



## “THE GREEN WATER HEATER”

**Product:** INOV8 model HW210 waste fryer oil fueled water heater. This system consists of a vertical steel tube boiler combined with an INOV8 dual-fuel burner that is controlled by a PLC (programmable logic control) to allow the use of fryer oil as the primary fuel, but have an automatic backup system to natural gas. The boiler can be customized to a desired BTU performance, but is factory set at 210,000 BTUs per hour, which consumes about 1.5 gallons per hour of fryer oil. This assumes the oil BTU value is 130,000 BTUs per gallon.

The system includes all controls necessary to operate the fuels, to operate and provide custom settings for the water heater functioning.

**Manufacturer:** [INOV8 International, Inc.](http://www.inov8-intl.com)

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**Fuel Type:** Fryer oil and gas (natural gas or LP)

**Installer:** Plumbing installer certified for gas-fired appliances.

The following is included for your review:

- INOV8 Model HW210 Water Heater with Dual-Fuel Burner Equipment Description
- Brochure for HW210
- A detailed cost analysis will be provided upon request
- A price quote will be provided upon request



## EQUIPMENT DESCRIPTION

The INOV8 water heater with dual-fuel burning capability is specifically designed to use available waste fryer oil as fuel to generate hot water. If the oil is depleted the system is designed to sense a loss of oil pressure and automatically revert the fuel selection to gas without interruption to the production of hot water. The water heater control will display a notification that the fuel was changed to gas to allow the operator to respond when convenient.

This system was designed to accommodate the characteristics of the fryer oil taking into account the high flash point of the oil, the filtering requirements, to provide for an automatic backup, and the ability to customize controls for hot water requirements. This hot water system includes: a boiler and dual-fuel burner rated at 210,000 BTUs, a control system that includes a PLC (programmable logic control) for custom settings and automatic fuel function, a gas valve train, oil control system, a cleanable in-line filter, an installation and operation instruction manual and spare filters and fuses. Optional items are available to complete the system, including a 50 gallon polyethylene oil storage tank with a built-in heating system, an oil level device that displays a remote light indicating empty and full tank levels, a chimney system that includes a provision for preheating fresh air for combustion, and an oil transfer pump capable of handling hot oil directly from the fryer.

### Benefits of a Boiler Used for a Water Heater

Commercial water heaters have a life expectancy in the seven year range, though industry contacts report failings as early as four years. The failing occurs due to the light-weight materials used in the construction of the water heater. By comparison the Triad Boiler used by INOV8 as the boiler for our water heater, is constructed of steel that is 17% to 33% heavier than industry requirements, and is rolled or expanded into place to prevent thermal stressing common from welded boilers. Each boiler has ASME certification as a pressure-fired vessel. That all means that this INOV8 water heater will last at least 20 years – but likely much longer. When used for domestic hot water, boilers are covered by the same installation codes as a water heater; they generally do not require annual boiler inspections and can be installed by your local plumber.

### Shipping & Receiving

This system will be shipped to the location specified by your order. It weighs about 800 pounds so it will be shipped via common carrier and requires a lift device to unload from the truck. All of the controls will be installed, except for the burner and the gas valve train.

### Performance & Savings

For restaurants generating fryer oil and interested in “**Green**” initiatives for their energy consumption this is a perfect solution. Independent analysis by Brooke Haven National Laboratories found that biofuels generate significantly less greenhouse emissions than standard fuels, including less CO, NO<sub>x</sub>, SO<sub>2</sub> and a little less in CO<sub>2</sub>. When burning vegetable oil as fuel it yields a carbon neutral effect as the fuel is simply releasing the CO<sub>2</sub> it absorbed in the growing process. Additional benefits are seen in the reduction of the mess and handling of the waste fryer oil; elimination of disposal costs, and a significant reduction in the consumption of fossil fuels. The resulting “**green**” that goes into our pockets also feels pretty good. Most users report savings that cover the cost of the equipment within two years. 30 gallons of fryer oil a week generates nearly 600 gallons of hot water each day. The heavy duty construction and sophisticated control package promises many years of satisfaction beyond conventional water heaters.



## INSTALLATION CONSIDERATIONS FOR THE GREEN WATER HEATER

### Location of Water Heater

Water Heaters are typically installed in mechanical or utility rooms of restaurants. The location should provide space around the water heater to facilitate servicing, access to gas supply, electrical, and allow for oil storage. It's important that the chimney have a vertical configuration for optimal performance. The installer should know local codes.

### Regulations and codes

The local installer will be expected to satisfy any local code requirements and/or permits.

### Chimney Details

Good consistent air movement up the chimney is essential to the reliable operation of the burner. Because many restaurants operate with negative building pressure, INOV8 recommends a unique chimney design that brings fresh air from outside along the chimney perimeter. This preheats the air for better combustion. Refer to the drawing at right.

### Compressed Air Requirements

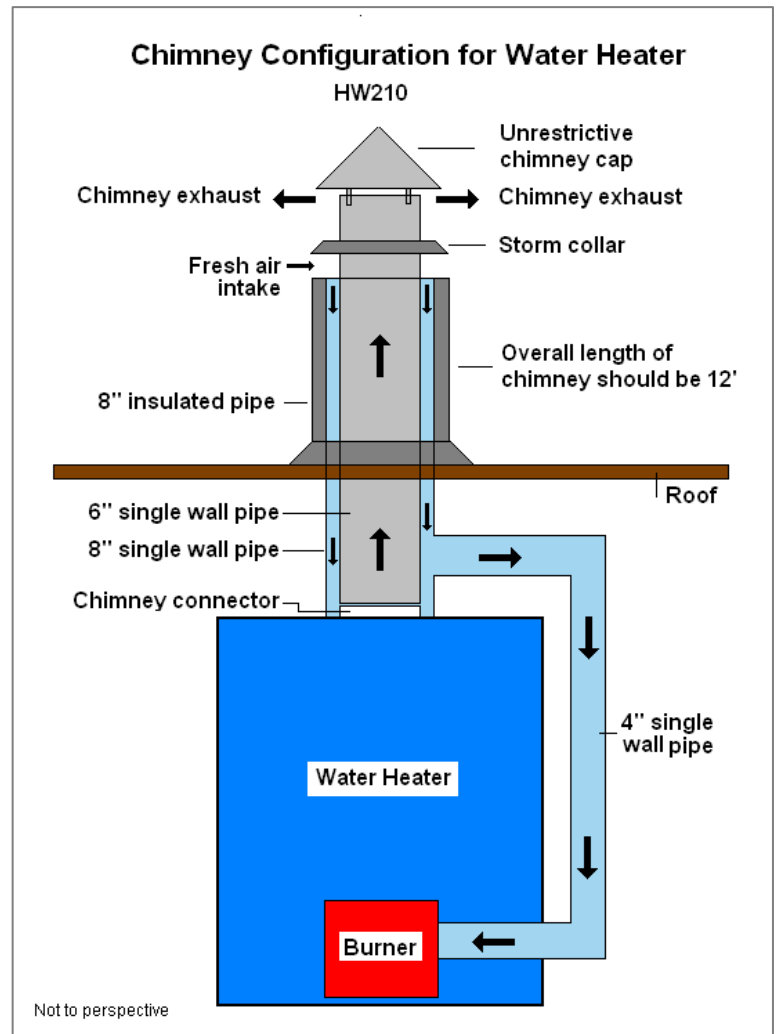
The INOV8 system requires compressed air for proper combustion of the fryer oil. INOV8 recommends a 15 or 20 gallon air compressor with psig capacity of 125, at least 3 cfm and a 3.5 hp heavy duty oil lube motor. An air dryer should be installed in the compressed air line. The air system can be located in a ceiling space or room separate from the mechanical room for noise abatement.

### Electrical Requirements

120-volt service, dedicated circuit with 20-amp fuse or GFCI circuit breaker (unit will draw a maximum of 20 amps when operating). There should be a minimum of 12-gauge wiring used.

### Natural Gas Requirements

- Gas supply pressures are: minimum 5" w.c. and maximum 7" w.c.
- Manifold pressures are: minimum 0.70" w.c. and maximum 1.84" w.c.

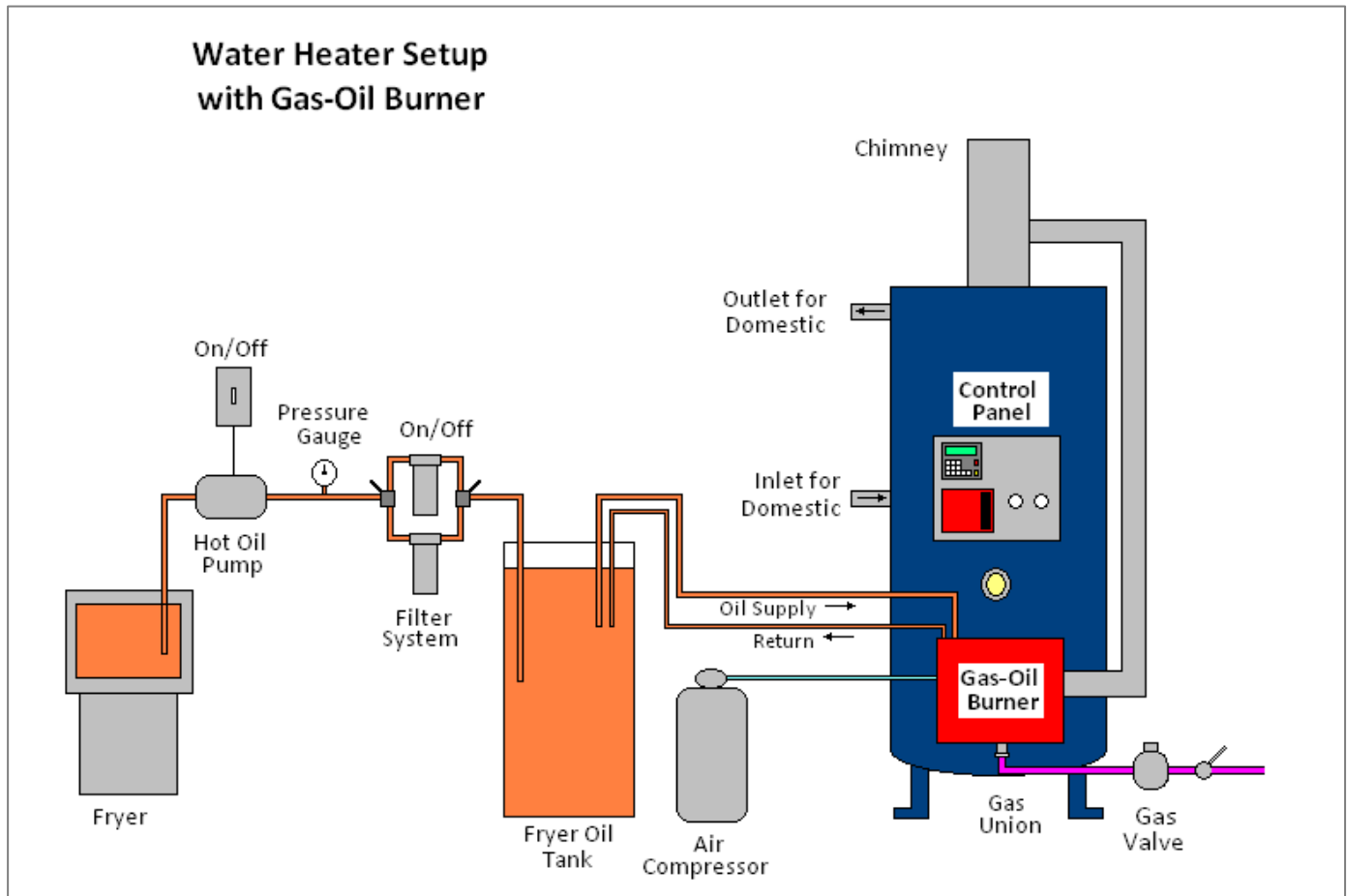




## Installer Expectations

The installer should be prepared to position the 750 pound water heater into the selected location and supply the following miscellaneous parts: supply the ¼" airline, ½" gas line, 6" chimney flue with 8" concentric for fresh air, ¾" water lines, miscellaneous fittings and a gas shut-off valve as needed. He should be capable of making the following connections: insert the electric plug into the 120 volt power, attach the gas line, install the chimney and fresh air supply, connect the water lines, install the burner, install the air compressor, run the air compressor lines to the burner, oil supply and return oil lines, install oil filter(s) in the oil lines. He should be prepared to set gas manifold pressure, adjust oil and air pressures, adjust combustion air and take combustion readings including draft, chimney temperature, CO, CO2 and a smoke patch test. Detailed installation instructions accompany the water heater.

## INSTALLATION ILLUSTRATION



Note – this drawing is to illustrate the relationship between each component

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## OPTIONAL ITEMS

- Oil Tank – (optional) the following options are available:
  - Various sizes and construction of storage tanks
  - Heavy duty oil transfer pump with pickup wand
  - Hot water coil for maintaining hot oil
  - Remote tank level indicator (full and empty)
- Heavy Extended-Duty Filters
- Secondary Pump for Space Heating
- Transfer pump for moving hot oil from fryer to tank
- Flat Plate Heat Exchanger for high volume hot water requirements
- Other equipment is available for customized requirements

## OPERATING THE GREEN WATER HEATER

INOV8's latest burner allows users to burn gas alone, oil alone or the combination of the oil has a high percentage of water content. It is operated with a fully certified control panel that contains a Fireeye combustion control and a PLC (programmable logic control). The PLC can sense a loss of oil pressure from a blockage in a filter or depletion of oil and automatically switch the fuel selection to gas, to prevent a loss of heat or hot water. This gas-oil burner is described below.

- INOV8 Gas-Oil Burner – this is the device contained under the red cover on the front of the water heater. The burner consists of components that preheat the oil and control its flow and pressure. There are two pressure settings that determine the firing rate of the oil side of the burner; the high pressure set at the designated BTUs and 50% of that rate. The pressures can be changed by adjusting the oil regulators also on the burner cover. The burner also controls the delivery of natural gas. Gas is used to initiate the burner and to ignite the oil, and then it turns off while the oil is being used as fuel. If the oil is depleted the control will automatically switch the fuel selection to gas, a notification will display on the control panel and the fuel lights will change to indicate gas is in use.
- Control Panel – this contains the main operating controls for the burner. The Fireeye combustion control (the red box) monitors the flame and the PLC allows customer options and notifications, and turns the fuel controls on and off. The PLC also records the hours of use of each fuel.



A Fuel Selection Switch provides three options:

- Gas Only
- Oil Only
- Gas & Oil



## Customized Settings

During installation customer options will be set into the PLC. When using fryer oil as fuel an operating requirement is that the gas be run once a week for two hours (without the oil). This is to maintain a clean combustion head on the burner to reduce maintenance. This requirement has three options that the customer can choose between:

- gas to run during 11 PM to 7 AM (during closed periods),
- gas pre-set to run one day a week (such as Monday or closed days), or
- one consecutive two-hour period any time during the week.

Based on the type of oil being used for fuel there is an adjustment to the oil preheat temperature. If oil contains animal fats that solidify at room temperature, the oil must be circulated in the burner at all times. This will be determined upon start-up of the burner.

## Start-up of Water Heater / Burner

Once the settings and fuel selection have been made, the power switch is turned on. That initiates the burner control to perform a “pre-purge” of the flue passages that takes 90 seconds. Then the gas starts on high fire while the oil is being preheated. When the oil reaches the desired temperature, the fuel automatically switches to 50% gas and 50% oil. The burner runs with gas and oil for (an adjustable period of) two minutes until the flame is well-established, then the burner controls automatically switch the fuel to 100% oil. The burner will cycle on and off as hot water is required. Each time the burner starts the combustion cycle, it will begin with the 90 second pre-purge period, then begin with gas and switch to oil within another minute. Should the oil be depleted the burner will automatically sense the loss of oil pressure and revert the burner to 100% gas. Notification will be displayed on the PLC’s LED readout panel and fuel lights will change to indicate that gas is being used. The control panel on the burner performs “self-diagnostics” to assure a safe and reliable operation of the combustion side of the water heater. Should a component fail during operation, the PLC will identify the failed component.

## Maintenance Requirements

During the first three months, INOV8 requires the burner head be examined after the first two weeks of operation. If the combustion head is clean, then it does not have to be checked for another month. If after one month the combustion head remains clean, then it can be checked every three months. If unburned oil has collected on the combustion head, it must be cleaned and a change made to either the oil preheat temperature or to the combustion air supply.

As is standard with all water heaters, once a year the INOV8 water heater should be inspected and cleaned by a certified HVAC contractor who will perform general maintenance. That will involve removing the cover from the burner and making sure all settings are proper, cleaning the burner and the water heater as needed and checking the chimney for obstructions. He will also inspect the water heater controls: the Aquastat, High\_Temperature Cut-out, the pressure relief valve, and the Low-Water Cut-off that they are operating properly.



## THE GREEN WATER HEATER MODEL HW210 SPECIFICATIONS

Water Heater Model Number	HW210
Type	Commercial
Fuel Type—Natural Gas or Propane	Yes
Oil (Fuel Oil, Fryer Oil or any clean biofuel)	Yes
Input (BTU)	210,000
Output BTU/Hr	174,400
Chimney Diameter	6"
HX Supply & Return Water Connections	3/4"
Water Heater Water Connections	1-1/4"
Jacket Diameter	22"
Water Heater Height	72-1/2"
Height to Hot Water Connection	60-3/4"
Height to Cold Connection	36-1/2"
Gas Connection	1/2"
Height to Gas Connection	15"
Manifold Gas Pressure:	.71 to 3.0
Compressed Air Requirement	2 cfm @ 35 psig
Voltage	120
Amps	20
Temperature Range (F)	100 to 180
Max. Vessel Pressure (PSIG)	125
Flow Rate @100 F Rise—GPM / GPH	3.49 / 209
Flow Rate @ 80 F Rise—GPM / GPH	4.36 / 262
Flow Rate @ 60 F Rise—GPM / GPH	5.81 / 349
Flow Rate @ 40 F Rise—GPM / GPH	8.72 / 523
Flow Rate @ 20 F Rise—GPM / GPH	17.43 / 1046
Shipping Weight—lbs.	850
Operating Weight—lbs.	1,140
Country of Origin	USA

Note: Flow rates are provided to give an indication only. A Flat Plate Heat Exchanger and/or a hot water tank may be needed to achieve required flows.

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## PRODUCT CERTIFICATION

- The water heater system has a unit certification by Intertek ETL-Semko to ANSI Z21.17\*AEI Domestic Gas Conversion Burner Issue: 1998/01/01, 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), UL296A\*AEI UL Standard for Safety Waste Oil-Burning Air-Heating Appliances – Issue: 1995/10/31 Ed:2 Rev: 2006/03/08, CSA B140.0\*AEI – General Requirements for Oil Burning Equipment General Instruction No 2-4 (R1991) – Issue: 2003/10/01 Ed: 3, CSA C22.2#3\*AEI – Electrical Features of Fuel-burning Equipment General Instruction No 1-2 (R1999) – Issue: 1988/01/09 Rev: 1999/01/01. Report # 3167331MIF-005.
- PLC Control Panel – Tested & Listed by Intertek ETL-Semko, to UL873 Temperature Indicating & Regulating Equipment – Report # 3184384CRT-001a.
- U.S. Patents: #5,149,260 & #5,341,832 & other patents pending
- The Triad boiler (water heater) is a ASME certified pressure vessel to the ASME Boiler Code, Section IV.

## WARRANTY TABLE

Category	Model #	Warranty Period
Furnaces – (heat exchangers are prorated 10% per year for 10 years)	F125, F200, F200 SC & F450	Two Years – parts only Limited Warranty on Cabinet
Boilers Systems - (boilers are prorated 10% per year for 10 years)	All Models	Two Years – parts only Limited Warranty on Boiler
Oil Storage Tanks	T300 HB T300 FB	One Year – parts only
Evaporator Systems (tank is prorated 33% per year for 3 years)	EV20, EV30, EV40 & EV60	Burner and Evaporator Controls - One Year parts only Limited Warranty on EV tank for 3 years
The Green Water Heaters - (are prorated 10% per year for 10 years)	All Models	Two Years – parts only Limited Warranty on Boiler/Water Heater

Note – please refer to warranty policy for complete details.