



WASTE WATER EVAPORATOR WITH ANY FUEL OPTIONS

Product: INOV8 Evaporators with INOV8 burners are designed to reduce or eliminate dirty water in the most cost effective manner, utilizing the most economic and available fuel. INOV8 offers evaporators that utilize natural gas or propane, diesel or fuel oil, or a gas-oil combination burner, or a waste oil burner. With the INOV8 gas-oil burner, even oils that contain a high percentage of water (such as coolant and machine cutting solutions) can be used as fuel when injected into the gas flame. In addition, the gas-oil burner has the unique feature of sensing a loss of oil pressure and automatically switching the fuel to gas for continued operation. An ultra-sonic level sensor maintains the proper level of solution for automatic and safe operation. Temperature controls measure solution temperature and heat exchanger temperature shutting down the burner at pre-set temperatures or in an overheat situation. The evaporator comes in three sizes: 20, 40 and 60 gallons per hour evaporation rate. Customized systems can be provided to include tanks, solution or fuel pumps, filtering set-ups, warning lights, custom operations, or other control options.

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NOTE: Additional details of technology can be viewed on website: www.inov8-intl.com or emailed.

INOV8 EVAPORATOR

THE INOV8 WASTE WATER EVAPORATOR INCLUDES:

1. Tank and heat exchanger are 304 stainless steel in wetted surfaces (other grades are available at an additional price).
2. A clean water evaporation rate of at least 20, 40 or 60 gallons per hour.
3. Two inches of insulation under the side panels.
4. Covers are stainless steel with one-inch rigid insulation.
5. An industrial rated Fireeye ultraviolet safety control system suitable for firing fuel oil, waste oil and/or natural gas or propane.
6. Ultrasonic level control system that monitors low water cutout to terminate firing, normal fill control to maintain fluid operating level, high water alarm to de-energize second air solenoid to stop fill and component failure detection.
This style of ultrasonic level control does not come in contact with the solution (a superior arrangement to other technologies that have gumming up tendencies).
7. Two 2" NPT ports each end for cleanout.
8. Safety temperature sensor on heat exchanger.
9. Fast fill and separate incremental fill provision.
10. Sloped bottom to facilitate cleaning
11. Extra surface area to prevent foam over (necessary for detergent laden solutions).
12. Thermal growth isolation.
13. Cleanout access into heat exchanger.
14. Powder coat paint in Ford Blue.
15. Heavy duty tubular steel frame provides stability and an anchor for accessories (pump, gas train).
16. Pressure tested during construction.
17. Control panel that includes:
 - Power feed connection at 120 volts AC, 15 amps
 - Main power switch to energize system
 - Temperature readout of heat exchanger
18. Complete Installation, operation and maintenance manual.

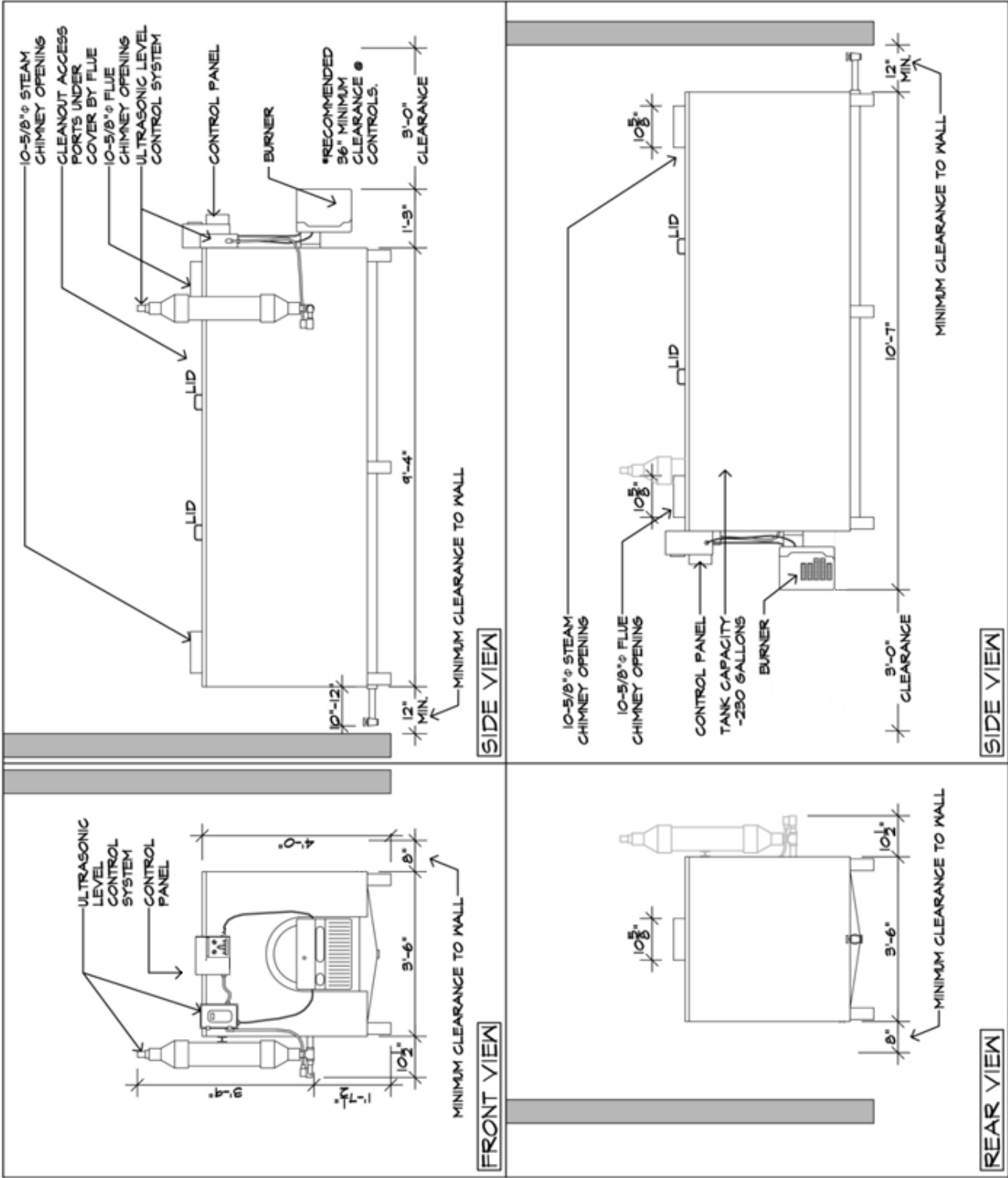


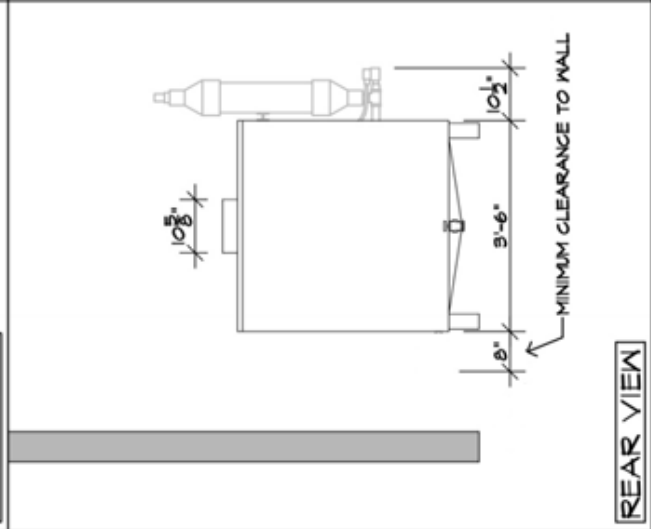
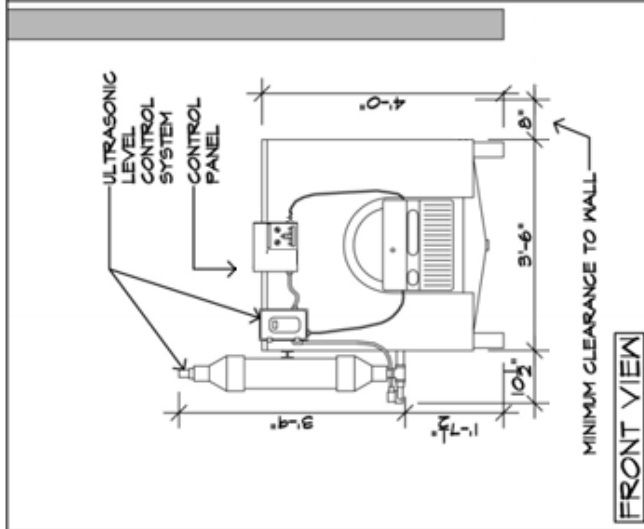
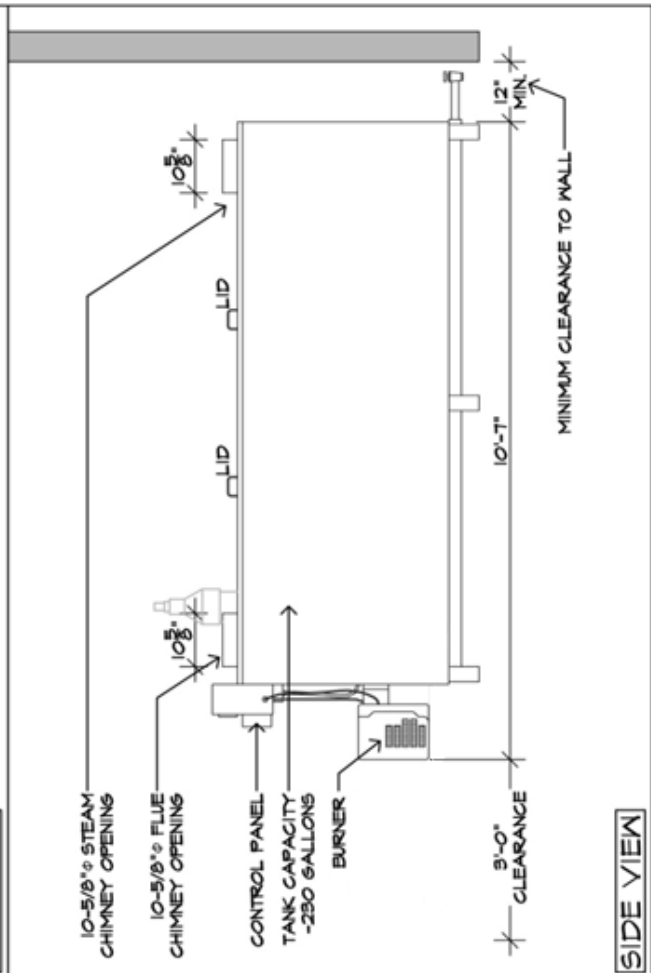
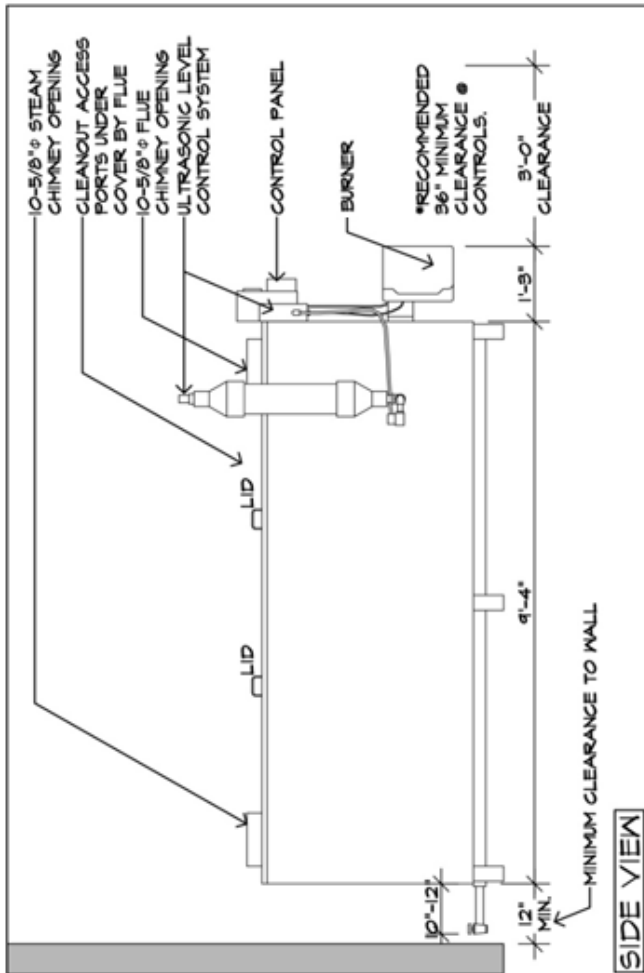
EV60 show with Multi-oil Burner

FACTORY START-UP SERVICE AND ON-SITE TRAINING IS AVAILABLE

\$575 per day plus travel expenses. This service includes commissioning of the already installed equipment, system review, combustion analysis with fine tuning of the burner, commissioning report, operator training.

DRAWING & SITE LAYOUT





Wastewater Evaporator Specifications

Models EV20, EV40 & EV60

The manufacturer shall provide a burner tested and listed by Intertek-ETL Semko, a national third party test agency to all applicable safety standards for use in the United States and in Canada, specifically: ANSI UL 296, Issue 1994/06/01, Ed: 10 Rev: 2006/02/24, Standard for Safety Oil Burners: CSA B140.0, Issue: 2003/10/01, Ed: 3, General Requirements for Oil Burning Equipment General Instruction No 2-4 (F1991). The efficiency shall not be less than 80% and the emissions shall not exceed a number 2 Bacharach spot test, when combined with an INOV8 approved unit heater or boiler or evaporator and burning listed fuels. The safety system shall be rated for commercial or industrial (as distinguished from residential) with the following features and standard equipment:

EVAPORATOR SPECIFICATIONS FOR MODELS:	EV20	EV40	EV60
INPUT BTU	250,000	432,000	648,000
FUEL USAGE, GPH*	1.78	3.08	4.62
DIMENSIONS, LENGTH/WIDTH/HEIGHT, INCHES (WITH BURNER)	52.5 / 42 / 48	88.5 / 42 / 48	127 / 42 / 48
EVAPORATION RATE WITH WATER	25	43	65
TANK CAPACITY, IN GALLONS	150	250	350
EFFICIENCY – THERMAL RATED IN %	86	87	87
EVAPORATOR CONSTRUCTION DETAILS			
TANK & COMBUSTION CHAMBER MATERIAL	10 Gauge 304 SS	10 Gauge 304 SS	10 Gauge 304 SS
OUTER SHELL MATERIAL	18 Gauge	18 Gauge	18 Gauge
OUTER SHELL FINISH	Powder-coat Blue	Powder-coat Blue	Powder-coat Blue
INLET & OUTLET PORTS FOR SOLUTION	¾”	¾”	¾”
WEIGHT, LBS.	850	1260	1575
TANK CLEANOUT PORTS – TWO ON BOTH ENDS	2”	2”	2”
FLUE CLEANOUT PORTS – TWO OR THREE	Two	Two	Three
THERMAL EXPANSION PROVISION OF TANK			
TANK BOTTOM DESIGN – V-SHAPED			
TANK INSULATION – 2” IN SIDE WALLS & 1” IN TOP			
CAN BE LIFTED BY FORKLIFT FROM BOTTOM OF TANK			
OPERATING CONTROLS ON EVAPORATOR			
ULTRASONIC LEVEL SENSOR FEATURES:	Yes	Yes	Yes
FOUR LEVEL CONTROL WITH SAFETY SHUTOFF			
AUTOMATIC KEEP FILL			
AUTOMATIC SOLUTION FILL SOLENOID – ¾” NPT			
DIGITAL ADJUSTABLE TEMP CONTROL FOR OVERHEAT SHUTOFF	Yes	Yes	Yes

SPECIFICATIONS, CONTINUED:	EV20	EV40	EV60
BURNER MODEL & SPECS	S200	S200	S200
ELECTRICAL SUPPLY, VOLTS	120	120	120
ELECTRICAL DRAW (MAX), AMPS	10	20	20
FREQUENCY – HZ	60	60	60
BURNER MOTOR, HP	1/5	1/5	1/5
BURNER MOTOR RPM	3,450	3,450	3,450
SEALED COMBUSTION KIT AVAILABLE	Yes	Yes	No
COMPRESSED AIR, REQUIRED, CFM	2	2	3
COMPRESSED AIR REQUIRED, PSIG	30	30	35
BURNER SAFETY CONTROL, FEATURES:			
FIREYE INDUSTRIAL CONTROL, MEC120R	Yes	Yes	Yes
<ul style="list-style-type: none"> • Ultraviolet flame detection • 90 second pre-purge cycle • Continual proof of atomizing air • 15 second post-purge cycle • Trial for ignition – 10 seconds • Flame failure shutoff, in 3 seconds • Main flame trial-for-ignition, 6 seconds • Safe start sequence • Safety shut-down indicator light 			
FUEL & AIR SHUT-OFF BY SOLENOID VALVES	YES	YES	YES

Listed fuels: Fuel oil, #2 up to #6, used crankcase oil, transmission & hydraulic, mineral spirits, vegetable oil, used crankcase oil with 10% gasoline. *Based on 140,000 BTU/gallon – oil must be analyzed for BTU content as oil pressure will vary.

Fuels capable of burning as fuel (& warranted with written approval from INOV8): Used crankcase oils, Transmission & Hydraulic oils, 90 weight gear box oil, heat transfer oil, Mineral spirits solvents, Machine shop cutting oils, Vegetable oils – new & used (soybean, peanut, canola, corn, olive), Synthetic oils, and Commercial & Military jet fuels.

Basic Operation Overview

Set the switch on the control panel to normal operation. The burner initiates combustion when the solution reaches the preset level set on the ultrasonic level sensor. If the fuel is diesel or fuel oil – the oil preheater is turned off and combustion starts immediately; if waste oil is used – the oil preheater is on and there is a delay of 5 minutes while the waste oil is being preheated. When the burner control senses the oil is at the desired temperature it initiates combustion.

The combustion chamber and two (or three) heat exchanger tubes are immersed under the solution, which is now being heated. There are two chimneys; one for steam and the second for the flue gases. Once boiling and evaporation begins, the keep fill function automatically maintains the proper water level. If the water level drops below the set point the ultrasonic level sensor shuts off the burner. There is a backup temperature sensor that if it reaches a preset 220 degrees the burner will shut off. If the ultrasonic level sensor measures the water level over the setpoint a secondary water solenoid is activated to close. If the solution contains detergent, anti-foaming agents must be added periodically. The evaporator will function at this setting until it consumes available solution, runs out of fuel, or a high temperature setting is achieved. A batch can be removed when the concentration level has been obtained. If the batch contains oil it can be later used as fuel in the burner.

Safety Certification

The INOV8 gas-oil burners are tested and listed by **Intertek ETL Semko (ETL)** - an internationally recognized third party test agency to ANSI Z21.17 AEI Domestic Gas Conversion Burner Issue 1998/01/01 and CSA 2.7-M98, UL296, Issue 1994/06/01, Ed: 10 Rev:2006/02/24, Standard for Safety Oil Burners; CSA B140.0, Issue: 2003/10/01, Ed:3, General Requirements for Oil Burning Equipment General Instruction No 2-4 (R1991) by Intertek ETL-Semko. The INOV8 oil burners are tested and listed by **ETL** to UL 296, Issue 1994/06/01, Ed: 10 Rev: 2006/02/04 – Standard for Safety for Oil Burners, and to CSA B140.0, Issue: 2003/10/01, Ed: 3, General Requirements for Oil Burning Equipment General Instruction No 2-4 (R1991), Report # 3128618CRT-002.

OVERVIEW OF EVAPORATION & OIL RECOVERY FOR FUEL

The standard oil burner and the gas-oil burner operate very similarly. The standard burner can use as fuel, diesel, fuel oil and most waste shop oil or vehicle lubricants. The standard waste oil burner cannot tolerate more than 3% water in the oil. The gas-oil burner can also use as fuel the same waste oil. The difference is the ability of the gas-oil burner to evaporate water present in the oil, during the combustion process providing a closed loop of waste disposal. This overview mainly covers the unique manner in which the gas-oil burner operates.

The primary fuel of the burner is natural gas (or propane); the secondary fuel is the collected residual oily water mixture and existing waste oils. The evaporator reduces water volume by continued boiling and adding solution to maintain an operating level. This process is explained further:

1. The temperature of the evaporating solution is monitored throughout the evaporation process as it increases to a pre-set temperature. IF the solution contains oil and the intention is to collect the oil and use it for fuel in the INOV8 burner, then a preset temperature if programmed into the control – for example 230°F. During the cycle of evaporation the percentage of oil will increase a higher concentration of approximately 50%. At the designated temperature the burner shuts off and the evaporation stops. If the liquid does not contain oil, the solution will continue to be fed into the evaporation body until it has been depleted.
2. If the solution contains oil, the concentrated solution is then manually transferred as a batch and placed into a storage tank for subsequent use as a fuel.
3. From the storage tank the concentrated solution will be transferred via a diaphragm pump to the burner. It is injected into the gas flame. The gas flame evaporates the water in the solution and ignites the oil to contribute any BTU value to the flame.
4. The dual fuel burner has adjustable air and fuel settings for both the gas side and for the oil side. The factory preset is at 50% and 100% for gas and oil. This allows the burner to operate on 100% of either gas or oil, or at half firing rates when burning the combination of oil and gas.

CONSTRUCTION FEATURES FOR SAFETY & ENERGY EFFICIENCY

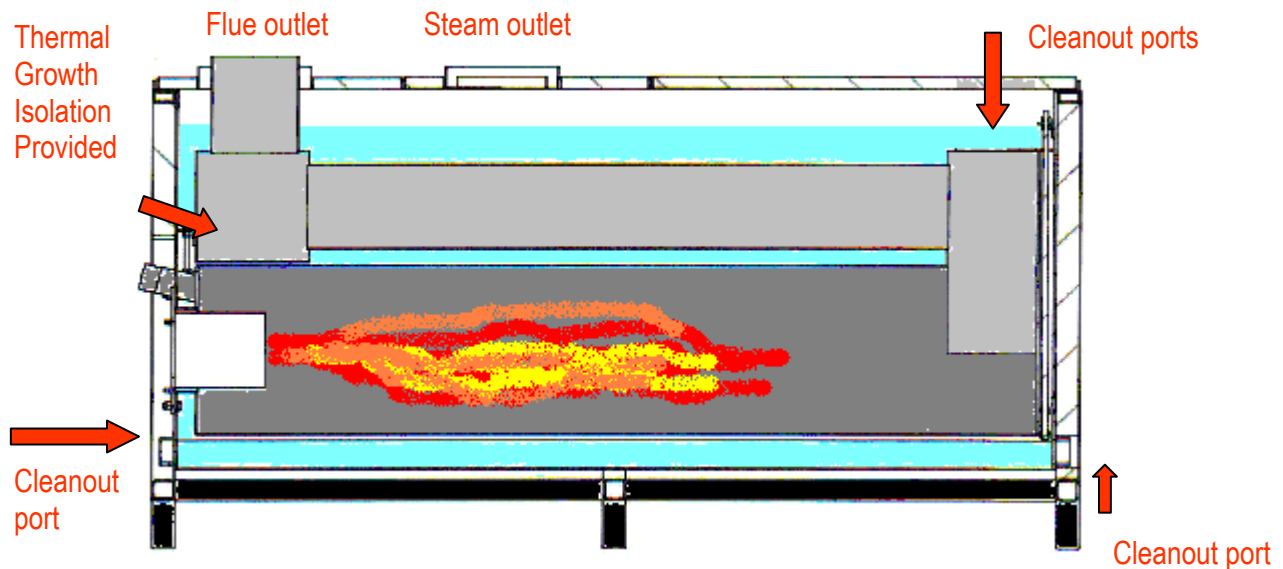
The INOV8 evaporator is engineered to be the most energy efficient design available. It utilizes the evaporating solution to extract the heat from the stainless steel. All hot surfaces are surrounded by water and will never exceed boiling temperature. There is no fire brick to reduce the heat transfer capabilities of the water, so the evaporator is also relatively light in weight. The flue gases are kept

separate from the steam to prevent operating problems associated with condensation and emission concerns from mixing products of combustion with steam. The heat exchanger is isolated from the tank to prevent thermal expansion from causing metal failure. The heat exchanger is also thermally isolated to prevent metal rupture during rapid heat-up conditions. These two isolation features prevent steel fatigue and provides long life for the evaporator.

The evaporator was designed to accommodate cleaning of the tank as well as the combustion zone. Access through the burner opening allows easy removal of the ash that will remain after burning waste lubricating oil. Additional openings are in the turn-around box at the opposite end of the burner, for cleaning the heat exchanger.

Each evaporator body is first created in a CAD computer program. Each part is carefully designed by INOV8's expert in heat transfer engineering to fit meticulously together. The fabricator cuts the stainless steel with laser equipment to produce precise results. The parts are then assembled and welded by certified welders. The tank is pressure tested to assure leak free, quality manufacturing. Insulation surrounds all the hot areas to accommodate safe operation as well as maintaining high efficiency by preventing heat loss between burner cycles. The outer skins are protected with the most durable and attractive power coat finish.

Construction Details:



Listed below is a summary of the engineering designs that assure the highest energy efficiency resulting in the lowest operating costs.

- The heat exchanger is cooled by the fluid being evaporated – no insulating fire brick or ceramic is needed (which diminishes thermal efficiency).
- The waste oil preheater cycles the heating element on and off as needed.
- Insulation surrounds the entire evaporator body to prevent unnecessary heat loss.
- The fuel can be low or no cost when using available waste oil. This also eliminates disposal costs for the waste oil.

- Use of diaphragm pumps versus electric driven gear pumps.

CONTROL SYSTEM OVERVIEW

The INOV8 Evaporator is designed for convenient operation while providing the highest level of safety. The operating and safety controls are mostly contained within the control panel located above the burner. Adjustments can be made from one location on the Evaporator. A heavy duty electrical box is hinged to expose wiring terminals for field connections, timers and relays, the fuse and circuit breakers and indicator lights. The cover of the electrical box provides the mounting for the Fireeye combustion control, the Ultrasonic fluid level sensor, the power switch, the fuel selector switch, operating and warning lights. Additional details on the various controls:

Level Sensing Technology

The INOV8 evaporator utilizes an Ultrasonic Level Sensor which is field adjustable. It provides three primary and two secondary functions:

- Signals if water level is too high, then shuts off “optional” secondary fill valve
- Senses low water condition, then shuts off burner
- Provides fill function to maintain water at desired level by turning on & off a primary fill valve
 - Sensor displays the distance between the sensor & water level
 - If it loses ability to determine water level it will shut the evaporator down

Gas Valve Train (if a gas burner is used)

The gas valve is included for two stage firing rate. Other valves, regulators and controls are required.

Fireeye Combustion Control

The features provided by the Fireeye industrial rated flame safeguard control are considered imperative for safety of personnel and property. This becomes particularly important when dealing with the variations found in fuels. Operational and safety features of this control system for the INOV8 Waste Oil Burners include:

1. ULTRAVIOLET flame detector, unlike cadmium sensors, performs well with a gas flame or an oil flame – or the combination.
2. INTERLOCK FUNCTION assures proper oil temperature prior to firing.
3. Ninety second PURGE to insure venting of explosive vapors before firing.
4. SAFE START cycle that will check all electronic circuits and assure there is no residual flame before firing can take place.
5. Ten (10) second TRIAL FOR IGNITION period. Ignition terminates.
6. Six (6) second MAIN FLAME TRIAL FOR IGNITION period without ignition.
7. Three (3) second period to TERMINATE OIL FLOW IF AN OUTAGE OCCURS after the flame has been established.
8. One attempt to RECYCLE before the control places the burner in a complete ‘shut-down’ mode, but then, only after purging as described in Item 1.

Temperature Limit control

The evaporator control receives temperature input from the hottest point of the heat exchanger inside the evaporator tank. If the temperature exceeds a preset level, the burner will be shut down and an alarm light on the control panel will be lit. An audio or remote light may be attached to the terminal strip in the control panel if desired. Once activated by the high temperature, the PLC Control must be manually reset by a button on its control panel to resume burner operation.

INSTALLATION REQUIREMENTS

Compressed Air Requirements

A continuous supply of 100 PSI of compressed air is required at all times for burner operation. The burner includes an air pressure regulator rated at 160 PSI that has a ¼" NPT inlet fitting. Install flexible hose the last few feet before the air regulator in order to open the door for servicing. It is also a good idea to install a quick-disconnect where the airline joins to the burner's air regulator. The burner on the boiler will need the following requirements of compressed air:

- Minimum 3.0 CFM and 38 PSI. A regulator on the burner will reduce the air pressure to what is required.
- Minimum of 3/8" reinforced hose or copper.
- Install a trap and valve on the air line to catch and dispose of water that will accumulate in the line.

Note! The burner requires this air supply at all times when it is in operation. Be sure that your compressor is of sufficient size and duty cycle to supply these continuous needs.

Electrical Requirements

- 120-volt service.
- Dedicated circuit with 10-amp fuse or circuit breaker (unit will draw a maximum of 10 amps when operating).
- Minimum of 12-gauge wiring.

EXAMPLE OF COST SAVINGS

Estimates of solution to be evaporated were not obtained so this chart was provided as a guide to cost savings to be expected by utilizing available waste oil and the reduced volume of coolant oil.

		Estimated Disposal Costs Per Gallon of Solution			
	Quantity of Solution	\$0.50	\$0.75	\$1.00	\$1.50
Per Month	8,300 Gallons	\$4,150	\$6,225	\$8,300	\$12,450
Per Year	100,000 Gallons	\$50,000	\$75,000	\$100,000	\$150,000

This is just an estimation of disposal cost savings that does not yet provide calculations for using waste oil as fuel, and the installation and maintenance costs were not available.