



Tips For Using a Catalytic Woodstove

By Mike Preetorius, Customer Service

A model of your stove was sent to Environmental Protection Agency for testing and certification by the factory before any mass production of that stove. The EPA tested it for air tightness, pollution emissions, and other things. After being certified, the model was returned to the factory to be used as a template for mass production. Any modifications made to that model will be returned to the EPA for re-certification.

When the EPA certifies the stove as air tight, they are intending that, as a safety precaution, if you the homeowner have a tragedy such as a flue fire, you the home owner has to have the means of extinguishing that fire. They are not intending for you to pour buckets of water into your stove, but rather to close off the air intakes that feed oxygen to the burning logs.

The engineers that designed your stove also intended for you to operate your stove as an air tight appliance. The internal air currents, the exhaust path through to the chimney, will only flow properly if your stove is air tight. You may notice one or more things if your stove is not air tight:

1. A smoky smell in the room when there shouldn't be. If air can leak into your stove, it can leak also leak out, and that will be in the form of smoke.
2. The glass on your stove is next to impossible to keep clean. Instead of the smoke evacuating properly through the chimney, the smoke will roll around in the woodbox constantly pushing soot onto the glass. By the way, never clean the inside of your stove with oven cleaners, glass cleaners, or any other chemical product. They leave residues that can later burn and so poison your catalytic combustor. Use only a razor blade scraper and a wet paper towel to clean your glass.
3. Air leaking into your stove, called 'Puffing', can make small columns of flame shoot up into your combustor like a mini-flamethrower. Over time, these small columns of flame can cause what's known as 'Flame Impingement'. This is the slowest acting and **first** of three causes of Flame Impingement.

Most air leakage problems can be corrected by replacing the door seal every two to three years. This is normal maintenance. The opening and closing tightly of your stove door will flatten the seal, letting air pass through. Manufactures also use this seal on other parts of your stove, such as around the ash can, glass, or door latch. If you need to replace the seal around your door, search for other locations of this material and also replace it. Do not expect yourself to remember a couple of years later which piece was replaced in what year. Do the job once and completely.

How do you know if you need to replace your seals? Here are 2 good non-scientific methods to try. One way is when your stove is cold, and the other is to try when you have a fire burning in it.

For a cold stove, do the old Refrigerator Door test. Take a dollar bill from your pocket and open the stove door. Insert the bill halfway in and close the door on it. If you can pull the bill out easily, you have air leakage. If the bill stays in snugly, then it is probably a good seal. Do this test all the way around the door. Remember to only do this test on a cold stove. Try it on a burning stove and you will lose your dollar.

If your stove is burning and you want to test it for air leakage, you can inspect more than just the seal around the door. You can inspect every weld and joint at the same time. This method is a take-off of the old Plumbers Smoke test. Get butane lighter and adjust the lighter to its highest flame level and light it. Very slowly, move the lighter around the closed door opening approximately one inch away from the door. The hot fire within the stove will make air move in or out if there is any leakage. If air is blowing out of the stove, the flame on the lighter will bend away from the stove. If air is moving into the stove, the flame on the lighter will bend towards the stove. Repeat this test along every weld, the edges of the glass, and every other joint that you can reach. Locating any source of leakage is the first step in repairing it.

Now that you have made your stove air tight again, complete the process of bringing your stove back to a new-like condition. Inspect the inside of your stove for any damaged components of your stove. Look for holes in things that should be solid, and bent or warped pieces that should be straight or flat. This is a perfect time to repair or replace any damaged parts of your stove. Your local woodstove dealer can help you with this.

Inspect and clean your catalytic combustor at least once a year before each burning season. Use a soft paint brush to remove loose particles and ash. Vacuum it with the brush attachment of your cleaner or even a shop-vac. Never use high pressure (compressed) air on your combustor. This can cause a hard particle to scratch off the coating of the combustor. Compressed air will also leave water inside your combustor. To unplug the holes (cells), use a pipe cleaner or a cotton swab. Never use a hard rod such as a metal or wood skewer to do the job.

Do not forget to sweep your chimney. Keeping your chimney free of build-up eliminates the risk of a flue or chimney fire.

Your stove is now in a new like condition. It can now be operated properly as the manufacture intended you to do.

The only fuel for use in your stove is clean, dry, seasoned for at least one year, split logs. Never use wood products such as treated lumber, plywood, colored paper, or trash of any kind. Even kiln dried lumber may not have been kiln dried enough. Never burn green or wet wood in your stove. The excessive moisture content will cause creosote build up, cracking in the combustor known as 'Thermal Shock', and lower burning temperatures. Seasoned wood are logs that were split and stored under cover away from moisture, drying for a full year. The logs should be stacked in a manner that allows good air circulation around and through the log stack to drive away moisture. Remember, just as wood will expel moisture, it can also soak up moisture, so keep your wood dry at all times. If at all possible, burn hardwoods instead of

softwoods. Hardwoods are better fuel for your stove than are softwoods. As a general rule, they burn cleaner and give off more heat than softwoods.

Starting your stove should be done the same way every time. Start with the bypass all the way open so that the future smoke and fumes will go straight up the chimney without going through the combustor. Secondly, open the air intakes so that your future fire will get all the oxygen that it can. Next, build your fire in the woodbox. Use uncolored newsprint or a good quality fire starter bought from your woodstove store. Make sure that it says wax only on the label. Cheap starters or logs can be just sawdust and diesel fuel and you would never want that in your stove. Close the door and after the fire goes from the small stuff to the larger logs, let your logs burn for twenty to thirty minutes with the bypass open. By conductive heating, you are warming up your stove and most importantly, the combustor, to its correct operating temperature. That temperature range should be 500 degrees F to 800 degrees F. A catalytic combustor has to be at least 500 F minimum in order for it to work. Burning your logs for twenty to thirty minutes with the bypass open will do this. Close the bypass too soon and the combustor will be too cold burn the smoke and fumes. The smoke will instead coat the combustor and block air from getting to point of combustion, so let your logs burn with the bypass open and the air intakes open for the full amount of time.

After the half hour of full burning, reduce the amount of air coming into your stove by reducing the opening of your air intakes. This will start to lower the flame level coming off your logs. You want heat. You do not want high flames. High flames coming into direct contact with the combustor is the **second** and most rapid way of getting Flame Impingement problems in your combustor. You can make your stove burn at very hot coals, yet have almost no flame by adjusting the air intakes. It may not be as pretty as high flames in your stove, but you will gain years of life on your combustor and save a lot of firewood in the process.

After lowering the air intakes on your stove, the last step is to close the bypass and route the smoke and fumes through the combustor. The hot smoke, assume it to be 650 degrees F, will then pass through the hot combustor, burning the fumes, creosote, soot, carbon monoxide, and what ever else is in the smoke to a temperature between 1,000 and 1,400 degrees F. If your stove has a blower on it, it is blowing heated air from a chamber on the exhaust side of your combustor, not air circulating through the firebox. The fire burning in the combustor is the fire that is heating your home, not the fire burning in the woodbox. The woodbox fire is there for two reasons and two reasons only- to maintain the 500 degree F. minimum temperature needed for the combustor to work, and to provide fuel in the form of smoke and fumes for the combustor to consume.

You never want to open the door of your stove while smoke is going through the combustor. Room temperature air is much colder than the hot smoke. If you were to have this cold air pass through the hot combustor, it could cause it to crack just as burning wet or green wood will do. Cold air from the open door or steam (212 degrees) from wet wood passing through the combustor at the same time as hot smoke are the two causes of Thermal Shock. If your stove is hot, always open the bypass fully before you open the door to the wood box.

When you need to reload logs into the woodbox, follow the same steps that you used to light the fire in a cold stove. The difference is that it won't take quite as long. As always, open the bypass fully which will disengage the smoke from going through the combustor. Open the air intakes so that the fresh logs can get the oxygen needed to burn fully. Now open the stove door and leave at

least one inch of ash on the hot coals inside. Place the logs on top of the coals and close the door. After the fresh logs have become fully involved in flame for 15 minutes or so, lower the opening of your air intakes and then close the bypass. Even though you have opened the door and your stove has cooled off, there is still a lot of residual heat in it and it won't take quite as long to get the combustor back up to temperature.

Burning the logs with the bypass open for 15 minutes serves another purpose as well. If you were to have a small amount of surface moisture on your logs such as from blowing rain or snow, that moisture will go to steam. That 212 degree F steam will go straight up the chimney as long as the bypass is open and not through the combustor.

A catalytic combustor is a ceramic honeycomb brick that has been coated in precious metals, palladium and/or platinum. Both of these metals are more valuable than gold. In an oxygen environment, the smoke and fumes given off by the burning logs will burn on contact with the heated precious metals as long as the middle of the combustor is at a minimum temperature of 500 degrees F. The combustor will not work below this temperature. You can maintain at least this minimum temperature by keeping a good hot bed of coals or low flame logs burning in the woodbox. It's a lot like grilling a steak in the back yard. You never throw your steak on the grill right after igniting the charcoal. You wait until the flames have died down and so becomes a much hotter fire. You want to burn your stove much the same way. Not only is this the correct way to burn your stove to protect the combustor, but, you will get more heat from a given log and use less wood.

Most people load their woodbox to the top before they go to bed at night. They want to heat their homes for 7-9 hours that they need to sleep and still have coals in the morning to relight the fire. This is the **third** and by far, the most common way of getting Flame Impingement deterioration of their catalytic combustors. When they loaded all of those logs to the top of the stove, the top layer of logs was only a couple of inches away from the combustor. Twenty minutes after loading the stove, the homeowner has fallen asleep and won't see what happens. Twenty minutes after loading the stove, the top layer of wood catches fire. Since the top layer is just a couple of inches from the combustor, there is almost no distance for even a modest amount of flame to travel into the combustor. This Flame Impingement makes the ceramic body start to crumble away. This process goes on for several hours until the log stack collapses in on itself, removing the flame from the combustor. This process also wastes an incredible amount of wood night after night. The solution to this problem is to simply reduce the amount of wood in the woodbox. Now your problem is, "How do I keep my stove hot enough to heat my home for the eight hours of sleep that I need?"

Try the following steps to learn a new way to use your stove. This will take you all day to do and may well be one of the dullest days of your life, but at the end, you will know how your stove wants to be used. We are assuming that you have brought your stove back to a new like condition by repairing or replacing any needed parts and your combustor is in good working order. Start from a cold stove condition. You are going to build a fire in your stove multiple times following the same steps each time.

First, open the bypass all the way open so that the smoke and fumes will not pass through the combustor. Open the air intakes fully so that the logs will get all the air possible. Open the door, lay in your kindling and start building your fire. Use only two big logs for the heating fire. After these two big logs become fully involved in flames for thirty minutes, close your air intakes all

the way off and close the bypass to route the smoke and fumes through the combustor. Your fire should go out from the lack of oxygen. Since the fire was extinguished, you now know the two things that you have to know in order to proceed.

1. Your stove is operating as the manufacture intended.
2. If you close your intakes to that point, there will be no oxygen to the fire.

You are now ready to start adjusting your stove. Rebuild your 2 log fire using the same steps. Close the air intakes first and then the bypass. Next, open the intakes a very small amount. Hopefully, this fire will also go out. You are on the right track. This means that you have opened the intakes in a very small increment. Rebuild your fire again the same way. This time open the intakes just a little bit more than the last time. Repeat this over and over again while opening the intakes a little bit more each time. Eventually, you will have opened the intakes enough so that the fire will stay lit. This will be the minimum opening that your stove requires to work. Mark that spot in some way such as scratch or a paint stick. You can increase the opening size later for more heat. For now, time those two burning logs to see how long that they will last as a low flame fire. You may be amazed to learn that two logs burning at low flame (coals) will last longer than eight logs burning at full air. If you find that two logs don't give you enough time or heat, build a fire with three logs and time them.

Remember, all that you have to do, and it is very crucial that you do so, is maintain 500 degrees F in the woodbox in order for the combustor to work. You can have a huge amount of coals in your stove that produce much more heat than you need yet producing very little flames by simply adjusting the air intakes. Low flame coals will produce ample fuel to the combustor and as long as you maintain at least 500 degrees F, a properly working combustor will burn it all. This is a minimum temperature. You can and will burn your stove hotter. Burn the woodbox between 500 degrees F and 800 degrees F.

By using these steps to learn how to better operate your stove, you are not only adding years of life to the catalytic combustor, but you are also helping to protect your stove from damage due to over firing. You will use much less wood and whether you buy it or chop it yourself, saving wood is always a good idea.