Soot Compounds and the Particulates We Breathe Generated by Heating Systems

The Inventor's theory is proven in test results using home and commercial heating fuel oils. "If you could ionize and cause a thermo-chemical reaction with a complex fuel chain like heating oil or diesel fuel, just before and during the onset of combustion, then these new free radicals could bond to create simple fuel chains. When this occurs, the fuel burns more completely, resulting in more H_2O, CO_2, SO_3, and fewer dangerous NO_x emissions, acid salts like nitric acid (largest component of acid rain), carbon monoxide (CO), sulfur monoxide (SO), and sulfur dioxide (SO_2) while saving an average of 25% on fuel usage. There would also be a large reduction in soot so your heat exchanger can run more efficiently all season long."

Inventor, Eric T. LaVoie

When using the same volume of the same fuel oil, why does a standard flame produce less heat output (~1,480°F) than The Burner Booster™ flame (~1,890°F), which uses the same fuel?

This happens most likely because:

1. S – Sulfur contains over 337,600 kg per mole of heat. It is extremely useful as additional heat energy fuel when ionization and complete oxidation occur, before and during combustion to higher oxidation thermal states. Sulfur in fuel oil is naturally combined with nitrates and phosphorous compounds for added heat.

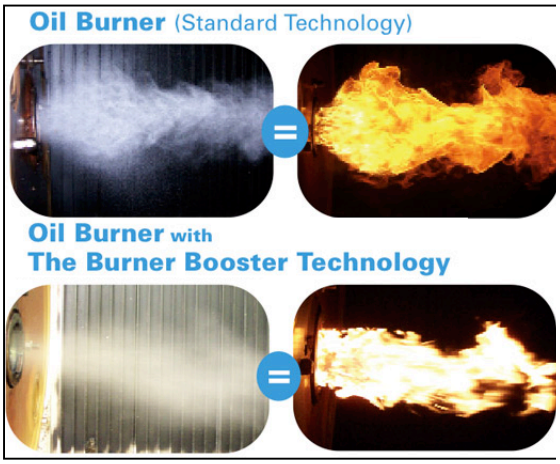
2. C – Carbon contains over 472,700 kg per mole of heat. It is also useful as heat energy fuel when treated the same way as sulfur. It produces more heat and less toxic Carbon Monoxide (CO). Carbon Monoxide and other unburned hydrocarbon gasses and particulates, when properly oxidized, will produce more heat, water and Carbon Dioxide (CO_2).

3. N – Nitrogen (N_2) and Oxygen (O_2) are elements of nitric oxide (NO), nitrites ($NO2^-$), nitrous oxide (N_2O_2), and nitrates ($NO3^-$) which are common in fuel oil. The input air for combustion is 70% nitrogen gas. This can have a very negative effect unless higher thermal stability can be reached. Excess combustion air cools the combustion area and causes heat loss and an increase of nitric acid gases and salts, SO production, and unburned radical hydrocarbon compounds in the combustion area, all while decreasing your efficiency. **Did you know that *NO_x gases are 310 times more harmful to the air, water, and the environment than CO_2?***

COMMON FLUE GASES AND SOOT PARTICULATES WE BREATHE

Sulfur Monoxide (SO) is four times more toxic than Carbon Monoxide and known as a radical compound when released into the air. The Hydrogen Sulfide (H_2S) smell of rotten eggs is an indicator of Sulfur Monoxide. SO stays at low levels, less than 1,000 feet above the ground and is a very serious lung, neurological and eye irritant. It causes damage to vegetation and animal life. SO is an indication of Sulfur compounds with incomplete/poor combustion.

Sulfur Dioxide (SO_2) is 12 times more harmful as a greenhouse gas than carbon dioxide (CO_2). This gas yields more complete combustion of sulfur compounds in a hydrocarbon fuel. Sulfur dioxide, while less harmful, exhibits greater heat yield which allows sulfur trioxide (SO_3), a lighter gas, to occur. This rise in SO_2 levels and decrease in sulfur monoxide (SO) levels is evidence of a more complete combustion and increased heat. There is often less than 3% sulfur in heating oil and it is not the most acidic compound in the combustion process. Nitrogen oxide (NO_x) compounds make nitric acid (HNO_3) at a ratio of 40 to 1 compared to sulfur-based acids.



Inventor's Comments

The percentage of Sulfur compounds in No. 2 heating fuel oil is between 2.5%-4.0% in most cases. The new Ultra Low Sulfur oil may have as little as **0.15%** Sulfur on average, but real-world use is now showing it will increase carbon dioxide (CO_2) and carbon monoxide (CO) emissions as it produces about 8% less heat per gallon of fuel oil. It also costs about 6-8 cents more per gallon to produce. So, the customer will see approximately a 15% increase in heating expenses, as well as increased soot emissions due to the decrease in heat in the chamber.

Sulfur Trioxide (SO_3) shows ideal combustion and proper oxidation. It is a lighter gas than SO_2 and bonds quickly to water vapor in the upper atmosphere to form a weak acid. It is the smallest component of acid rain.

Carbon Dioxide (CO_2) and water vapor are light greenhouse gases, which are major components in the earth's carbon cycle. CO_2 and water along with other greenhouse gases are mostly absorbed by the planet's oceans and land bio-mass.

DID YOU KNOW? Water and nitrogen oxides (NO_x) generated from fossil fuel combustion are the most prevalent greenhouse gases released into the environment, not carbon dioxide. NO_2 mixes with water in our atmosphere to make nitric acid, the biggest component in acid rain. SO_x compounds in the atmosphere make up less than 5% of the components in acid rain (this level maybe higher in and near China).

The Burner Booster™ uses what would become SOOT as added fuel to produces a cleaner, hotter burn.

The wasted fuel from standard burner technology increases the cost and pollution of operations while reducing efficiency in heating systems. The Burner Booster™ system produces 28-32% less NO_x and SO_2 emissions. It also produces 12-18% less CO_2, a whopping 80% less Carbon Monoxide and Sulfur Monoxide, and less soot compounds because of the unique patented burn technology.

A series of live fire tests were conducted with industrial fuel oils (like 4 and 6) and with both high and low Sulfur levels. Some of our customers have seen drastic savings! The dirtier the oil, the better and cleaner the burn.

Results and comparison of test run by Worcester Poly Institutions. Dated July 29th & 30th, 2009

Test Number	1	2	3	4	5	6	7	8	9
Nozzle Size	Voided due to improper instrument calibrations	1.00	1.35	> 0.5	> 0.5	> 0.5	> 0.5	Voided due to power failure	> 0.5
Gallons of Oil used / hr.		1.08838	1.5031	0.66175	1.06593	1.07914	1.18745		1.34991
Pressure (psi)		130	130	625	1,000	1,200	1,500		1,800
Time (seconds)		300	180*	180*	180*	120*	120*		120*
Total Heat Released (MJ/m^2) per 60 seconds		44.19	48.66	54.00	58.66	70.5	70.50		80.5
Average HRR during 1st 60 seconds(kW/m^2)		752	871	945	989	1216	1277		1360
Peak Heat of Combustion (kJ/g)		696	796	873	899	1054	1154		1243
Average Heat Released per second (MJ/m^2)		0.73667	0.81111	0.97778	0.90000	1.17500	1.17500		1.34167
Average Heat Released per ml of oil (MJ/m^2)		0.644	0.513	0.793	1.405	1.048	0.941		0.945
Average CO (grams/minute)		0.300	0.360	0.180	0.120	0.058	0.057		0.057
Burner Used for Test		2008 Becket AFG		THE BURNER BOOSTER					

Comparison based upon average heat released per second from 60 seconds after ignition to 90 seconds

Test Number	1	2	3	4	5	6	7	8	9
Nozzle Size	Voided	1.00	1.35	> 0.5	> 0.5	> 0.5	> 0.5	Voided	> 0.5
Pressure (psi)		130	130	625	1,000	1,200	1,500		1,800
Average Heat Released per second (kJ)		6.533	7.190	8.232	8.807	10.305	11.132		11.851
10 minute Test- oil used per second (ml)		1.1444444	1.5805556	0.8997450	1.0733100	1.1431350	1.2668250		1.3566000
Heat per ml of oil kj/ml		5.71	4.55	8.21	9.15	9.01	8.79		8.74
Gain over standard burner using 1.0 nozzle				43.74%	60.28%	57.92%	53.94%		53.03%
Gain over standard burner using 1.35 nozzle				80.38%	101.13%	98.17%	93.17%		92.04%
Burner Used for Test		2008 Becket AFG		THE BURNER BOOSTER					

Notes

The average heat Released per ml of oil on the top of this page is based on ignition to flame out.
The gain over standard burner are percentage improvements in the amount of heat released per ml of oil.
The quantity of oil (in grams) used in the test on the top of this page may not have been accurate for the booster test due to varying amounts of oil in the accumulator. Thus the subsequent 12 or 10minute tests measured the amount of oil (in liters) exiting the nozzle without being ignited
* Test 6,7 ,& 9 - the Test time was reduced as the heat output was melting the instrumentation hoses.