



**The Cleaner,
Greener Fire**

**Manufactured Firelogs
The Cleaner Burning
Alternative**

**South Coast Air Quality
Management District Wood Smoke
Control Technology Forum**

August 15, 2007

Duraflame Overview

- Duraflame is a privately owned company based in Stockton California. Annual revenues exceed \$100 million. It created the extruded wood/wax firelog in the late 60's out of a need to recycle wood waste from a related family company's production of wood products for the pencil industry.
- Through its manufacture of firelogs, Duraflame annually recycles approximately 50,000 tons of wood chips, sawdust, and agricultural biomass generated by other commercial operations.
- Burning of Duraflame firelogs saves 1.2 million trees from use as firewood every year
- There are over 100 million firelogs used by consumers in fireplaces annually in North America, Duraflame is the leading brand in the market place with over 50% market share.



The Cleaner, Greener Fire

S. California Fireplace Fuels Market

- 15 million firelogs used annually in S. CA. It is the largest consumption market for firelogs in the USA
- 50% of fireplace users have used a manufactured firelog in the last year, while 20% of households that use fireplaces burn firelogs as their normal fuel source.
- Common Firelog brands in S. CA Market; duraflame, crackleflame, Pine Mtn., Java Logs, Envirollog, Vons Brand and Ralph's Fireside Supreme
- S. CA is also the largest market for packaged firewood sales, 2-3 million equiv .75 cu ft bundles sold annually



The Cleaner Greener Fire



25-30 lb bundle - \$3.99



6lb firelog - \$2.99



Equivalent Fires

Performance Characteristics of Fireplace Fuels

Measure	Cordwood	Manufactured firelogs
Average Duration of Fires (hrs)	3.5	3.4
Burn rate in fireplace (mode - dry kg/hr)	3.5	.58
Energy Content (BTU / lb)	8156	13,293
Moisture Content (mode – dry basis)	17	2.2

Source; “Global Warming Reduction Benefits of Manufactured Biowax-fiber Fireplace Logs” March 2007, J.Houck, Omni Environmental Services Beaverton, OR



Firelogs have lower burn rates and moisture content than cordwood

Emissions Comparison – Firelogs vs Cordwood

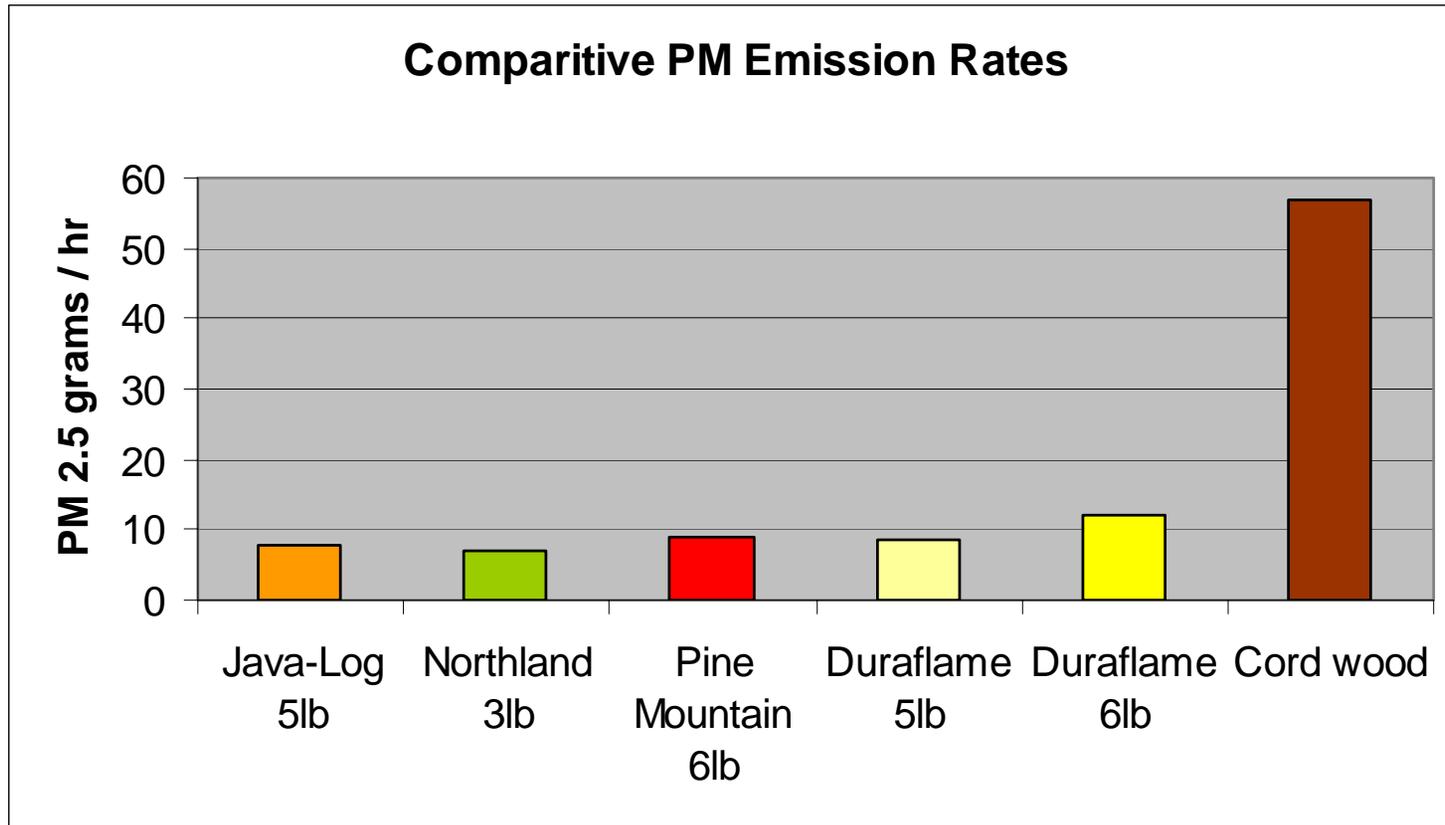
Pollutant, Units	Mean ± Std. Dev. for Wax/Fiber Firelogs, This Study	Mean ± Std. Dev. for cordwood from a previous study
PM, g/hr	9±2	60±19
PM _{2.5} , g/hr	9±2	57±22
CO, g/hr	42±17	241±30
Formaldehyde, g/hr	0.6±0.1	5±1
Benzene, g/hr	0.3±0.1	1.4±0.4
16-PAH, mg/hr	47±14	730±300

Source; Content and emission characteristics of Artificial Wax Firelogs
May, 2006, Omni Environmental Services for EPA Reg 5 / Environment Canada



Firelogs emit over 80% less PM and HAP's than an equivalent cordwood fire

Emissions Comparison – Firelogs vs Cordwood



Source; Content and emission characteristics of Artificial Wax Firelogs
May, 2006, Omni Environmental Services for EPA Reg 5 / Environment Canada



All major firelogs brands produce consistently lower emissions than cordwood

Emissions Comparison – Firelogs vs Cordwood

Dioxin/Furan Air Emissions of Duraflame Firelogs and Douglas Fir Cordwood

Product Tested	Units	Background	Run 1	Run 2	Run 3	Mean ± Standard Deviation
Doug Fir Cordwood	ng TEQ/hr	NA	0.804	0.848	0.844	0.832±0.024
Duraflame Firelogs	ng TEQ/hr	0.100	0.173	0.252	0.235	0.220±0.042

Laboratory Analysis for The Puget Sound Clean Air Agency
By Omni Environmental Services, Inc.
May 23, 2006



**Firelogs emit over 70% less Dioxin
than an equivalent cordwood fire**

New Petroleum Free, All Renewable Formula

new
ALL
NATURAL
INGREDIENTS



PATENT PENDING

THE BEST IS EVEN BETTER

- **Better for the Environment:** Now made with 100% renewable resources
- **Better Performance:** Even faster lighting and more robust flames
- **New Look:** Warm, engaging package design for better retail impact
- **National Ad Campaign:** Targeting high consumption firelog users via HGTV and HGTV.com



duraflame



The Cleaner, Greener Fire

New Petroleum Free, All Renewable Formula

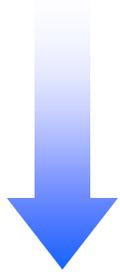
- Our new formula will **replace** the annual emission of approximately 320K tons of non-renewable fossil fuel-based carbon with carbon from renewable sources



320,000 Tons Non-Renewable
Fossil Fuel-Based Carbon



62,835 Annual Emissions of
Passenger Cars



REPLACED WITH

Carbon from Renewable Sources –
bio-wax derived from
vegetable/plant fats and oils

The logo for Duraflame, featuring the word "duraflame" in a stylized, bold font with a red flame icon above the letter 'a'.

duraflame

**Converting to Renewable Carbon for a
Better Climate**

Energy per Fireplace Fire Event (FFE)

Fireplace/Fuel Type	Btu/FFE	Fuel Unit/FFE
Vented NG Fireplace	76,800	74.8 ft ³
Vented LPG Fireplace	76,800	0.84 gal.
Vented NG Log Set	155,950	151.8 ft ³
Vented LPG Log Set	155,950	1.70 gal.
Wax-Fiber Firelog in Solid Fuel Fireplace	79,760	6 lbs.
Cordwood in Solid Fuel Fireplace	219,390	26.9 dry lbs

Source; "Global Warming Reduction Benefits of Manufactured Biowax-fiber Fireplace Logs"
March 2007, J.Houck, Omni Environmental Services Beaverton, OR



Firelogs consume 50-60% less energy than cordwood or natural gas log sets for an equivalent fire

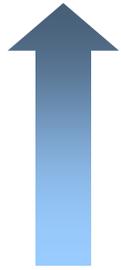
Fireplaces in California and Their Greenhouse Gas Emissions

Fireplace/Fuel Type	Number of Fireplaces in Use in California	GHG Emission per Fireplace per Fire (lbs. CO ₂ -Eq./FFE ²)
Vented Gas Fireplaces		
Natural Gas	1.7 million	11.7
LPG	0.2 million	12.6
Vented Gas Log Sets		
Natural Gas	1.0 million	24.0
LPG	0.06 million	25.7
Solid Fuel Fireplaces		
Cordwood		5.5
Traditional Petroleum Wax-Fiber Firelogs		17.5
New Biowax-fiber Firelogs		4.3

Global Warming Reduction Benefits of Manufactured Biowax-Fiber Fireplace Logs, Omni Environmental Services, March 2007

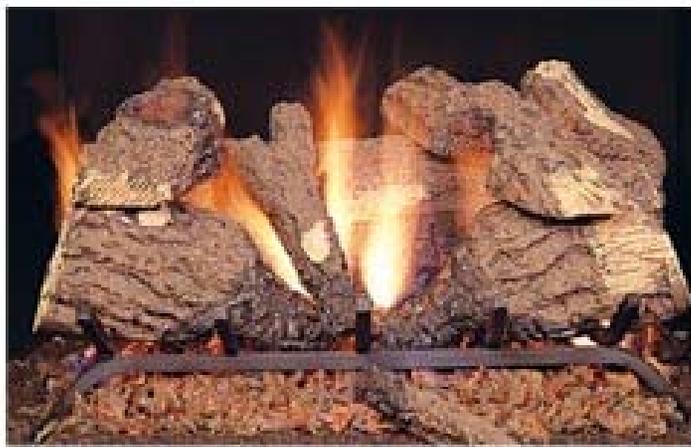


Bio-wax Firelogs emit 60-80% less GHG than an Natural Gas Fireplaces and Log Sets

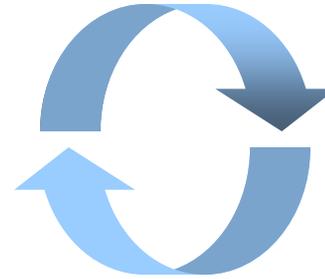


Net increase of atmospheric concentrations of CO₂ occurs from combustion

Atmospheric CO₂



Natural Gas Fireplaces
Petroleum Wax Firelogs



NO net increase of atmospheric concentrations of CO₂ occurs from combustion

Atmospheric CO₂



All renewable Firelogs,
Firewood, Wood Pellets

Cost Effectiveness of Typical Fireplace Fuels

Fireplace / Fuel Type	Cost of Fuel / Fire	Amortized Cost of Log Set Installation / fire	Total Cost (per fire) of Operation of Fireplaces over the lifetime of the log set	Total Cost (per year) of Operation over lifetime of the log set
Vented NG Log set ₁	\$1.81	\$2.50	\$4.31	\$164
Wax-fiber firelog	\$2.99			\$114
Bundled Cordwood	\$3.99			\$152
Bulk Cordwood ₂	\$2.83			\$60

1- average natural gas cost for S. Cal, average cost to install gas log set \$1200 2 – Average bulk wood cost of \$283/cord

Source; “Global Warming Reduction Benefits of Manufactured Biowax-fiber Fireplace Logs”
 March 2007, J.Houck, Omni Environmental Services Beaverton, OR



Firelogs are the most cost effective fireplace fuel for occasional fireplace users

Cost Effectiveness For Emissions Reduction From Open Fireplaces

“Similarly, for wood-burning fireplaces used for aesthetics manufactured wax / fiber firelogs offer the lowest cost per unit of mass of air pollutant reduction” – MARAMA December 2006

	Pollutant Reduction Cost Effectiveness (\$/ton)	
Pollutant	Vented Natural Gas Log set in Fireplace	Wax/Fiber Firelogs burned in fireplace
PM	\$2.99E+04	\$2.53E+03
VOC	\$4.95E+04	\$5.11E+03
CO	\$6.14E+03	\$5.16E+02

Source; Control Analysis and Documentation for Residential Wood Combustion in the MANE-VU Region – MARAMA, December 19, 2006



Firelogs are the most cost effective fuel for reducing emissions from fireplaces

Air Quality Agencies That Have Recognized Firelogs as a Cleaner Burning Alternative for Fireplaces

- California Air Resources Board
- San Joaquin Unified Air Pollution Control District
- Bay Area Air Quality Management District
- Puget Sound Clean Air Authority
- Oregon Dept of Environmental Quality – Portland Metro Branch
- Spokane County Air Pollution Control Authority



The Cleaner, Greener Fire

Cooperative Public Education Programs Implemented with Air Districts

- Coop Radio Advertisements
- Traffic Radio Sponsorships
- Clean Air PSA's on TV
- Cooperative Newspaper & regional magazine advertisements
- Light it right tonight message on Supermarket Shopping Bags
- Free Product / Discount Coupon Give aways
- Air District Pamphlets / Web Site



Light it right tonight!

Duraflame Recommendations for Air Quality Agency's Residential Wood Combustion Control Measures

- Implement public information programs to promote cleaner burning practices for residential wood combustion, including the use of manufactured firelogs as cleaner burning fuel for open hearth fireplaces.
- Implement episodic curtailment programs of residential wood combustion on the worst air quality days, but exempt clean burning appliances and fuels, such as manufactured firelogs from curtailment periods as an incentive to homeowners to switch to cleaner burning practices
- Reconsider strategy to ban or replace open fireplaces with natural gas appliances, in light of the increased greenhouse gas impact of gas fireplaces which burn non-renewable, fossil fuels, and emit more than twice as much CO₂ to the atmosphere than solid fuel fireplaces.



The Cleaner, Greener Fire