INTEROFFICE MEMORANDUM

Date: April 13, 1989

From: T. K. Thompson *TKT*

To: Jim Haugen, ENG-1, MS-M721

Subject: Conceptual process description of M division incineration project.

The conceptual flowsheet and material and energy balances are shown on LANL drawings ENG-PL-3948 sheets 1 and 2. Sheet 1 shows the steady-state operating conditions and sheet 2 shows the maximum startup conditions. The process is composed of a size reduction by shedding step and followed by an incineration step to dispose of the shredded wood.

The shredder is a low speed (<25 rpm) shredder that tears the wood apart, rather than beating it apart in a hammer mill type of size reduction device. The low speed feature will minimize the mechanical impact shock to the wood pieces and eliminate the need dust control on the shredder. The shredder is sized so that complete test stand tables (4' x 8' x 2') can be fed. The tables are transported to the incineration site using a dump truck, or similar vehicle, and manually dumped into the shredder feed hopper. The hopper is sized to accommodate a full truck load of material. After dumping, the operator will secure the area (no persons allowed near the shredder) and start the shredder operation from the control panel located in a remote control house. The shredder and belt conveyor both start from the same on-off switch on the control panel. The tables are reduced in size in the shredder to pieces less than 2" x 1 1/2" x 24"; this is the maximum size that results when a 2 x 4 enters the shredder in an end-on orientation. A smaller shredder would make smaller pieces of shredded wood; however, the smaller size could not handle whole test stands. The shredded wood is transferred to the live-bottom storage bin with the belt conveyor. The shredder will operate on an as-needed basis whenever test stands are transported to the site for disposal. Throughput rate of the shredder on whole test stands is estimated to be about 1500 lb/hr via conversations with shredder manufactures.

The live-bottom storage bin uses a "walking floor" design for positive unloading of the shredded wood onto the transfer conveyor. This design was originated for "hog fuel" storage bins in the sawmill industry. The "hog fuel" is the part of logs that are unusable for lumber and are reduced in size using a hammer mill. The live-bottom bin will have a simple roof for

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protecting the shredded wood from rain and snow. The bin will have a usable volume of 700 ft³ for storing 1 months worth of shredded test stands (10,000lb/15 lb/ft³ = 666.7 ft³). The transfer conveyor can feed either the recycle conveyor or the feed conveyor to the incinerator.

The purpose of the recycle conveyor is to allow the shredded wood to be processed again through the shredder for further size reduction. This is necessitated because the opening of the ram feeder charging hopper is about 24" x 36" on incinerators of the size we are using. The re-shredded material is stored again in the live-bottom bin waiting incineration. This operation will be done probably once a month prior to operating the incinerator. The use of the recycle conveyor approach is simpler than using a screen to remove the oversize pieces of shredded wood from the feed to the incinerator. The majority of incinerator downtime in "hog fuel" service is feed problems; secondary shredding will eliminate the problem.

The shredded wood is incinerated in a dual chamber controlled air type of incinerator. The wood waste is batch fed to the primary chamber using an automatic ram feeder mechanism that is part of the incinerator equipment package. The feed hopper supplying the ram feeder is loaded with wood waste prior to a charging cycle by operating the live bottom bin, transfer conveyor and incinerator feed conveyor for a preset time increment. The operating controls of the live bottom bin, transfer conveyor, and incinerator feed conveyor will have to be interfaced with the ram feeder logic in the incinerator control panel. The primary (lower) chamber operates in a starved air (sub-stoichiometric) mode to control the temperature to < 1600 degrees F. where the wood waste is pyrolyzed to gaseous products. The primary chamber operates in a quiescent, non-turbulent mixing mode, thereby minimizing ash entrainment in the offgas. Carbon is removed from the ash by oxidation in the ash pile with the underfire air. The ash will stay in the primary chamber during operation, no continuous ash removal is necessary. Ash will be manually removed from the primary chamber and placed in a dedicated dumpster after an incineration campaign. It is anticipated that the ash can be disposed of in a landfill as it will be the same material as fireplace ash.

The primary chamber offgas passes into the secondary chamber where complete oxidation takes place. The temperature of the secondary chamber is controlled by excess secondary air to about 1800 degrees F. A large amount of air (227.8 % stoichiometric total) is necessary to keep the secondary chamber temperature to 1800 degrees F. because of the high heat content of the wood waste (7382 Btu/lb at 15% moisture content).

The size of the incinerator (400 lb/hr) is set by the requirement to contain all the ash produced from 10000 lb/month of wood waste (134 lb ash). During normal steady-state operation, the

burners for both chambers are in an "idle" state, firing at about 50,000 Btu/hr (5.164 lb/hr or 0.71 gal/hr total) of # 2 fuel oil in the low-fire position to serve as positive ignition sources. Both burners are responsible for temperature control of their respective incinerator chambers if conditions warrant (wet wood, low feed rate, etc.).

The incinerator can be operated in one continuous campaign per month of 25 hours duration to burn the monthly 10,000 lb of wood. The incinerator may also be operated in a several day campaign by "parking" the unit overnight in a low fire mode to conserve temperature with no wood feed.

Maximum use of fuel oil occurs during heatup immediately before wood waste feed starts. These conditions are shown in sheet 1 of the drawing package. The maximum # 2 fuel oil firing rate is 64.15 lb/hr (8.84 gal/hr). If initial heatup from ambient to operating temperature takes 10 hours, then about 45 gal of # 2 fuel oil would be required. About 18 to 25 gal would be required for a 25 hour operating campaign depending upon weather conditions etc. Therefore, about 70 gal of fuel may be required per month of operation.

A brief study was made of potential gaseous emissions from the incinerator. Maximum particulate emissions occur during steady state operation and are estimated at 0.2285 lb/hr ash. This is based on 95% ash retention in the primary chamber with 5% being contained in the offgas and a wood ash content of 1.34%, which is an average number for most woods and was obtained from Marks Mechanical Engineers Handbook, 8th ed., page 7-12. The 95% is a conservative number; the controlled air incinerator at HSE-7 routinely achieves 98% ash retention. Carbon monoxide (CO) was estimated at 100 ppm maximum immediately after a wood feed charging cycle during steady-state operation; this equals 0.521 lb CO/hr. The maximum sulfur dioxide (SO₂) emissions occur during the maximum oil firing rate during heatup which equals 0.282 lb SO₂/hr. All of the sulfur comes from the fuel oil; wood normally does not have any sulfur in it. Almost all the NO_x comes from fixed nitrogen in the fuel oil (1.265 lb NO₂/hr) rather than thermal NO_x (0.0024 lb NO₂/hr) due to the low (1300 F.) operating temperature. Wood does not normally have any nitrogen component.

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

INTEROFFICE MEMORANDUM

Date: April 27, 1989

From: T. K. Thompson

To: Jim Haugen, ENG-1, MS-M721

Subject: Costs of incinerator and live bottom bin.

Attached is a cost quotation on the incinerator for the M division job. The estimated cost of the live bottom bin is \$30,000 obtained from telephone conversations with vendors; I have no firm written cost proposals on the bin. The bin and conveyors are in one procurement package and the vendors cannot price until we send them elevation drawings for their design efforts.

The conveyor from the shredder to the live bottom bin is 3' wide and about 30' long and will handle 1500 lbs/hr. The recycle conveyor from the bin back to the shredder needs to be only 2' wide by about 30 ft long and handles 1500 lb/hr also. The transfer conveyor on the end of the live bottom bin is a 2' wide by 10' long belt conveyor that is reversible. The incinerator feed conveyor is a 1' wide by about 15' long drag chain type that can handle about 600 lb/hr maximum. This should give you an idea of conveyor sizing for cost estimating purposes. Call if you have any other questions. I'll be back in the office on about May 10.

Ted D. Miller Associates, Inc.

2140 South Ivanhoe Street
Denver, Colorado 80222
(303) 758-3912
TLX 45-636

April 21, 1989

TO:

PLACE ORDER WITH:

T.K. Thompson, Inc.
118 Yosemite Drive
White Rock, New Mexico 87544

Joy Energy Systems, Inc.
c/o Ted D. Miller Assoc., Inc.
2140 South Ivanhoe Street
Denver, Colorado 80222

Attention: T.K. Thompson

Reference: Wood Incinerators/Los Alamos New Mexico
Ted D. Miller Reference #8-4022

We are pleased to offer our budgetary quotation for the Joy Energy E Series Incinerator.

We have based our selection on the following information:

1. Wood volume reduction (2 x 4's, plywood, pallets all shredded to approximately 2" x 2" x 12" size)
2. 7500' elevation, outside installation
3. Operate 1 week/month - approximately 4000#/hr load rate total 10,000#/month
4. 1800° F. secondary chamber
5. Simple incinerator, loader, and controls
6. 8000 BTU/# for wood

We have selected a Model 650E with SR-22H loader with the following components:

- Base Model 650E - 400#/hour:
Modulating primary air, modulating secondary air, six (6) straight stack sections, stainless steel stack spark screen, clean out tools, operating design 8-10 hrs/day.
- E Series SR-22H Loader:
Single ram, 22 ft.³ capacity complete with hydraulic power pak.
- Controls:
Standard with the following modes: Warm-up, load, stop load, burner off, automatically cycles burners, blowers.

Indicator of temperature with adjustments per chamber. All motor starters for incinerator and loader.

Budget Price.....\$76,500.00
F.O.B. Factory: Charlotte, North Carolina
Delivery: 12-14 weeks after approval of drawings

Michael A. Thomas

Michael A. Thomas
cc: Letter Quote-Save Schuler
Bud Strobe

MODEL 650E

Data

Waste Type	(1)Auxiliary Fuel Usage BTU's/HR	(2)Flue Gas Retention Seconds @ 1,800°F	(3)Burn Rate Lbs./Hr.
0	negligible	.52	500
1	negligible	.55	650
2	226,363	.85	650
3	1,097,127	.99	585
4	1,500,278	1.21	520

Heat Release Capacity = 4,225,000 BTU/HR
 Specific Heat Release = 15,089 BTU/FT³/HR

Physical Properties	Primary Chamber	Secondary Chamber
Volume	220 FT ³	60 FT ³
Refractory	4 in.	4 in.
Refractory	2,500°F	2,500°F
Insulation	1-1/2 in.	1-1/2 in.
Shell	3/16 in.	3/16 in.
Charging Door	24 x 24 in.	N/A
Cleanout Door	32 x 45 in.	N/A
Viewport	Optional	Optional
Modulated Air	Optional	Optional
Type K Controller	Yes	Yes

- (1) Auxiliary fuel is estimated, based on type of waste and proper operation of equipment. Auxiliary fuel usage is not guaranteed.
- (2) Flue gas retention times for Type 2, 3 and 4 waste include flue gas from auxiliary fuel input.
- (3) This is the actual burn rate. Incinerator may be charged at a greater rate when allowance is made for burn down time.

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E-SERIES INCINERATORS
Notes

(1) Incinerator Base Price:

The base price includes the incinerator complete, with refractory, burners, blowers, NEMA 12 control panel, two (2) Type R thermocouples, two (2) programmable temperature controllers, modulated secondary air, pushbutton start/stop, shutdown timer and a 24" x 24" charging door built into a large cleanout door. The 100E through 300E have 24" x 33" cleanout doors and the 480E through 780E have 32" x 45" cleanout doors. Each chamber has a 3" viewport without a blastgate. The 480E through 780E have separate blowers for primary and secondary air supply. The 100E through 300E have a single blower to supply both primary and secondary air.

(2) Pathological Option:

The pathological option includes a "pathmode" switch and controls for the 100E and 150E. The pathological option includes a "pathmode" switch, controls and an increased burner capacity for the 300E. The 480E through 780E receive a "pathmode" switch, controls and an additional primary burner with this option. Primary gas burners supplied with the pathological option are as follows:

<u>Unit</u>	<u>Burner Model</u>	<u>Capacity</u>
100E	J-83	800,000 Btu/Hr
150E	J-83	800,000 Btu/Hr
300E	J-121	1,200,000 Btu/Hr
480E	(2) J-83	1,600,000 Btu/Hr
650E	(2) J-121	2,400,000 Btu/Hr
780E	(2) J-121	2,400,000 Btu/Hr

The pathological option should be selected when burning waste which has a moisture content greater than 70% (i.e., Type 3 and type 4 waste).

(3) Outside Installation:

The standard outside installation option includes weather hoods for the burners, weatherproofing kits for damper motors, a panel heater, and a NEMA 3R control panel. The panel includes a drip shield and the temperature controllers are mounted inside the panel behind a plexiglass window.

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(4) Modulated Primary Air:

Modulated primary air automatically controls the flow of combustion air to the primary chamber, based on primary chamber temperature, by decreasing air supply as temperature increases and increasing air supply as temperature decreases. The intent is to maintain substoichiometric conditions in the primary chamber. Modulated primary air includes a motor to modulate the primary air valve.

(5) Modulated Secondary Fuel:

Rather than having an on-off operation the secondary burner will modulate to maintain the temperature in the secondary chamber at the set point. This option includes an additional programmable temperature controller. It does not include an additional thermocouple.

(6-8) Stack Options:

The incinerator base price does not include the stack. Each stack section is four feet long. A minimum of sixteen feet of stack should be used for proper draft. Stack sections may be ordered with drawbands or flanges. Test ports are included. Please be sure to take into account geographical elevation and add twenty inches of stack for each 1000 ft. above sea level. Do not use over twenty feet of stack without consulting the factory for pricing. Please refer to the attached information about altitude correction factors.

(9) Spark Screen:

E-Series spark screens are manufactured from 316L stainless steel, per NFPA code requirements.

(10) Cleanout Tools:

The cleanout tools include a hoe, a slice bar and a no. 8 coal scoop. Some specifications require these tools.

(11-12) F.M. and I.R.I Controls:

F.M. and I.R.I. burner controls are offered as options to comply with insurance company regulations if required.

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(13) One Second Retention:

The secondary chamber volumes listed below will provide one second retention based on burning type 1 Waste at 1,800°F and at the rated capacity of the unit. This option includes a modulated secondary burner sized to achieve 1,800°F prior to charging waste. High temperature (2,800°F) refractory is also included.

<u>Unit</u>	<u>Volume</u>	<u>Burner Model</u>	<u>Capacity</u>
100E	17 Ft ³	J-121	1,200,000 Btu/Hr
150E	26 Ft ³	A50G	1,500,000 Btu/Hr
300E	51 Ft ³	G-58	1,800,000 Btu/Hr
480E	84 Ft ³	G-69	2,500,000 Btu/Hr
650E	109 Ft ³	A55G	3,000,000 Btu/Hr
780E	135 Ft ³	A55G	3,000,000 Btu/Hr

To achieve two seconds retention of flue gases reduce the waste charging rate to one-half of full capacity. If this is not feasible, double the price for one second retention and maintain the standard rated capacity.

(A) Hydraulic Loader Base Price:

The Model SR-6M loader is for use on applications where the customer does not want the operator exposed to the fire while loading a manually-fed incinerator, but is unwilling to pay for a hydraulic loader. The loader has the same sequence of operation as a hydraulic loader. However, all operations are manual. The guillotine charging door is operated by a manual crank and the ram has a tee handle to push in for charging and pull out for retracting. The base price for the SR-12H through SR-37H includes the loader with hydraulic power pack, charging door, hydraulic hatch, flame detection, water spray and manual override controls.

(B) Cart Dumper:

The cart dumper is designed to use Rubbermaid carts as follows:

<u>Loader</u>	<u>Cart Size</u>
SR-22-H:	1/3 cubic yard
SR-28-H:	1/2 cubic yard
SR-37-H:	1 cubic yard

ECOLAIRE COMBUSTION PRODUCTS, INC.

P O. Box 240707
Charlotte, North Carolina 28224

TERMS AND CONDITIONS OF SALE

This proposal, submitted by Ecolaire Combustion Products, Inc. ("Company") in response to your request for quotation and the Company's offer to sell the equipment described herein, is subject to the Terms and Conditions stated herein. The Company hereby gives notice of its objection to any addition or different Terms contained in your request for quotation or purchase order. In the event the Purchaser issues a letter of authorization to proceed or purchase order number for the intended to be covered by this proposal prior to the execution of a definitive contract covering the subject matter of this proposal, it shall be understood that the Company's proceeding under such authorization shall be in accordance with the Terms and Conditions contained herein.

1.0 PAYMENTS: Unless otherwise stated in the proposal, terms of payment shall be net cash within thirty (30) days of presentation of invoice with bill of lading. All payments shall be made without discount in U.S. currency. The Company is authorized to make partial shipments, and prorata payments shall be made after receipt of any such partial shipment. If delivery is prevented or postponed by Purchaser, then all dates of payment related to delivery shall relate instead to the date of completion of manufacture.

2.0 SHIPMENTS AND DELIVERY: The Company shall use its reasonable efforts to meet all shipment or delivery dates stated herein or in Purchaser's order, but any such dates are estimates only and are not guaranteed. Company shall have no liability to Purchaser for damages or penalties, direct or indirect, for any delay in shipment or delivery, whether such delay is minor or substantial, nor shall Purchaser have the right to declare a breach of contract because of any such delay. Delivery schedules are subject to prompt receipt by Company of all necessary information and instructions from Purchaser, including any required approval of drawings.

3.0 TITLE: Title and risk of loss or damage to the Equipment shall pass to the Purchaser upon tender of delivery F.O.B. manufacturing facility unless otherwise stipulated in this contract, except that a security interest in the Equipment or any replacement shall remain in the Company, regardless of mode of attachment to realty or other property, until full payment in cash has been made therefore.

Purchaser agrees upon request to do all things and acts necessary to perfect and maintain said security interest and shall protect Company's interest by adequately insuring the Equipment against loss or damage from any cause wherein the Company shall be named as an additional insured.

4.0 TAXES: The price does not include any Federal, State or local property, license, privilege, sales, use, excise, gross receipts or other like taxes which may be now or hereafter applicable to, measured by, or imposed upon or with respect to this transaction, the Equipment, its sale, its value or its use, or any services performed in connection therewith. Such taxes will be itemized separately to Purchaser, who shall make prompt payment to the Company. The Company will accept a valid exemption certificate from Purchaser, if applicable. If an exemption certificate previously accepted by the Company is not recognized by the governmental taxing authority involved, Purchaser agrees to promptly reimburse the Company for any taxes covered by such exemption certificate which the Company is required to pay.

5.0 WARRANTY: All equipment of the Company's manufacture is warranted to be free of original defects in material and workmanship for a period of one year after the date of installation or two years after the date of delivery, whichever is earlier. The Company's obligation under this warranty is strictly limited to repairing or replacing free of charge F.O.B. factory or repair facility any such defective material reported to the Company within the aforesaid period, provided Purchaser gives prompt written notification of such defects and returns the defective parts freight prepaid for examination. The Company will not be responsible for the effects of abrasion, corrosion, erosion or fouling of the Equipment by any foreign substance that may be deposited therein or thereon or for any damages resulting from handling, storage, installation or failure to follow good industry practices and the specific recommendations of the Company regarding the operation and maintenance of the Equipment.

The Company shall not be liable for any costs related to the repair, replacement or adjustment of the Equipment incurred by Purchaser without the Company's prior written approval. Warranty on Equipment not of the Company's manufacture is limited to the warranty extended to the Company by the manufacturer.

THE FOREGOING IS IN LIEU OF ALL OTHER WARRANTIES EITHER EXPRESSED OR IMPLIED. THE COMPANY EXPRESSLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR USE.

6.0 LIMITATION OF LIABILITY: In no event shall the total liability of the Company arising out of the performance or breach of this agreement, whether based on contract, warranty, negligence, indemnity, strict liability or otherwise, exceed the purchase price of the unit of Equipment upon which such liability is based.

The Company shall in no event be liable for any consequential, incidental, indirect, special or punitive damages arising out of this Agreement or any breach thereof, or any defect in the Equipment purchased hereunder, whether based upon lost profits or revenue, work stoppage, impairment of other goods, loss by reason of shutdown or non-operation or increased expenses of operation or otherwise, whether or not such loss or damage is based on contract, warranty, negligence, indemnity, strict liability or otherwise.

7.0 CHANGES: Purchaser may request alterations or changes in the design of the Equipment from time to time, provided the requested changes are capable of being readily incorporated in the Equipment offered by the Company hereunder. If such changes affect the price or delivery of the Equipment, Purchaser will be so notified. The Company will only proceed with such changes upon receipt of a written change order from the Purchaser specifying the change and the agreed revision to the price and the delivery schedule.

8.0 FORCE MAJEURE: Notwithstanding any other provision of the agreement to the contrary, the Company shall not be liable for any costs or damages for failure or delay in delivering the Equipment for reasons beyond the reasonable control of the Company, including but not limited to war, riots, civil insurrection, fire, flood, strikes or other labor disturbances, acts of civil or military authority including governmental laws, orders, priorities or regulations, acts of the Purchaser, embargo, delays or inability to obtain transportation and inability to obtain necessary labor or materials.

9.0 PATENT INDEMNITY: The Company warrants that the Equipment purchased hereunder shall, at the time of delivery, be free of the valid claim of any third person by way of infringement of any United States patent subject to the following. Purchaser agrees that Company has the right to defend, or at its option to settle, and Company agrees, at its own expense to settle or defend any such claim, suit or proceeding brought against Purchaser. Company agrees to pay, subject to the limitations set forth in this paragraph, any final judgment entered against Company on such issue in any such suit or proceeding, provided Purchaser promptly notifies the Company in writing of any such claim, suit or proceeding and at Company's expense, gives Company proper and full information and assistance to settle or defend any such claim, suit or proceeding. If the goods furnished hereunder become the subject of any claim, suit or proceeding, for infringement of any patent, or in the event of any adjudication that such goods infringe any United States patent, or if the use, lease or sale of such goods is enjoined, Company may at its option and its expense (1) procure for Purchaser the right under such patent to use, lease or sell the subject goods, or (2) replace the subject goods, or (3) modify such goods, or (4) remove such goods and refund the aggregate payments and transportation costs paid therefor by Purchaser, less a reasonable sum for use, damage and obsolescence. Company shall have no liability for any infringement arising from (a) the combination of such goods with any other product or part not furnished to Purchaser by Company, or (b) the modification of such goods unless such modification was made by Company,

or (c) the use of such goods in practice of a process, or (d) the furnishing to Purchaser of any information, data, service or application assistance. Purchaser shall hold Company harmless against any expense, judgment or loss from infringement of any patents which results from Company's compliance with Purchaser's special design, specifications or instructions. Company shall not be liable for any costs or expense incurred without Company's written authorization.

10.0 SUSPENSION: Upon prior written notice, Purchaser may suspend the Company's work or extend schedules for up to one year, or as otherwise mutually agreed, for all or any portion of the goods and services to be furnished pursuant to this contract. In the event of any such suspension or termination, the Company shall submit its invoices for charges incurred to date plus applicable overhead and profit, which invoice shall be paid by Purchaser within 30 days of receipt. If not applicable to the prices quoted herein prior to such suspension or extension, the prices shall become subject to escalation from the date of the original order, in accordance with the Company's standard escalation provision.

11.0 ACCEPTANCE: The Company shall not be bound by any contract until approved in writing by an officer. The contract, when so approved, shall supersede all previous communications, either oral or written. No modification shall be binding upon the parties unless such modification shall be in writing, duly executed by the Purchaser and approved by an officer of the Company.

12.0 GOVERNING LAW: The rights and obligations of Purchaser and the Company shall be governed by the laws of the State of North Carolina.

TERMS OF PAYMENT

10% of the contract amount shall accompany the buyers purchase order.

10% of the contract amount will be invoiced with engineering submittals and will be due and payable upon receipt of invoice.

75% of the contract amount will be invoiced as three (3) equal progress payments of 25% of the contract amount each and will be due and payable upon receipt of invoice and prior to shipment.

5% of the contract amount will be invoiced at the time of shipment and will be due and payable upon receipt of invoice.

Should the equipment offered in this proposal be purchased for resale, the buyer's payment to the seller will not be dependent upon the buyer's receipt of payment on resale.

The price for the equipment and services offered in this proposal is based on the above terms of payment. Any deviation from these terms of payment may result in a corresponding price adjustment.

All invoices which are outstanding and unpaid for more than thirty (30) days will be subject to a late charge of 1.5% per month (or at the highest amount or rate which under applicable law buyer may contract to pay in order to induce prompt payment, whichever is less).

The seller takes exception to any and all retainage or liquidated damages.

E-Series Incinerators

Compact. Versatile. Economical.

Ecolaire's E-Series incinerators are small in every way except performance!

They're ideal incinerators for small to medium industrial, commercial and institutional applications which must meet rigid pollution standards. They're easy to operate...and easy to maintain.

Dual Chamber Combustion

The E-Series Incinerator features the same proven two-chamber combustion principle as used on larger Ecolaire T-Series. Two-chamber combustion helps assure that all combustibles are reduced to an exhaust gas that meets applicable pollution standards. Automatic controls maintain safe, dependable performance.

Material Loading

E-Series Incinerators are available with the type of waste loading system that best suits your requirements: Manually fed hoppers, automatic hydraulic systems, or manual loading.

The Price Is Right

E-Series Incinerators from Ecolaire bring safe, clean incineration within the budget of practically any business. Write today for a quotation on the E-Series Incinerator that solves your waste handling problems. Models are available for either oil or gas firing.

E-SERIES

Burning Rates for E-Series Incinerators* (Lbs./Hr.)

Model No.	Type 0	Type 1	Type 2	Type 3	Type 4
100E	75	100	100	90	80
150E	115	150	150	135	120
300E	230	300	300	270	240
480E	385	500	500	450	400
650E	500	650	650	585	520
780E	610	800	800	720	640

*Burning rates were determined by tests conducted by an independent testing laboratory in accordance with the Federal Environmental Protection Agency standards.

Units can be charged at a rate 25% above those shown when allowance is made for burn down time.

Dimensions and Weights for E-Series Incinerators

Model No.	A	B	C	Stack O.D.	Approx. Wt. (Lbs.)
100E	7'2"	3'9"	6'3"	16"	6,000
150E	7'7"	4'	6'8"	16"	7,300
300E	9'3"	5'	7'6"	19 1/2"	9,800
480E	11'3"	6'	8'6"	26 1/2"	16,000
650E	13'7"	7'	9'2"	31 1/2"	23,000
780E	14'7"	7'6"	10'7"	33 1/2"	28,600

Models 100E thru 780E

**ECOLAIRE COMBUSTION
PRODUCTS, INC.**

11100 Nations Ford Rd.
P.O. Box 240707, Charlotte, NC 28224
Phone: 704-588-1620 Telex 572-549

MODEL 650E

Data

Waste Type	(1)Auxiliary Fuel Usage BTU's/HR	(2)Flue Gas Retention Seconds @ 1,800°F	(3)Burn Rate Lbs./Hr.
0	negligible	.52	500
1	negligible	.55	650
2	226,363	.85	650
3	1,097,127	.99	585
4	1,500,278	1.21	520

Heat Release Capacity = 4,225,000 BTU/HR

Specific Heat Release = 15,089 BTU/FT³/HR

Physical Properties	Primary Chamber	Secondary Chamber
Volume	220 FT ³	60 FT ³
Refractory	4 in.	4 in.
Refractory	2,500°F	2,500°F
Insulation	1-1/2 in.	1-1/2 in.
Shell	3/16 in.	3/16 in.
Charging Door	24 x 24 in.	N/A
Cleanout Door	32 x 45 in.	N/A
Viewport	Optional	Optional
Modulated Air	Optional	Optional
Type K Controller	Yes	Yes

- (1) Auxiliary fuel is estimated, based on type of waste and proper operation of equipment. Auxiliary fuel usage is not guaranteed.
- (2) Flue gas retention times for Type 2, 3 and 4 waste include flue gas from auxiliary fuel input.
- (3) This is the actual burn rate. Incinerator may be charged at a greater rate when allowance is made for burn down time.

NOTES:

1. Ambient Conditions:
 Atmospheric Pressure = 11.31 psia
 Temperature = 70°F
 Relative Humidity = 20.3%
2. Incinerator ash loss = 200,000 BTU/hr.
3. Wood moisture = 15%. Gross heating value = 7382 BTU/lb.
 Ash content = 1.32% at.
4. 95% ash retention in Primary Chamber.
5. Process offgas particulate loading = 0.0245 gr/DSCF.
6. SCFM at 60°F & 14.70 psia.
7. Total oxygen to incinerator = 227.8% stoichiometric.
8. Basis for enthalpy calculations is 420 in liquid state at 32°F.

STREAM NUMBER	1	2	3	4	5	6	7	8	9	10	11	12
TEMPERATURE (°F)	70	70	150	75	75	75	80	80	80	80	1800	70
PRESSURE (PSIA)	11.31	11.31	11.31	30.0	21.3	21.3	12.18	12.18	12.18	12.18	11.31	11.31
INLET AIR	0	0	0	0	0	0	0	0	0	0	0	0
WOOD FEED TO INCINERATOR	0	0	0	0	0	0	0	0	0	0	0	0
CO2 (LB/HR)	0	0	0	0	0	0	0	0	0	0	0	0
CO (LB/HR)	0	0	0	0	0	0	0	0	0	0	0	0
H2O (LB/HR)	0	0	0	0	0	0	0	0	0	0	0	0
ASH (SCFM)	0	0	0	0	0	0	0	0	0	0	0	0
N2 (LB/HR)	0	0	0	0	0	0	0	0	0	0	0	0
O2 (LB/HR)	0	0	0	0	0	0	0	0	0	0	0	0
H2O (LB/HR)	0	0	0	0	0	0	0	0	0	0	0	0
ENTHALPY (BTU/HR)	0	0	0	0	0	0	0	0	0	0	0	0

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	1	2	3	4	5	6	7	8	9	10	11	12
STREAM NUMBER	1	2	3	4	5	6	7	8	9	10	11	12
TEMPERATURE (°F)	70	70	150	75	75	75	80	80	80	80	1800	70
PRESSURE (PSIA)	11.31	11.31	11.31	30.0	21.3	21.3	12.18	12.18	12.18	12.18	11.31	11.31
(IN WC)	0	0	0	--	--	--	-24.0	-24.0	-24.0	-24.0	0	0
SOLIDS (LB/HR)	0	0	0	--	--	--	--	--	--	--	0.0084	--
LIQUIDS (LB/HR)	--	--	--	64.15	38.73	25.42	--	--	--	--	--	--
GASES (SCFM)	--	--	--	--	--	--	121.8	157.4	0	79.92	446.8	75.0
(ACFM)	--	--	--	--	--	--	152.7	197.3	0	100.2	2524	99.36
N2 (LBMOLES/HR)	--	--	--	--	--	--	15.11	19.53	--	9.916	53.86	9.306
O2 (LBMOLES/HR)	--	--	--	--	--	--	4.017	5.91	--	2.636	7.665	2.474
CO2 (LBMOLES/HR)	--	--	--	--	--	--	--	--	--	--	4.650	--
H2O (LBMOLES/HR)	--	--	--	--	--	--	9.124	0.160	--	0.081	4.443	0.076
TOTAL (LBMOLES/HR)	--	--	--	--	--	--	19.25	24.88	--	12.63	70.63	11.86
ENTHALPY (BTU/HR)	--	--	--	1.24307	30484	92528	76861	1333	0	5.7504	07344	5806
	--	--	--	E-6	E-5	E-5	E-3	E-4	--	E-3	E-6	E-3

NOTES:

1. Ambient Conditions:
Atmospheric Pressure = 11.31 psia
Temperature = 70°F
Relative Humidity = 20.0%
2. Incinerator skin loss = 200,000 BTU/hr.
3. 0% ash retention in Primary Chamber.
4. Process effluent particulate loading = 0.0018 gr/DSCF.
5. SCFM at 60°F & 14.70 psia.
6. Total oxygen to incinerator = 215.2% stoichiometric.
7. Basis for enthalpy calculations is H2O in liquid state at 32°F = 0.0 BTU/lb.

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