ECO WASTE SOLUTIONS

Mary River Project

#H377697-PM406

SECTION 2

GENERAL DESCRIPTION

ECO 2TN 1P

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General Description - Thermal Oxidation Concept

The **ECO 2TN 1P** Incinerator system consists of a **Primary Chamber** and a **Secondary Chamber** (also known as the Afterburner). Both chambers are vessels constructed of steel with a special insulating liner known as refractory.

The **Primary Chamber** has a front door for loading of waste material and for the removal of residual ash.

The waste is loaded into the **Primary Chamber** until it is ¾ full. Once ¾ full the **Primary Chamber** is sealed and the combustion cycle begins. This type of system is known as *batch-fed* processing.

Primary Chamber

In the first stage, a burner is used to elevate the temperature of the **Primary Chamber** to ignite the waste. Once the **Primary Chamber** reaches a temperature of approximately 650-800°C, the burn process becomes self-fuelling and the burner will shut off. To save fuel and control temperatures, only when the energy contained within the waste is depleted, will the burner periodically turn on. At these operating temperatures, waste is allowed to fully combust and is rendered sterile. Waste is reduced in volume by over 90%. Independent tests have shown that the residual ash is non-hazardous, non-leaching and essentially inert. After enduring the combustion process, metals and glass remain intact. Preservation of metals and glass not only protects the refractory lining from damage caused by melted and fused metals and glass, but also allows for post-combustion recycling where possible.

The **Primary Chamber** operates under *controlled temperature* conditions. The amount of heat released, from the burning of the waste, is controlled by limiting the air into the **Primary Chamber** to less than what is required to complete combustion. This is described as *starved air* conditions. With controlled air and temperature the waste is dried, heated and burned thereby releasing moisture and volatile components. The non-volatile, combustible portion of the waste is burned in the **Primary Chamber** to provide heat while the non-combustible portion accumulates as ash. These conditions ensure that the waste is allowed to fully combust and is rendered sterile. In the end, the waste volume is reduced by over 90%.

Remaining in the **Primary Chamber** are non-combustibles, such as metal and glass, and carbonaceous residue. The incoming air, subjecting the non-combustibles to high temperatures, further burns the carbonaceous residue. The result is an oxidized ash product.

Controlling the gas velocity through the system is an important factor in limiting pollution. The gases flowing from the **Primary Chamber** are a result of the interaction of the air with the waste during the controlled burning process. Both the quantity and velocity of the gas product vary according to chamber temperature conditions and the type of waste being burned. The integrated controls for the **Primary** and **Secondary Chamber** act to minimize peaking activity thus controlling pollution automatically.

The combustion gases released in the **Primary Chamber** then pass into the **Secondary Chamber** through a turbulent mixing zone where ignition takes place and additional combustion air is provided to complete the burning process.

Secondary Chamber

As waste burns in the Primary Chamber, gases containing the products of combustion enter the high temperature zone of the **Secondary Chamber** for cleansing. The Secondary Chamber is sized to retain the incoming gases for a minimum of 2 seconds at 1000°C (1832°F). This chamber utilizes a packaged, high output, fully modulating diesel burner to maintain the required temperature (even in the absence of energy input from the first stage which is important when processing wet or low energy waste). This stage employs a large blower, tightly controlled by the control system using a variable frequency drive on the motor. The blower creates the turbulence required to mix the gases and oxygenate them. This fosters the high efficiency combustion required to break hydrocarbon chains into carbon dioxide and water vapour.

The **Secondary Chamber Blower** air is introduced into the **Secondary Chamber** by an air ring manifold that surrounds the **Secondary Chamber**. The manifold has small air jets called tweers that open into the **Secondary Chamber** at the side walls and create a powerful vortex of excess air to mix the incoming gases and ensure complete combustion. The flow of air is tightly managed by the control system using a Variable Frequency Drive (VFD) to control the speed of the fan and modulating motors on the blower inlet dampers.

The **Secondary Chamber Blower** is extremely important as it creates the turbulence required to mix the gases and oxygenate them. This fosters the high efficiency combustion required to break hydrocarbon chains into carbon dioxide and water vapour. It also acts to cool the **Primary Chamber** and prevent temperature overruns.

The **Secondary Chamber Burner** is similar to the burner used in the **Primary Chamber** except that it is a much higher output burner and its output is self modulated over a broad range for very precise temperature control.

The **Secondary Chamber** is sized to allow two seconds of retention time. This is the time that the gases from the **Primary Chamber** are retained in the **Secondary Chamber** before they exit to the next stage. Two seconds of retention is considered to be ideal to destroy any harmful organic hydrocarbons produced from the **Primary Chamber**.

Main Control Panel

There is one **Main Control Panel** for each package that controls all of the interconnecting modules. The Operator has one simple interface to start the equipment, view system status and change control settings if required. The system utilizes a PLC (programmable logic controller) to automate its functions. All critical process parameters such as temperature, combustion airflow, burner output and induced draft fan speed, are operated using EWS' patented system control program to maintain optimal combustion and air pollution abatement.

Protecting the Environment

Why Incinerate

As society becomes more environmentally conscious, environmental regulations on the proper disposal of solid waste have become more stringent. As a result, incineration has become an environmentally responsible and socially acceptable alternative for handling medical and pharmaceutical waste at the point of need. However, incineration does not eliminate the need to landfill waste but it does reduce the amount of waste that must be placed in landfills.

Primary Advantages of incineration are:

- It greatly reduces the weight and volume of waste material that must be disposed of in landfills
- It destroys organic materials that may be harmful or that may be degradable to harmful materials in landfills
- The incinerator sterilizes the waste; that is, the high temperatures in incinerators can destroy any pathogens that may be in infectious waste materials
- The incinerator destroys animal or human pathological wastes that the general public finds objectionable to handle or see.

Environmental Concerns

The general public will not accept incineration as an option for treating waste of any kind, if they do not believe that it is safe environmentally. The primary concerns are about air pollutants produced by the incinerator and the toxicity of the residual ash. This section will present some of the terminology that is important to understanding these concerns. The remainder of the manual will describe how an incineration system can be operated and maintained in a way that keeps environmental releases at an acceptable level.

Air Pollutants of Concern

Particulate matter may be defined as fine liquid or solid matter such as dust, smoke, mist, or fumes found in the gaseous emissions from the incinerator. Particulate matter emissions may have a dark or light color. Particulate matter emissions can be described in terms of opacity. Opacity is the degree to which light is obscured by a polluted gas (a clear window has 0 percent opacity while black paper has 100 percent opacity). Opacity may be measured with the naked eye or using an opacity monitor. Particulate matter is a problem because it can cause or aggravate respiratory problems in humans. It also creates aesthetic problems since it is readily noticed and is a nuisance because of soiling of exposed surfaces on houses and cars.

Hydrochloric HCl acid is generated when polyvinyl chloride (PVC) plastic (usually clear plastic) material is burned in the incinerator. The appearance of a white plume or cloud a short distance above the stack indicates that HCl is condensing. The major concerns about HCl are that it causes respiratory problems in humans, contributes to acid rain problems, and causes material damage to metals and concrete.

Toxic metals include cadmium, arsenic, beryllium, chromium, nickel, lead, and mercury. These metals may be found in municipal wastes. These metals are known to be hazardous to human health.

Organic compounds are compounds that contain primarily carbon and hydrogen and may also contain other elements such as oxygen, nitrogen, and chlorine in smaller amounts. Some organic compounds are known to cause or are suspected of causing cancer and are considered hazardous air pollutants. The public's primary concern is related to dioxin and furan emissions, but other organic compounds such as benzene and vinyl chloride may be emitted.

Carbon Monoxide (CO) also is generated during combustion if the combustor is not operated properly. (Your automobile generates some amount of CO.) CO is toxic to humans if concentrations are high enough, and it also is an indicator of combustion quality.

Solid Waste Ash Quality

One of the major objectives of incineration is to generate a high quality ash for land disposal. All pathogens should be destroyed, and almost all organic material should be completely burned. Ideally, no large chunks of unburned waste material (other than metals or glass) should remain in the waste. A measure of ash quality is "burnout," which is the percentage of organic material remaining in the waste. For example, a burnout of 95 percent means that the ash can contain only 5 percent organics. Adequately burned and quenched ash may be disposed of in a sanitary (municipal) landfill. The ash should be stored in covered containers or kept wet prior to transport to the landfill to prevent 'fugitive \ emissions.' Individual landfills may have requirements that must be followed in order for your waste to be accepted. You should familiarize yourself with these requirements to prevent refusal of the waste.

The Operator – Your Role

It is the operator's role and responsibility to protect the environment by:

1. Complying with all emission limits and operating practices specified in the permit to operate.
2. Minimizing emissions of particulate matter, HCl, toxic metals, carbon monoxide, and organic compounds through proper incinerator;
3. Operating the incinerator to generate high quality ash that is sterile and can be disposed of in landfills;
4. Minimizing particulate matter emissions from ash handling;
5. Disposing of ash properly by sending it to appropriate disposal sites; and
6. Performing the regular maintenance inspections to catch any operational problems early.

Basic Combustion Principles

The Combustion Process

Combustion of Municipal Solid Waste (MSW) is a chemical reaction. In the incinerator, organic materials and oxygen react rapidly and violently to produce combustion gases and energy in the form of heat and light.

Organic Solid Material + Oxygen $\xrightarrow[\text{Heat}]{}$ Combustion Gas + Solid Residue + Energy(Heat)

For the reaction to begin and to keep going, all three elements - organic material, oxygen, and heat-must be present. The organic material used in the reaction comes from two sources, waste and auxiliary fuel. Some organic material is contained in most solid waste types. Depending on the fraction of organics and the specific organic composition, the waste may be adequate to sustain combustion. Auxiliary fuel may be used to maintain combustion if the waste material does not contain enough organic material to maintain high temperatures. The combustion reaction between the organic material and oxygen that causes the organics to burn will occur only after the temperature of the organic material is raised to the point that combustion can begin.

Energy in the form of heat is required to raise the temperatures of the incinerator chamber and organic material and O_2. Initially, this energy usually is supplied by the pilot and auxiliary fuel burners. After the system is in full operation, the energy released from the burning waste often is adequate to maintain these high temperatures.

Fate of Combustion Air

The oxygen needed for the combustion reaction is supplied by the ambient combustion air. Combustion air is supplied to the combustion chambers through air ports by a forced draft fan, by an induced draft fan, or by natural draft. In general, this air contains about 21 percent oxygen (O_2) and 79 percent nitrogen (N_2), so about 21 percent of the total combustion air fed to the incinerator is oxygen that is available to react with the organic material in the waste and fuel. The nitrogen passes through the chamber mostly unreacted; some nitrogen oxides are formed.

Oxygen Reaction

Solid waste contains two types of organic materials

1. Volatile Matter
2. Fixed Carbon

These two types of materials are involved in distinct types of combustion reactions, and the operating variables that control the two types of reaction are different.

Volatile matter is that portion of the waste that is vaporized (or evaporated) when the waste is heated. Combustion occurs after the material becomes a gas. The combustion variables that influence this reaction are gas temperature, residence time, and mixing.

- A minimum temperature is needed to start and sustain the chemical reaction.

- Residence time is the length of time, generally measured in seconds that the combustion gas spends in the high temperature combustion chamber. The residence time must be long enough for the reaction to be completed before it leaves the high temperature zone.
- Turbulent mixing of the volatile matter and combustion air is required to ensure that the organic material and oxygen are well mixed.

Fixed carbon is the nonvolatile organic portion of the waste. The combustion reaction is a solid-phase reaction that occurs primarily in the waste bed (although some materials may burn in suspension). Key operating parameters are bed temperature, solids retention time, and mechanical turbulence in the bed.

- The solids retention time is the length of time that the waste bed remains in the Primary Chamber.
- Mechanical turbulence of the bed is needed to expose all the solid waste to oxygen for complete burnout. Without mechanical turbulence, the ash formed during combustion can cover the unburned waste and prevent the oxygen necessary for combustion from contacting the waste.

Products of complete combustion are:

- Carbon dioxide
- Water

One example of volatile waste is backyard charcoal grill with starting fluid. The starting fluid is highly volatile. When put on the charcoal and ignited with a match, it rapidly volatilizes and burns. The charcoal contains less volatile matter and primarily burns slowly as a fixed carbon bed.

Operating Factors Related to Combustion

The three operating factors that have the greatest effects on the combustion reaction are:

- Combustion airflow rate and distribution,
- Operating temperatures, and
- Waste feed rate and characteristics.

These three factors are all related. Controlling them controls the combustion reaction. The two key questions about combustion air are:

- How much combustion air is needed to sustain the combustion reaction?
- What happens if there is too much or too little combustion air?

Stoichiometric Air

In the chemical reaction between organic materials and oxygen, the amount of oxygen required under ideal or "perfect" conditions to burn all of the organic materials with no oxygen left over is called the stoichiometric (or theoretical)-oxygen level. The amount of combustion air associated with that oxygen level is called the stoichiometric air level. At stoichiometric air level the combustion gas would contain no oxygen because it would all be used in the combustion reaction.

Substoichiometric Air

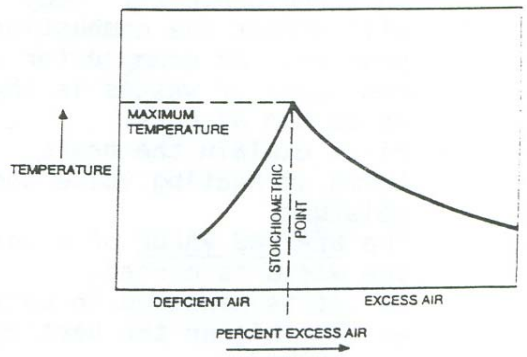
Airflows less than those required at stoichiometric levels are called deficient air or substoichiometric starved-air levels. Under starved-air conditions, the combustion gas would again contain no oxygen, but organics also would remain because combustion is not complete.

Excess Air

Air flows greater than those required at stoichiometric levels are called excess-air levels. Typically an incinerator operates with an overall 140 to 200 percent excess air level. That is, the incinerator operates with one and one-half to two times more air than required at stoichiometric levels. Excess air is used to assure that enough oxygen is available for complete combustion.

Control of Temperature as a Function of Air Level

Maximum combustion temperatures are always attained at stoichiometric conditions. As the amount of excess air is increased above the stoichiometric point, the temperature in the incinerator drops because energy is used to heat the combustion air. If the amount of combustion air is too great, the temperature drops below “good combustion temperature," and undesirable combustion products are generated as a result of incomplete combustion. As the amount of excess air is decreased, the combustion temperature increases until it becomes maximum at the stoichiometric point. Below the stoichiometric point, the temperature decreases because complete combustion has not occurred.



CONTROL OF TEMPERATURE AS A FUNCTION OF EXCESS AIR

The relationship of how combustion air level can affect temperature has just been shown. Temperature also plays an important role in the combustion of waste. Temperatures need to be maintained at levels high enough to ensure pathogen destruction and to sustain the combustion reaction. However, temperatures that are too high also cause problems. Continuous exposure of the combustor refractory to high temperatures is generally not desirable because it can cause the ash to fuse and can cause damage to the refractory.

Waste Characteristics

The primary characteristics of the waste that affect the combustion reaction are:

- The heating value
- The moisture content
- The chlorine content

Different wastes have different heating values and moisture contents. They will affect the combustion process.

The HEATING VALUE of a waste is a measure of the energy released when the waste is burned. It is measured in units of Btu/lb (J/kg). A heating value of about 5,000 Btu/lb ($11.6x10^{-6}$ J/kg) or greater is needed to sustain combustion. Wastes with lower heating values can be burned but they will not maintain adequate temperature without the addition of auxiliary fuel. The heating value of the waste can be used to calculate total heat input to the incinerator where:

Heat Input (Btu/h) = Feed Rate (lb/h) x Heating Value (Btu/lb)

Heat input to the incinerator will affect temperature. More heat input yields higher temperature. Heat input also will affect air requirements; more air is required (1 SCF/100 Btu).

MOISTURE is evaporated from the waste as the temperature of the waste is raised in the combustion chamber. It passes through the incinerator, unchanged, as water vapor. Evaporation of moisture uses energy and reduces the temperature in the combustion chamber.

CHLORINE in plastics or solvents in the waste feed will react to form hydrochloric acid (HCl). This HCl can be an emission problem. It can create corrosion problems of the equipment downstream from the incinerator.

The heating value (Btu value) and moisture varies widely. Compare plastics (high Btu, no moisture) to beddings, shavings, etc. to anatomical

Summary of Key Operation Factors Affecting Combustion

1. Key factors are interrelated.
2. Air quality/distribution
3. Sufficient air for complete reaction
4. Distributed to promote mixing
5. Mixing
6. Assure contact of oxygen and organics
7. Temperature
8. High enough to sustain combustion
9. High enough to have complete reaction
10. Residence/retention time
11. Sufficient time to allow reaction to complete

Waste characteristics also are important

- Heating value
- Measure of energy released
- Heat input determines air required
- Moisture content
- Requires energy to vaporize water
- Chlorine content
- Affects HCl emissions

This summarizes the key parameters affecting combustion.

Products of Combustion Reaction

Complete Combustion

The primary products of waste incineration are:

- Combustion gases
- Solid residue (ash)
- Energy

The primary objectives of the combustion process are to generate an ash residue that is sterile (free of pathogens) and does not contain unburned, recognizable wastes; and to minimize air pollutants in the combustion gas stream.

The organic materials that enter the incinerator with the waste and fuel are primarily made up of carbon, hydrogen, and oxygen. Ideally, these organic materials react with oxygen in the combustion gas to form carbon dioxide and water vapor. The chemical reaction for this ideal situation is

$$\underset{(C,\ H,\ 0)}{\text{Organics}} + O_2 + \text{Heat} \longrightarrow CO_2 + H_2O + \text{Heat}$$

This ideal reaction represents complete combustion.

Incomplete Combustion

However, this ideal reaction does not occur in operating waste combustion systems. Factors that lead to a less than ideal reaction are poor mixing, too little combustion air, and low temperatures. Under those conditions products of incomplete combustion are emitted with the stack gases. The most common product of incomplete combustion is CO. Another product of incomplete combustion that often is emitted under poor mixing conditions or high temperature, low excess air conditions, is elemental carbon (or soot). The soot particles are very fine and generally result in high opacity at the combustion stack. Other products of incomplete combustion that cause concern because of their health impacts are hazardous organic compounds such as benzene, dioxins, and furans. Although these compounds are not found in the waste, under incomplete combustion conditions they can be formed as intermediate combustion products.

The waste feed also includes inorganic materials; generally, they are not involved in the combustion reaction. The inorganic materials in the waste feed (ash) are either retained in the ash or are emitted as particulate matter in the combustion gas. Air velocities in the combustion bed are controlled to reduce the amount of inorganic material entrained (picked up by) the combustion gas and emitted with the combustion gas. If combustion is not complete, organics will remain in ash; this is typical…it is atypical to have 100 percent combustion of ash bed. Under poor conditions (low temperature, low turbulence in ash bed) may have pathogens remaining in ash; i.e., may not sterilize ash.

Combustion Indicators

The information presented in the above section suggests that the following indicators can be used to monitor combustion quality.

Opacity

The opacity of the combustion gas stream is a measure of the degree to which the stack gas plume blocks light.

- High opacities indicate high emissions.
- Opacity is primarily caused by noncombustible ash or uncombusted carbon (soot) in the flue gas.
- High opacities can indicate poor mixing or low levels of combustion air.
- High opacities also may be generated by high levels of HCl emissions or poor burner operation in the secondary chamber.

If a large amount of water vapor is present in the combustion gas, the water can condense when it cools as it leaves the stack forming a dense white "steam plume." This is not an indicator of poor combustion and should not be confused with a black or white smoke plume caused by soot or acid gases. Opacity can be visually determined by a person or measured by an instrument.

Other indicators which provide information about combustion conditions are measurements of the combustion gas oxygen and CO levels. However, these measurements require instruments and most facilities do not have those instruments.

Ash Quality

Visual appearance of ash can be an indicator of combustion problems. If an incinerator is operating properly, little organic material will remain in the ash. Whitish gray ash indicates better burnout and less carbon than black. The extent of organics combustion can be measured by the quantity of combustible materials remaining in the ash. Noted increases in combustibles in the ash indicate a combustion problem which may include bed temperatures that are too low, improper distribution of combustion air in the bed, or insufficient waste retention times.

Equipment Warranty

To the original Purchaser, **EWS** warrants that the products and parts manufactured by the Corporation and supplied hereunder shall be free from defective workmanship and material for a period of 18 months from notice of ready to ship or 12 months from start-up at Purchaser's site, whichever is less. **EWS**' warranty is limited to **EWS** supplying the Purchaser with parts F.O.B. Purchaser site, replacement of any product or parts which shall be proved to the Corporation to be defective, provided that the Purchaser gives notice in writing within three (3) days after defect discovery.

To provide all labour related to **EWS** manufactured / warranted parts for 12 months. In the case where **EWS** has purchased components from other vendors or suppliers, warranty will be limited to providing, render reasonable assistance to Purchaser when requested, in order to enable Purchaser to enforce such warranties and guarantees by third party manufacturers suppliers.

Equipment Covered by Warranty

Equipment supplied under a purchase order to **EWS** including:

- Primary and Secondary Chamber
- Connecting ductwork between Primary and Secondary Chambers (Breech Sections) and the Stack Sections
- Controls – Manual, Electronic and Electric

Extent of Warranty Coverage

All costs related to the repair or replacement of system components where failure is due to defect in material, workmanship or design is covered by **EWS** for one year from the date of repair or replacement.

Replacement due to abuse, misuse, and/or lack of maintenance or carelessness is not covered. Wear from normal use, or alternative disposal costs are not covered.

There is no warranty on the following parts (consumables):

- All burner flame-front parts
- Thermocouple elements + protection tubes
- Electrodes, photocells
- Gaskets, Seals and tubing
- Fuses, light bulbs and glass assemblies
- Nozzles, filters, sensors/probes
- Refractory Surface Cracks*
- Tubing

*Note: Normal in high temperature applications

Warranty Provisions and Exceptions

EWS does not guarantee or warrant, either expressly or implied, the materials and workmanship of supplies, materials, equipment or machinery manufactured by third parties and furnished and installed by **EWS** (outside of the scope of this proposal) in the performance of the Work, to the extent such supplies, materials, and equipment or machinery is itself an end product with its own customary warranty.

EWS shall endeavor to obtain from all such vendors and suppliers and assign to Purchaser the customary warranties and guarantees of such vendors and suppliers with respect thereto. **EWS** shall, at the sole expense to Purchaser, render reasonable assistance to Purchaser when requested in order to enable Purchaser to enforce such warranties and guarantees by third party manufacturer's suppliers.

EWS will not be liable for any consequential damages, loss or expense arising from any change in or alteration to equipment of its manufacturer such changes or alterations having been made by any persons other than personnel of **EWS** or its agents, in which event such agents must have written permission of **EWS** prior to making such changes or alterations.

EWS shall in no event, be liable for consequential damages as a result of any breach of this agreement by or for any other reason. This warranty shall not apply to products or parts not manufactured by **EWS** or to equipment parts which shall be subject negligence, accident or improper control, improper operation, maintenance, storage, or damage or circumstances beyond the control of **EWS** or to other than normal use or service. Regarding parts of the equipment purchased by **EWS**, no warranty is made other than that offered by the original equipment manufacturer.

THE ABOVE ARE **EWS**' SOLE WARRANTIES, AND THE REMEDIES SET FORTH ABOVE CONSTITUTE PURCHASER'S EXCLUSIVE REMEDIES IN THE EVENT SUCH WARRANTIES ARE BREACHED. WITH RESPECT TO THE CONSTRUCTION AND MECHANICAL FUNCTION OF THE PRODUCTS, EWS MAKES NO OTHER WARRANTIES OF ANY KIND WHATEVER, AND THESE WARRANTIES ARE IN LIEU OF ALL OTHER WARRANTIES OR GUARANTEES, WRITTEN OR ORAL, STATUTORY, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION THE WARRANTY OF MERCHANTABILITY AND THE WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE.

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SECTION 5

OPERATING AND MONITORING INSTRUCTIONS

ECO 2TN1P

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ECO WASTE SOLUTIONS

Table of Contents

Important Information

Proper operating and maintenance procedures must be followed in order for the ECO Model Incinerator system to perform at maximum efficiency.

Do not attempt to start or operate this equipment until this Operator Manual is read thoroughly and is understood.

The equipment has been designed with many safety features, however, like all thermal processes; this equipment is not free from the inherent hazards of high temperature processes.

Safety procedures and precautions must be followed at ALL times during operation.

There are safety procedures outlined in this Manual, however, no amount of written instruction can replace good judgment and safe operating practices.

Responsibility for the safe operation and maintenance of the equipment supplied rests solely on those operating it.

There are many engineered features incorporated into the ECO Model Incinerator system to free the operator of repetitive chores. They do not, however, relieve the operator of maintenance responsibilities. In order to maximize the operating life of the equipment, it is strongly recommended that the maintenance procedures, outlined in Section 6, be followed diligently. It is advisable to keep an equipment log for recording maintenance activities along with unusual operation.

NOTE

In the event that the equipment is not operating in the normal manner, contact Eco Waste Solutions immediately at (905) 634-7022. It is important to report problems as soon as they are noticed to minimize damage that faulty operation could cause.

Incinerator Design

The **ECO 2TN1P** incinerator is designed specifically for to process 2,000 kg per batch (one batch per day) of the waste. This waste stream is assumed to include the following:

3.2.3 Waste will include food waste, hydrocarbon and solvent contaminated maintenance shop waste and dewatered sewage treatment sludge.

The incinerator will be used for combustible, non-hazardous wastes including, but not limited to:

- Putrescible wastes from construction and accommodation camps;
- Organics from construction camps;
- Maintenance / workshop waste (such as hydrocarbons and solvents contaminated rags, oil filters, etc.) and
- Sludge from the sewage treatment plant.

Biomedical waste, hazardous waste, non-combustible materials, or treated wood products must not be incinerated. Incineration of plastics will be minimized to reduce the volume of potentially dioxin/furan-related plastics during the procurement process.

This waste will need to be comingled to ensure that wet low heat value waste is mixed with other drier materials. Dewatered sewage treatment sludge will be added onto a layer of other wastes and will comprise no more than 20% of the batch by weight.

Regardless of recycling programs that may or may not be available, it is assumed that the waste is typical of domestic solid waste and will include some plastic packaging and containers. The waste is expected to be bagged, stored in skips/bins around the mine operation then brought to the incinerator by truck.

It is important to note that inappropriate materials including, but not limited to, reactive/explosive chemicals and items containing heavy metals will not be processed in the incinerator proposed herein.

Waste Assumptions

Based on the waste streams anticipated, the following characteristics have been used in the design of the ECO 1TN1P unit:

Description	Total Moisture Content	Density	Higher Heat Value
Mixed Solid Waste	Up to 40%	10-15 lbs/ft^3 160-240 kg/m^3	6,500 BTU/lb 15,150 KJ/kg

NOTE

This incinerator was designed for the type of waste and amount of waste described in this document. It is important that the waste processed in the incinerator is in line with the quantities and characteristics described. The processing of other waste amounts and properties will impact performance, emissions and wear on the incinerator.

To ensure a high standard of performance, it is important that:

- **waste segregation and tracking procedures are in place;**
- **operators are required to be properly trained, and;**
- **the equipment is properly maintained.**

It is also important to note that some waste-streams are unacceptable and SHOULD NOT be processed in the incinerator (please see next page).

Unacceptable Waste-streams

The following is a list of some of the waste streams that should not be processed in our system.

Waste Materials Not Suitable for Processing in Eco Waste Solutions Technology

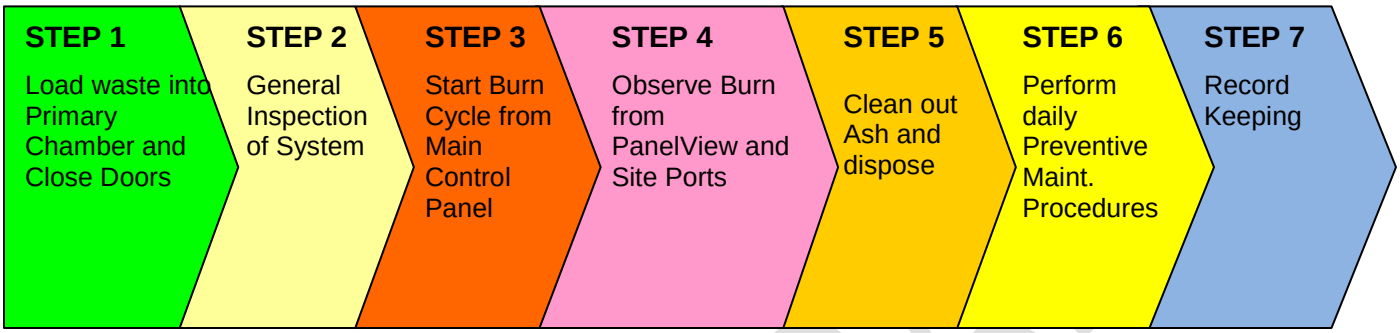
Solid Waste	Description	Origin
Bulky Materials	Automotive or heavy equipment parts such as engine blocks and transmissions	From vehicles and equipment maintenance shop
Non-Combustible Materials	Drywall, asbestos, bricks, concrete, soils	Construction activity
Radioactive Materials	Smoke detectors, laboratory wastes	From Buildings, laboratories
Potentially Explosive Materials	Large propane tanks, other pressurized vessels. Actual explosives	From warehouse, plant and production facilities
Heavy Metals	Items containing lead, mercury, cadmium, for example: batteries, electronic devices, fittings, old pipe work, fluorescent light bulbs, electrical switches, thermometers, PVC plastics, aluminum solder, photovoltaic cells	From maintenance activities, operations and construction activities
Liquid Waste	**Description**	**Origin**
High Alkaline or High Acid Materials	By-products of industrial processes, unrefined fuels	From warehouse, plant and production facilities
Solvents	Solvents such as acetone, xylene, methanol	From vehicles and equipment maintenance shop

Important Notes:

1. These lists are guides and should not be assumed to be an exhaustive list of materials
2. A waste and procurement audit is highly recommended and encouraged to ensure that all sources of heavy metals (especially mercury) are identified and diverted from the incinerator

General Operating Overview

The operation of the **ECO 2TN1P Waste Incinerator** package follows 7 general steps that take place over a 24-hour period.



Although all 7 steps are critical in the general operation of the incinerator system, this section of the manual focuses on **Step 3** and **Step 4** and how to start the system and monitor it during operation.

It is assumed, at this point, that the waste material is properly loaded with the weight, density and type the incinerator is designed for, as outlined on page 5 of this section.

It is also assumed that the waste is loaded after the ash has been removed from the previous burn cycle and any daily maintenance routines have been completed.

This section will also cover **Step 7** on how to use the historical charts, store incinerator data, and access incinerator historical information for record keeping purposes.

Monitoring and Data Acquisition System

Overview

The **PanelView** operator interface system automatically monitors the entire process and all system inputs are recorded and logged for record-keeping purposes and also allows for historical trending of key operating conditions.

The integrated **PanelView** in the Main Control Panel monitors and records the following:

1. Temperature in the Primary Chamber, Secondary Chamber and Stack
2. Differential pressure in the Primary Chamber
3. Auxiliary burner operation
4. Fan amperage monitoring (via current transducer)
5. Interlocks (door position, high temp limit, low fuel level limit, air proving switch)
6. Integrated weigh scale to record weight of waste prior to incineration (if purchased)[1]

This system automatically records the operations log and the USB data port allows for data transfer to Windows OS computers for printing of data for easy record-keeping.

The operating and monitoring system for the **ECO 1TN1P** incinerator designed for the **Mary River Project** complies with the monitoring requirements outlined in the CCME "*Technical Document for Batch Waste Incineration*" March 2009. All parameters listed above will be monitored and recorded by the system.

Notes:

1. If the integrated scale is not purchased as part of the incinerator package, owner/operator must have weigh scale available and manually take weight measurements daily and maintain records to meet the guideline requirements.

PanelView Operator Interface

Main Control Panel Components

Number	Name	Purpose
1	**Main Disconnect Switch**	Isolates the incinerator from its source of electric power.
2	**PanelView Operator Interface**	Displays various screens reflecting system performance.
3	**Control Power ON**	1. Green light indicates the control power in the panel is on. 2. Pushing it if the **Emergency-Stop** is out will turn on the control power.
4	**Emergency Stop Pushbutton**	Stops the cycle if it is on and disables any possibility of starting it.
5	**Burn Cycle Stop/Start**	This switch starts stops or restarts the cycle.
6	**Primary Chamber Pressure Gauge**	Indicates the amount of vacuum in the Primary Chamber: This should never read less than zero or smoke will escape from the Primary Chamber.
7	**Waste Material Selection Switch**	Select either Solid Waste, Waste Oil or Both

The PanelView Operator Interface

The **PanelView Operator Interface** controls the operation of the incinerator directly from the **Main Control Panel.**

The **Main Menu** screen displays all the available options for viewing the system in operation.

The **PanelView** has a touch-screen and items can be selected by touching them on the screen.

Main Menu

The first screen the operator will view is the **Main Menu** (see below).

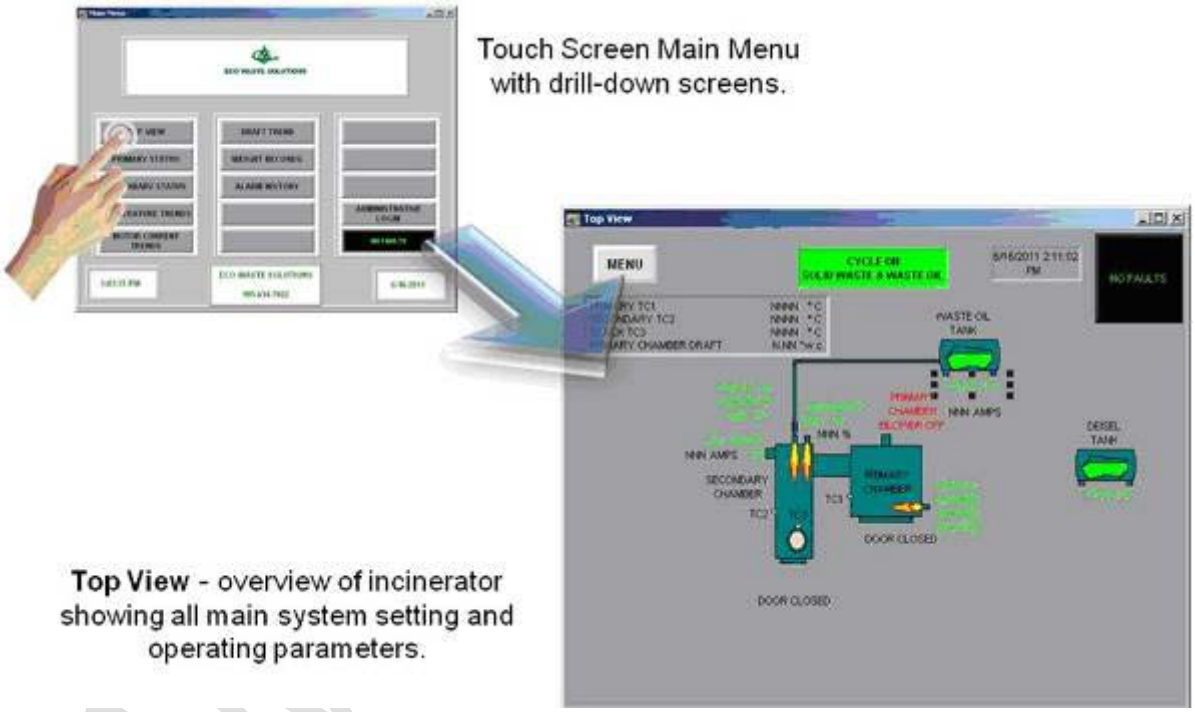
Top View

When the ***Top View*** button is selected, an overview of the incinerator and related components is displayed. This shows key temperatures, flows, and other indicators of what is happening in the process in a real-time basis.

NOTE

The system will not start if there are alarms or faults present. To clear and/or acknowledge faults, go directly to page 14 of this section of the Manual.

At any time, touch **Main Menu** to go back to the main screen.



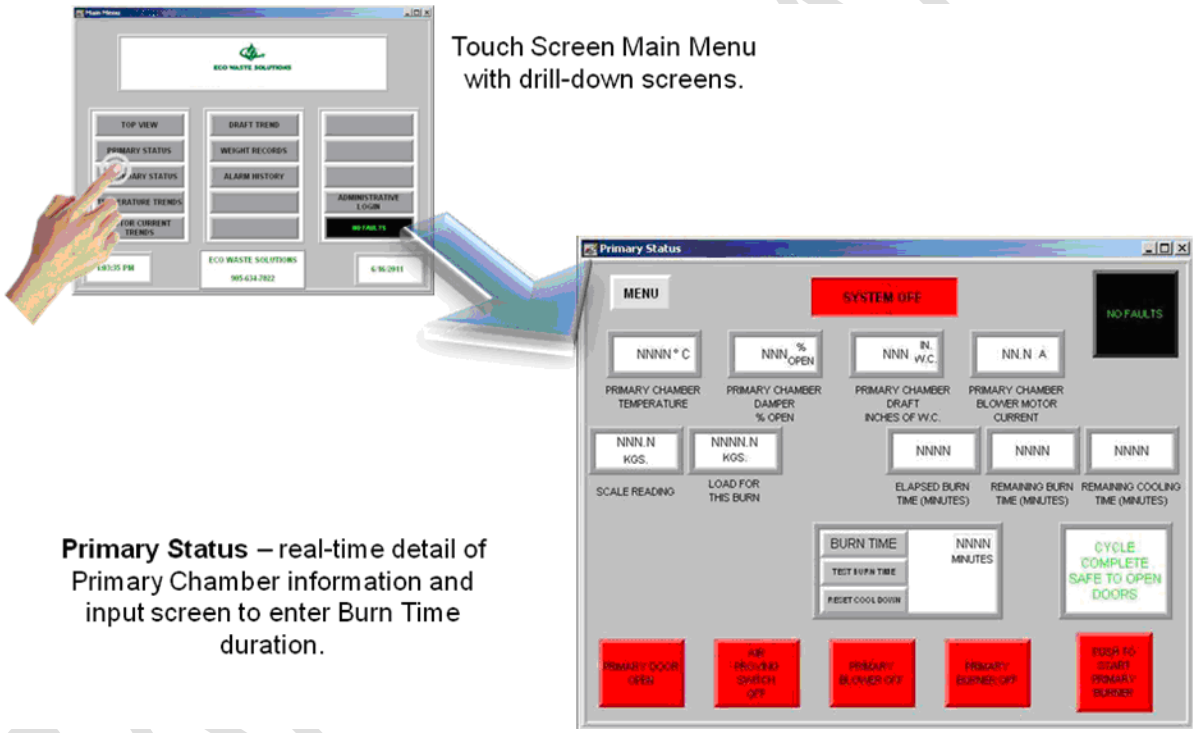
Top View - overview of incinerator showing all main system setting and operating parameters.

Primary Status

When the ***Primary Status*** button is selected from the **Main Menu,** a screen will display the status of all the operating parameters of the Primary Chamber, such as the temperatures and the time remaining in the cycle, as well as displaying other informational items such as status of the door and blowers, etc.

The operator can change the burn time of the cycle by selecting “BURN TIME” and entering a time (in minutes). The operator may do this over time to either prolong the burn time, or decrease the burn time depending on the waste mixture; for example a very wet batch of garbage will take more time to burn than a dryer batch of waste.

At any time, touch **Main Menu** to go back to the main screen.

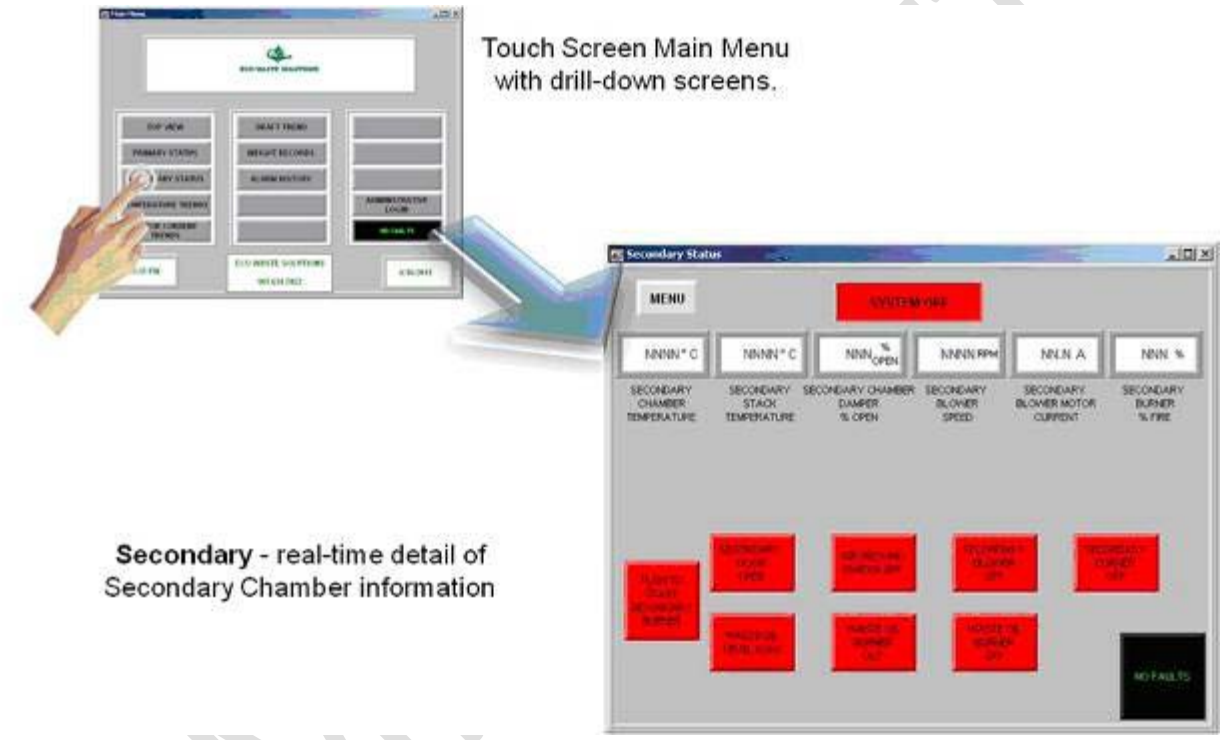


Primary Status – real-time detail of Primary Chamber information and input screen to enter Burn Time duration.

Secondary Status

When the ***Secondary Status*** button is selected from the **Main Menu**, a screen will display the status of all the operating parameters of the Secondary Chamber, such as the temperatures, burner and blower status, etc.

At any time, touch **Main Menu** to go back to the main screen.

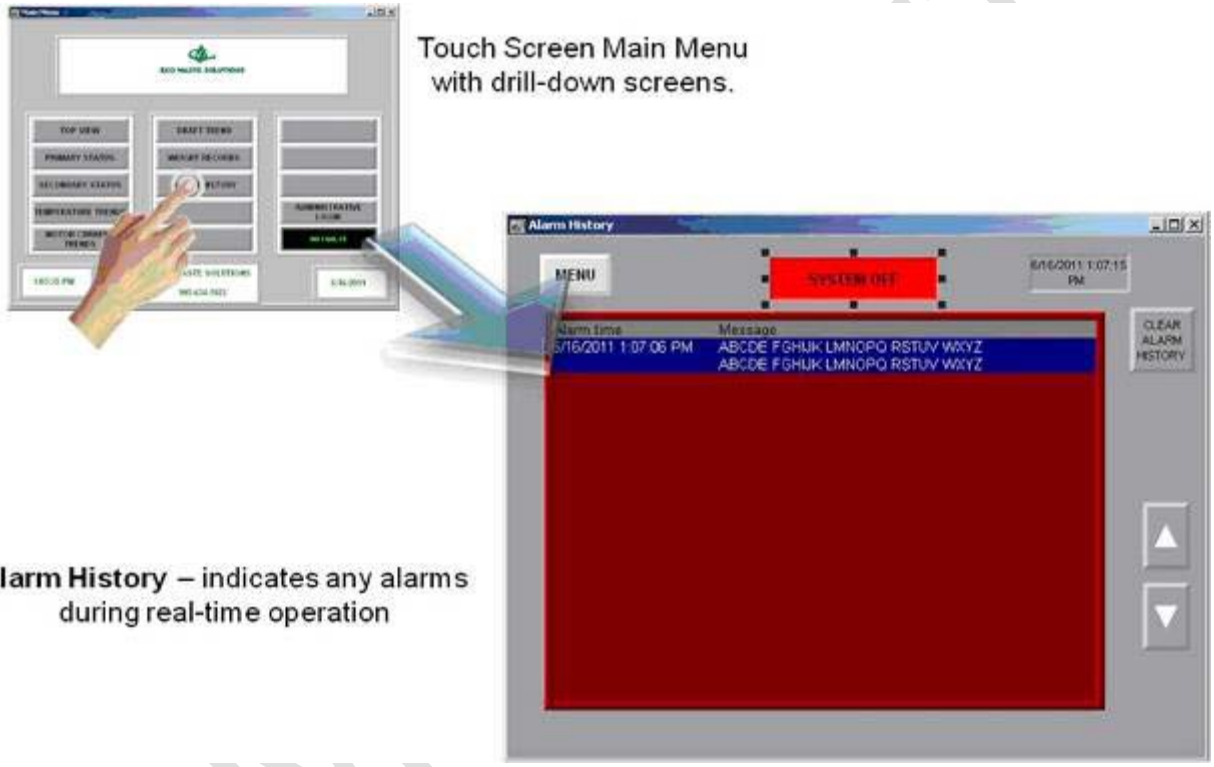


Alarm History

When the ***Alarm History*** button is selected a screen will display the last 128 faults with the date & time of occurrence.

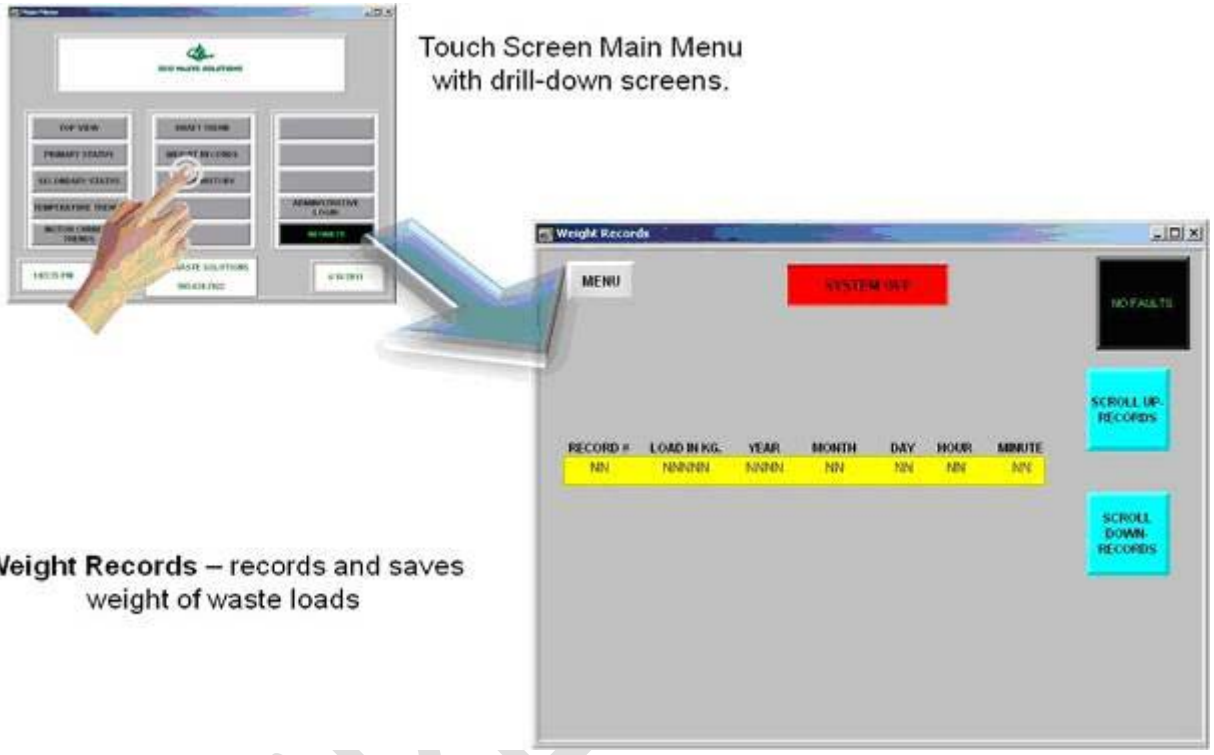
The operator can press the *CLEAR ALARM HISTORY* to clear all of the faults, if they wish to. This does not affect the record-keeping feature of the system.

At any time, touch **Main Menu** to go back to the main screen.



Load Records

When the ***Load Records*** button is selected a screen will display the weight of the total waste load on any given day.



Weight Records – records and saves weight of waste loads

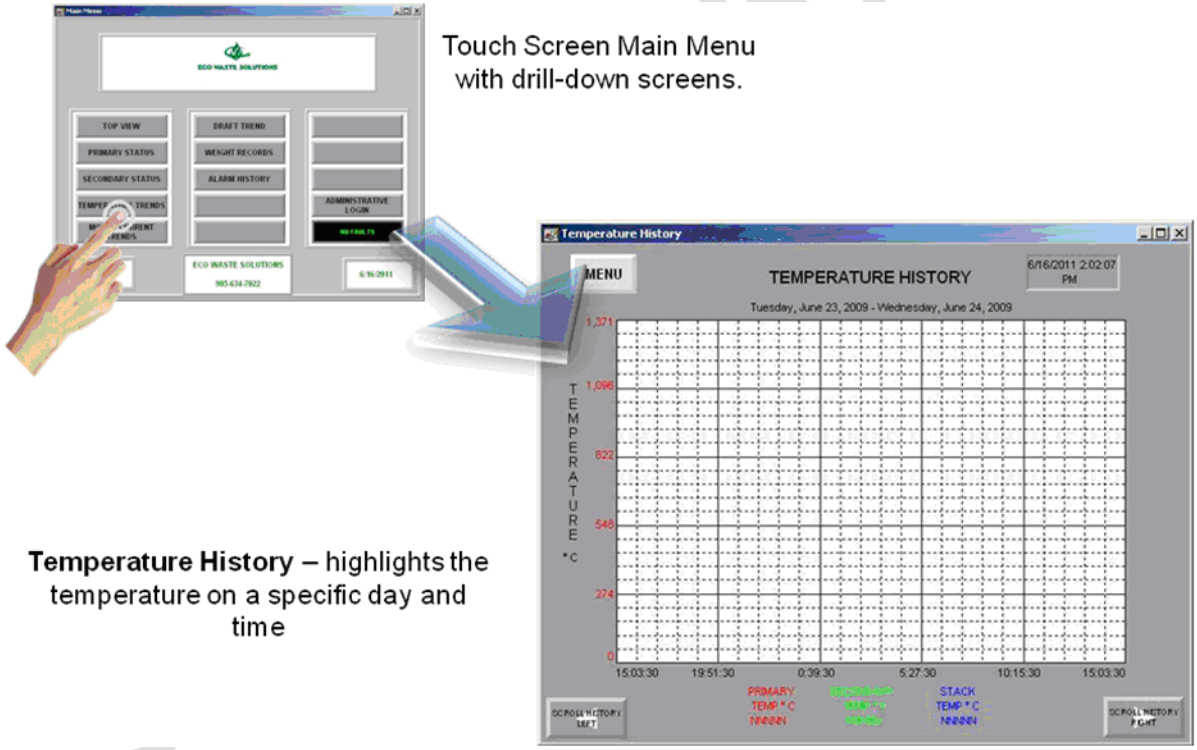
Overview of Historical Charts

The **PanelView** operator interface monitors and records (every minute) critical operating parameters of the incinerator system like the temperature, motors, draft, load weights and alarms. Each operating parameter has its own graphic display for the operator to view, at any given time. Each display can easily be selected from the **Main Menu** of the **PanelView**. The display will show the specific data collected from previous burn cycles.

This **Incinerator Data** is important for regulatory purposes and for general operating purposes. Also, the incinerator data is to be downloaded on a weekly basis to USB key for record-keeping purposes.

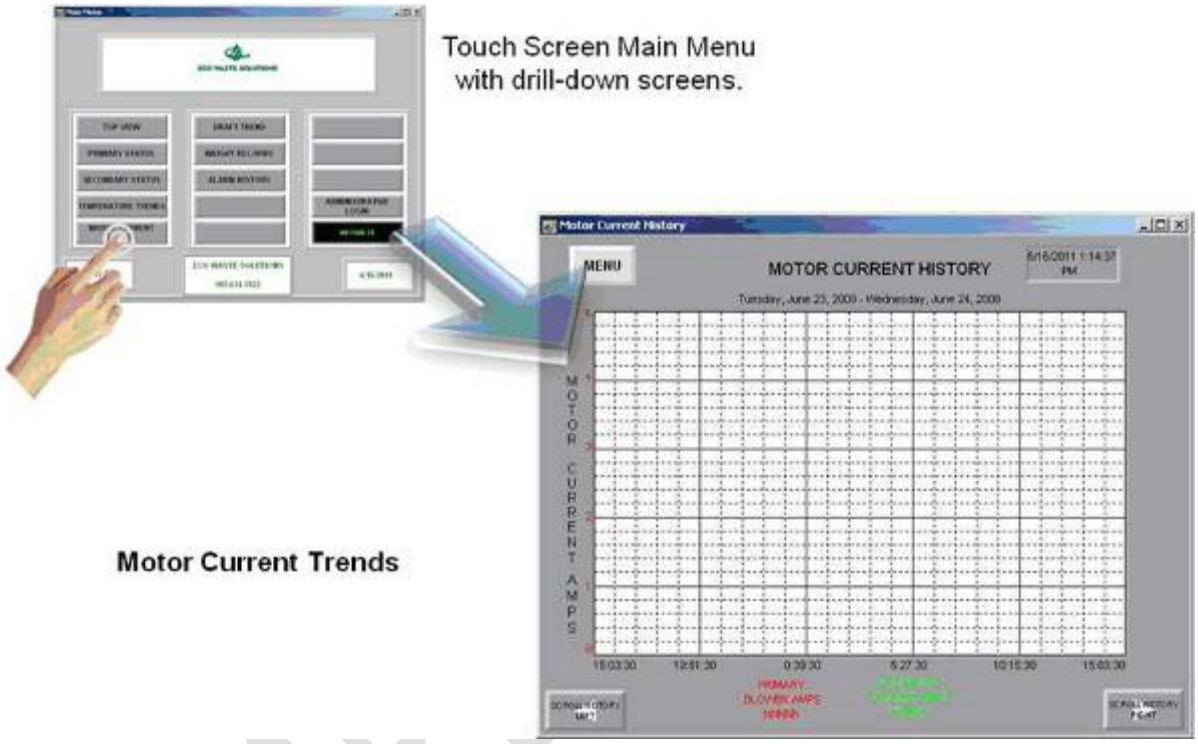
Temperature History

For example, when the ***Temperature History*** button is selected, the screen will display the trend in temperature during the operation of the system, include date & time of occurrence of that specific temperature.



Motor Currents History

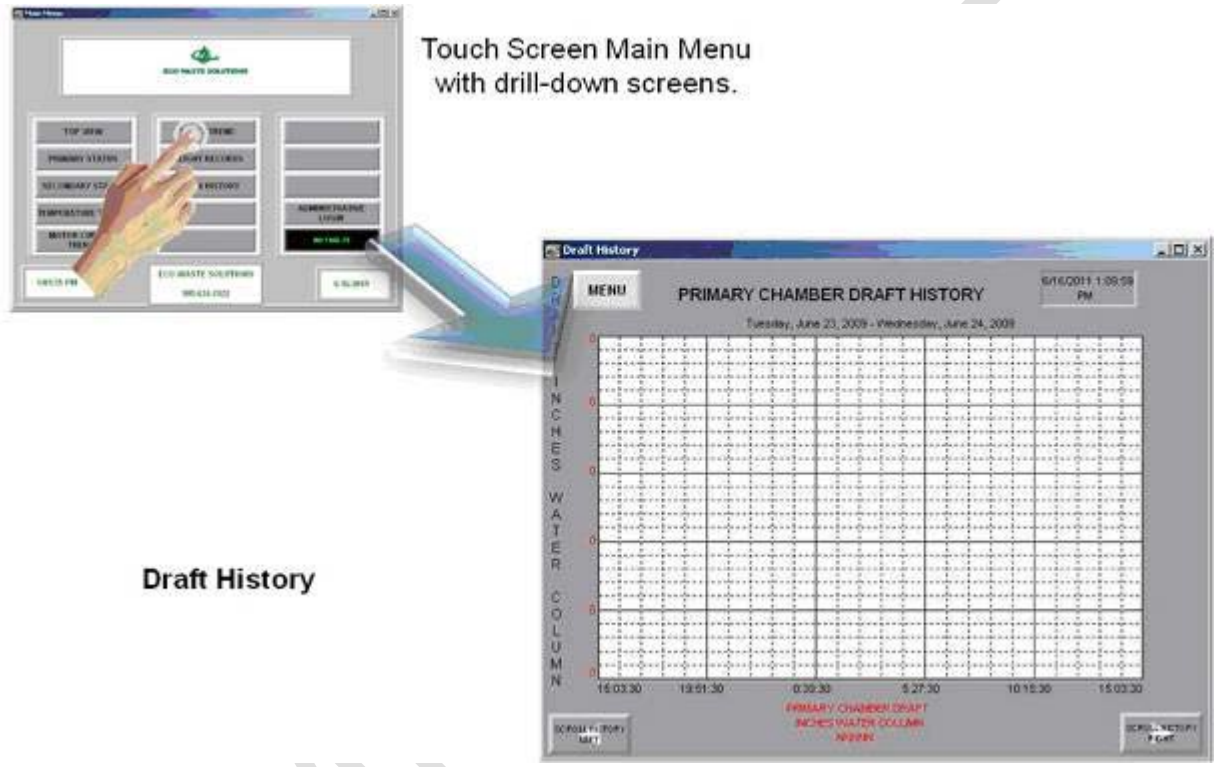
When the ***Motor Currents History*** is selected a screen will display the motor currents from the Primary Burner and the Secondary Burner, in AMPS, during the operation of the system, including date & time of occurrence of that specific motor current.



Motor Current Trends

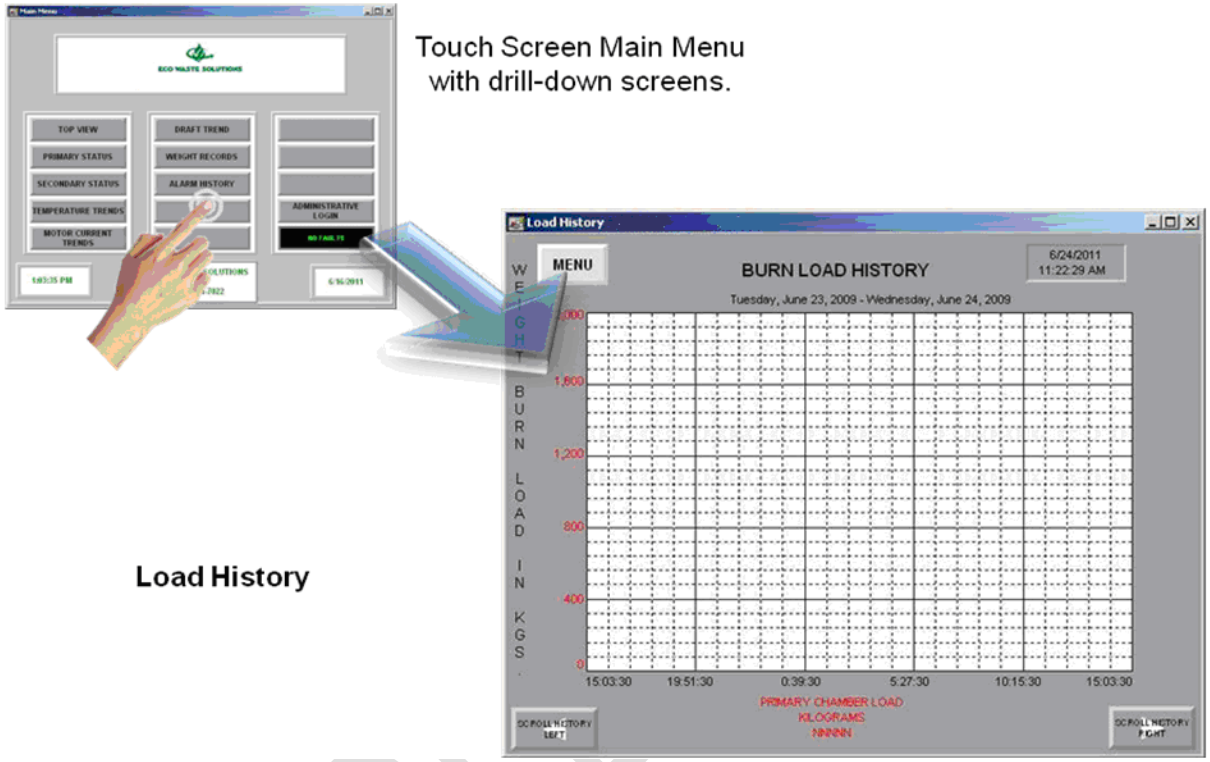
Draft History

When the ***Draft History*** button is selected a screen will display the draft during the operation of the system, include date & time of occurrence of that specific draft trend.



Load History

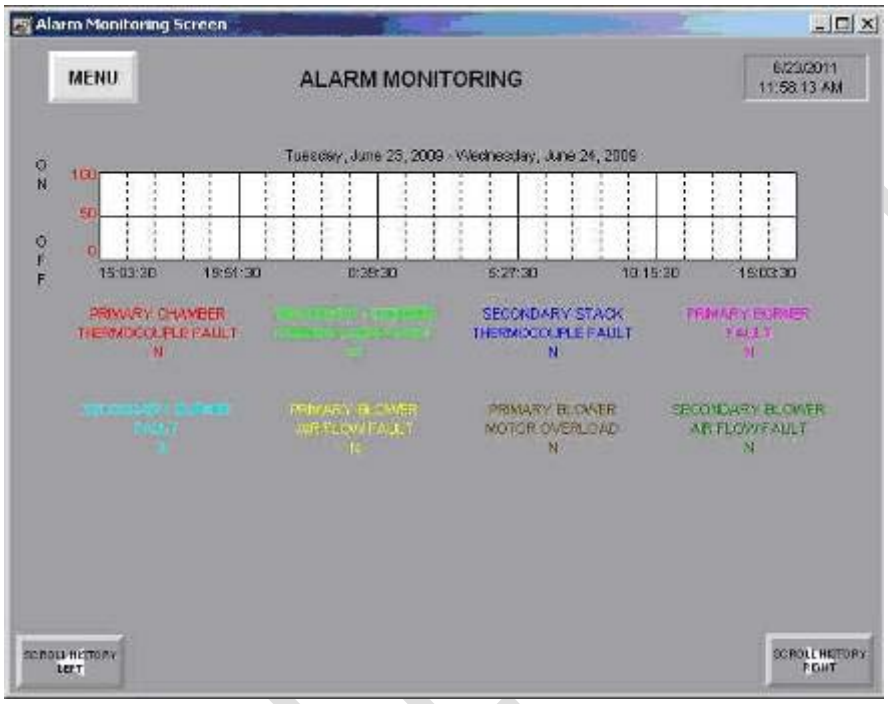
When the ***Load History*** button is selected, the daily waste volumes will be displayed as a trend.



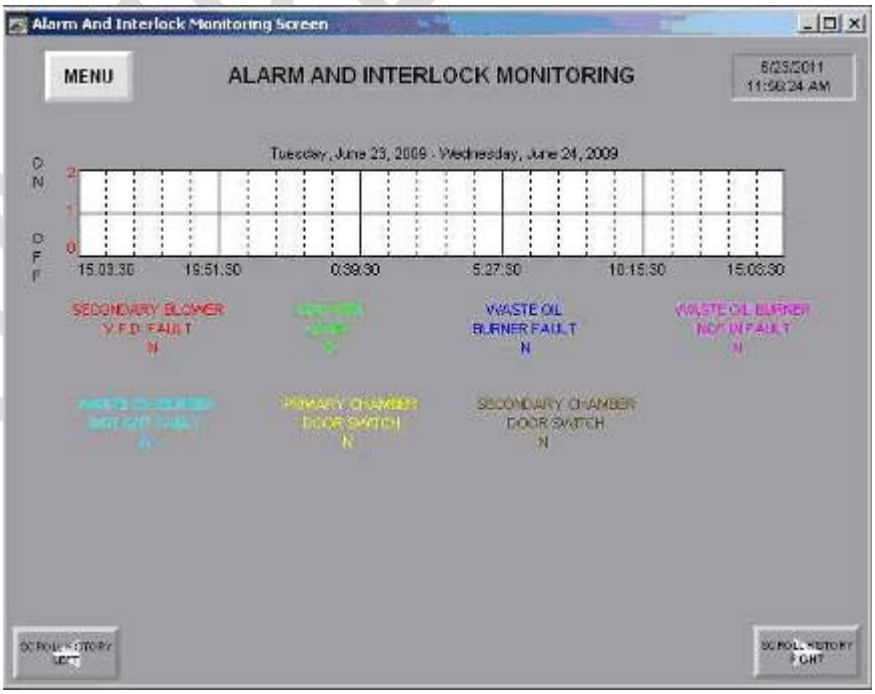
Load History

Alarm Monitoring Display

In order to download the alarm history, the **PanelView** monitors the alarms in one of two display pages shown below. By selecting these displays, the operator can view a selected alarm.



Alarm and Interlock Monitoring Display



Procedures For Commissioning (Initial Start Up ONLY)

NOTE

This section highlights a set of mandatory commissioning/start-up procedures to be performed prior to operating the incinerator system for the first time. Please follow them carefully. Once the procedures have been completed, the operator will not have to perform them again, unless a new burner is installed (has to be replaced).

NOTE

If this set of procedures has already been followed, please go directly to the next section "Standard Daily Operating Procedures".

Commissioning Procedures

NOTE

The following commissioning/start-up procedures are to be read and followed after all proper installation and assembly instructions have been completed and inspected.

1. Turn on main disconnect on the **Main Control Panel**, **Panel View** will load
2. Once the **Panel View** is running, push the "Control Power On" button.
3. Ensure there is power supply to the incinerator by selecting the ***Top View*** button from **Main Menu** and check:
    a. All temperature readings (if 1371˚C is displayed the thermocouple is not connected or is faulty.)
    b. That the Primary and Secondary Chamber door position on screen is the same as on the system.
4. Fill Diesel and Waste Oil Tanks, and ensure they are full. (see instructions below)
5. Located on the fuel train outside the Primary Chamber, ensure all ball valves are in the closed position.

ONLY DIESEL FUEL CAN BE STORED IN THE DIESEL FUEL TANK AND ONLY WASTE OIL (WITHOUT ADDITIVES) CAN BE STORED IN THE WASTE OIL STORAGE TANK

NOTE

Before filling either tank ensure:

a. The storage tank is in good condition, e.g. tank shall not exhibit severe rusting, apparent structural defects or deterioration.

b. No leaking visible. If leaking is detected perform the following clean-up steps:

   i. Stop the release.
   ii. Contain the released waste oil.
   iii. Clean up and properly manage the released waste liquid as per best environmental standards.
   iv. Repair or replace the leaking waste storage tank prior to returning it to service.

c. Inspect the bottom of tank for sludge formation. Perform the following steps:

   i. Remove fuel tank access cover.
   ii. Do a visual inspection of the inside of the tank, clean if necessary. A drain valve is located at the bottom of the tank to assist with cleanout. Ensure the drain valve is in place before filling.
   iii. Ensure valve is closed.
   iv. Fill the tank through the access.
   v. When the tank is full, do a "walk around" of the tank and inspect tank for leaks and structural defects.

NOTE

Load the oldest liquid (waste oil) inventory first. Long term storage may result in the formation of sludge or the growth of soluble and insoluble bacteria that can clog the downstream filters.

6. Prime the fuel lines by attaching a tee fitting to the highest point closest to the fuel tank on the supply fuel line.
   a. Loosen the Pressure Gauge Attachment (item # 3) on both burners, see figure A and C).

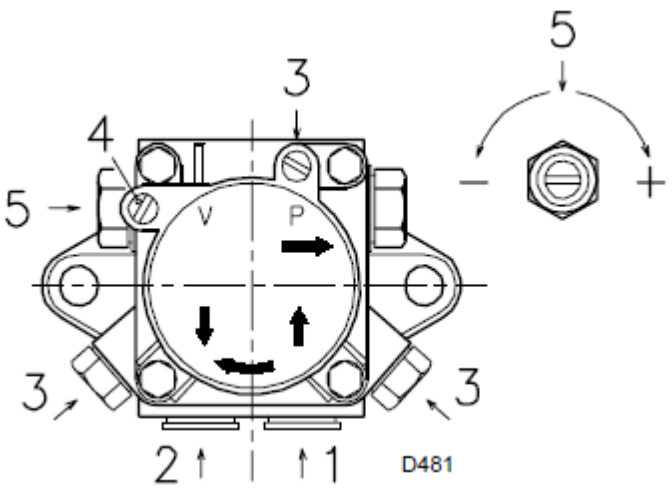
   b. Remove the plug from the fitting and insert a funnel.

   c. Fill the fuel lines until light oil starts coming thru the pressure gauge attachment on the burner pump.

7. Physically prime the Primary Burner located in the Primary Chamber.

   a. Before starting the Primary Burner, make sure that the tank return line is not clogged.

   b. The pump leaves the factory with the by-pass closed.



Legend:

1. Suction
2. Return
3. Pressure Gauge Attachment
4. Vacuum Gauge Attachment
5. Pressure Adjustment Screw

Figure A

c. In order for self-priming to take place, one of the screws #3 in Figure A (above) of the pump must be loosened in order to bleed off the air contained in the suction line. Start the Primary Burner by closing the control devices and with switch #1 in Figure B (below) in the "ON" position. The pump must rotate in the direction of the arrow marked on the cover.

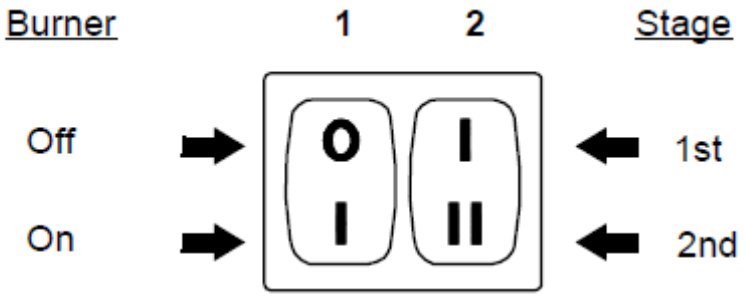


Figure B

d. The pump can be considered to be primed when the light oil starts coming out of the screw #3 in Figure A with no air bubbles. Stop the burner: switch #1 in Figure B set to "OFF" and tighten the screw #3 in Figure A. The time required for this operation depends upon the diameter and length of the suction tubing. If the pump fails to prime at the first starting of the burner and the burner locks out, wait approx. 15 seconds, reset the burner, and then repeat the starting operation as often as required. And so on.

e. After 5 or 6 starting operations allow 2 or 3 minutes for the transformer to cool.

f. Be careful to not allow ambient light to illuminate the photocell or the burner will lock out.

g. Assuming tank is installed at ground level and piping is ½" line. If the length of the suction piping exceeds 60 meters, the supply line must be filled using a separate pump. If the tank is installed below or above grade refer to the Riello Manual.

8. Physically prime the Secondary Burner located in the Secondary Chamber

   a. Before starting the burner, make sure that the tank return line is not clogged. Obstructions in the line could cause the sealing organ located on the pump shaft to break.

   b. In order for self-priming to take place, screw #3 in Figure C (below) of the pump must be loosened in order to bleed off the air contained in the suction line.

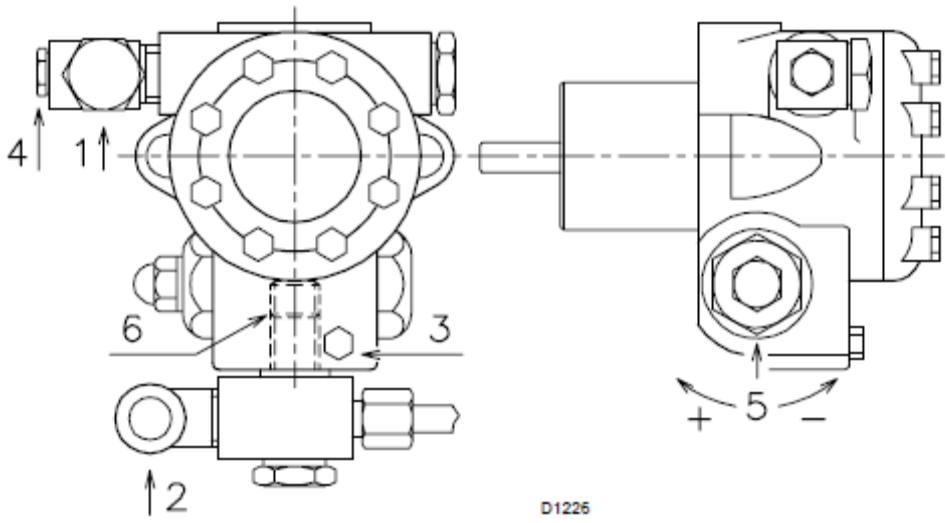


Figure C

Legend:

1. Suction
2. Return
3. Pressure Gauge Attachment
4. Vacuum Gauge Attachment
5. Pressure Adjustment Screw

c. Start the burner by closing the control devices with switch #1 in Figure D (below) in the "MAN" position. As soon as the burner starts, check the direction of rotation of the fan blade, by looking through the flame inspection window.

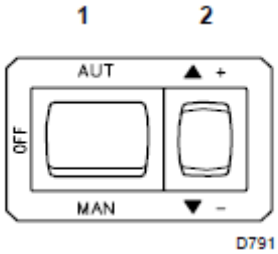


Figure D

d. The pump can be considered primed when the light oil starts coming out of screw #3 in Figure C (above) with no air bubbles. Stop the burner: switch #1 in Figure D (above) set to "OFF" and tighten screw #3 in Figure C (above). The time required for this operation depends upon the diameter and length of the suction tubing. If the pump fails to prime at the first starting of the burner and the burner locks out, wait approx. 15 seconds, reset the burner, as often as required. After 5 or 6 starting operations allow 2 or 3 minutes for the transformer to cool.

e. Assuming the tank is installed at ground level and piping is ½" line. If the length of the suction piping exceeds 40 meters, the supply line must be filled using a separate pump. If the tank is installed below or above grade refer to the Riello Manual in *Section 10: Supplier Catalogues, Volume 2 of 2*.

9. Physically prime the Waste Oil Burner located in the Secondary Chamber
   a. Refer to supplier manual *Clean Burn Waste Oil burner* in *Section 10: Supplier Catalogues, Volume 2 of 2.*

Curing Refractory

NOTE

A username and password is required to proceed with the following procedures. To obtain them you must contact Eco Waste Solutions directly at (905) 634-7022.

NOTE

This procedure is ALSO only to be performed the first time the system is ever used; it will only be required to be done once.

1. From the **Main Menu Screen**, select the ***Administrative Login*** button and then select the *Curing and Settings Menu* button.

2. From the **Curing & Settings Menu** select ***Curing Status*** button, push the following buttons to set up the curing for Primary and Secondary Chamber ***Push to enable Primary Curing*** and ***Push to enable Secondary Curing.***

3. From Main Control Panel turn the switch to Start.

4. The system will start the curing process which takes 24 – 30 hours.

.

5. If the curing cycle is interrupted turn the switch to START.

6. The cycle will restart from where it got interrupted.

7. To start the curing cycle from the beginning after an interruption, reset the cycle from the curing status screen.

NOTE

In the event of a power shut down to the system, the Main Control Panel must be re-started from the PanelView.

1. On the **Main Menu** of the Panel View, select the ***Administrative Login*** button, and then select the ***Push to Login*** button.

2. From this menu, then select ***Administrative Settings*** button. From this screen, select the ***PanelView Configuration*** button. The application will now shut down. (This will take 1-2 minutes).

3. There will be a GREY screen with a number of Touch Buttons.

4. Press the “RUN (F1)” button on this screen.

5. The application will now restart. (This will take approximately 1-2 minutes)

6. When it is up and running, the system is now ready for operation.

Operating the Integrated Weigh Scale

1. The operator has two options for managing the waste quantity prior to loading the Primary Chamber:

   Option 1: The operator may use a bin or skid (that is previously tared) to load waste onto the weigh scale.

   Option 2: The operator may load waste/garbage (in bags/boxes) on the weigh scale directly.

2. Regardless of the option selected above, once the waste is on the weigh scale the Operator has to push the RECORD WEIGHT (black button) on the Weigh Scale Push-Button Station. By pressing this button, the weight value of that particular load of waste is sent to the PLC and the weight is recorded. At this time, the MAXIMUM WEIGHT (green button) will flash green, once.

3. Then, the operator must take the waste and load it into the Primary Chamber.

4. The operator returns to the weigh scale with some more waste and repeats Steps One, Two and Three. This entire procedure is repeated until the maximum load weight is reached. The PLC will indicate this to the operator when the MAXIMUM WEIGHT (green light) comes on and remains on. This indicates that the maximum weight permitted, in this case, the incinerator is designed for a maximum of 1500 kg of waste material, has been reached.

NOTE

No more waste should be loaded into the Primary Chamber after the load has reached the maximum weight.

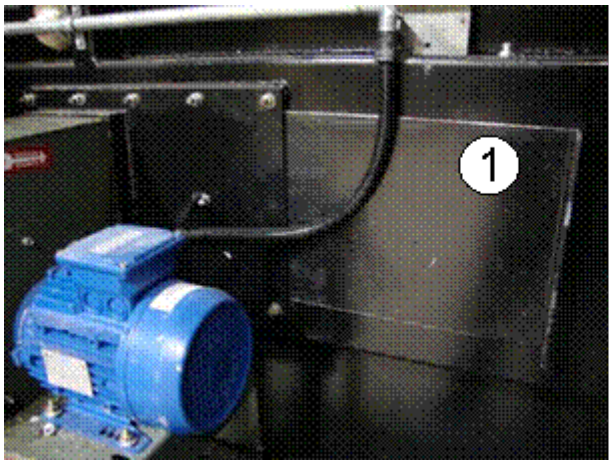
NOTE

If an automated weighing and recording system is not available, waste must be manually weighted and recorded.

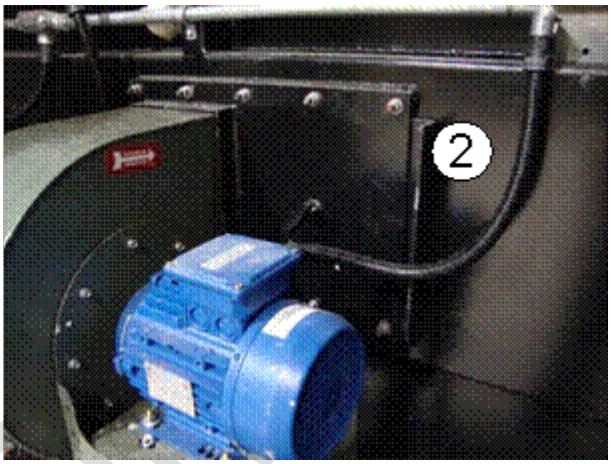
5. The Primary Chamber is loaded, and the incinerator is ready to start.

Incinerator Daily Start up

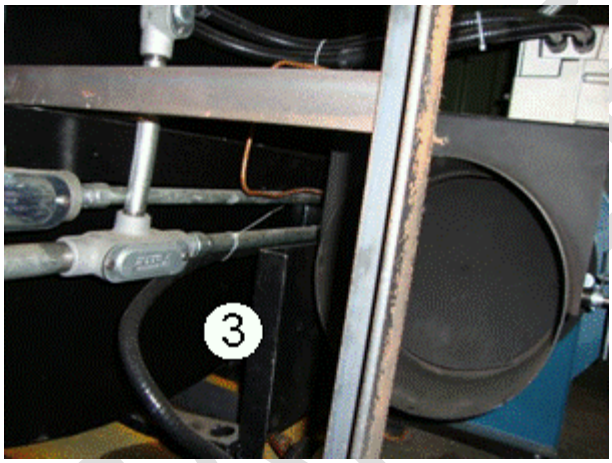
1. Ensure that manual slide gates for each blower are in the open position for free airflow into the **Primary and Secondary Chambers**.



1. **Primary Chamber Blower** Manual Slide Gate Open



2. **Primary Chamber Blower** Manual Slide Gate Closed



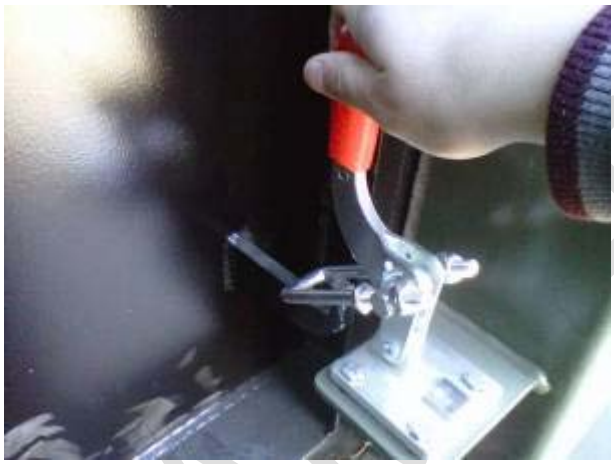
3. **Secondary Chamber Blower** Manual Slide Gate Open

2. Visually inspect the burner hoses to ensure that there are no fuel leaks. Check to see if lines are brittle or cracked, check for any oil spills near the burner, which would indicate a leak.

3. Ensure the draft gauge hose connection is tight and sealed. This is a clear flexible tubing located in the back upper corner of the **Primary Chamber** (see photo below).

Sample picture

4. Unlatch all eight clamps on the **Primary Chamber** door, open and secure in the open position



5. Ensure that the **Primary Chamber** has been cleaned out, and the **Primary Chamber** floor is cool (less than 90°C).

If the floor is hotter than this temperature the waste may spontaneously catch on fire during loading.

6. Begin loading the **Primary Chamber** with the waste material, using the Front Loading Door. Make sure that the waste is even without ridges.

NOTE

Do not deliberately throw the waste towards the sides of the Primary Chamber. Doing so will damage the ceramic blanket refractory.

NOTE

Load only the waste stream that the system has been designed for.

NOTE

Do not load the Primary Chamber above its rated capacity by weight.

NOTE

Do not load the Primary Chamber such that the Breech and Burner section is blocked in any way.

Breech Opening

Burner port

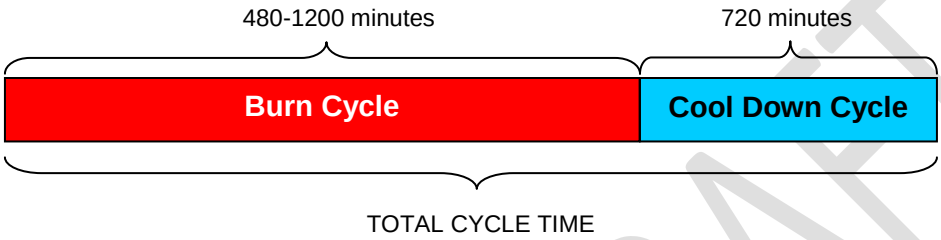
7. Close the **Primary Chamber** access door by clamping each latch until it is tight
8. Lock the **Primary Chamber** Front Loading Door and ensure all latches are properly engaged.
9. Proceed to the **Main Control Panel** on the **PanelView**

NOTE

The burn time will be set to the previous burn, if you wish to change the set time, proceed to the Primary Status screen and click on the BURN TIME button. The minimum number of minutes you can enter is 480 (8 hours). When you have finished, the time will be displayed in minutes beside the BURN TIME button

NOTE

The burn time value (in minutes) determines the length of the burn cycle before cool down cycle starts.



Hours	Minutes
8	480
8.5	510
9	540
9.5	570
10	600
10.5	630
11	660
11.5	690
12	720

Hours	Minutes
12.5	750
13	780
13.5	810
14	840
14.5	870
15	900
15.5	930
16	960
16.5	990

Hours	Minutes
17	1020
17.5	1050
18	1080
18.5	1110
19	1140
19.5	1170
20	1200

10. Check that the PRIMARY DOOR CLOSED LIGHT located on **Main Control Panel** is on.
11. Check that no alarms are displayed on the **PanelView.**
12. Check that the EMERGENCY STOP BUTTON is out.
13. Ensure that the switch for the waste selection is set for the desired waste processing. Either “SOLID WASTE” or “WASTE OIL” or “BOTH”

Selection	Waste Oil Burner Position
Solid Waste	Waste Oil Burner OUT
Waste Oil	Waste Oil Burner IN
Both	Waste Oil Burner IN

14. On the **Main Control Panel** turn the switch to "START". The following steps will automatically take place, controlled by the **Main Control Panel**:
    I. The **Primary Blower and Secondary Blower** will purge the system for 2 minutes.
    II. The **Secondary Burner** will purge for safety, and upon completion will ignite.
    III. Once the **Secondary Chamber** temperature reaches 1000°C, the **Primary Burner** will purge for safety and upon completion will ignite.
    IV. The burn time will start counting down when the temperature in the **Primary Chamber** reaches 427°C.

NOTE

The Main Control Panel System will maintain proper operating conditions and will provide continuous monitoring capability

After the burn cycle is completed the system will enter the cool-down cycle when the following things will occur:

- Primary Chamber & Secondary Chamber burners OFF
- Secondary Chamber Blower OFF
- Primary Modutrol 100% open
- Primary Blower ON

Once fully cooled and the temperature is below 90°C, proceed to the **Primary Chamber Clean Out Procedures** on the next page.

Primary Chamber Clean Out Procedures

Operators responsible for loading and cleaning out incinerators should wear appropriate protective equipment, including eye protection, dust masks, heavy gloves and safety shoes with puncture-proof toes and soles to avoid injury.

Although the ash from the system is considered sterile and will not contain microorganisms, it may contain a quantity of sharp objects, such as broken glass and other sharps which may not be fully destroyed in the burning process, and may thus still pose a hazard to persons who clean out the ash and residues. Also removing the ash does create dust particles in the air. Dust should not be inhaled. The operator must wear dust protection safety gear.

Please follow these steps when the cycle is complete:

1. When the internal temperature of the **Primary Chamber** has cooled to less than 90°C, lock out the power to the system on the **Main Control Panel** by moving the main disconnect to the “OFF” position.
2. Unlock all door latches on the access door to the **Primary Chamber.**
3. While standing in front of the **Primary Chamber** door, slowly open the door to allow clear entry. Secure **Primary Chamber** Door in the OPEN position.
4. Clean the **Primary Chamber** by using ash handling tool(s) and proper safety equipment (not provided).
5. Inspect the interior of the **Primary Chamber** for wear and inspect around the door seals to ensure the door will maintain a tight seal upon closure.
6. Check the air inlet holes and remove any obstructions if necessary.
7. Inspect the door seals to ensure there are no gaps between the door gasket and the door jamb.
8. Close the **Primary Chamber** access door by clamping each latch until it is tight.
9. Clean the inspection **View Port** (glass) with a mild soap and water. To clean the view port, unscrew it by hand and re-tighten by hand.

In Case of Emergency

1. Go to manual Slide Gates on the **Primary Chamber**, located just after the blower and close them all the way. This will help to put the fire in the **Primary Chamber** out.

2. Check alarms to see what the problem is.

3. Do not open the door of the **Primary Chamber** unless the temperature inside the chamber is below 90^{o}C.

4. Call a certified technician to fix the problem and/or consult with **Eco Waste Solutions Customer Service Department at 905.634.7022, toll free 1-866-326-2876.**

Start Up After Power Failure

1. Once the power is restored turn breaker (main disconnect) back on.
2. The Operator Interface and PLC will begin a boot up procedure.
3. Wait until the **PanelView** on the **Main Control Panel** has booted up before turning the control power to the panel back on by pressing the Control Power ON button.
4. When the power is restored to the **Main Control Panel**, the button should illuminate.
5. If the system was interrupted during a burn cycle, restart the system by turning the key switch to ON. If the system was interrupted during cool-down cycle, it will resume the cycle where it left off.

Dealing with Warning and Faults

Troubleshooting

The burn cycle will not start if one of the following conditions exists:

1. The system is in the “cool-down” part of the cycle. Wait until the “cool down” cycle is complete.

2. There is a fault in the system as indicated on the **PanelView**.

3. Loss of power due to any one or more of the following:

    - The main disconnect (see image) is off or there is no electrical power. Turn on the disconnect switch or check why there is no power.

Power is OFF in this position

Power is ON in this position

    - An open breaker. Check the breakers and replace any that are defective.

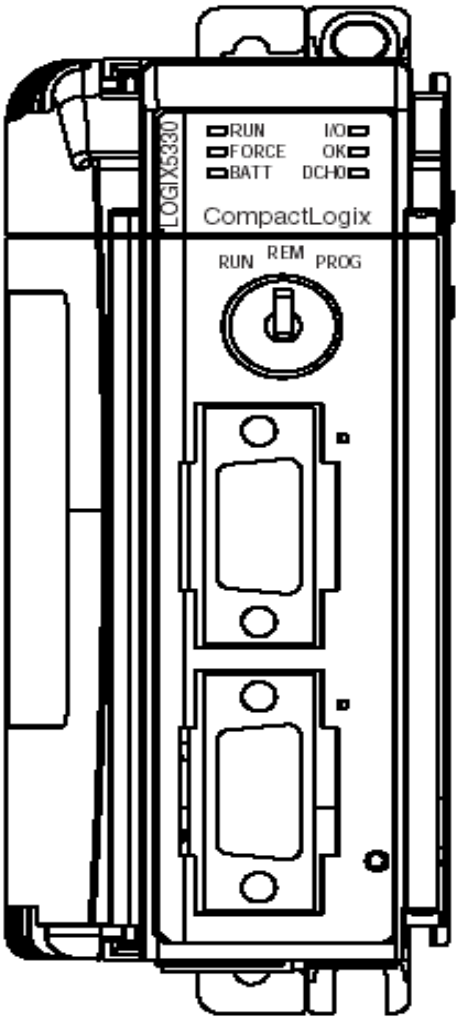
    - The EMERGENCY STOP is pushed in. Twist the EMERGENCY STOP button to unlock, and then push the CONTROL POWER ON button. The CONTROL POWER BUTTON should now be illuminated.

4. If on the “Top View” screen on the **PanelView** the **Primary Chamber** door is not closed, the door has not been shut properly. Adjust the limit switch lever arm if necessary. Check the limit switch and that the wiring is in working order.

5. If on the “Top View” screen on the **PanelView** the **Secondary Chamber** door is not closed, the door has not been shut properly. Adjust the limit switch lever arm, if necessary. Check the limit switch and that the wiring is in working order.

6. If fuel tank is low, system will not start. Tank on the **PanelView** will be red, indicating the level is low and needs to be filled.

PLC Processor Problem

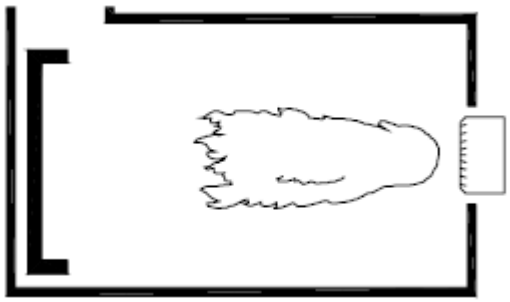
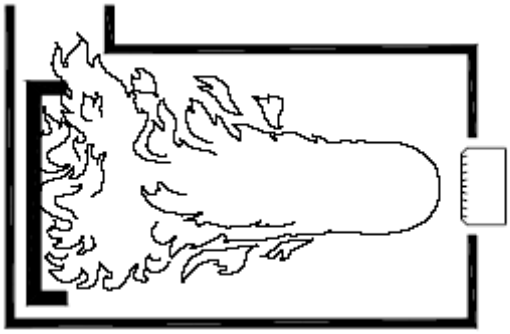
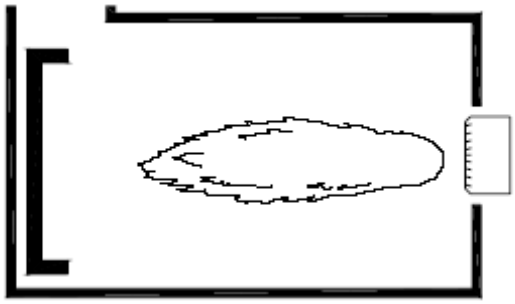


- Check the run light on the PLC processor. If it is on the PLC it is ready.
- "OK LIGHT" is green = Controller is OK.
- "OK LIGHT" is Red Flashing = this is a recoverable fault, check the PLC processor. This fault is very unlikely to occur.
- OK LIGHT is Red = this is a non-recoverable controller fault. Cycle Power. The OK LED should change to flashing red. If LED remains solid red, replace the PLC. This fault is very unlikely to occur.
- DCHO light is green = this indicates the PLC processor has lost the program. The PLC is equipped with a flash card that will automatically load the program back onto the PLC.

Possible Problems, Causes and Solutions

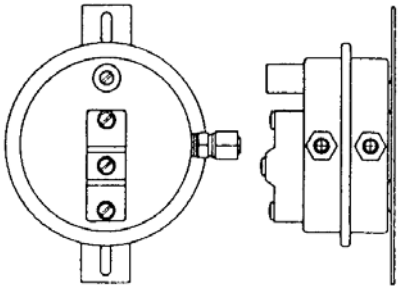
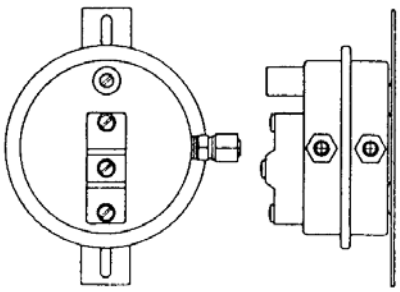
Problem	Causes	Solutions
Blower Fails to start	Over load tripped, blown fuse	Turn power off. Open Panel and reset overload. Check fuse and replace.
	Motor starters or contactor coil is burnt out	Locate contactor for Blower and visually observe if the contactor is pulled in. Use a volt meter to check for voltage across the coil If there is voltage across the coil and the contactor is not pulled in, replace the contactor.
Secondary Burner won't ignite	Bad Electrodes	Refer to Section 6 of this manual.
	Low Oil Pressure	Adjust pressure setting on burner pump. Refer to Riello Manual in Section 10.
	Fuel Line Leak	Visually inspect the lines for the leak. Tighten any fittings that are near the leak.
	Door Switch not making contact Burner alarm has been tripped	Make sure main door is closed and latched shut. Make sure limit switch is hitting striker plate.
	Bad Thermocouple	Replace thermocouple .
Primary Burner won't ignite	Bad Electrode	Refer to Section 6 of this manual.
	Low Oil Pressure	Adjust pressure setting on burner pump. Refer to Riello Manual in Section 10.
	Fuel Line Leak	Visually inspect the lines for the leak. Tighten any fittings that are near the leak.
	Door Switch not making contact or broken	Make sure main door is closed and latched shut. Make sure limit switch is hitting striker plate.
	Secondary temperature not at 1000°C	Wait until Secondary temperature is at 1000°C and try again.
	Burner main switch is turned off	Turn switch on.
	Burner alarm has been tripped	Acknowledge burn alarm and then hit the reset button on control panel.

Problem	Causes	Solutions
Persistent Black Smoke	Insufficient air supply to Secondary Chamber to completely consume emissions	Check to ensure combustion air blower/damper assembly is operating properly.
	Secondary Chamber is not hot enough.	Check that the Secondary temperature is operating at required temperature set point.
		Too much draft, open barometric damper.
	Overloading or loading highly volatile material	Decrease load size on next batch (confirm by weighing), ensure the waste mix is correct.
	Burner failure	Check burner operation – if no flame or a poor flame is visible through the flame view port adjust air/fuel ratio.
	Operation at too high a Primary Chamber temperature	Check/decrease primary chamber combustion air.
Smoke coming out of Primary	Too much air	Check dampers on primary blower.
	Too much volatile material loaded	Decrease load size on next batch (confirm by weighing), ensure the waste mix is correct.
	Primary Chamber temperature too high	Waste loaded may not be a good mix of heat value .
Too much fuel usage	Too much secondary combustion air	Check/reduce secondary combustion air.
	Too much air infiltration	Reduce air flow by adjusting the damper.
	Fuel leakage	Check fuel trains and burners for fuel leakage.
	Wet waste	Spread wet waste with other waste through several loads – do not charge all of the wet waste at one time.
	Excessive draft	Check/reduce draft – check door seals and other seals for leakage adjust damper.
	Burner setting too high	Check air/fuel mix.

Problem	Causes	Solutions
		Correct Maximum Flame Adjustment (Proper Oil and Air Pressure with correct supply of combustion air)
		Incorrect Flame Adjustment (Not enough Combustion Air)
		Incorrect Flame Adjustment (Air Pressure too high; too much air)
Incomplete burnout/poor ash quality	Build-up around air holes – clogged with ash from previous burn	Check around air holes and clean.
	Poor draft	Draft should be -0.2-0.06 KPa (or 0.8-0.25“ W.C).
	Too much wet waste – overloading system	Spread wet waste with other waste through several loads – do not charge all of the wet waste at one time.
	Insufficient burn time	Allow longer burn time period.
Waste Oil Burner		
System will not start when Solid is selected	Waste Oil burner is inserted into the back of the Secondary Chamber	Remove Waste Oil burner assembly from the Secondary Chamber.

Possible Alarms (Faults)

#	ALARM (System Fault)	SOLUTION
1	The Primary Chamber Top Thermocouple is faulted	Refer to Section 6 of this manual for corrective maintenance procedures.
2	The Secondary Chamber thermocouple is faulted	Refer to Section 6 of this manual for corrective maintenance procedures.
3	The Secondary Stack Thermocouple is faulted	Refer to Section 6 of this manual for corrective maintenance procedures.
4	The primary burner is faulted	The primary burner has failed to light when it received a signal telling it to start. To reset the burner, press the reset button located on the Burner. If this does not start the burner, refer to Supplier Catalogue (Riello Burner) Section 10 of this manual.
5	The secondary burner is faulted	The secondary burner has failed to light when it received a signal telling it to start. To reset the burner, press the reset button located on the Burner. If this does not start the burner refer to Supplier Catalogue (Riello Burner) Section 10 of this manual.

#	ALARM (System Fault)	SOLUTION
6	The system has shut down due to primary blower low air flow. 	Visually examine the primary blower for any obstructions that may be causing low air flow. Check slide gate located between Primary chamber and blower, ensure it is open. Check damper assembly, ensuring modutrol crank arm is still connected and that butterfly damper is open, allowing air flow. Air proving switch may be defective. Refer to Section 6 of this manual. There are two ports on the air flow switch marked V and P. Ensure the inlet tube is attached to the port marked “P” for pressure. V stands for vacuum. Ensure the “V” port is open to atmosphere and is not blocked. If no air restriction is observed (i.e. blockage in the tube) change the air proving switch. Refer to Section 6 of this manual.
7	The primary blower motor overload is tripped.	Turn power off on Control panel by turning the Main Disconnect to the OFF position. Reset overload.
8	The system has shut down due to secondary blower low air flow 	Visually examine the Secondary Blower for any obstructions that may be causing low air flow. . Check slide gate located between Secondary chamber and blower, ensure it is open. Check damper assembly, ensuring Modutrol crank arm is still connected and that butterfly damper is open, allowing air flow. Air flow switch may be defective. Refer to Section 6 of this manual. There are two ports on the air flow switch marked V and P. Ensure the inlet tube is attached to the port marked “P” for pressure. V stands for vacuum. Ensure the “V” port is open to atmosphere and is not blocked. If no air restriction is observed (i.e. blockage in the tube) change the air proving switch. Refer to Section 6 of this manual.

#	ALARM (System Fault)	SOLUTION
9	The Secondary blower variable frequency drive is faulted	Push fault reset button on the Panel view If fault persist check the error code on the variable frequency drive and check manual for troubleshooting alarm.
10	The burner fuel level is low.	Add fuel to the fuel tank and the alarm should reset itself. If alarm persists, replace the low level switch. Refer to Section 6 of this manual.
11	The waste oil burner is not out.	Check to see if the waste oil burner is pulled all the way out of the Secondary Chamber • Pull waste oil burner all the way out, ensuring it makes contact with the limit switch • If the waste oil burner is all the way out and making contact with the limit switch, replace the limit switch. Refer to Section 6 of this manual.
12	The waste oil burner is not in	Check to see if waste oil burner is all the way in. Push waste oil burner all the way in ensuring it makes contact with the limit switch. Replace limit switch.
13	The waste oil burner is faulted.	The waste oil tank is empty, fill tank. Check that the instrument air is going to the burner check the air pressure gauge on the burner and adjust regulator if necessary. Check that the fuel pump is in working condition. Check that the waste oil breaker is not tripped.

Record Keeping

Using Historical Charts

1. Go to the **Main Menu** screen of the **PanelView Operator Interface.**
2. Select the historical chart you want to view (for example, Temperature History)
3. Once the desired chart appears the “buttons” on the bottom left and right of the screen can be used to scroll through to previous days’ information by selecting them.
4. Once the desired date is selected the graph will be on the screen indicating the time and specific data trends (eg. Temperature, time remaining) of the burn.
5. The historical incinerator data is to be saved on a weekly basis to a USB key located on the front of the Main Control Panel (below the operator interface)
6. The USB key can be inserted into the USB drive slot and the data will automatically be copied to it. The key can then be removed and taken to a computer in order to store the incinerator data.

Storing Incinerator Data

1. The **PanelView** only stores a limited number of data, and then it will start to overwrite these records. **We recommend that the incinerator data be downloaded on a weekly basis onto the USB Key.** This data must be then transferred to a computer immediately for storage and printing purposes. The same USB key will be used to download the next set of incinerator data and so on.

2. Inserting the USB key into a computer will allow the operator to access the file (containing the incinerator data).

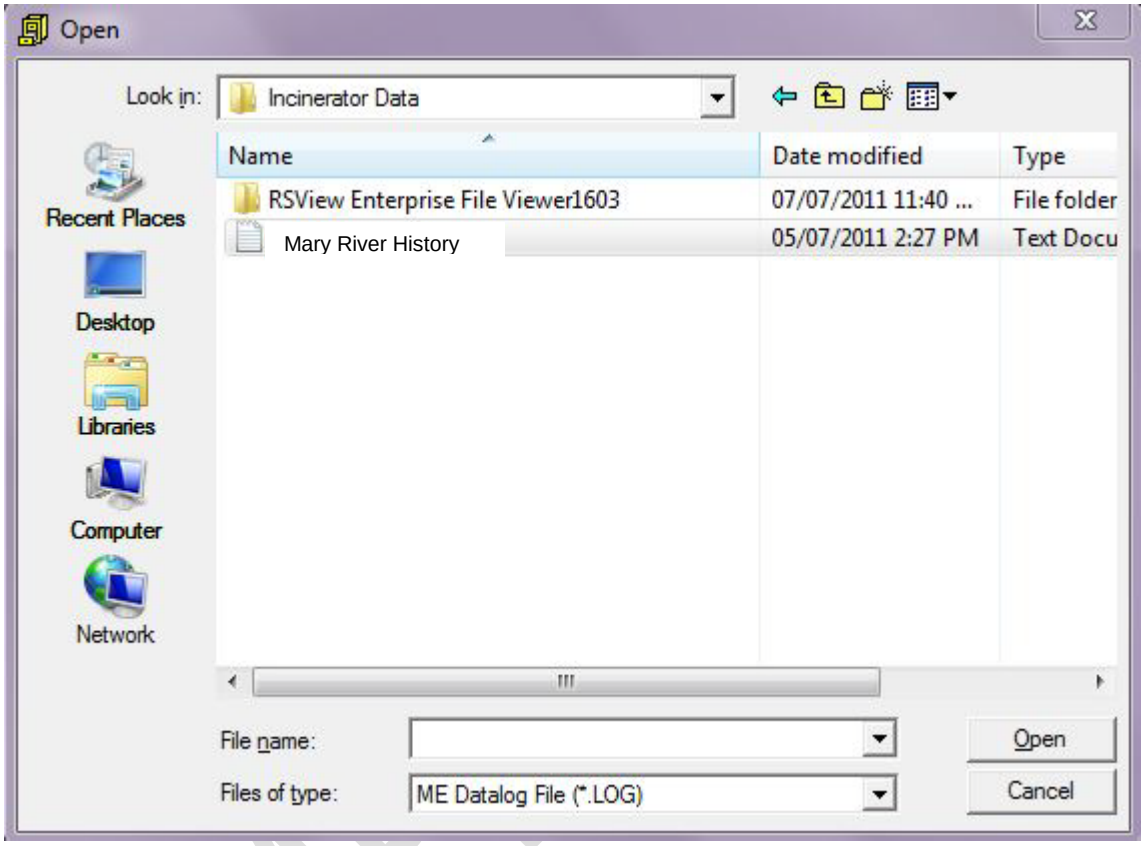
3. It is recommended that a dedicated folder be setup on the destination computer that is used for storing incinerator data.

4. Again, on a weekly basis, copy the data file from the USB Key to this directory and name the file with the date to easily access previous week’s information.

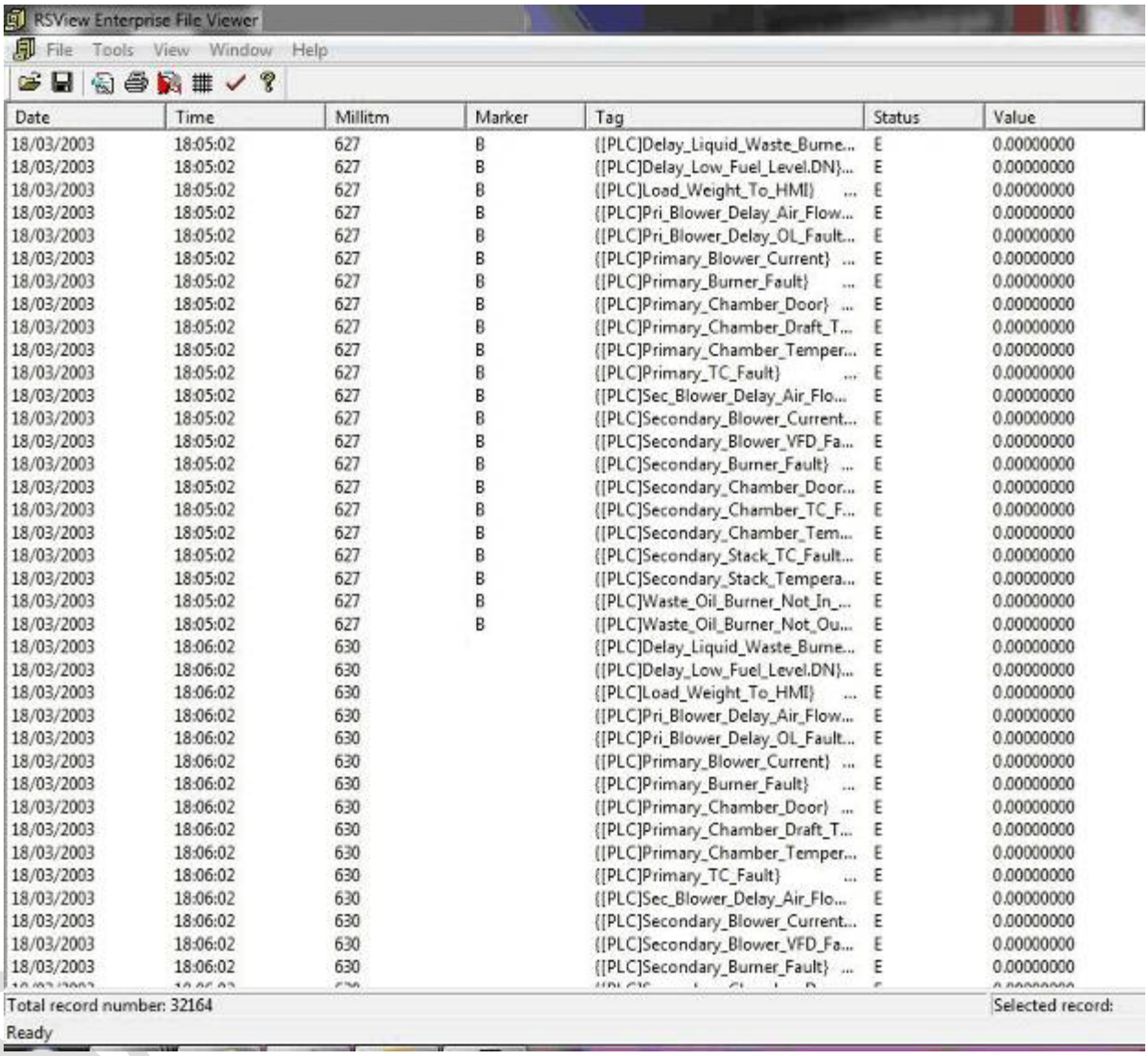
Accessing Historical Information

1. **NOTE The USB Key contains a file called “RSView Enterprise Viewer.EXE”. Copy this file to the destination folder created in “Storing Incinerator Data” above**.
2. To open previous week’s data, double click on the RSView Enterprise Viewer application. From the File menu select Open. Make sure you are searching in the folder containing the historical incinerator data files (as setup in Storing Incinerator Data instructions above).

3. In the Open dialogue box, in the File of type choose **ME Datalog File (*.LOG)** to view all files. Click on the specific Text Document that you wish to open



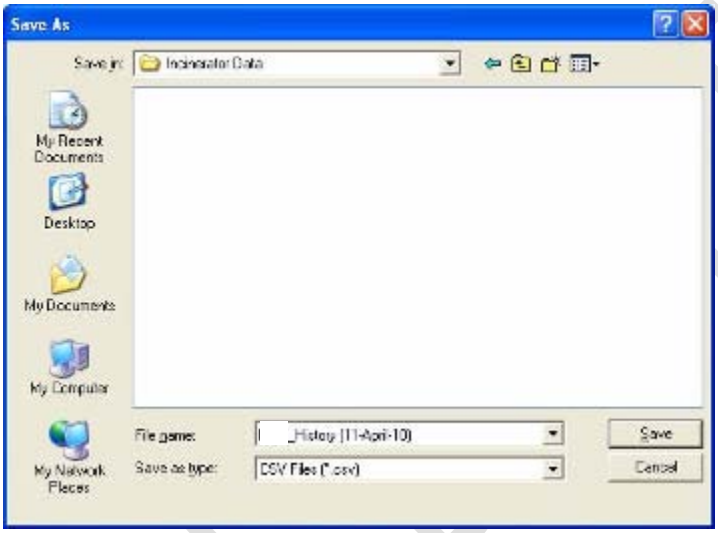
4. Once the data is open, it will look like the following:



Date	Time	Millitm	Marker	Tag	Status	Value
18/03/2003	18:05:02	627	B	{[PLC]Delay_Liquid_Waste_Burne...	E	0.00000000
18/03/2003	18:05:02	627	B	{[PLC]Delay_Low_Fuel_Level.DN}...	E	0.00000000
18/03/2003	18:05:02	627	B	{[PLC]Load_Weight_To_HMI} ...	E	0.00000000
18/03/2003	18:05:02	627	B	{[PLC]Pri_Blower_Delay_Air_Flow...	E	0.00000000
18/03/2003	18:05:02	627	B	{[PLC]Pri_Blower_Delay_OL_Fault...	E	0.00000000
18/03/2003	18:05:02	627	B	{[PLC]Primary_Blower_Current} ...	E	0.00000000
18/03/2003	18:05:02	627	B	{[PLC]Primary_Burner_Fault} ...	E	0.00000000
18/03/2003	18:05:02	627	B	{[PLC]Primary_Chamber_Door} ...	E	0.00000000
18/03/2003	18:05:02	627	B	{[PLC]Primary_Chamber_Draft_T...	E	0.00000000
18/03/2003	18:05:02	627	B	{[PLC]Primary_Chamber_Temper...	E	0.00000000
18/03/2003	18:05:02	627	B	{[PLC]Primary_TC_Fault} ...	E	0.00000000
18/03/2003	18:05:02	627	B	{[PLC]Sec_Blower_Delay_Air_Flo...	E	0.00000000
18/03/2003	18:05:02	627	B	{[PLC]Secondary_Blower_Current...	E	0.00000000
18/03/2003	18:05:02	627	B	{[PLC]Secondary_Blower_VFD_Fa...	E	0.00000000
18/03/2003	18:05:02	627	B	{[PLC]Secondary_Burner_Fault} ...	E	0.00000000
18/03/2003	18:05:02	627	B	{[PLC]Secondary_Chamber_Door...	E	0.00000000
18/03/2003	18:05:02	627	B	{[PLC]Secondary_Chamber_TC_F...	E	0.00000000
18/03/2003	18:05:02	627	B	{[PLC]Secondary_Chamber_Tem...	E	0.00000000
18/03/2003	18:05:02	627	B	{[PLC]Secondary_Stack_TC_Fault...	E	0.00000000
18/03/2003	18:05:02	627	B	{[PLC]Secondary_Stack_Tempera...	E	0.00000000
18/03/2003	18:05:02	627	B	{[PLC]Waste_Oil_Burner_Not_In_...	E	0.00000000
18/03/2003	18:05:02	627	B	{[PLC]Waste_Oil_Burner_Not_Ou...	E	0.00000000
18/03/2003	18:06:02	630		{[PLC]Delay_Liquid_Waste_Burne...	E	0.00000000
18/03/2003	18:06:02	630		{[PLC]Delay_Low_Fuel_Level.DN}...	E	0.00000000
18/03/2003	18:06:02	630		{[PLC]Load_Weight_To_HMI} ...	E	0.00000000
18/03/2003	18:06:02	630		{[PLC]Pri_Blower_Delay_Air_Flow...	E	0.00000000
18/03/2003	18:06:02	630		{[PLC]Pri_Blower_Delay_OL_Fault...	E	0.00000000
18/03/2003	18:06:02	630		{[PLC]Primary_Blower_Current} ...	E	0.00000000
18/03/2003	18:06:02	630		{[PLC]Primary_Burner_Fault} ...	E	0.00000000
18/03/2003	18:06:02	630		{[PLC]Primary_Chamber_Door} ...	E	0.00000000
18/03/2003	18:06:02	630		{[PLC]Primary_Chamber_Draft_T...	E	0.00000000
18/03/2003	18:06:02	630		{[PLC]Primary_Chamber_Temper...	E	0.00000000
18/03/2003	18:06:02	630		{[PLC]Primary_TC_Fault} ...	E	0.00000000
18/03/2003	18:06:02	630		{[PLC]Sec_Blower_Delay_Air_Flo...	E	0.00000000
18/03/2003	18:06:02	630		{[PLC]Secondary_Blower_Current...	E	0.00000000
18/03/2003	18:06:02	630		{[PLC]Secondary_Blower_VFD_Fa...	E	0.00000000
18/03/2003	18:06:02	630		{[PLC]Secondary_Burner_Fault} ...	E	0.00000000

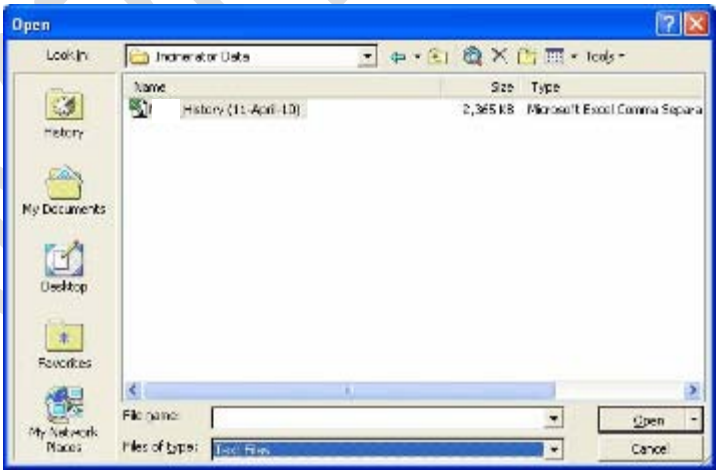
Saving Data to Excel

1. To save the data in a Microsoft Excel format – with the data open (as above) from the File menu select Save As and select the directory where you wish to save the file. Make sure you have a logical name in the File Name field (it will default to the same file name as the TXT file you have opened). Make sure CSV is selected in the "Save as Type" drop down box and select the Save button.



Sample pop up window

2. To view the file in Microsoft Excel, open the Excel application and from the File menu, select Open and then make sure that "Files of Type" is on "Text Files"



Sample pop up window

3. Choose the file you wish to open and select "Open" from the dialogue box. The file is now open in Excel.

ECO WASTE SOLUTIONS

Mary River Project

#H377697-PM406

SECTION 6

MAINTENANCE INSTRUCTIONS

ECO 2TN 1P

Corporate Office:

Eco Waste Solutions

5195 Harvester Road, Unit 14

Burlington, ON, Canada L7L 6E9

Tel: 905-634-7022 Fax: 905-634-0831

Email: info@ecosolutions.com

Web: www.ecosolutions.com

6.1 Zero Mechanical State & Lock Out Procedures

Proper maintenance of the equipment is essential to ensure long term, reliable operation of the EWS model Incinerator.

NOTE The warranty will become void if proper maintenance is not performed as instructed.

6.1.1 Safety

During maintenance of the EWS mobile incinerator, it is very important to be aware of special hazards. Two safety programs are described in the following sections:

1. Zero Mechanical State
2. Power Lock Out Procedures

Failure to comply with these instructions during maintenance could result in injury or death. The responsibility for implementation of a comprehensive safety program rests with the operating staff and supervision. The safety procedures in this *Manual* should be considered only as a starting point for the safety program at site.

ACCIDENTS CAN BE PREVENTED A CAREFUL WORKER IS THE BEST SAFETY DEVICE

6.1.2 Zero Mechanical State

Zero Mechanical State (ZMS) exists when the possibility of an unexpected mechanical movement has been eliminated. During maintenance, it is absolutely mandatory to totally deactivate the incinerator so that there is no possibility of an unexpected machine movement. Power lock-out, described in the next section, is commonly used for this purpose. Most machines are powered by electrical, hydraulic or pneumatic drives. Energy may be stored in a shutdown machine in various ways: Air pressure in a cylinder, hydraulic pressure fluid stored in pressurized hoses, or machine members whose weight can generate fluid pressure. Therefore, just cutting off the electrical power may not be enough to neutralize all power sources. Certain maintenance procedures at site should require ZMS condition as a matter of course.

6.1.3 Zero Mechanical State (ZMS) Checklist:

1. Every electrical power source to the incinerator must be cut off and locked out (to prevent others who may not be aware of maintenance work from turning the power back on inadvertently).
2. Ensure that the mechanical potential energy of the incinerator is at its lowest practical value so that opening of pipe, tubing, hose or actuation of any valve will not produce an unexpected movement that could cause injury.

3. Check that there is no pressurized fluid (air, oil, gas or other) trapped in the incinerator lines, cylinders or other components. This will ensure that there will be no incinerator motion when a valve is actuated.

4. Secure loose or freely moving parts so that there is no possibility of accidental movement.

6.1.4 Power Lock Out Procedures

Unexpected operation of electrical equipment started by automatic or manual remote control may cause injuries to persons who happen to be nearby. For this reason, when repair work is to be done on motors or other electrical equipment the circuit should be opened at the switch box and the switch pad locked in the OFF position. Tag the switch with a lock out tag indicating who must be contacted before the power is turned back on again.

BECAUSE OF THE SEVERE CONSEQUENCES, INCLUDING DEATH, OF NOT PROPERLY LOCKING OUT ELECTRICITY SUPPLIES DURING MAINTENANCE, THE SUPERVISOR SHOULD ENSURE THAT THERE IS ONLY 1 KEY FOR THE LOCK USED TO LOCK OUT THE POWER SUPPLY.

For identification, locks may be color coded to indicate different crews or shifts.

The Supervisor should maintain the master key and list of key numbers, and should keep an extra key to each lock for his department. The master key should not be loaned out under any circumstances.

No matter what method is used to lock out power to electricity, strict discipline and constant supervision should be employed during any equipment maintenance work.

6.1.5 Power Lock Out Checklist

1. Alert the operator of the equipment.

2. Before starting the work on an engine or motor, line shaft or other power transmission equipment or power-driven machine, make sure it can not be set in motion without your knowledge.

3. Place your own padlock on the control switch, lever, or valve, even if someone has locked the control panel before you. You will not be protected unless you put your own padlock on it. (Another maintenance person could remove their lock and then someone else could start the equipment if they were not aware of maintenance work being done.)

When finished working at the end of your shift remove your own padlock. Never permit someone else to remove it for you. Be sure you are not exposing someone else to danger by removing your padlock

6.2 Instruction Classification

Each component is associated with an identification number, see table below:

System Component	Identification number
Primary Blower	01-001
Secondary Blower	02-001
Primary Burner	01-002
Secondary Burner	02-002
Refractory	05-001
Waste Oil Burner	02-003
Air Compressor	03-001
Thermocouple	05-002
Main Control Panel	03-010
Paint	05-003
Electrical	05-004
Limit Switch	05-005

To differentiate if the instruction is weekly, monthly, quarterly or yearly, the above identification number will be followed by a letter:

Daily:	D
Weekly:	W
Monthly:	M
Quarterly:	Q
Yearly:	Y

For example**, 01-001.Q.01** Primary blower assembly quarterly instruction number 1.

6.2.1 Daily Instructions

Primary & Secondary Chamber Burners: (01-002.D & 02-002.D)

Do not store flammable or hazardous materials in the vicinity of fuel burning appliances.

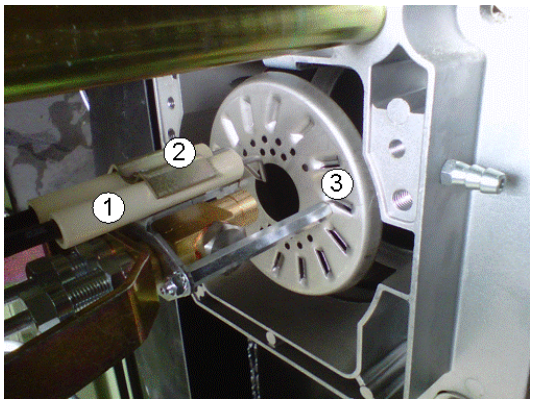
Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or death.

Burner shall be installed and maintained in accordance with manufacturer's requirements as outlined in the Burner manual, local codes and authorities having jurisdiction.

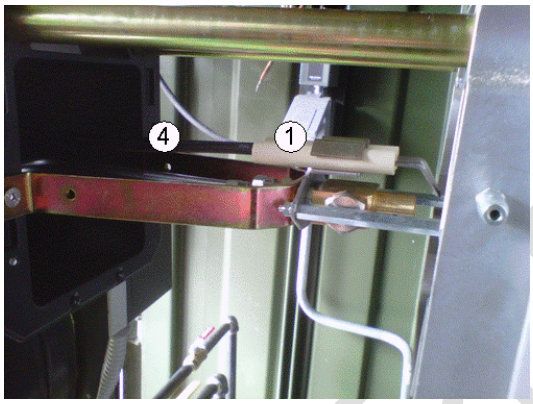
INSTRUCTION 01/02-002.D.01: INSPECTING AND CLEANING ELECTRODES

1. Remove the cover from the Burners as described in 01-002.W.01 and 02-002.W.01.

2. Inspect the electrodes (PN: 3003796) for any soot build-up.



1. Electrode
2. U-bolt
3. Diffuser Disc

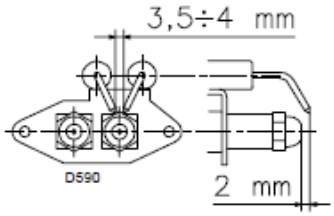


4. HT Leads

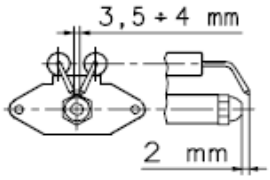
3. Clean/wipe down the ignition electrode with a cloth should there be a build-up of soot.

NOTA Do not use sand paper as this will increase the deposit of future soot.

4. If electrodes are damaged remove the screws and u-bolt (see above photo) and install new electrodes. When reinstalling the electrodes make sure that they are positioned as shown below.



Primary Burner



Secondary Burner

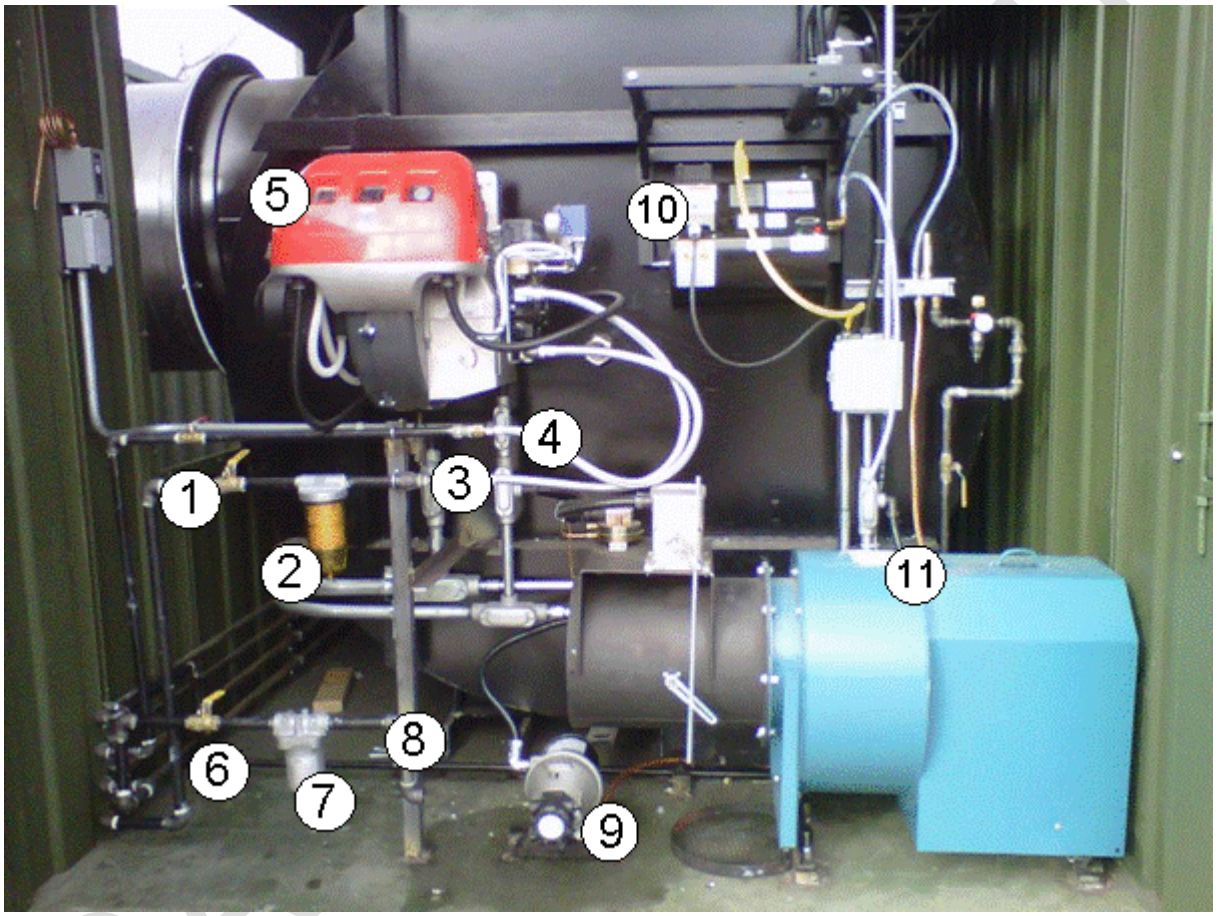
Check the High Temperature (HT) Leads (PN: 3012393) for any heat damage. If HT Leads are severely damaged (ie, you can see the wire beneath the sheathing) then replace. (See *CMI 6.3.3/01-002A & 6.3.3/02-002A)*

INSTRUCTION 01/02-002.D.02: INSPECTING THE FUEL LINES

1. Visually inspect all fuel lines to the Primary and Secondary Burner as well as to the Waste Oil burner for any leaks.

2. The Primary and Secondary Burner have two oil lines, one feed and one return. The Waste Oil Burner only has one feed line.

3. If any leaks are observed tighten or replace the fitting where the leak is occurring



1. Fuel In Ball Valve
2. Fuel Filter
3. Fuel Line In
4. Fuel Line Out
5. Secondary Burner
6. Waste Oil Ball valve
7. Waste Oil Filter
8. Waste Oil Line In
9. Waste Oil J-pump
10. Waste Oil Burner
11. Secondary Blower

INSTRUCTION 01/02-002.D.03: INSPECT AND CLEAN BURNER NOZZLES

Primary Burner:

1. Remove the burner cover as outlined in 01/02-002.W.01 REMOVAL OF BURNER COVERS
2. Remove the centre retaining bolt.
3. Slide burner out.
4. Check nozzle. If there is carbon remove the nozzle and clean.
5. Reinstall or replace if necessary (PN: C5222433)

Secondary Burner:

1. Remove the burner cover as outlined in 01/02-002.W.01 REMOVAL OF BURNER COVERS
2. Remove the 4 retaining bolt on either side of the burner.
3. Slide burner out.
4. Check nozzle. If there is carbon remove the nozzle and clean.
5. Reinstall or replace if necessary (PN: C5220102)

Refractory: (05-001.D)

When working with the refractory make sure you use the proper tools; wear goggles, approved dust mask and gloves

INSTRUCTION 05-001.D.01: INSPECTING THE REFRACTORY

Ensure power is locked out.

Please follow all instructions outlined in *Section 6.1 Zero Mechanical State & Lock Out Instructions.*

1. Open Primary Chamber door by unlatching all four clamps.
2. Tie-off door to open position to ensure that it will not close unintentionally.
3. Enter Primary Chamber and check the refractory for shrinkage, any gap between the modules greater than 2.5 cm should be patched with the blanket refractory
4. Check for any exposed metal between the modules, if metal is exposed make sure to patch area with blanket material (PN: 1" x 24" 8# 2600) or new module (PN: 6" Mod ZR) (*CMI 6.3.2/05-001A & 6.3.2/05-001B)*

6.2.2 Weekly Instructions

Primary & Secondary Chamber Blowers: (01-001.W & 02-001.W)

Do not attempt any maintenance on a fan unless the electrical supply has been completely disconnected and locked.

Please follow all instructions outlined in *Section 6.1 Zero Mechanical State & Lock Out Instructions.*

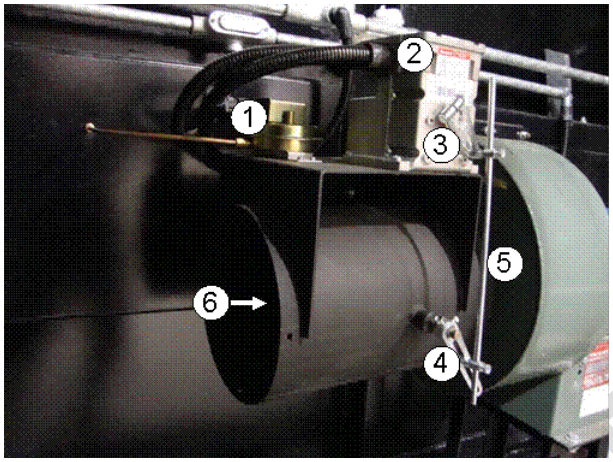
A fan can windmill despite removal of all electrical power therefore, take extra care when working with fans in the system.

The rotating assembly should be blocked securely before attempting maintenance of any kind.

INSTRUCTION 01/02-001.W.01: DAMPER CRANK ARM

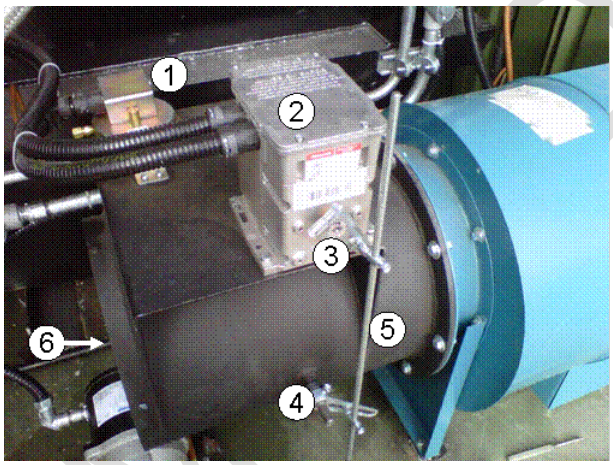
Check to see that the damper crank arm is connected to the damper and the rod.

Ensure mechanical linkage on damper is tight, if loose tighten with wrench.



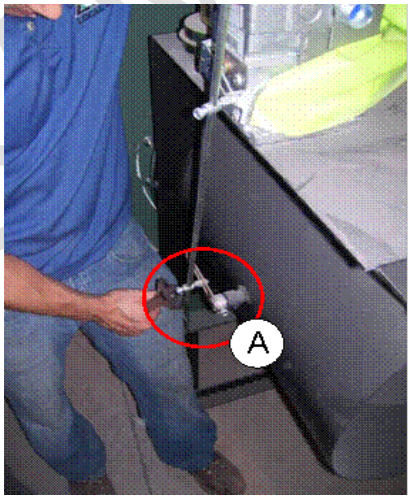
PRIMARY BLOWER

1. Air Proving Switch
2. Modutrol Motor
3. Motor Crank Arm
4. Damper Crank Arm
5. Rod
6. Damper



SECONDARY BLOWER

1. Air Proving Switch
2. Modutrol Motor
3. Motor Crank Arm
4. Damper Crank Arm
5. Rod
6. Damper



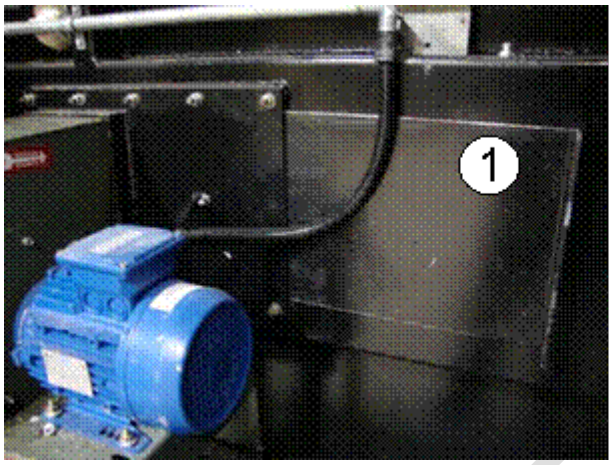
A. Damper Crank arm and connection to Damper and Rod

INSTRUCTION 01/02-001.W.02: SLIDE GATES

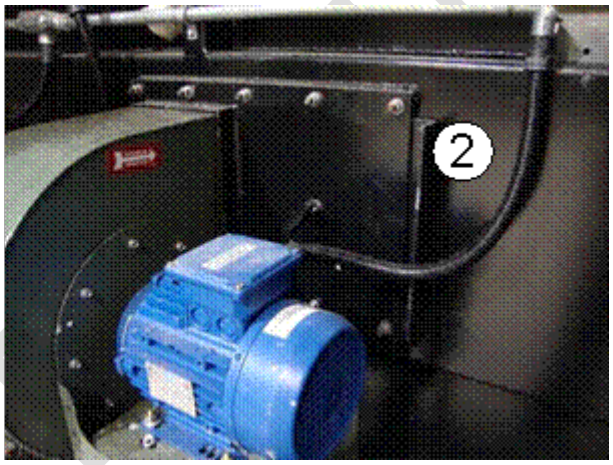
Check to see if slide gates move freely.

1. Move slide gate in and out to ensure free movement. If sticking, use lubricant to loosen. Lubricant should be rated for a high temperature (>150°F) application.

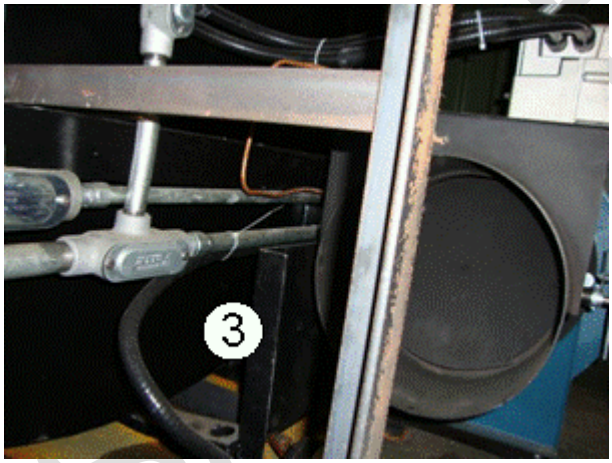
2. Gates must be opened to allow under fire air to enter the chamber. They should only be closed to reduce air in abnormal operating conditions.



1. Primary Chamber Slide Gate Open



2. Primary Chamber Slide Gate Closed



3. Secondary Chamber Slide gate Open

Primary & Secondary Chamber Burners: (01-002.W & 02-002.W)

Do not store flammable or hazardous materials in the vicinity of fuel burning appliances.

Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or death.

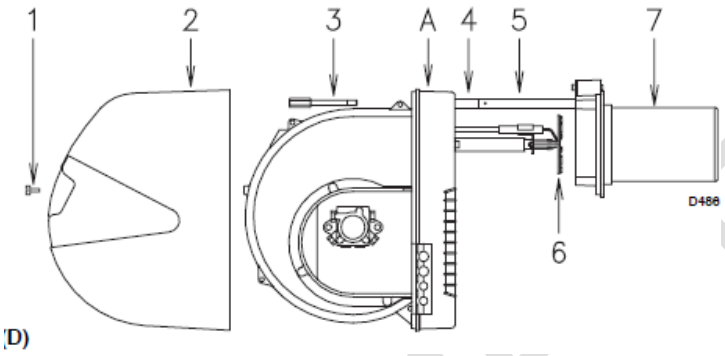
Burner shall be installed and maintained in accordance with manufacturer's requirements as outlined in the Burner manual, local codes and authorities having jurisdiction.

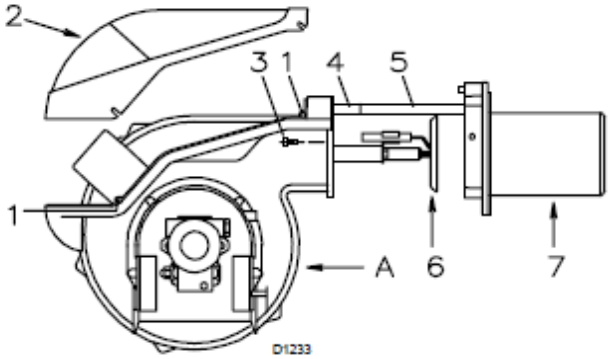
INSTRUCTION 01/02-002.W.01: REMOVAL OF BURNER COVERS

Switch off the electrical power. Please follow all instructions outlined in *Section 6.1 Zero Mechanical State & Lock Out Instructions.* Cover must be removed to perform maintenance on burners.

To remove the cover and to pull out the Primary or Secondary Burner, follow instructions below:

1. Loosen screw (Item #1, in the following diagrams) and withdraw the cover (Item #2, in the following diagrams)
2. Primary Burner has, one screw to remove the cover. The Secondary Burner has four screws to remove the cover.
3. Remove bolt (Item #3) for the Primary Burner, or screws (Item #3) for the Secondary Burner.
4. Pull (Part A) backwards keeping it slightly raised to avoid damaging the diffuser disk (Item #6).





Primary Burner has 1 screw

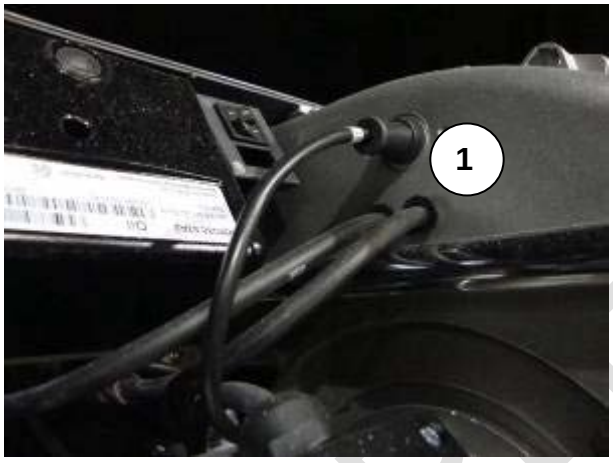
Primary

Secondary Burner has 4 screws (2 on each side)

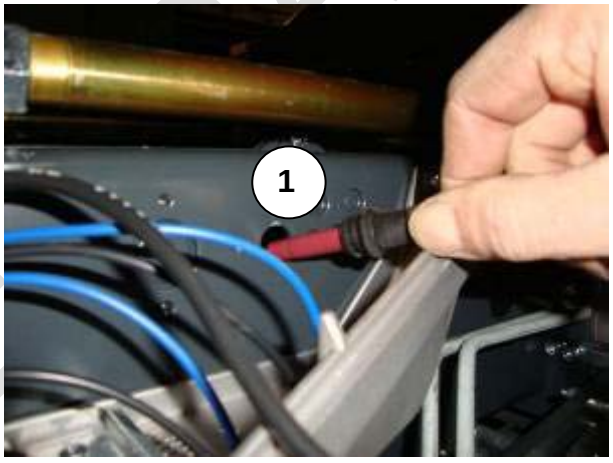
Secondary

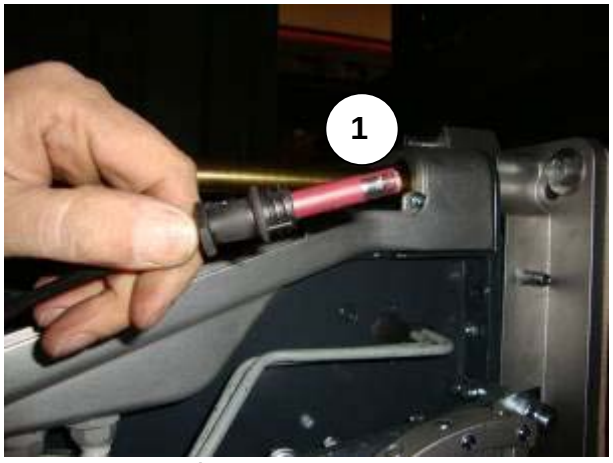
INSTRUCTION 01/02-002.W.02: CLEANING THE PHOTO ELECTRIC CELL

1. Remove the cover from the Burners as described in Instruction 01/02-002.W.01.
2. Clean Photo Electric (P.E) cell with a wet cloth (Primary Burner PN: 3006216) and the Photo Electric (P.E) (Secondary Burner PN: 3006216) with a cloth.
3. P.E. cell (Item #1) can be removed by pulling it outward forcefully. Ensure you take note of the position of the eye while removing, this will help when reinstalling.
4. Once cleaned insert P.E. cell back into position ensuring the eye is not facing directly into the chamber (where the flame will be) but on the same angle as before it was removed.
5. Replace burner cover.



Primary Burner PE Cell

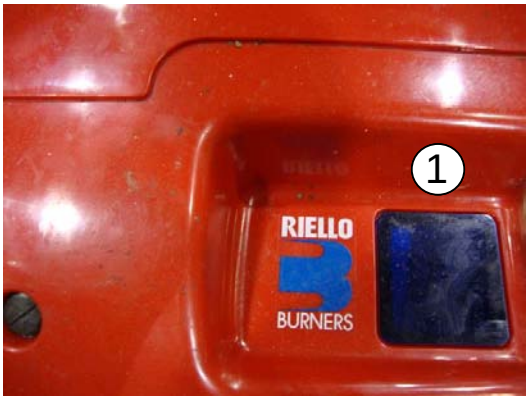




Secondary Burner UV Detector

INSTRUCTION 01/02-002.W.03: CLEANING THE INSPECTION WINDOWS

Clean the inspection windows with a wet cloth.



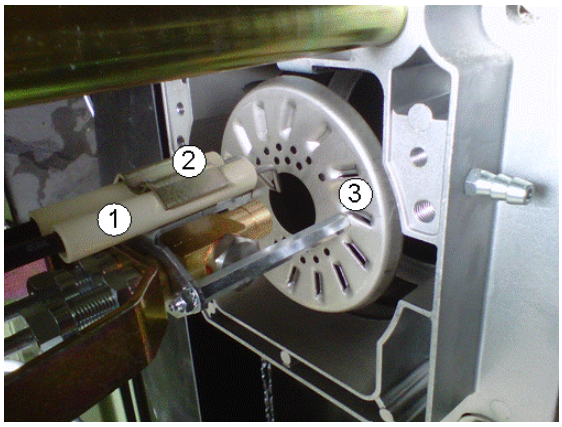
1. Primary Burner Inspection Window
2. Secondary Burner Inspection Window

INSTRUCTION 01/02-002.W.04: INSPECTING THE DIFFUSER DISC ASSEMBLY

1. Remove the cover from the Burners as described in 01/02-002.W.01.

2. Check the diffuser disc assembly (Primary Burner PN: 3003791) and the diffuser disc (Secondary Burner PN: 3012463) for any heat damage

3. If any heat damage, deformation or excess rust is noted, replace. (*CMI 6.3.8/03-009K)*



1. Electrode
2. U-bolt
3. Diffuser Disc

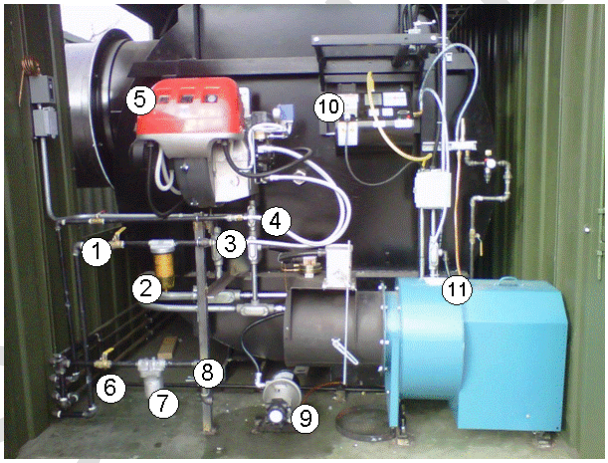
Waste Oil Burner: (02-003.W)

Failure to maintain and/or improper servicing by unqualified personnel will adversely affect the efficient and safe operation of your burner, will reduce the service life and will void your warranty

INSTRUCTION 02-003.W.01: INSPECTING & CLEANING WASTE OIL FILTER

To clean the waste oil filter Item #7, please follow instructions below:

1. Close the ball valve Item #6 adjacent to the filter
2. Position a container under the filter
3. Unscrew the four bolts to drain the oil from the canister
4. Remove the canister bowl
5. Clean the screen and the bowl in a parts washer
6. Examine the filter components as you reassemble them
7. Ensure that the canister filter is 100% airtight by firmly tightening the four bolts
8. Open the ball valve item #6



1. Fuel In Ball Valve
2. Location of Fuel Filter
3. Fuel Line In
4. Fuel Line Out
5. Secondary Burner
6. Waste Oil Ball valve
7. Waste Oil Filter
8. Waste Oil Line In
9. Waste Oil J-pump
10. Waste Oil Burner
11. Secondary Blower

Air Compressor: (03-001.W)

INTAKE AIR. Can contain carbon monoxide or other contaminants. Will cause serious injury or death. This air compressor is not designed, intended or approved for breathing air. Compressed air should not be used for breathing air application.

HAZARDOUS VOLTAGE. Can cause serious injury or death. Disconnect power and bleed pressure from the tank before servicing.

MOVING PARTS. Can cause serious injury. Do not operate with guards removed. Machine may start automatically. Disconnect power before servicing.

HOT SURFACES. Can cause serious injury. Do not touch. Allow to cool before servicing. Do not Touch hot compressor or tubing.

HIGH PRESSURE AIR. Bypassing, modifying or removing safety/relief valves can cause serious injury or death. Do not bypass, modify or remove safety/relief valves. Do not direct the air stream at body. Rusted tanks can cause explosion and severe injury or death. Drain tank before each use. Drain valve located at bottom of tank.

RISK OF BURSTING. Use only suitable air handling parts acceptable for pressure of not less than the maximum allowable working pressure of the machine.

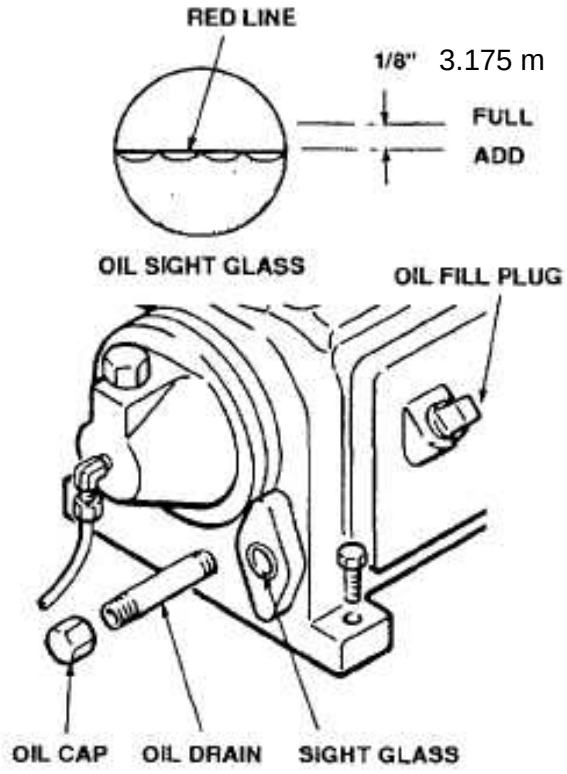
Before maintenance is performed on electrical or rotating equipment make sure that the appropriate electrical disconnects are locked out/tagged out. Before removing the vessel access ports make sure that the equipment is off and cool. If the container of caustic solution (customer supplied) or any associated equipment (pumps, hoses, etc.) needs to be moved to access the components in the Scrubber, make sure the handling precautions that are outlined on the MSDS sheet for the caustic solution (customer supplied) are followed.

INSTRUCTION 03-001.W.01: INSPECTING OIL LEVEL IN AIR COMPRESSOR

1. Check and maintain oil level at centerline of sight glass and add oil as necessary.
2. Compressor Oil PN: V0421-2
3. The oil level should reach 3.175 mm (1/8”) above the red line, on the sight glass. See diagram below.
4. If the oil level is below the red line, remove the oil fill plug and add oil until the sight glass shows the correct level.

NOTA

Too much or too little oil will harm the compressor.



INSTRUCTION 03-001.W.02: INSPECTING AIR FILTERS IN AIR COMPRESSOR

1. Remove the filter cover.
2. Gently grab filter element and remove.
3. Visually inspect filter for damage or dirt.
4. If damaged, replace the filter. If dirty, blow out the filter with compressed air.
5. Reinstall the filter and the cover.

INSTRUCTION 03-001.W.03: CLEANING AIR COMPRESSOR & CHECKING SAFETY VALVE

Cleaning

A dirty compressor will cause abnormally high temperature and result in oil carbonization on valve components.

Clean all external parts of the compressor with compressed air. Concentrate the cleaning on the external fins where dirt can accumulate as cooling air is forced across them.

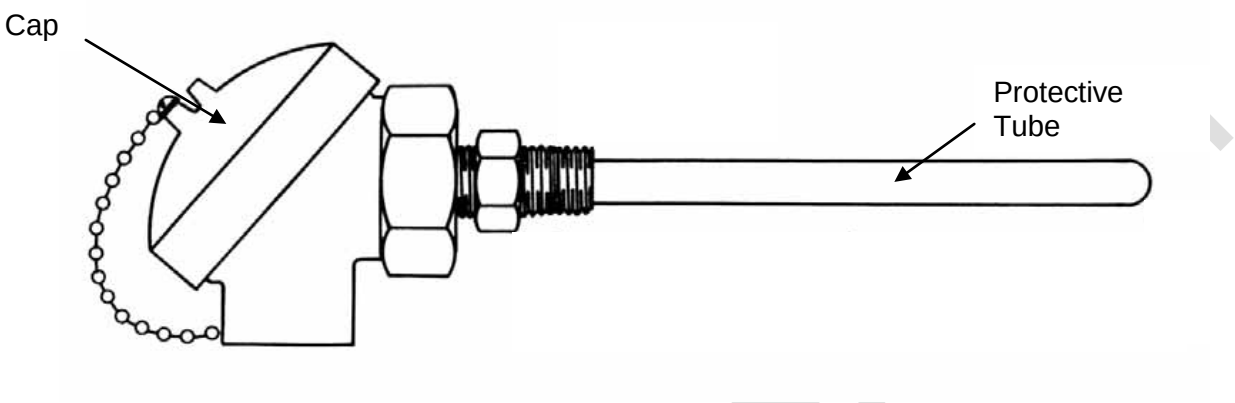
Check Safety Valve

1. Check the safety valve manually by pulling ring or lever to make sure that it moves freely and is not siezed.

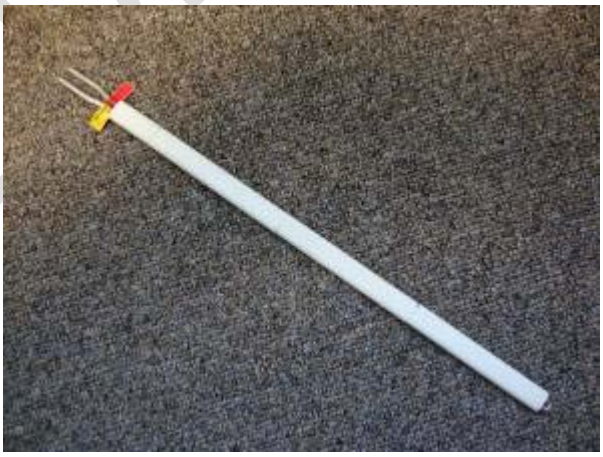
2. Allow the ring to snap back to normal position.

Thermocouple: (05-002.W)

When working with electrical components ensure lock out instructions are being followed.



Thermocouple Assembly



Thermocouple Element

INSTRUCTION 05-002.W.01: INSPECT THERMOCOUPLE FOR DAMAGE

Turn main power to the system off - Remove thermocouple and visually inspect for damage. If damaged, see *CMI 6.3.1/05-002A*

1. Primary Thermocouple (TC1)

2. Secondary Thermocouple (TC2) on Secondary Chamber

Stack Thermocouple (TC3) on Stack

6.2.3 Monthly Instructions

Primary & Secondary Chamber Blowers: (01-001.M & 02-001.M)

Do not attempt any maintenance on a fan unless the electrical supply has been completely disconnected and locked. In many cases, a fan can windmill despite removal of all electrical power. The rotating assembly should be blocked securely before attempting maintenance of any kind.

Please follow all instructions outlined in *Section 6.1 Zero Mechanical State & Lock Out Instructions.*

INSTRUCTION 01/02-001.M.01: CHECK FAN WHEEL

1. Check the fan wheel for any wear or corrosion, as either can cause catastrophic failures, if left in operation.

2. The wheel can be accessed one of two ways.
   a. Remove the blower assembly from the unit and look down the outlet of the blower.
   b. Remove the damper assembly from the inlet of the blower and inspect by looking through the inlet of the blower.

3. Check also for the build-up of material which can cause unbalance resulting in vibration, bearing wear and serious safety hazards.

4. Clean the wheel as required.

5. If replacement is necessary follow these steps:

   a. Remove damper assembly from the unit
   b. Remove the blower assembly
   c. Remove the blower housing around the wheel
   d. Loosen all set screws that are located on the wheel.
   e. A puller may be required if the wheel hasn't been removed for some time.
   f. Ensure the shaft "key" is installed on the shaft before installing the new wheel.
   g. When installing a new wheel, the wheel should be positioned in the housing with the correct spacing between the edge of the inlet cone and the wheel. The wheel to cone clearance on the Primary Blower is 0.3175 cm.
   h. Ensure that the wheel is installed securely before reassembling the blower assembly.
   i. Install the blower assembly
   j. Install the damper assembly

Primary & Secondary Chamber Burners: (01-002.M & 02-002.M)

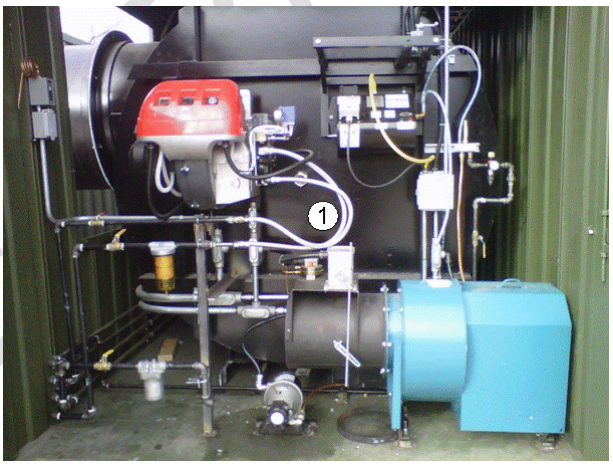
Do not store flammable or hazardous materials in the vicinity of fuel burning appliances. Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or death. Refer to the Burner manual for instructional or additional information.

INSTRUCTION 01/02-002.M.01: CHECK FLEXIBLE OIL LINE

1. Check flexible oil lines to make sure that they are still in good condition. This includes frayed, leaking, or worn swivel joints.

2. If any type of damage is observed replace the flexible oil lines see *CMI 6.3.3/01-002F & 6.3.3/02-0002F*

Primary Chamber Burner Flexible lines (1 Above)



Secondary Chamber Burner Flexible Lines (1 Above)

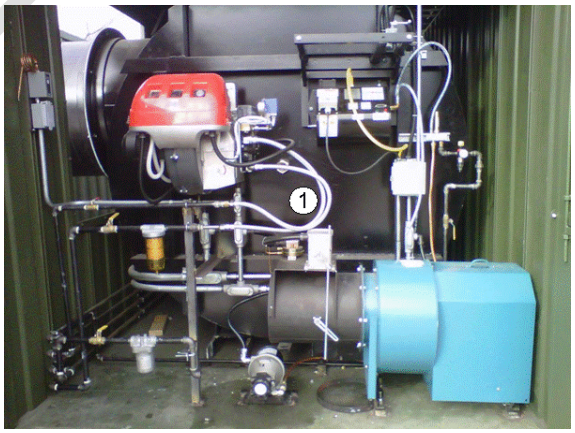
INSTRUCTION 01/02-002.M.02: INSPECT BURNER PUMP DELIVERY PRESSURE

1. Remove the cover from the Burners as described in Instruction 01/02-002.W.01.

2. The pump delivery pressure must be between 180-210 psi, and can be viewed on the gauge shown below.

3. If the pressure is found to be unstable or if the pump is running noisily try the following:
   a. Detach the flexible hose from the line filter (Shown below as #1).
   b. At the tank pour fuel into the supply line.
   c. If there is fuel coming in through the filter it means the filter is not clogged. If no fuel is coming through the filter remove and replace.

Primary Chamber Burner Flexible lines



Secondary Chamber Burner Flexible Lines

4. If the pump is found to be responsible:
   a. Loosen the bleed screw.
   b. Turn on the burner
   c. Once all the air has been bled out. Close the bleed screw.

   If the pump is still not working after these steps replace the pump.

5. If the problem lies in the suction line, check to make sure that the filter is clean and that air is not entering the piping from a loose fitting or damaged line.

INSTRUCTION 01/02-002.M.03: CLEAN BURNERS OF DUST

1. Remove the cover from the Burners as described in Instruction 01/02-002.W.01.
2. Check that no dust has accumulated inside the burner fan or on fan blades.
3. If any dust is visible take a clean soft cloth to the fan or the blades and wipe clean.

INSTRUCTION 01/02-002.M.04: CHECK BURNER COMBUSTION HEAD

1. Remove the cover from the Burners as described in Instruction 01/02-002.W.01.
2. Check that all parts of the combustion head are in good condition, free of all impurities, and that no deformation has been caused by operation at high temperatures.

(Below is an example of burner in good condition)

If damage is found, please refer to *CMI 6.3.3/01-002D & 6.3.3/02-002D*

Refractory: (05-001.M)

When working with the refractory make sure you use the proper tools; wear goggles, dust mask and gloves

Please follow all instructions outlined in *Section 6.1 Zero Mechanical State & Lock Out Instructions.*

INSTRUCTION 05-001.M.01: INSPECT REFRACTORY

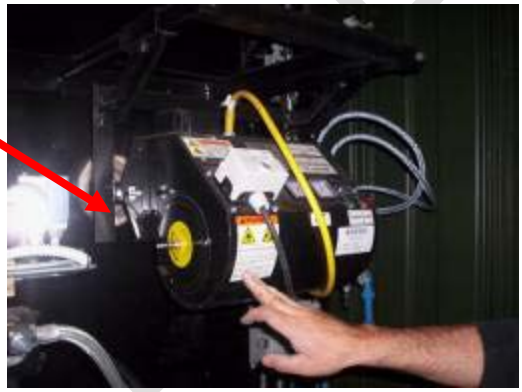
1. Ensure power is locked out.
2. Open Secondary Chamber door.
3. Fasten door open, ensuring it will not close by its own weight.
4. Enter Secondary Chamber and check the refractory for shrinkage, any gaps between the modules greater than 2.5 cm should be patched.
5. Fix gaps with supplied blanket by stuffing material into opening. (See *CMI 6.3.2/05-001A)*
6. Check for any exposed metal, if metal is exposed make sure to patch area with blanket material or new module. (See *CMI 6.3.2/05-001A & 6.3.2/05-001B)*
7. Pay special attention to areas where the junction boxes are located, as any excessive heat may melt the wires within the box.
8. From Secondary Chamber interior look up the stack while the cap is in closed position.
9. View the surface of the bottom of the stack cap flap with a flash light
10. Some cracking is normal, however if pieces are missing or have fallen out, (See *CMI 6.3.2/05-001E)*

Waste Oil Burner: (02-003.M)

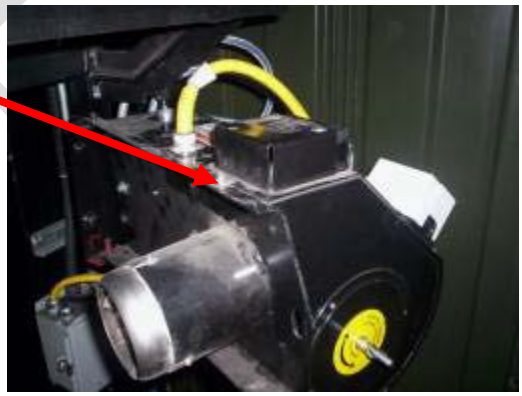
Failure to maintain and / or improper servicing by unqualified personnel will adversely affect the proper, safe operation of your burner, will reduce the service life of your burner and will void your warranty

INSTRUCTION 02-003.M.01: INSPECT ELECTRICAL COMPONENTS

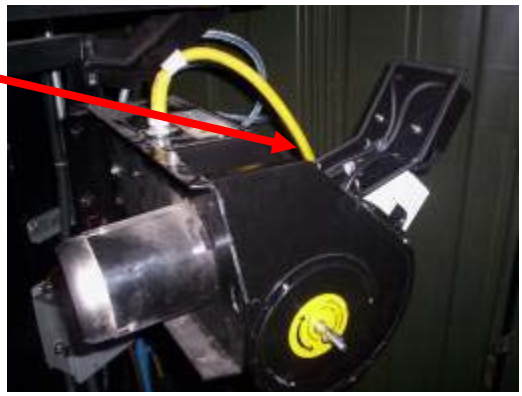
1. Check all electrical components for any heat damage.
2. If heat damage is observed remove and replace.
    1. Slide out burner
    2. Undo Bolt



3. Loosen Bolt



4. Open hinged hatch to access front components



INSTRUCTION 02-003.M.02: INSPECT HEATER ELEMENT

1. Remove heater element from casing and inspect for build-up

2. Clean any deposits.

3. If damaged, heater element needs to be replaced. Removal involves the following steps:
   a. Remove all electrical connections attached to the heater block identified in Picture #3 below.
   b. Remove all the bolts attaching the heater to the burner housing.
   c. Remove all fuel line connections.
   d. Remove the heater element and install the new one. (PN: 33173)
   e. Reinstall the heater block.

4. When reinstalling the heater element always ensure the element will be restarted immersed.

⚠ **NEVER use the inline heater dry**

1. Unscrew (yellow) electrical connection

2. Remove cover screw

3. Open hatch cover to expose heater element

Air Compressor: (03-001.M)

INTAKE AIR. Can contain carbon monoxide or other contaminants. Will cause serious injury or death. This air compressor is not designed, intended or approved for breathing air. Compressed air should not be used for breathing air application unless treated in accordance with all applicable codes and regulations.

HAZARDOUS VOLTAGE. Can cause serious injury or death. Disconnect power and bleed pressure from the tank before servicing. Compressor must be connected to properly grounded circuit. Do not operate compressor in wet conditions. Store indoors.

MOVING PARTS. Can cause serious injury. Do not operate with guards removed. Machine may start automatically. Disconnect power before servicing. Lockout/Tagout machine.

HOT SURFACES. Can cause serious injury. Do not touch. Allow to cool before servicing.

HIGH PRESSURE AIR. Bypassing, modifying or removing safety/relief valves can cause serious injury or death. Do not bypass, modify or remove safety/relief valves. Do not direct air stream at body. Rusted tanks can cause explosion and severe injury or death. Drain tank before each use. Drain valve located at bottom of tank.

RISK OF BURSTING. Use only suitable air handling parts acceptable for pressure of not less than the maximum allowable working pressure of the machine.

INSTRUCTION 03-001.M.01: CHECK FASTENERS FOR TIGHTNESS

1. Check all fasteners for tightness (tighten as required).

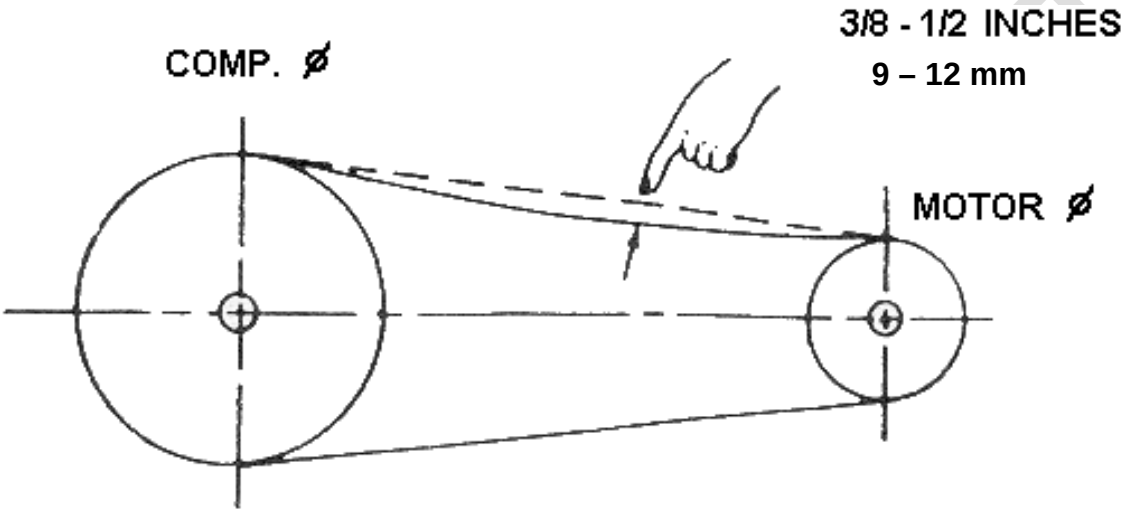
2. Check the safety valve manually, by pulling ring or lever, to make sure that is not stuck. Allow the ring to snap back to normal position

INSTRUCTION 03-001.M.02: CHECK BELT FOR TENSION

Proper belt tension and pulley alignment must be maintained for maximum drive efficiency and belt life.

1. Check all belt tension. If belts are worn or cracked replace as per instructions below.

2. The v-belt(s) should be adjusted so that a declination of about 3/8" – ½" (9-12 mm) will be obtained when it is pushed by a finger at the middle point as shown



Adjusting instructions:

1. Remove the belt guard.

2. Loosen the motor mounting bolts on the base, using a lever if necessary, or by turning the adjusting the bolt at the end of the base.

3. Use a straight edge to ensure pulleys are inline and square to one another.

4. Retighten motor mounting bolts.

5. Check to ensure that the tension remained correct.

6. Reinstall the belt guard. All moving parts must be guarded.

NOTA
Do not over tighten belts.

6.2.4 Quarterly Instructions

Primary & Secondary Chamber Blowers: (01-001.Q & 02-001.Q)

Do not attempt any maintenance on a fan unless the electrical supply has been completely disconnected and locked. In many cases, a fan can windmill despite removal of all electrical power. The rotating assembly should be blocked securely before attempting maintenance of any kind.

Please follow all instructions outlined in *Section 6.1 Zero Mechanical State & Lock Out Instructions.*

INSTRUCTION 01/02-001.Q.01: LUBRICATE BEARINGS

1. Lubricate the bearings, but do not over lubricate.

2. Bearings are completely filled with grease at the factory; they may run at an elevated temperature during initial operation. Surface temperatures may reach 180°F and grease may bleed from the bearing seals. This is normal and no attempt should be made to replace lost grease. Bearing surface temperatures will decrease when the internal grease quantity reaches a normal operating level.

3. Bearings should be lubricated with premium quality lithium-based grease conforming to NLGI Grade 2. Examples are:

   Mobil - Mobilgrease XHP
   Texaco - Premium RB
   Chevron - Amolith #2
   Shell - Alvania #2

4. Add grease to the bearing via the grease nipple while running the fan or rotating the shaft by hand. Be sure all guards are in place if lubrication is performed while the fan is operating. Add just enough grease to cause a slight purging at the seals. Do not over lubricate.

INSTRUCTION 01/02-001.Q.02: INSPECT V-BELT

1. Check the V-belt drive for proper alignment and tension as outlined in Instruction 03-001.M.02 Check Belt for Tension.

2. Check for proper alignment.

NOTA Excess tension shortens bearing life. The lowest allowable tension is that which prevents slip-page under full load (3/8").

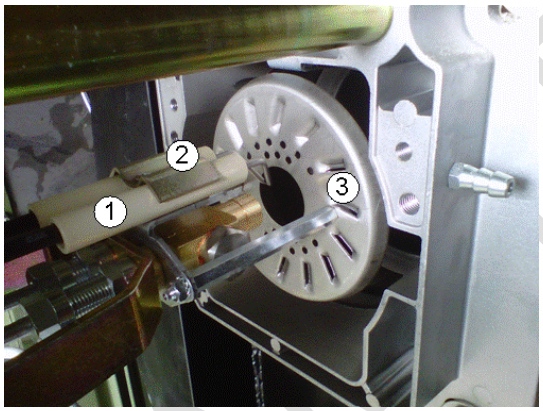
3. If belts are worn, replace.

Primary & Secondary Chamber Burners: (01-002.Q & 02-002.Q)

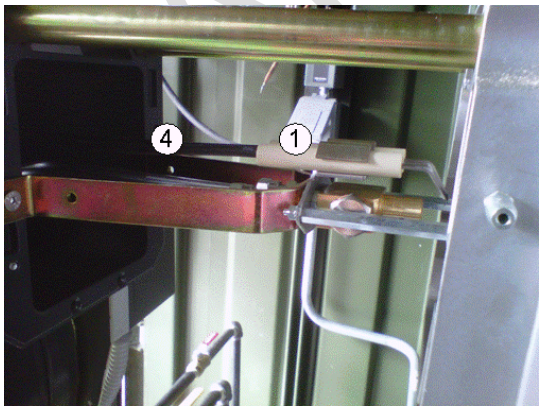
Do not store flammable or hazardous materials in the vicinity of fuel burning appliances. Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or death. Refer to the Burner manual for instructional or additional information.

INSTRUCTION 01/02-002.Q.01: INSPECT COMPONENTS FOR HEAT DAMAGE

1. Check all components for heat damage.
2. Look for excessive rust, deformation of all the parts including but not limited to the end cone and the diffuser disc.
3. Check to see that the High Temperature Leads (HT leads) are still intact and have not melted from any excessive heat coming back into the burner. If they are damaged replace with new HT Leads (PN: 3012995 Primary Burner & PN: 3012959 Secondary Burner). *See CMI 6.3.3/01.002A and 6.3.3/02-002A.*
    a. The HT leads are attached to the control box and the electrode via a squeeze fitting. Remove the leads from the electrode and control box by simply pulling them out.



1. Electrode
2. U-Bolt
3. Diffuser Disc



4. HT Leads

End cone

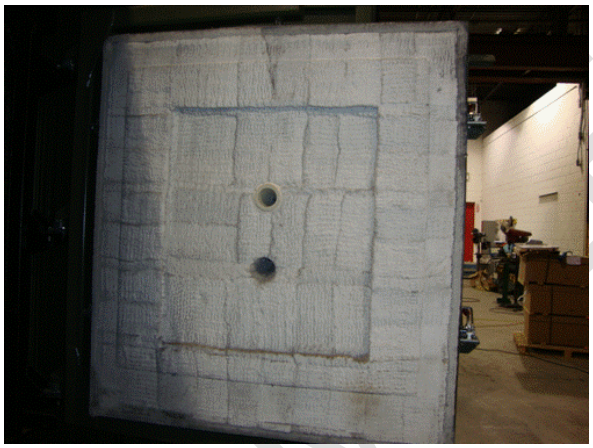
Refractory: (05-001.Q)

When working with the refractory make sure you use the proper tools; wear goggles, dust mask and gloves

Please follow all instructions outlined in *Section 6.1 Zero Mechanical State & Lock Out Instructions.*

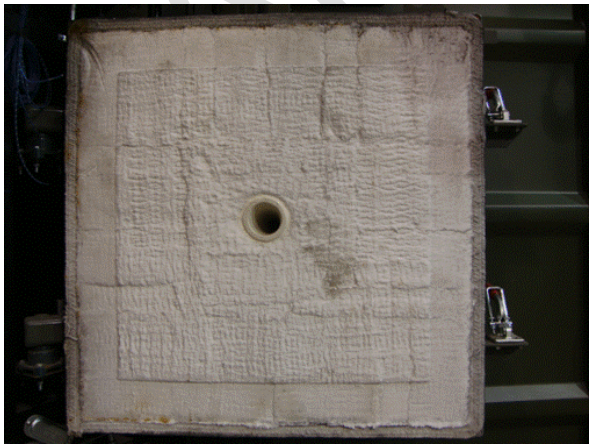
INSTRUCTION 05-001.Q.01: INSPECT DOOR GASKETS

1. Open Primary and Secondary Chamber doors.
2. Fasten doors open, ensuring the door will not close on its own.
3. Inspect door gasket for damage.
4. Replace any damaged segments of door gasket (PN: GSB 1.5") if necessary. Cut out the damaged section and replace with new door gasket. See *CMI 6.3.2/05-001C*.
5. Doors must close tightly and securely, ensuring a good seal.



Primary Door (refractory lined)

1. Primary Door Gasket



Secondary Door (refractory lined)

1. Secondary Door Gasket

INSTRUCTION 05-001.Q.02: INSPECT REFRACTORY FOR SHRINKAGE

1. Ensure power is locked out.
2. Open Primary and Secondary Chamber doors.
3. Fasten doors open, ensuring they will not close on their own.
4. Enter Primary and Secondary Chamber and check the refractory for shrinkage, anything greater than 2.54 cm should be patched.
5. Check to make sure the anchoring of the modules is still strong and intact, if any modules seem loose replace complete module with new module.

A. **REMOVAL:** Remove existing Module (physically pull away existing refractory from underlying Module Anchor).

B. Remove welded stud from steel casing (cut with hack saw or other device between Module Anchor and Furnace Casing/Shell).

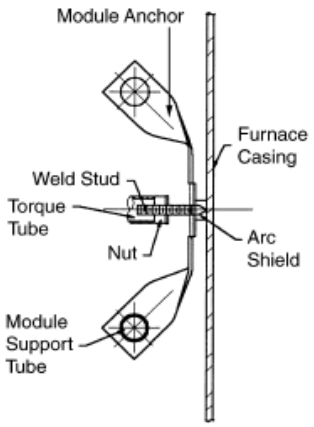


Figure 1: Side view of the Weld Loc Module

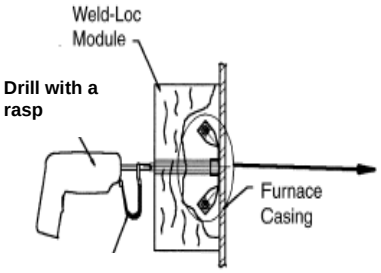


Figure 2: Stud Gun with rasp and Torque Tube.

A. **INSTALLATION**: Once the new module (PN: 433026) is in place take the stud gun (PN: ECO-STUD) with rasp to the Torque Tube and drill into place.

B. Once it has tightened the Torque Tube should come off with the drill.

Air Compressor (03-001.Q)

 **INTAKE AIR. Can contain carbon monoxide or other contaminants. Will cause serious injury or death. This air compressor is not designed, intended or approved for breathing air. Compressed air should not be used for breathing air application unless treated in accordance with all applicable codes and regulations.**

 **HAZARDOUS VOLTAGE. Can cause serious injury or death. Disconnect power and bleed pressure from the tank before servicing. Lockout/Tagout machine. Compressor must be connected to properly grounded circuit.**

 **MOVING PARTS. Can cause serious injury. Do not operate with guards removed. Machine may start automatically. Disconnect power before servicing. Lockout/Tagout machine.**

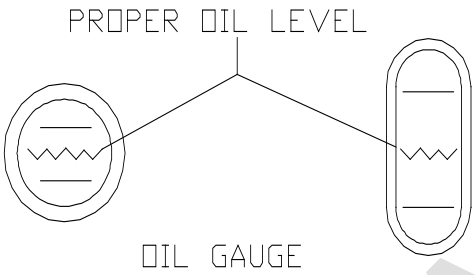
 **HOT SURFACES. Can cause serious injury. Do not touch. Allow to cool before servicing. Do not Touch hot compressor or tubing.**

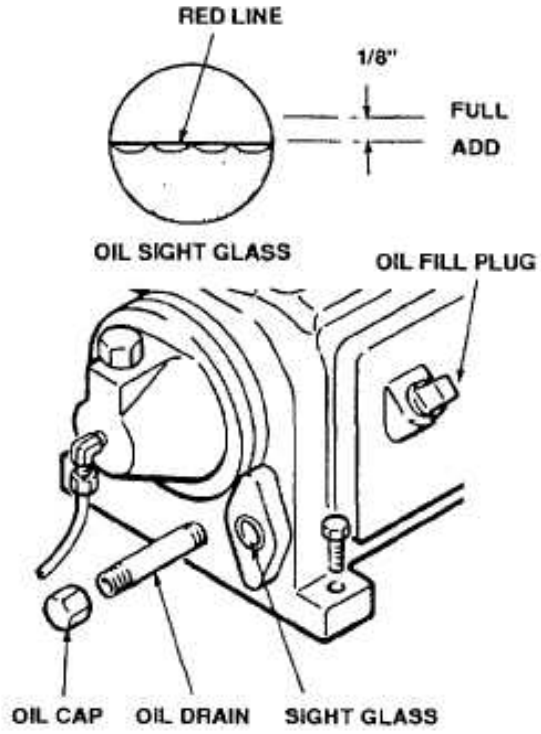
 **HIGH PRESSURE AIR. Bypassing, modifying or removing safety/relief valves can cause serious injury or death. Do not bypass, modify or remove safety/relief valves. Do not direct air stream at body. Rusted tanks can cause explosion and severe injury or death. Drain tank before each use. Drain valve located at bottom of tank.**

 **RISK OF BURSTING. Use only suitable air handling parts acceptable for pressure of not less than the maximum allowable working pressure of the machine.**

INSTRUCTION 03-001.Q.01: CHANGE THE OIL

1. Change the oil - Oil capacity 0.8 litres. Compressor Oil part # V0421-2





2. Remove the oil cap (above) to drain the oil.
3. Replace oil cap.
4. Refill the oil reservoir, using compressor oil, to the fill line as illustrated above.
5. Maintain oil level mid-way between the upper and lower lines of the crankcase sight gauge. See illustration above.

Paint: (05-003.Q)

Ensure proper ventilation and proper equipment is being used when using any paint product.

INSTRUCTION 05-003.Q.01: INSPECT AND MAINTAIN EXTERIOR PAINT

1. Maintain paint exterior to protect metal from heat and corrosion damage. This includes all components in the system including containers and incinerator components.

2. If discoloration is noted and painting needs to be performed, on areas where paint will be applied, you must do a light sanding before application.

3. Follow paint manufacturer's application instructions which will include surface preparation, priming and painting.

4. If components within the container need to be painted, for example the Primary Chamber or the Secondary Chamber, proceed as above. Use a type of paint that meets the following specifications:

Paint Specifications:

Incinerator Paint: This is the paint coated directly on the incinerator shell. This includes the following components:

- Primary Chamber
- Secondary Chamber
- Breech Section
- Hot Stack Section (Black)

Finish needs to be able to withstand temperatures in the 650-750°F (340-400°C) range.

Parts: There are no paint specifications for each individual component. This is left up to the discretion of the customer.

6.2.5 Yearly Instructions

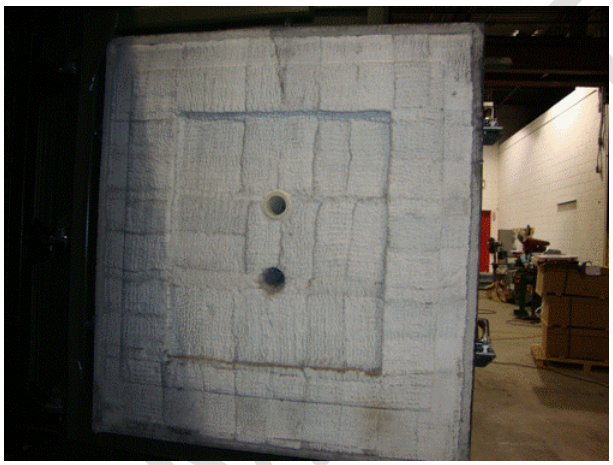
Refractory: (05-001.Y)

When working with the refractory make sure you use the proper tools; wear goggles, dust mask and gloves

INSTRUCTION 05-001.Y.01:
CHECK DOOR GASKET ALONG PRIMARY & SECONDARY CHAMBER DOORS

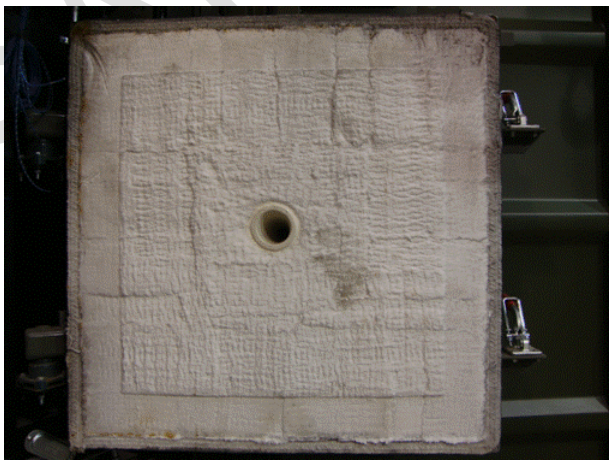
1. If required replace the door gasket. The gasket can last over 2 years but will depend on the careful use by the operator when loading and unloading.

2. Remove the damaged section of door gasket from door and reinstall new gasket (PN: GSB 1.5")



Primary Door (refractory lined)

Primary Door Gasket



Secondary Door (refractory lined)

Secondary Door Gasket

Electrical: (05-004.Y)

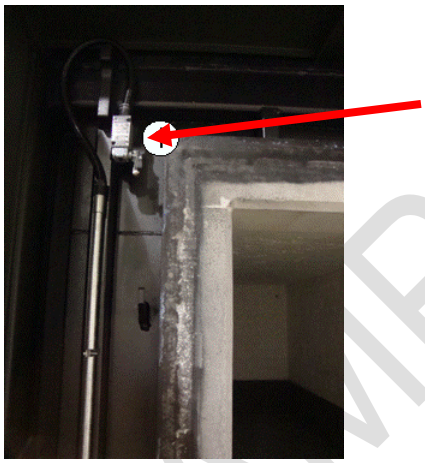
When working with electrical components ensure lock out instructions are being followed

Please follow all instructions outlined in *Section 6.1 Zero Mechanical State & Lock Out Instructions.*

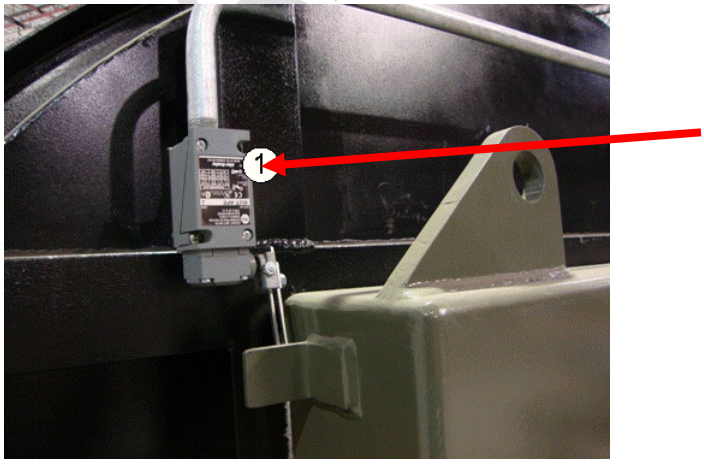
INSTRUCTION 05-004.Y.01: CHECK LIMIT SWITCHES

NOTA System must not be running or in cool down to perform this inspection.

1. Open Primary and Secondary Chamber doors and check top view screen on the HMI Panel view to ensure that it indicates door is open.
2. Close Primary and Secondary Chamber doors and check top view screen on the HMI Panel View to ensure that it indicates door is closed.
3. All limit switches located on the unit are checked this way.
4. Replace limit switches (PN: 802T-APE) if necessary.



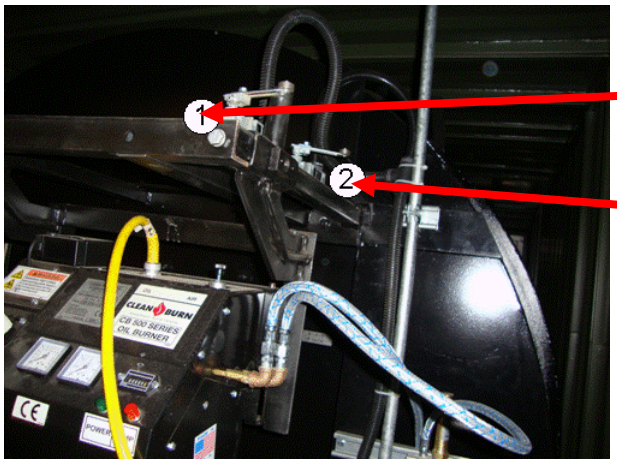
Primary Chamber Limit Switch



Secondary Chamber Limit Switch

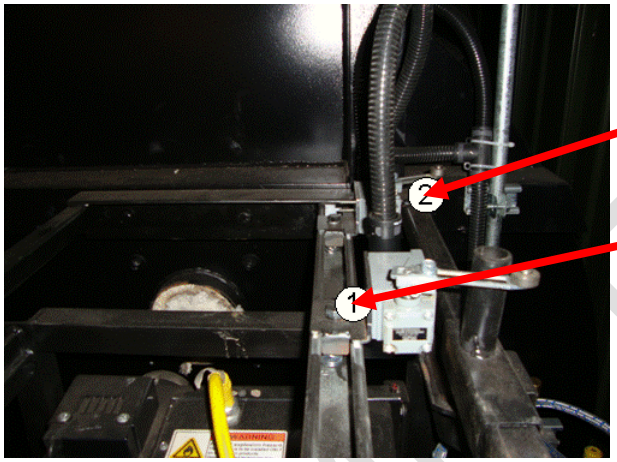
5. See *CMI 6.3.1/05-005A)*.

6. Check all other limit switches in the system. See below for locations:



Waste Oil Burner Out Limit Switch

Waste Oil Burner In Limit Switch



Waste Oil Burner In Limit Switch

Waste Oil Burner Out Limit Switch

6.3 CORRECTIVE MAINTENANCE INSTRUCTIONS (CMI)

The following instructions relate to the replacement or correction (fixing) of components of the EWS Mobile Incinerator Package.

These Corrective Instructions are grouped in this section by the following:

As per the *Preventive Maintenance Instructions Section 6.2* of this *Manual*, the following table is utilized to identify the components of the system that require corrective maintenance.

System Component		**Identification number**	
Primary Blower		**01-001**	
	Air Proving Switch Replacement		6.3.4/01-001A
	Damper Calibration		6.3.4/01-001B
	Modutrol Resistor Replacement		6.3.4/01-001C
	Damper Crank Arm Replacement		6.3.4/01-001D
	Motor Replacement		6.3.4/01-001E
	Modutrol Motor & Transformer Replacement		6.3.4/01-001F
Secondary Blower		**02-001**	
	Air Proving Switch Replacement		6.3.4/02-001A
	Damper Calibration		6.3.4/02-001B
	Modutrol Resistor Replacement		6.3.4/02-001C
	Damper Crank Arm Replacement		6.3.4/02-001D
	Motor Replacement		6.3.4/02-001E
	Modutrol Motor & Transformer Replacement		6.3.4/02-001F
Primary Burner		**01-002**	
	Replacing Fuel Filter		6.3.1/01-002A
	HT Lead & Electrode Replacement		6.3.3/01-002A
	Diffuser Disc Replacement		6.3.3/01-002B
	Nozzle Replacement		6.3.3/01-002C
	End Cone Replacement		6.3.3/01-002D
	Nozzle Assembly Repair or Replacement		6.3.3/01-002E
	Burner Flexible Oil Line Replacement		6.3.3/01-002F
	Low Level Switch Replacement		6.3.3/01-002G
	Inspection Window Replacement		6.3.3/01-002H
	Fuel Pump Replacement		6.3.3/01-002I
	Control Box Replacement		6.3.3/01-002J
	Oil Tube Replacement		6.3.3/01-002K
	Burner PE Cell & UV Detector Replacement		6.3.3/01-002L