# TECHNICAL SUMMARY

CUMBERLAND STOVE WORKS

MF SERIES

MULTI-FUEL

*Pellet Stoves*

MF3700

MF3800

FEATURING

TRI-X HEAT CONTROL


CUMBERLAND STOVE WORKS
MF SERIES

# Overview

The Cumberland Stove Works MF Series with Tri-X Heat Control was designed to overcome three major shortcomings in multi-fuel biomass stove design that exist in the industry; low overall efficiency, low burn efficiency, and cumbersome fuel changes. After overcoming these flaws, Cumberland Stove Works engineers added to the list of improvements by including features such as a circulating air filter, a gravity seal ash pan, an easy-to-read Tri-X controller, and fuel burning technology that reduces the amount of carbon monoxide produced by the stove during shutdown.

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# Overall Efficiency and Burn Efficiency

The Cumberland Stove Works MF Series has a patent pending heat exchanger design that makes it 10-40% more efficient than other stoves in its class. There are three basic physics principals that were followed to enable the MF Series to achieve these efficiencies; warm air rises, increasing heat exchange area increases heat exchange, and increasing volume of air across the heat exchanger increases the efficiency. The following illustrations show how the MF Series puts these principals into practice.

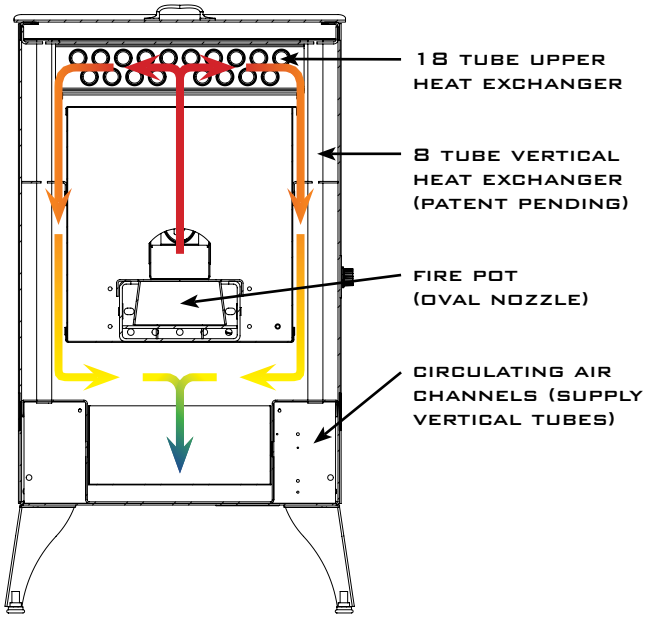


Illustration #1: Fire box overview / Air flow and heat gradient

In the middle of illustration #1 is the Cumberland Stove Works exclusive Oval Nozzle fire pot. The geometry of the fire pot allows the MF Series to convert over 99% of the solid fuel into usable heat energy. Other stoves in its class have two to three times as much ash production per mass of fuel (See illustration #3).

After the solid fuel gets converted into heat energy, the hot gases surround the banks of tubes within the firebox and exchange over 80% of the heat released from the fuel. Illustration #3 shows how the MF Series compares to three other stoves in its class.

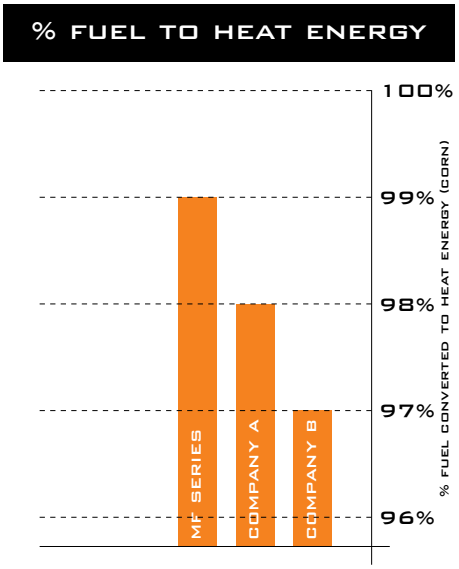


Illustration #2: Fuel conversion rate (corn)

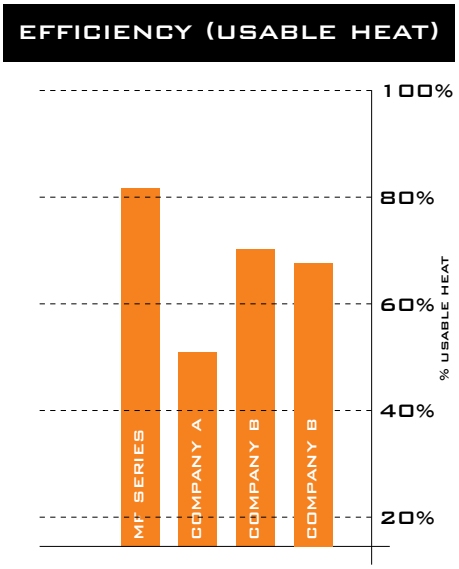


Illustration #3: Efficiency defined as BTU Usable/BTU Input

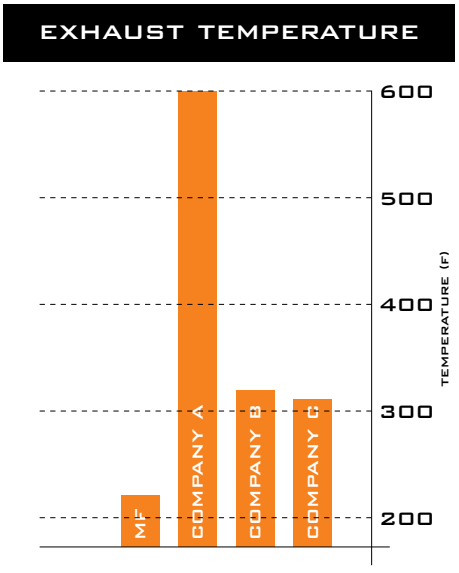


Illustration #4: Exhaust temperatures going outside

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# Fuel Changes

The MF Series provides 24 different burn settings. The controller is now detachable and can easily be mounted to a wall or held at arms-reach for comfortable operation. The Easy-to-read alphanumeric messaging makes operation a breeze. There are no codes to figure out. Simple plug-and-play technology allows you to hook up a thermostat for more consistent heating.

The easy-to-read display, is a 16 x 2 character backlit display that tells the stove's user in plain English what is happening in the stove at all times. With the push of a button the range is chosen and the correct fuel maps are loaded for that fuel. Once the fuel range is selected, the controller will prompt the user to perform the steps necessary to light and burn the stove. If anything happens to the stove during operation, the display will tell the user the exact cause of the stove going out.

For example, if the glass door is opened during operation the controller will display "LOSS OF VACUUM," "CHECK DOOR SEALS." Prior to the Tri-X Controller other stove controllers would blink a cryptic sequence of LEDs or diplay "Err-1" which in turn would send the user scrambling for the owners manual to decode the error.

The MF Series allows the user to change fuels with just the push of a button. There are no other pots, agitators, screens, or baffles. Just dump a different fuel in the hopper and choose a different fuel setting on the controller.


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# Low Carbon Monoxide Levels

The MF Series fire pot does not require agitation. This is beneficial in three keys areas: ash production, safety and cleaning. The ash production was already shown in Illustration #3. When a biomass stove encounters a vent blockage, power outage, fan failure or even during a normal shutdown condition, the carbon monoxide within the house will increase. Agitation allows other company's stoves to operate with an overly rich fuel to air ratio. Stoves with agitators produce more carbon monoxide after a failure than those without because of the excess fuel left in the fire pot. Illustration#5 shows the allowable carbon monoxide levels per ASTM 1509 compared to the MF Series.

Stoves with agitation pulverize the ash within the pot. The pulverized ash goes airborne and ends up coating the interior of the stove, the exhaust system, and the outside of the house. The MF Series produces very little airborne ash. The airborne ash that is produced is contained within the fire box and ash pan. This ash is cleaned out with normal maintenance.

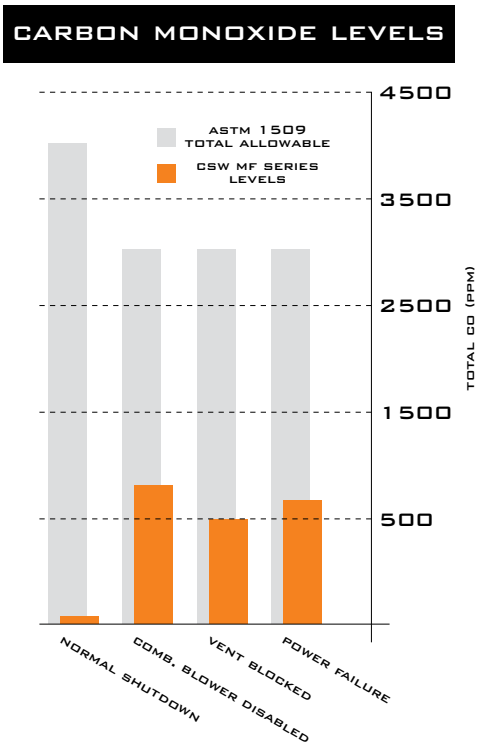


Illustration #5: CSW Carbon Monoxide levels compared to ASTM limits

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# Cleaning and Regular Maintenance

All cleaning is accomplished from the front of the stove, including the exhaust system. Cleaning the pot takes two seconds and is as easy as pulling and pushing the cleaning rod. Note: The pot needs to be cleaned each time the hopper is refilled. Although if fuel quality is poor or the pot is misaligned you may need to clean the pot more often. The ash from the fire pot falls into the ash pan. The ash pan is sealed by gravity and therefore does not need latches, screws or hinges to operate. Note: The ash pan is designed to need be cleaned after 800 lbs. of corn and 2400 lbs. or pellets are burned in the stove. This is based on using high quality fuel.

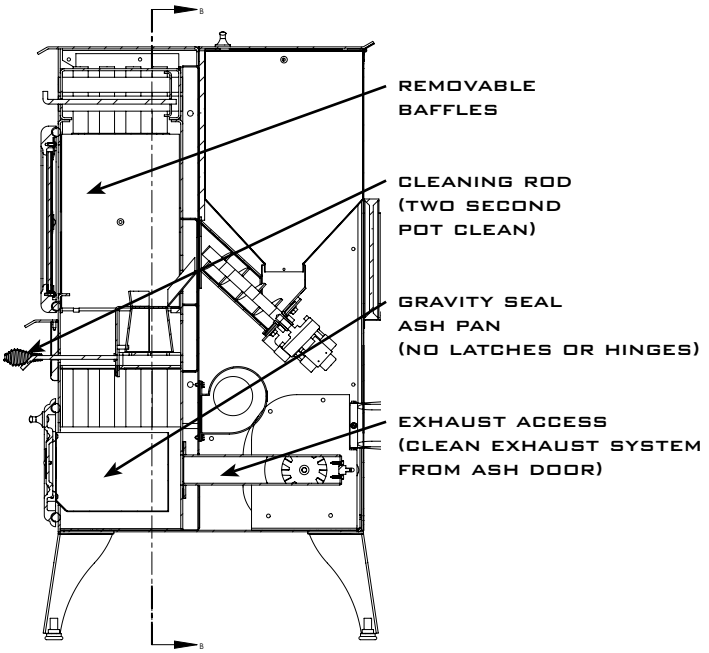


Illustration #6: EASY CLEAN design

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# Circulating Air Filter

A circulating air filter is included with every stove. The filter traps indoor pollution. It also protects the blowers, motors, and electronics from clogging with debris. See Illustration #9.

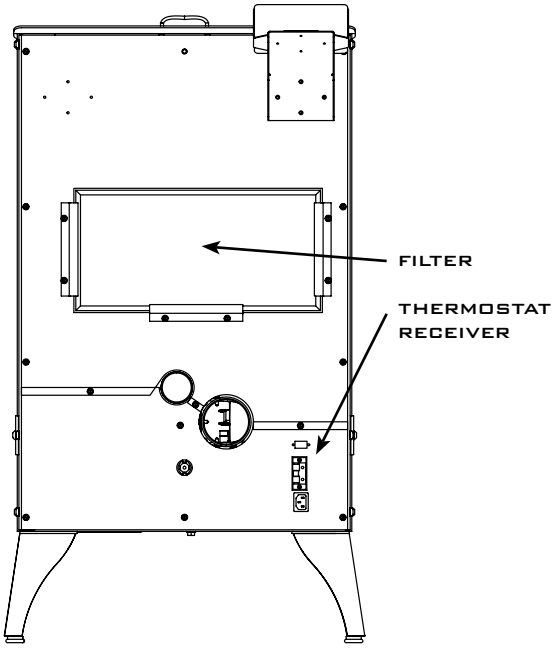


Illustration #8: Circulating Air Filter

# Thermostat

The Tri-X Heat Controller also accepts an auxiliary thermostat (not included with unit). Simply plug the two wires from a thermostat into the Red and Black compression terminal (See in Illustration #8). The stove will keep the dwelling at the temperature set on the wall.

# Conclusion

The MF Series solves three major flaws found in other stoves: low overall efficiency, low burn efficiency, and time-intensive fuel changing. While solving these three main problems the MF Series offers improvements in cleaning and maintenance. Furthermore, the circulating air filter improves the longevity of all of blowers and electrical components. All of these improvements and innovations make the Cumberland Stove Works MF Series stoves the best new multi-fuel pellets stoves available.

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