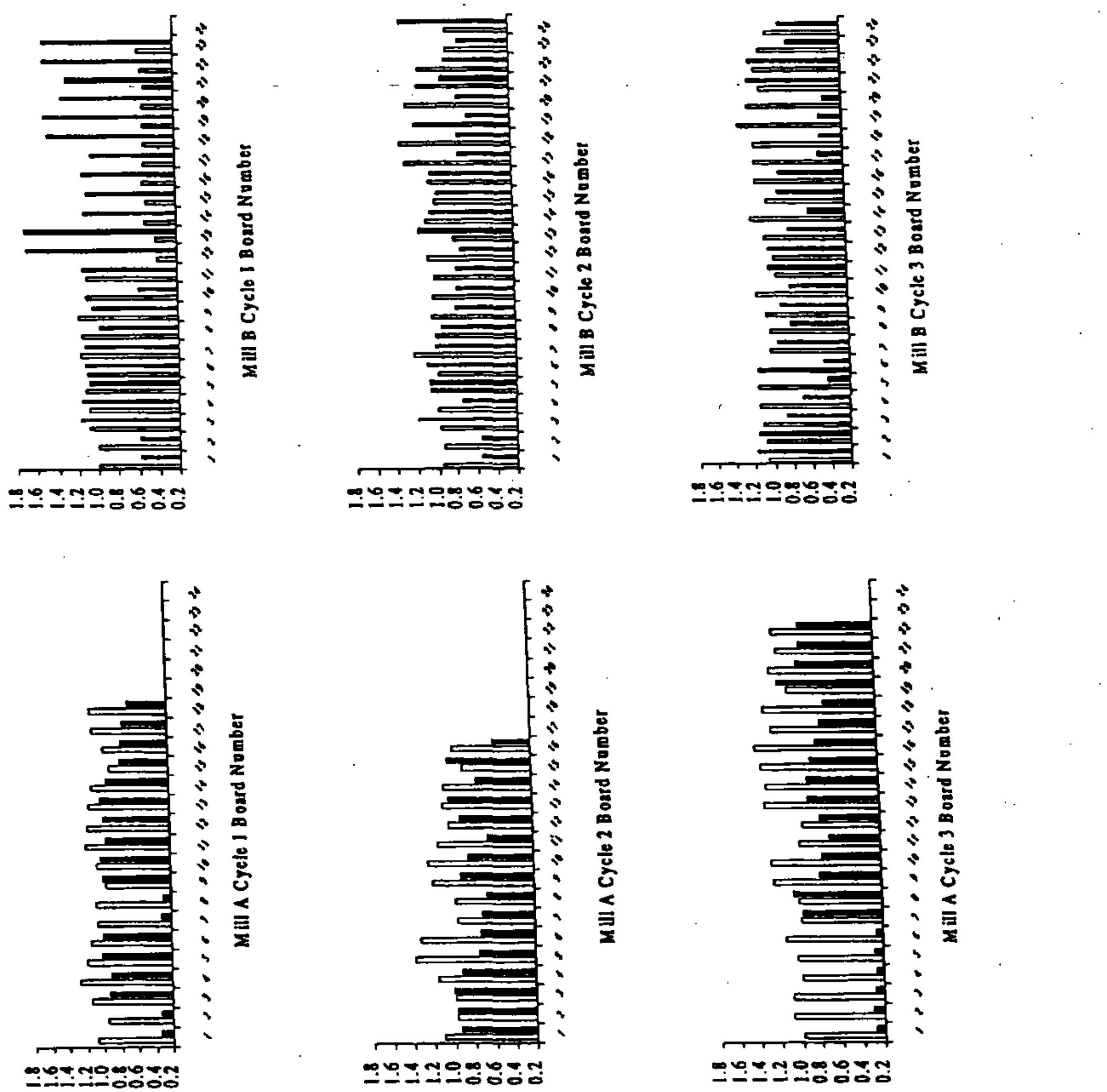


Figure 2. Summary of Lumber Moisture Loss during Drying

The Relative Standard Deviation (RSD) of the measurements was calculated from all samples at each mill. The RSD of the data from Mills A and B was 34 and 31 percent, respectively. The magnitude of the RSD indicates that the mean value for each cycle at each mill is within one standard deviation of the mill mean.

Significant variation was noted in the lumber moisture loss measurements. Considerable variability in results was noted from board-to-board. The initial weights varied depending on the board density and the number of knots in each sample. The final moisture loss values also probably varied with the number of knots in the sample. Figure 3 highlights the variability of the individual measurements.



Black bar represents moisture (in kg/bf) lost during drying and open bar represents board density (in kg/bf) after drying.

Figure 3. Variability in Individual Moisture Loss Measurements

Carbon Mass Balance Correlation

A carbon mass balance (CMB) calculation for the direct-fired kiln was compared to the results obtained by the WMB approach. This was done by calculating the volume of CO_2 generated from combustion of the wood shavings and propane and then relating the THC concentration to the measured CO_2 concentration. Table IV summarizes the results of this approach.

Table IV. Carbon Mass Balance Comparison for Direct-Fired Kiln

	Cycle 1	Cycle 2	Cycle 3	Mean
Mean O_2 Conc, %	12.8	12.0	12.7	12.5
Mean CO_2 Conc, %	8.1	7.9	8.7	8.2
Mean THC Conc, ppm dry	590	630	542	587
Heat Input, MMBtu/Cycle	383	387	352	374
THC Emission Factor, lb/Mbf				
- CMB Approach	1.49	1.51	1.11	1.37
- F_c-factor Approach	1.27	1.39	1.03	1.23
- F_d-factor Approach	1.34	1.30	1.15	1.26

The THC emission factor calculated from the CMB approach, the carbon F-factor (F_c), and the oxygen F-factor (F_d) show good agreement cycle-to-cycle. The heat input value used to calculate the two F-factor emission factors do not include the heat from propane (which was insignificant).

The THC emission factor calculated using the CMB approach (1.37 lb/Mbf) is lower than that calculated using the WMB approach (2.49 lb/Mbf). The variation may be due to the variation in lumber moisture loss measurements and the gas moisture content measurements.

CONCLUSIONS AND RECOMMENDATIONS

The water mass balance approach to measuring lumber kiln emissions is a cost-effective method to apply. The results are comparable to those obtained by other methods as reported in the literature and by direct comparison.

The greatest variable in the method is in the measurement of moisture lost from the lumber during the drying process. The best way to determine the moisture loss would be to directly weigh a representative number of kiln cars. Cutting samples from the representative and weighing those samples before and after drying produce variability due to the density of the particular sample.

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- Mr. Rodney Padgett of Roy F. Weston, Inc. for his on-site leadership and coordination of the field test team.
- Mr. Charles Woodley of Roy F. Weston, Inc. for his assistance with calculations and presentation of the data.

APPENDICES

- A Calculation Procedures
- B Lumber Water Loss Measurements
- C Steam-Heated Lumber Kiln Test Program
- D Direct-Fired Lumber Kiln Test Program

APPENDIX A - CALCULATION PROCEDURES

WATER MASS BALANCE (WMB)

The basic WMB equation below was used as the basis for all calculations. (Refer to Figure 1 in the paper text for a schematic drawing of a lumber drying kiln.)

$$L_I + A_I + D_I + C_I + F_I = L_O + W_O + V_O \tag{1}$$

Where:
- L_I = mass of water introduced with the lumber
- A_I = mass of water introduced with ambient air into the kiln (for combustion air and in-leakage)
- D_I = mass of water introduced with dilution air (negligible)
- C_I = mass of water generated from combustion of fuel (natural gas plus wood)
- F_I = mass of water introduced with the fuel (wood chips)
- L_O = mass of water exiting the kiln in the lumber (after drying)
- W_O = mass of water that condenses during initial heating that runs out of the kiln
- V_O = mass of water leaving the kiln as vapor through the roof vents and as fugitive emissions

Rearranging equation (1),

$$V_O = (L_I - L_O) + A_I + D_I + C_I + F_I - W_O \tag{2}$$

By calculating all terms in the right hand side of the equation, we know the total mass of water being vented from the kiln (V_O). The following paragraphs outline the calculations.

The water loss from the lumber during drying (L_I - L_O) was measured as described in Appendix B. Six to twelve representative boards were cut to provide kiln samples for each drying. The moisture loss of the kiln samples represented the entire kiln charge.

The water introduced with ambient air (A_I and D_I) was calculated from the amount of ambient air introduced into the kiln, the ambient temperature, and the relative humidity. For the steam-fired kiln, this value was assumed to be zero. For the direct-fired kiln, the water mass (A_I) was calculated from the fraction of dry air calculated in the reheat gas. This air volume was drawn through the burner as combustion air. The amount of dilution air (D_I) was assumed to be zero.

The mass of water generated from combustion (C_I) was calculated from the stoichiometry of combustion. This value was equal to zero for the steam-heated kiln. For the direct-fired kiln, the carbon, hydrogen, and oxygen contents of the wood shavings were measured. The amount of water generated from the combustion was calculated based on the carbon and hydrogen content and the mass of shavings burned during the drying cycle. The volume of natural gas burned was used to calculate the moisture generated using the stoichiometric relationship.

$$CH_4 + 2\,O_2 \longrightarrow CO_2 + 2\,H_2O$$

The mass of water introduced with the fuel (F_I) was calculated from the measured moisture content of the shavings and the mass of wood shavings burned during the cycle. This mass of water was small when compared to other water inputs.

The water which condensed during the cycle (W_O) was collected and weighed. This amount was insignificant when compared to the total volume of water lost from the kiln to the atmosphere.

By measuring or calculating all terms on the right hand side of equation (2), we now know the total mass of water vented from the kiln during the drying cycle (V_O). The moisture content (BWS) of this gas was measured hourly to calculate the total volume of gas (V_I) and the volume of dry air (V_O) during the kiln cycle. The mass of water emitted from the kiln during the drying cycle (V_O) was converted to a volume of water at standard temperature and pressure (20 °C and 760 mm Hg) by using the molar volume of water at the temperature (18 kg of water = 24.0 m^3). Therefore, the volume of water (V_W) can be calculated by equation (3).

$$V_W = V_O \times 1.33\ m^3 \qquad (3)$$

The moisture content of the vent gas (BWS) was measured hourly during each drying cycle. Therefore, the total gas volume (V_T) was calculated from the definition of moisture content in equation (4)

$$BWS = \frac{V_W}{V_T} \qquad (4)$$

where V_T is the sum of the volume of dry air (V_A) and the volume of water vapor (V_W).

The mass of any parameter measured on a total volume or a dry gas volume can be calculated. If all concentrations are measured on a "wet" or total volume basis, one can calculate the total mass of pollutant emitted. That is

$$C\ \text{fraction} \times V_T\ \text{in}\ m^3 \times \frac{\text{new in kg}}{\text{mole volume in}\ m^3} = \text{mass pollutant in kg} \qquad (5)$$

CARBON MASS BALANCE (CMB)

A carbon mass balance (CMB) was performed on the direct-fired kiln as a cross check the water mass balance calculations. The total amount of CO_2 generated from the combustion of wood chips and natural gas was calculated from combustion stoichiometry. The total amount of carbon burned (to produce CO_2) was measured from the carbon content of the shavings and the total mass of shavings burned. The volume of natural gas burned was used to calculate the CO_2 generated from combustion.

The CO_2 vented from the kiln was monitored instrumentally throughout the kiln drying cycle. The mean CO_2 concentration measured in the re-circulation duct was used to calculate the amount of dilution air. (The CO_2 concentration in the recycle duct is assumed to be the same as that vented from the kiln). Results were reported hourly.

The total volume of CO_2 generated during the cycle was calculated from the stoichiometric relationship

$$C + O_2 \longrightarrow CO_2 \qquad \text{(for wood)}$$

and

$$CH_4 + 2\,O_2 \longrightarrow CO_2 + 2\,H_2O \qquad \text{(for natural gas)}$$

such that 3.67 kg of CO_2 was produced from each kg of carbon burned. The volume of CO_2 was then calculated using the ideal gas laws (44 kg of CO_2 equals 24.0 m^3 of CO_2).

The mean measured CO_2 concentration was used to calculate the total amount of dilution air added to the kiln. The measured pollutant concentrations was then correlated to the CO_2 concentration to back-calculate the total amount of each compound emitted.

APPENDIX B - LUMBER WATER LOSS MEASUREMENTS

curate measurement of the amount of moisture lost from the lumber is critical to the WMB calculation. Ideally, one would like to measure the weight lost from an entire charge (or at least weigh a representative number of kiln rs before and after drying). For this test program, adequate scale facilities were not available to weigh a kiln car, d it was logistically impossible to access the kiln cars after loading to weigh them.

Therefore, an alternate procedure was used to weigh representative lumber samples before and after drying. Water st from the lumber during drying was measured and calculated as described in the "The Dry Kiln Operator's anual", Edited by William T. Simpson, U.S. Department of Agriculture, Forest Service, Madison, WS, Revised 1991. Chapter 6 of the reference above describes kiln samples used to determine moisture content (and loss) during drying. The following paragraphs summarize the procedure to be used during the kiln test program.

Kiln samples are representative samples used to monitor the drying cycle. Selection of representative samples and representative placements of the kiln samples are necessary to the validity of the results and the representativeness of moisture lost for the entire kiln charge. Samples must be chosen that represent the lumber and its variability. Samples must be spread throughout the kiln at various heights and locations such that the samples are subject to the same airflow as the lumber. Because only Southern Yellow Pine was dried, species variation was not significant. Moisture content and board width varied. All material was nominally 2" thick. Two boards (of representative width) were selected from each kiln car before loading into the kiln. Two kiln samples each of 24" length were cut from each board using a carbide tip blade.

The ends of the board were coated with an asphalt-based coating product to minimize moisture loss through the sample ends. The boards were weighed on a scale accurate to 1% at the weight of the board. The weight per volume (kg/board foot) was calculated for each of the samples.

Each kiln charge normally holds seven kiln cars. A total of 6 to 12 boards were selected (one from each kiln car). Therefore, a total of 18 to 24 samples per drying cycle were used to measure the moisture loss. Each sample was uniquely marked to track its location (and identity) during the drying cycle.

The kiln samples were dispersed throughout the kiln cars. The gaps at the ends of the lumber bundles served as holding slots for the samples. The kiln samples were subjected to the same drying conditions as the lumber in the kiln.

Initially, at the end of the drying cycle, each board was removed and a 6" section was cut from each end to leave a 12" section to be weighed after drying. The purpose for these extra cuts was to ensure that the ends of the kiln samples were not being dried more than the center. After weighing several whole samples (24") and comparing the results to the cut sample (12"), it became evident that the results were the same. The cutting practice was discontinued in favor of weighing the whole sample.

The weight per volume was recalculated to determine the weight loss of each kiln sample using the equation:

$$\text{initial mass/bf} - \text{final mass/bf} = \text{water loss/bf}$$

The mean weight loss for all kiln samples was used to determine the total mass of water lost during drying. The mean weight loss per volume was multiplied by the total volume of the kiln charge (in board foot). Each kiln charge volume (in Mbf) was provided by kiln operations personnel.

APPENDIX C - STEAM-HEATED LUMBER KILN PROGRAM

SAMPLING PROCEDURES

Sampling was conducted inside the kiln only after the kiln reached operating temperature and conditions such that emissions are exhausting the vents. Three representative locations were sampled simultaneously using the sampling scheme shown in Figure C-1. The sample was split for analysis as shown. Heated (120 °C), Teflon sample lines were used to transport the sample gas. Sample gas was extracted by the No. 1 heated-head pump at the rate of 6 to 8 liters per minute.

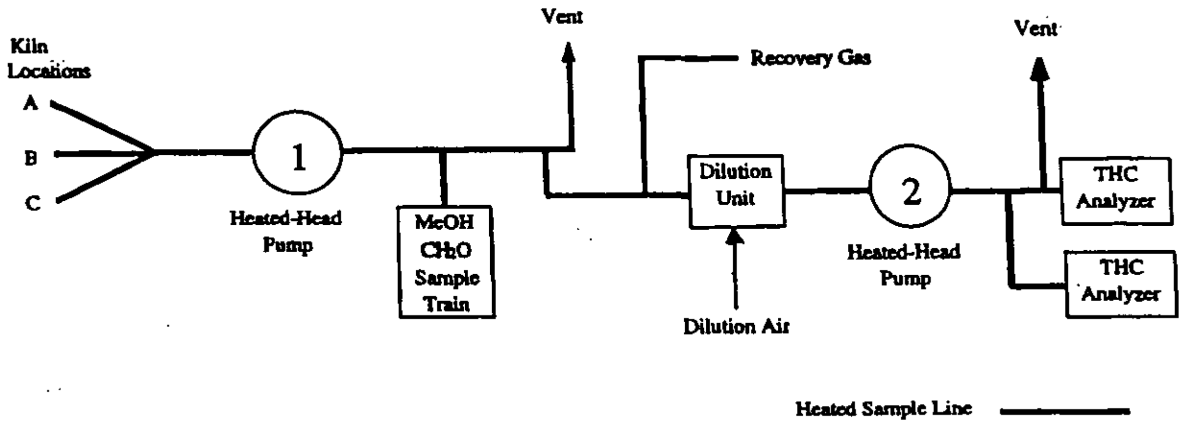

Figure C-1 Sampling Schematic

Total Hydrocarbons

Total hydrocarbon (THC) emission testing was conducted continuously over the entire drying cycle in accordance with the EPA Reference Method 25A. Two THC analyzers was used in parallel. The sample was diluted with zero-grade air to reduce the moisture content to less than 20% prior to introduction into the THC analyzer.

Certified mixtures of propane in air were used to calibrate the flame ionization analyzers. A pre-test calibration was performed prior to beginning the drying cycle. The instrument was off line for 30 minutes every four hours of the drying cycle for calibration and dilution checks. A post-test calibration was conducted at the conclusion of each drying cycle.

A constant dilution (approximately 1:3) was used to reduce the moisture content to less than 20 percent. Every three to four hours, a known concentration of propane in air (the recovery gas) was introduced upstream of the dilution unit to verify the dilution and calibration of the THC analyzer. The mean dilution ratio measured before and after a sampling period was used to calculate the measured results.

Before and after each cycle, a Tedlar bag with methanol in air was introduced at the probe tip (A, B, or C) to verify the integrity of the sampling system. The contents of the same bag were introduced at the inlet to THC analyzers. The most recent calculated dilution was used to correlate the results. The recovery of methanol through the sampling system was calculated to demonstrate sampling system integrity.

The concentration results (as ppmw carbon) were reported as one-hour averages. The mean result of all hourly averages (exclusive of the kiln heat-up period) was used to calculate the mass emission rate for total hydrocarbons.

ethanol, Formaldehyde, and Moisture Content

tion of the kiln gas was slip-steamed off the sampling system prior to the heated dilution system and passed rough two midget impingers containing DI water and a silica gel sorbent tube (or impinger with silica gel) for ethanol, formaldehyde, and moisture determination. One sample was collected every hour during the drying cycle scribed by EPA Reference Method 308. (EPA Method 308 was modified to accommodate the use of a critical e in place of a dry gas meter). The moisture content of the sample was determined by weighing the impingers nd silica gel tube before and after sampling. An aliquot of the impinger solution was analyzed for methanol and ormaldehyde. The silica gel tube was not analyzed for methanol because NCASI has demonstrated effective re by the two impingers.

MEASUREMENT PARAMETERS

e C-1 summarizes the parameters monitored throughout each test cycle. Results from the measurement parameters were used to calculate emission rates for the compounds of concern.

le C-1 Measurement Parameters for Steam-Heated Kiln

Measurement Parameter	Measurement Frequency	Report Frequency	Report Units	Notes
iln Charge (volume of lumber)	begin cycle	1/cycle	Mbf	– use kiln data
iln Temperatures vet bulb/dry bulb)	2/hr	2/hr	°F	– use process instrumentation
Lumber Moisture Loss	begin/end cycle	1/cycle	kg/bf	– 2 bds/kiln car – 2 samples/bd
HC by M25A	1/min	hourly average	ppmC (wet)	– correct for mean dilution every 4 hrs – calibrate analyzer before and after cycle – begin when kiln vents
MeOH Moisture Formaldehyde	1/hr	1/hr	ppm (dry)	– use same train for all parameters – sample 40-45 min – begin when kiln vents

ALCULATIONS

Mass emissions of VOCs were calculated using the assumption that the volume of gas exiting the kiln corresponds o the amount of moisture generated as steam during the drying process.. The amount of moisture released during the drying process was determined by weighting selected samples from the kiln charge before and after drying. The procedure for moisture determination of the lumber is provided in Appendix B. The difference in weights was assumed to correspond to water loss. The mass of water loss during drying was converted to gas volume at standard temperature and pressure. Multiplying the average measured concentrations of VOCs (on a wet basis) by the total volume of gas released during the drying yields a value that corresponds to the bass of VOCs released during the drying process. The mass of water that drains from the kiln during start-up was quantified for the entire drying cycle.

The kiln operator recorded relevant production data such that emission test results can be expressed in terms of lb VOC/MMbf. Production data included board feet per kiln charge, kiln operating temperatures, and relative humidity.

APPENDIX D - DIRECT-FIRED LUMBER KILN TEST PROGRAM

SAMPLING PROCEDURES

Samples were collected as described for the steam-fired kiln except that a single sample line was used to remove sample from the return air (reheat) duct. The assumption was that the reheat air is of the same concentration and moisture content as that exiting the kiln through the roof vents and as fugitive emissions.

Total Hydrocarbons

Sampling and analysis for total hydrocarbons (THC) were conducted as described for the steam-fired kiln. The THC concentration was measured during the entire kiln drying cycle because emissions take place throughout the entire cycle.

Methanol, Formaldehyde, and Moisture Content

Sampling and analysis for methanol, formaldehyde, and moisture content was performed as described for the steam-fired kiln. Samples were collected throughout the entire drying cycle.

Carbon Dioxide and Oxygen

Carbon dioxide and oxygen were measured continuously by EPA Reference Method 3A. A paramagnetic analyzer was used and calibrated at the same time as the THC analyzer. Results were summarized as hourly averages in tabular form. The CO_2 and O_2 data were used to perform a carbon balance on the kiln.

MEASUREMENTS PARAMETERS

Table D-1 summarizes the parameters to be monitored throughout the test. Results from the measurement parameters will be used to calculate emission rates for the compounds of concern.

CALCULATIONS

The same WMB approach was used as for the steam-fired kiln. Additional water was introduced into the kiln from combustion (C_1, A_1, and F_1). These values were added to the water vapor generated from drying. The VOC results as calculated by the WMB approach were used to compare to the carbon balance that was performed simultaneously.

The kiln operator recorded relevant production data such that emission test results can be expressed in terms of meaningful emission factors. Production data included board feet per kiln charge, kiln operating temperatures, and relative humidity.

The carbon balance was performed hourly throughout each of the three drying cycles. A single (composite) fuel analysis for the entire drying cycle was performed to determine the carbon content of the fuel (wood shavings). The amount of fuel (natural gas and wood shavings) added was monitored on an hourly basis to calculate the carbon input. Carbon dioxide was measured hourly to calculate hourly averages throughout the cycle. All VOC measurements were also performed hourly.

Table D-1 Measurement Parameters for Direct-Fired Kiln

Measurement Parameter	Measurement Frequency	Report Frequency	Report Units	Notes
Kiln Charge (volume of lumber)	begin cycle	1/cycle	Mbf	– use kiln data
Kiln Temperatures (wet bulb/dry bulb)	2/hr	2/hr	°F	– use process instrumentation
Natural Gas Consumption	1/hr	1/hr	cfh	– use process instrumentation
Wood Shavings Burned	1/hr	1/hr	kg/hr	– use calibrated screw feed rate
Lumber Moisture Loss	begin/end cycle	1/cycle	kg/bf	– 2 bds/kiln car – 2 samples/bd
CO_2 and O_2	1/min	hourly average	xx.x%	– report dry basis – begin sampling when kiln heat begins
THC by M25A	1/min	hourly average	ppmC (wet)	– correct for dilution every 4 hrs – calibrate analyzer before and after cycle – begin sampling when kiln heat begins
MeOH Moisture Formaldehyde	1/hr	1/hr	ppm (dry)	– use same train for all – sample 40-45 min – begin sampling when kiln heat begins
Wood Shavings Sample – heat – hydrogen – carbon – moisture	1/hr	1/cycle	Btu/lb xx.x%	– heat in Btu/lb – all other to 0.1% – composite all samples for one analysis

ATTACHMENT D

EMISSION RATE CALCULATIONS

EMISSION INVENTORY WORKSHEET

Champion International - McDavid Sawmill | **K1 - K3**

EMISSION SOURCE TYPE

INDIRECT-FIRED KILNS	**Figure: 2-2**

FACILITY AND SOURCE DESCRIPTION

Emission Source Description:	Kilns 1 - 3
Emission Control Method(s)/ID No.(s):	None
Emission Point ID:	K1 - K3

EMISSION ESTIMATION EQUATIONS

Emission (lb/hr) = Production Rate (MBF/hr) x Pollutant Emission Factor (lb/MBF)

Emission (ton/yr) = Production Rate (MBF/hr) x Pollutant Emission Factor (lb/MBF) x Operating Period (hrs/yr) x (1 ton/ 2,000 lb)

Source: ECT, 2000.

INPUT DATA AND EMISSIONS CALCULATIONS

Operating Hours:	24 Hrs/Day	7 Days/Wk	8,760 Hrs/Yr
Production Rates:	25.68 MBF/hr	225,000 MBF/yr	

Criteria Pollutant	Pollutant Emission Factor (lb/MBF)	Potential Emission Rates (lb/hr)	(tpy)
PM/PM_{10}	0.037	0.95	4.2
VOC (Hourly)	3.32	85.3	N/A
VOC (Annual)	2.84	72.9	319.5
Methanol	0.28	7.19	31.5
Formaldehyde	0.025	0.642	2.81

SOURCES OF INPUT DATA

Parameter	Data Source
Operating Hours	Champion, 1999.
Production Rates	Champion, 1999.
Emission Factor; VOC, PM/PM_{10}	NCASI, 1999.
Emission Factor; Methanol	TAPPI International Environmental Conference, 1999.
Emission Factor; Formaldehyde	TAPPI International Environmental Conference, 1999.

NOTES AND OBSERVATIONS

DATA CONTROL

Data Collected by:	T. Davis	**Date:**	4/00
Evaluated by:	T. Davis	**Date:**	4/00
Data Entered by:	T. Davis	**Date:**	4/00

ATTACHMENT E

CONTROL DEVICE
VENDOR INFORMATION

ay 11, 1999

Mr. Terry Kassabaum
hampion
P.O. Box 200
Camden, TX 75934

SENT VIA FAX

RE: Budget Price Proposal A80-796, R1 for Lumber kiln exhaust

Dear Mr. Kassabaum:

Thank you for the opportunity to provide a budgetary quote for your lumber kiln exhausts. The following proposal provides a complete equipment proposal for an Eisenmann Valveless Regenerative Thermal Oxidizer system. Key advantages of the VRTO include:

1. Only one moving part and a system with two failure points,
2. Very low maintenance requirements leading to high uptime reliability,
3. High destruction efficiency with constant purge,
4. Small footprint with treatment provided in a single vessel.

Mr. Kassabaum if you have any questions before your meeting tomorrow you can reach Charles Reich at 281.852.7206. If you have any questions or comments that Charles is unable to answer please do not hesitate to contact me at 630.681.9604 or call Eisenmann direct for information.

Thank you for the opportunity to be of service to Champion-Camden.

Sincerely,

Howard Hohl
Sales Manager
Eisenmann Corporation

Cc: Mark West EN, Charles Reich, The Reich Co.

BUDGET PROPOSAL NO. A80-796, REVISION 1

FOR

VALVELESS
REGENERATIVE THERMAL OXIDATION SYSTEM

CHAMPION
CAMDEN, TX

MAY 11, 1999

RTO SYSTEM TECHNICAL DATA

haust Flow Rate	:	3 vessels at 46,000 acfm each
olvent Loading	:	85.3 lb./hr average each
haust Inlet Temperature	:	150 to 180°F range
ombustion Temperature	:	1500°F min.
ean Air Outlet Temperature	:	120°F above inlet
stem Thermal Efficiency	:	93%
urner Installed	:	3 at 9.0 mmbtu/hr each
urner Operating	:	3 at 6.0 mmbtu/hr
an Motor Operating (at max. flow nd includes -2.0" duct drop)	:	3 at 254 bhp
an Motor Installed	:	3 at 300 hp
oundation Size	:	100 X 28 ft. (L X W)
quipment Weight	:	100 tons each
essel Diameter	:	Approx. 25 ft.

SIGN DESCRIPTION

exhaust flow from the process is directed to a central duct header that is located at the inlet of the atement system fan. After exiting the abatement system fan, the exhaust air is propelled to the lveless Regenerative Thermal Oxidizer (VRTO).

nce within the VRTO unit, the exhaust is directed by the rotating distributor to the appropriate sections of t ceramic heat exchanger media. The exhaust will then pass vertically upward through this media taking the heat and raising the air temperature close to the combustion temperature.

the combustion area, the burner will provide additional energy to reach the combustion temperature of proximately 1500°F. At this temperature, the solvents are oxidized and purified. Then the clean hot air sses down through separate sections of the exchanger media returning its heat back to the system. This r exits the VRTO at approximately 120°F above the inlet exhaust temperature depending on the oplication.

third section of the VRTO between the effluent and clean sides is utilized for purging. This is ccomplished by taking clean air from the VRTO combustion area it through the purge zone and circulating it into the fan inlet. The EISENMANN rotating distributor continuously turns shifting which ction of the media is in the upward, downward or purge cycles. In this manner, a constant thermal fficiency and pressure drop is maintained.

COPE OF DELIVERY

EISENMANN:

ree (3) Valveless Regenerative Thermal Oxidizers - complete with burner, gas train, mbustion air blower, purge system, system finish paint, ceramic media, rotary exhaust distributor, platform & ladder, insulation as described in technical data.

hree (3) 300 H.P. Process Blower with TEFC Motor, Direct Drive and OSHA Guards.

Three (3) Blower Motor with VFD (Variable Frequency Drive).

nterconnecting ductwork between Eisenmann supplied components

Flexible connectors to allow for thermal expansion as required

nsulation and cladding to maintain OSHA standards

One Turnkey control panel with Allen Bradley PLC and graphic interface

Optional on-line, clean bake out for each vessel

Field services, start-up and operator training

Freight from the Factory to Camden, TX

By Others:

Concrete pad

Utility drops to system tie-in points

Duct from the process equipment to the system inlet

All permits as required to meet local requirements

Mechanical and electrical installation

Clean Air stack

Inlet air filter, if necessary

DVANTAGES OVER OTHER RTO SYSTEMS

- EISENMANN's design is the only damperless, single vessel unit proven in the market. A rotating distributor shifts the exhaust through the heat exchanger eliminating the pressure shocks associated with dampers.
- The high maintenance associated with damper type RTOs is eliminated. The Eisenmann system replaces the pneumatics, actuators, dampers, linkage and lubricants with a simple rotating distributor that is driven by one exterior mounted 0.75 hp motor and gearbox.
- A simpler design with fewer moving parts results in higher uptime reliability.
- The damperless design enables the fan to be located at the inlet to the oxidizer which reduces the cost of the fan and lowers the motor sizing by 15%.

UDGETARY PRICING

udgetary pricing is for the Regenerative Thermal Oxidation System as described in this document.

Regenerative Thermal Oxidizer
Freight to site is included
Full package of start up services and operator training classes is included

lase Price

umber Kiln Exhaust
ludget for equipment, freight, plus field services ....$ 1,900,000.00

ptional on-line, clean bake-out feature ....$ 150,000.00

chedule

Time to delivery	:	22 weeks
nstallation	:	6 weeks
Start up and Testing	:	2 weeks
Total Duration	:	30 weeks

EISENMANN CORPORATION

Howard Hohl
Sales Manager
Clean Air Technology

GEOENERGY
International Corporation

101 North Virginia Street
Suite 210
Crystal Lake, IL 60014 USA
(815) 477-9173
FAX (815) 477-9174

June 7,1999

Champion
PO Box 200
Camden, TX 75941

Attn: Mr. Terry Kassabaum

Subject: VOC Emission Control Equipment

Reference: Geoenergy Proposal Number 9999-05-259-RCO

Dear Mr. Kassabaum:

Geoenergy International Corporation is pleased to provide you with our revised budgetary proposal as referenced above. This revision is for a GeoTherm® Regenerative Catalytic Oxidizer (RCO) system to control VOC emissions from your wood drying kilns in Camden, TX.

The RCO system is the same design as the RTO with the addition of catalyst as the top layer of heat exchange media. The design will allow the unit to operate under a full range of combustion chamber temperature (800-1500°F). This is important for the long-term operation of the RCO. As the catalyst degrades the combustion chamber temperature can be increased to maintain destruction efficiency, and should the removal and/or replacement become necessary the system can then operate as an RTO with a combustion chamber temperature of 1500°F.

Based on your process requirements we have designed the RCO with 95% thermal efficiency to minimized fuel consumption during normal operation.

The following is a brief summary of our recommendations for a GeoTherm RCO system to treat the gas stream that you have described. Included are a description of the recommended scope-of-supply, the estimated operating costs, a suggested project schedule and a budget price estimate.

DESIGN CONDITIONS

Our proposal and design is based on preliminary information supplied for this project as follows:

GeoTherm Design Volume (ACFM)	138,000
Oxidizer Thermal Efficiency (%)	95
Oxidation Temperature (°F)	800
Process Exhaust Temperature (°F)	205
Moisture content (% by volume)	56
VOC Loading (#/hr)	85
VOC Gross Heating Value (BTU/#)	12,500
VOC Destruction Requirements (%)	95

Note: The process exhaust air stream is assumed not to contain acids, caustic or halogenated hydrocarbons.

SYSTEM OPERATING COST

RCO SYSTEM

	THREE SYSTEMS @ 46,000 ACFM ea.
Process Exhaust Volume (ACFM)	46,000/unit
Oxidizer Inlet Temperature (°F)	205°F
Oxidation Temperature (°F)	800°F
Oxidizer Outlet Temperature (°F)	235°F
Heat Load Requirement @ 28.4 #/hr VOC	1,203,000 BTU/hr
Heat Load Requirement @ 0 #/hr VOC	1,611,000 BTU/hr
Oxidizer Force Draft Fan (Bhp)	134
Power Requirement (kW)	110
Fuel Cost @ $3.50/MMBTU (@ 28.4#/hr)	$4.21/hr
Fuel Cost @ $3.50/MMBTU (@ 0 #/hr)	$5.64/hr
Power Cost @ $0.037/kW-hr	$4.07/hr

Mr. Terry Kassabaum
June 7, 1999

SCOPE OF SUPPLY

	Included	Excluded	N/A	Option
• RCO housing including transition, recovery and combustion chambers	X			
• Oxidizer ceramic blanket internal insulation	X			
• Heat recovery media for 95% T.E.	X			
• Catalyst	X			
• Burner system with fuel train	X			
• Two-way fast action poppet valves with pneumatic actuators	X			
• Forced draft supply fan and motor	X			
• Variable frequency drive	X			
• Inlet and outlet manifold	X			
• External manifold insulation		X		
• Main exhaust stack 50'-0" high	X			
• Burner access platform and ladder	X			
• Main control panel pre-wired and shop tested (A-B PLC supplied)	X			
• All motor starters	X			
• Local disconnects		X		
• Process exhaust ductwork to RCO		X		
• Foundations		X		
• Mechanical and electrical installation	X			
• Start-up and operator training	X			
• Freight to job site	X			
• O&M manuals (3)	X			
• Compliance testing		X		

BUDGETARY PRICING

Geoenergy will supply one (1) 46,000 ACFM GeoTherm Regenerative Catalytic Oxidizer System per the attached scope of supply for the budgetary price of..............$685,000.00/system

Cost for replacement catalyst for the RCO systems..............................$90,000.00/system

PROPOSAL SCHEDULE

The following is Geoenergy's standard schedule and may be modified to meet specific project requirements.

TASK	# OF WEEKS	WEEK(s) AFTER P.O.
Contract Review	1	1
Design Engineering	3	4
Engineering Approval	1	5
Fabrication and Equipment Procurement	12-16	14-18
Deliver	1	15-19
Installation	3	18-22
Start-Up	1	19-23

We hope you find our offering to be of interest and look forward to supplying you with a more detailed proposal once your specific design criteria has been established. In the meantime, if you should have any questions regarding this proposal or require additional information please call me at (815) 477-9173.

Best regards,

Ray Elsman
Manager of Applications Engineering

CC: Ronald Lansing, Geoenergy International Corporation

ATTACHMENT F

RESPONSE FROM
MIDWEST RESEARCH INSTITUTE

ATTACHMENT F

RESPONSE FROM MIDWEST RESEARCH INSTITUTE

khanks@mriresearch.org on 04/17/2000 10:00:37 AM
Please respond to <khanks@mriresearch.org>

To: <fergup@champint.com>
cc:
Subject: Lumber kiln controls

Phil,

You asked if we have learned of any lumber kilns that are operating with air pollution controls through our information gathering efforts to support the plywood and composite wood products NESHAP. We have looked at lumber kilns from the standpoint that lumber kilns co-located with plywood or composite wood products facilities could contribute to the facility-wide emissions, and therefore affect whether a facility is considered as a major or area source for HAPs. We conducted an extensive survey of the plywood and composite wood products industry in 1998 in which we asked for details about co-located lumber kilns. We sent surveys to nearly 500 wood products plants and collected information on at least 330 lumber kilns. None of the kilns had air pollution controls. In addition to the survey, we searched the RACT/BACT/LAER Clearinghouse and did not find any controlled lumber kilns listed. Thus, we do not know of lumber kilns that operate with air pollution controls.

Katie Hanks
Midwest Research Institute
5520 Dillard Road, Suite 100
Cary, NC 27511
(919) 851-8181, Ext. 5175
(919) 851-3232 (fax)