

# PORTAGE & MAIN

Est. 1973

**OUTDOOR WATER FURNACE  
WOOD GASIFICATION  
OPTIMIZER 250, OPTIMIZER 350  
& ECONOMIZER IDM 100**

**EPA  
QUALIFIED**

**HIGHLY  
EFFICIENT  
SCOTCH MARINE  
TUBE HEAT  
EXCHANGER**

The Economizer IDM 100 is specifically designed for installation inside outdoor buildings such as shops, barns, sheds or garages.



*All three furnaces burn ALL types of dry, seasoned wood!*

**OPTIMIZER  
250**

**OPTIMIZER  
350**

**ECONOMIZER  
IDM 100**



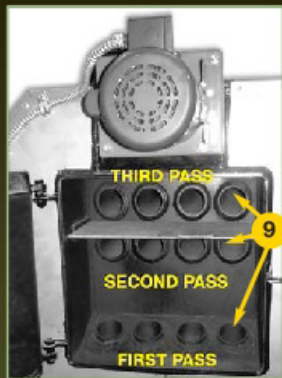
Watch the gasification action video at  
[www.portageandmainboilers.com](http://www.portageandmainboilers.com)



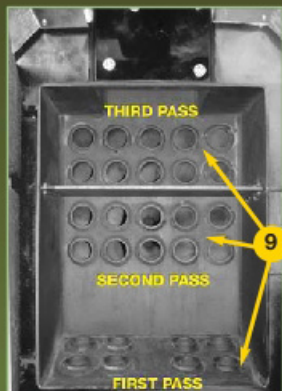
# WOOD GASIFICATION ~ ECONOMIZ

## WATER FURNACE UNITS ~ Excellent Engineering,

CSA



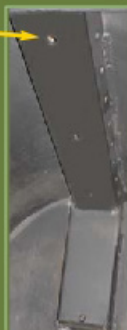
**Economizer IDM 100**  
Scotch Marine Design  
Multi-Pass Heat Exchanger  
(back view)



**Optimizer 350**  
Scotch Marine Design  
Multi-Pass Heat Exchanger  
(back view)



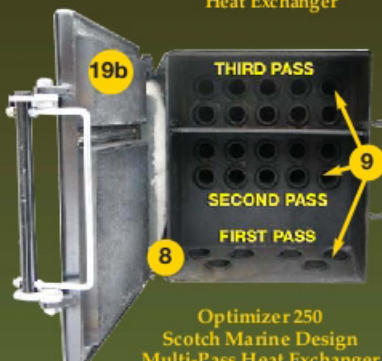
Extensive amount of  
heavy-duty pre-cast  
heat-treated refractory brick



Air injection  
ports



Front of the  
Optimizer 250  
Heat Exchanger



**Optimizer 250**  
Scotch Marine Design  
Multi-Pass Heat Exchanger  
(back view)

**3RD PASS:** is through a second set of ten 1.5" tubes. Optimal heat has been extracted before the gases exit the stack.

**2ND PASS:** gasses travel through ten 1.5" horizontal tubes.

**1ST PASS:** is the extreme heat passing through the reaction walls towards and up the heat exchanger's six 2" vertical tubes which are easy to access and clean (with supplied brush).



**Optimizer 250 Reaction Door & Reaction Chamber.** Optimizer 350 is larger.



**Optimizer 350**  
Gasification Chamber Reaction



**Optimizer 250**  
Gasification Chamber Reaction

The Economizer IDM 100 and the Optimizer units use the wood gasification process to produce highly efficient combustion in the furnace's primary burn and reaction chambers. Wood in the firepot burns from the bottom up, drying the top layer of wood in the firepot. Gases and exhaust are forced into the lower burn refractory brick chamber where gases are burnt at temperatures of 2000°F. plus. Temperature variation is based on fuel type, burn rate and other conditions.

The extensive refractory brick lining of both burn chambers, produces and absorbs the chamber's high burn temperatures required for consistent gas combustion. This significantly reduces emissions, prevents creosote build up and minimizes ash build-up in the unit. Maximum heat extraction is achieved as the exhausting air travels the full length of the burn chamber, up through the vertical passes and horizontal passes. Please check chart on the back page for number of passes and sizes. These multiple tubes running through the water jacket heats the water quickly and efficiently. Water gets up to temperature faster with this design. This was the most efficient design of boilers 150 years ago and still is today. Optimal heat extraction saves both the work and the cost involved with wood.

# ECONOMIZER IDM 100, OPTIMIZER 250 & 350

Economical, Environmental and Operator-Friendly.  
 A US Certified. Optimizer 250 & 350 EPA Qualified.

**Incorporates the existing features of the conventional Portage & Main unit - longevity, reliability and efficiency and adds these great features to the Economizer IDM 100, Optimizer 250 & Optimizer 350:**

- All P & M models have rounded firepot with *Over Under Air*. For example, on Optimizer 250 air is injected above the fire with air injection ports along the full length of the firepot. In P & M Gasification models air rolls gently down the sides of the firepot going under the fire, giving a super clean turbo burn with no creosote and no one-spot burning. Both air ports are adjustable.
- Extensive amount of heavy-duty, pre-cast, heat-treated, stainless steel reinforced refractory brick in target area. The total base is 4" thick heat-treated pre-cast refractory brick.
- Water jacketed, the fire chamber has extensive amount of heavy-duty, pre-cast, heat-treated, stainless steel reinforced refractory brick.
- Fire chamber has 9" high heavy-duty, pre-cast, heat-treated, stainless steel reinforced refractory brick all around.
- Common removable, re-arrangeable, replaceable refractory brick reaction chamber for the gasification process and to assist in re-ignition. Easiest reaction area to clean. Straight forward access. No bumps to clean around.
- Heavy-duty, pre-cast, heat-treated, stainless steel reinforced refractory brick combustion nozzle.
- Secondary combustion/reaction chamber bottoms are a re-arrangeable, replaceable refractory brick. Heat gases travel towards the tubes of the heat exchanger.
- Water cooled lower reaction area behind the refractory brick allows for heat transfer into the water jacket. This is where the intense heat from gasification process is extracted.
- Large area of heat recovery with extensive water covered heat extraction surfaces. The scotch marine multi-pass tube heat exchanger, which is a time tested and proven design/ The Optimizer 250 consists of six 2" vertical tubes and 20 full length 1.5" horizontal tubes; Optimizer 350 consists of eight 2" vertical tubes and 20 full length 2" horizontally; Economizer IDM 100 has four 2" diameter tubes and eight 2" horizontal tubes.
- Easy, convenient access to the large pump install area is provided by the back, insulated, hinged doors. These doors have lockable paddle type latches.
- Protected behind the doors are aquastats and blower. The Optimizer's simple digital controls allow the operator to accurately regulate the furnace's heat output as controls are programmable to within one degree (Johnson Control). No temperature creeping to boiling point. High limit safety aqua stat controls can be remotely mounted in the home/building easily. Economizer IDM 100 has Honeywell Digital Controls with safety high limit setting and low water shut-off. Economizer IDM 100 has a negative pressure system which creates a draw to move the smoke out. Optimizer 250 has a forced air system. These systems create a draw/turbulence to mix oxygen with the combustible gases to complete the gasification process. Double pump Hook up shown on Optimizer 250. Optimizer 350. Economizer IDM 100 units have single pump hook up. Extra pumps can be tied in. Pumps not included.
- CSA approved high quality capacitor-run bearing motor.
- Motorized 120 volt gasketed flapper air shut off.
- Adjustable primary and secondary air. Motor fan switch and electrical control box.



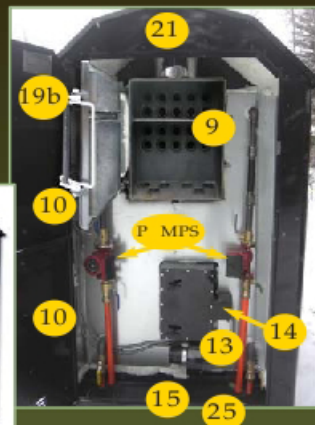
**TESTIMONIAL** ~ I purchased a 250 Opt (Outdoor Water Furnace) quality. I live in NE basement. All in all everything is good. If fur  
 ~ Patrick B., NE, North Carolina

# TURNING GREEN INTO GOLD

**& KEEPING THE GREEN IN YOUR POCKET!**

**Original, undisputable optimal designed, classic named Portage & Main Outdoor Water Furnaces lead the industry in high efficiency, dependable, long lasting, engineered products, with proven technology that has stood the test of time for over 150 years.**

15. Return water enters low to pick up intense heat.
16. All parts are laser cut for precision fitting which allows the bevel to be accurately filled with strong double pipeline (Boiler style welds). Welding inside and outside takes more time but is worth it as it results in stronger total penetration welds, which help prevent weld corrosion, cracking and pin hole leaks.
17. Rounded top firepot has air introduced along the full length of the firepot. This prevents one spot violent burns.
18. Firepot and heat exchanger are made of 1/4" W44 cold rolled steel which eliminates the problems associated with stainless steel. W44 cold rolled steel has the same corrosive resistant properties as boiler plate and is noted for being a very "uniform" steel that is easy to shear, break and is welder friendly. Inside water jacket is made of 1/4" cold rolled steel. Outside water jacket is made of 3/16" cold rolled steel.

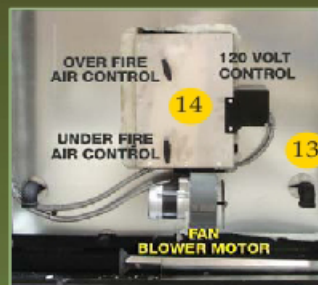


19. Convenient, easily accessible, insulated, or double stainless steel doors have adjustable latches and adjustable heavy duty hinges using of 3/8" hardware. The safety latch doors seal with top quality industrial core gasket giving a long-lasting, positive seal.

- 19 A and 19 B: allow for total open access cleaning of fire tubes from both ends. Cleaning is an easy straight through motion with the cleaning brush.
- 19 C: Heavy-duty charge door, insulated with Roxull insulation to 2,200 degrees F, is at a convenient, easy loading height.
- 19 D: Easy ash removal

Economizer IDM 100 charging door(not shown) has extra thick refractory brick.

20. Easy to read, convenient float water level indicator has no sight glass to fog or discolor or electronics to give problems.
21. Chimney comes out of the furnace below water level. This prevents stack corrosion.
22. Powder coated finish on the one-piece roof. Top quality mirror-like paint on the rest of the furnace. The Economizer IDM 100 has a stainless steel cover.
23. Furnace is very well insulated using R20 quality insulation which will not burn down, crack, separate, burn or cause rust on the outside of the unit. The Economizer IDM 100 is insulated with Roxull insulation.
24. "PORTAGE & MAIN" is proudly stamped on every unit.
25. Base floor insulated with high temperature Roxull insulation to 2,200 °F.
26. NO additional insulated water storage tanks are required to extend heating period of the P & M wood gasification units therefore NO additional costs are incurred.



Digital Aqua Stat Controls

...mizer 250 wood gasification unit. I really like the Portage and Main  
 North Carolina up at an elevation of 3200'. I have in-floor heat in  
 ...ace continues to work as it has I am very pleased.



# Portage & Main Outdoor Water Furnace WOOD GASIFICATION UNITS

*Optimal Designed, and Manufactured for Optimal Efficiency and Operation Ease*

## What it means for you!

Portage & Main Outdoor Water Furnaces have been producing highly efficient, long-lasting furnaces that are simple to operate and maintain, since 1973. They have industry's best warranty. The wood gasification process gives optimal high efficiency by extracting heat from the gases and other emissions, that are released into the atmosphere when a conventional furnace is used. This optimum high efficiency gives you optimal benefits and savings all around.

The optimal high temperature burn produces more heat from less wood, lowering total heating cost. It takes less wood to give a greater BTU output. The wood burnt in P & M gasification units can produce twice the amount of heat, than if the same amount of wood was burnt in any conventional boiler design. P&M wood gasification units burn cord wood; therefore, there is less processing costs (cutting and splitting). This saves both resources and time! It can burn all types of seasoned dry wood, so it achieves even more savings for you.

P&M wood gasification units combine the benefits and safety, of the low temperature conventional water furnace/boiler, with the extra savings and technology, of high temperature water furnaces to supply your heating needs (your home, greenhouse, pool, shop, business, industry or other buildings). You are not dependent on fossil fuels and their rising costs. It is designed for easy operation, low maintenance and, of course, highest efficiency.

The round scotch marine tubes keep the hot gases to the perimeter of the tube so heat is easily extracted by the water surrounding the tubes. This guarantees maximum heat transfer to the water. Turbulent heat transfer only occurs with round tubes. It is not possible with rectangular or square pipe as they rely on laminar flow.

High temperatures of the gasification process eliminate creosote build-up in the scotch marine tube heat exchanger.

Front and back fire tube access doors

make cleaning out fly ash from the flues a simple and easy task. The front access door for the fire chamber makes this area accessible and easy to maintain ash free.

Access doors make hook up simple. The Optimizer models can be installed as total stand alone outdoor units. The Economizer IDM 100 is to be installed under a roof (shed, barn, shop, garage, etc.) The Optimizer units may also be installed under a roof. This keeps the fire and wood pile away from your home which in most cases lowers home insurance costs.

No expensive hot water storage tanks are required.

These design and production elements are beneficial to you and to the environment.

## What it means for the environment.

The reports of dwindling fossil fuel supplies and a growing concern for the environment have governments and individuals, alike, looking for alternative heating options.

With their leading edge experience and expertise in alternative energy products for 40 years, Portage & Main Outdoor Water Furnaces have answered the call for greater efficiency and less environmental emissions, with their wood gasification units. It was a natural!

The highly efficient Portage & Main Outdoor Water Furnaces have always burnt 1/3 to 1/2 less wood than other boilers. It stands to reason, if less wood is burnt, there will be less emissions into the environment. Portage & Main Outdoor Water Furnaces have always incorporated the time tested, efficient elements of wood burning into their furnaces.

We have combined the unsurpassed quality of the Portage & Main Outdoor Water Furnaces, with the high temperatures of wood gasification, pre-cast heat-treated, stainless steel reinforced, refractory brick and scotch marine heat extracting tubes to produce an environmentally and user friendly, long lasting, efficient unit. P & M

wood gasification, clean burning models use even less wood to produce double the amount of BTUs and are virtually smokeless – which means very, very, little emissions.

## Gasification Process: How it works.

The Physics Laws Combustion Stages:

1. Wood burns and boils out moisture.
2. As temperature increases, the wood begins to release volatile gases.
3. These gases are burnt. This is the final stage of combustion which releases the most heat.

Low temperature conventional furnaces cannot maintain the 1300°F plus temperatures, required to burn these gases. The Portage & Main high temperature wood gasification chamber maintains 3 stage combustion, which produces optimal heat. The very efficient large scotch marine tube design heat exchanger, optimally extracts heat into the water jacket. The heated water is circulated to your home's (building) heating system through underground insulated pipes.

Outdoor water furnaces can be used for new building heating, or easily integrated into your existing heating system. They can be used with any forced air heat source, existing electric, gas, or heating oil.

A simple fan coil radiator is installed in the furnace plenum, and the existing fan blower distributes the heat. The fan blower is now controlled by a new thermostat, leaving the existing system intact for emergency back-up. Heat is distributed evenly throughout the building. You can also use a plate heat exchanger to connect to your existing indoor boiler. Boiler fluids are left intact and ready for emergency backup. You can use a plate exchanger or a sidearm, to produce unlimited domestic hot water.

# Portage & Main Outdoor Water Furnace WOOD GASIFICATION UNITS Specifications:

WOOD GASIFICATION UNITS	ECONOMIZER IDM 100	OPTIMIZER 250	OPTIMIZER 350
Maximum Furnace Output (Btu/Hr)	Up to 140,000	Up to <b>190,000</b>	Up to <b>231,719</b>
Heating Area (Sq. Ft.)*	3,000	5,000	7,000 to 15,000
Total Size W x D x H	29.5" x 40" x 66"	47" x 66" x 81"	50" x 72" x 95"
Shipping Weight	1,600 lbs	3,030 lbs	4,000 lbs
Chimney Size	6"	6"	8"
Door Size W x H	12.5" x 14"	18" x 20"	18" x 20"
Firepot W x H x L / Cubic Feet	20" x 30" x 20" / 7	28" x 30" x 30" / 11	32"x 44" x 34.5"/27
Water Capacity (US Gallons)	70	240	350
Horizontal Fire Tubes	8 (2" diameter)	20 (1.5" diameter)	20 (2" diameter)
Vertical Fire Tubes	4 (2" diameter)	6 (2" diameter)	8 (2" diameter)
Maximum Log Length	18"	26"	34"
Split or suggested Log Diameter**	4" to 5"	4" to 6"	4" and up
Electrical Requirement	110/220 Volt	120 Volt	120 Volt
Power Draft Motor		Positive Pressure	Positive Pressure
Suction Motor	Negative Pressure		
Heat Exchanger	Triple Pass	Triple Pass	Triple Pass
Limited Warranty	Lifetime	Lifetime	Lifetime

\* Approximate only - heat load should be calculated. Many factors influence the heating area - such as the insulation value of the structure, and the climate in which the furnaces operates. It is always best to calculate the number of BTUs required per hour for your heating needs. \*\* For optimum performance wood gasification requires dry, seasoned wood.

Manufacturers reserve the right to make changes or modifications to products.

Brochures are updated regularly, however for the most

current information please see the website

[www.portageandmainboilers.com](http://www.portageandmainboilers.com)

CONSULT WITH DEALER FOR DETAILS AS, MAX OUTPUT BTU'S LISTED  
IS BASED ON EPA REQUIRED TESTING

Why burn **THIS MUCH** wood, when you  
can purchase a P & M Gasification unit and burn...

**THIS LITTLE!**

*Simply the Best!*

North American Portage & Main Outdoor Water Furnace Distributor

Authorized Portage & Main Outdoor Water Furnace Dealer



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