

FIREDRAGON

Clean Bio Fuel for our futures

FireDragon is;

1

Eco-Friendly

2

High-Performance

3

Safe and clean to use



www.firedragonfuel.com

FireDragon is made from recycled wasted vegetation and with a 97% purity. It is therefore an environmentally friendly, green and clean fuel.

As such it will help address some of the UN Sustainable Development Goals.

Goal 1 – No Poverty

Goal 3 – Good Health & Well Being

Goal 5 – Gender Equality

Goal 7– Ensure access to affordable, reliable sustainable modern energy.

Goal 9 – Industry, innovation & infrastructure

Goal 10 – Reduced inequalities

Goal 13– Climate Action

Goal 15 – Life on Land



Made from Recycled raw material



Recyclable Packaging





FireDragon is All-Weather
Which means it can be lit and used in harsh conditions such as rain or snow.



Based on bio-ethanol, FireDragon is sustainable and not a fossil fuel.

It is a safer fuel for both the user and the environment

FireDragon also outperforms all other solid fuels



FireDragon can be used as a Hand Sanitiser
Which can prevent germs spreading when handling food prior to cooking.



FireDragon is Quick & Easy to light
And doesn't take much to get it going. A spark or a match will suffice to light FireDragon

Fuel for the future is:

- Sustainable
- Cooks quickly
- Burns intensely
- Is easy to light
- Safe to carry and transport
- Gives off very little soot or heavily polluting fumes.

Cleaner than the rest

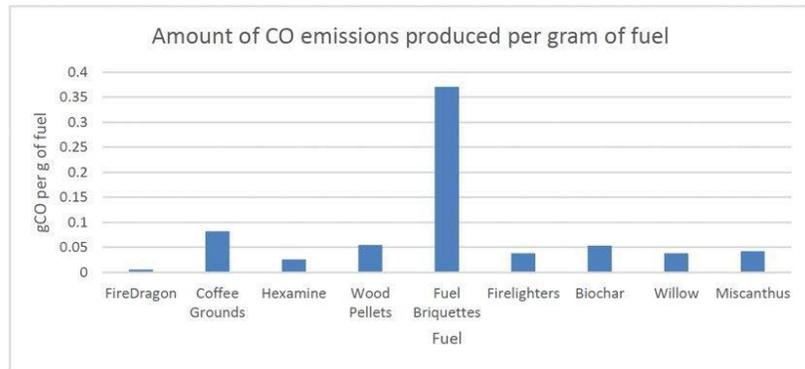


Figure 63 Amount of CO emissions in grams produced by a gram of each fuel

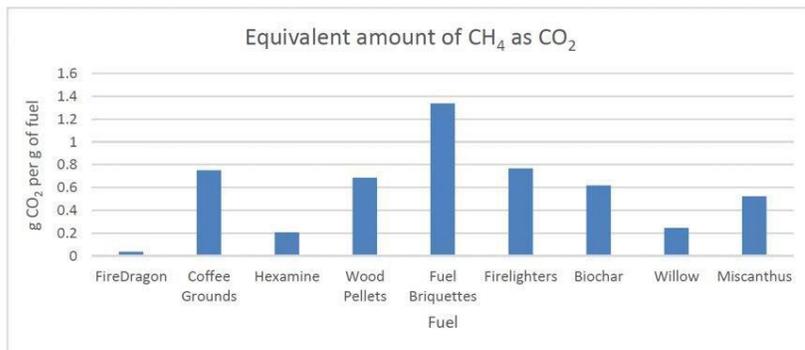


Figure 66 Amount of CO₂ and equivalent amount of CH₄ as CO₂, in grams, per gram of fuel

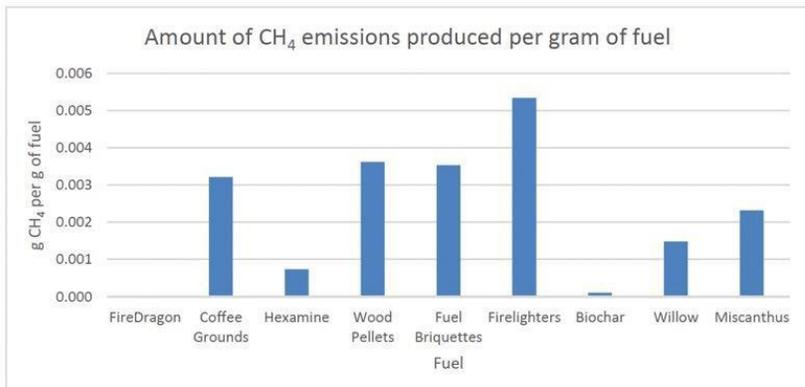


Figure 65 Amount of CH₄ emissions in grams produced by a gram of each fuel

- Burning FSC wood firelighters is still burning wood
- Wood should be left to grow (even if it is planted for harvesting or FSC-certified wood).
- If trees have fallen they should be left to keep sequester the Carbon Dioxide for as long as it can.
- When wood is burnt, as you can see below, it is highly polluting and bad for the planet when compared to FireDragon fuel.
- We should not burn any wood, even if FSC, dressed up as eco or renewable firelighters

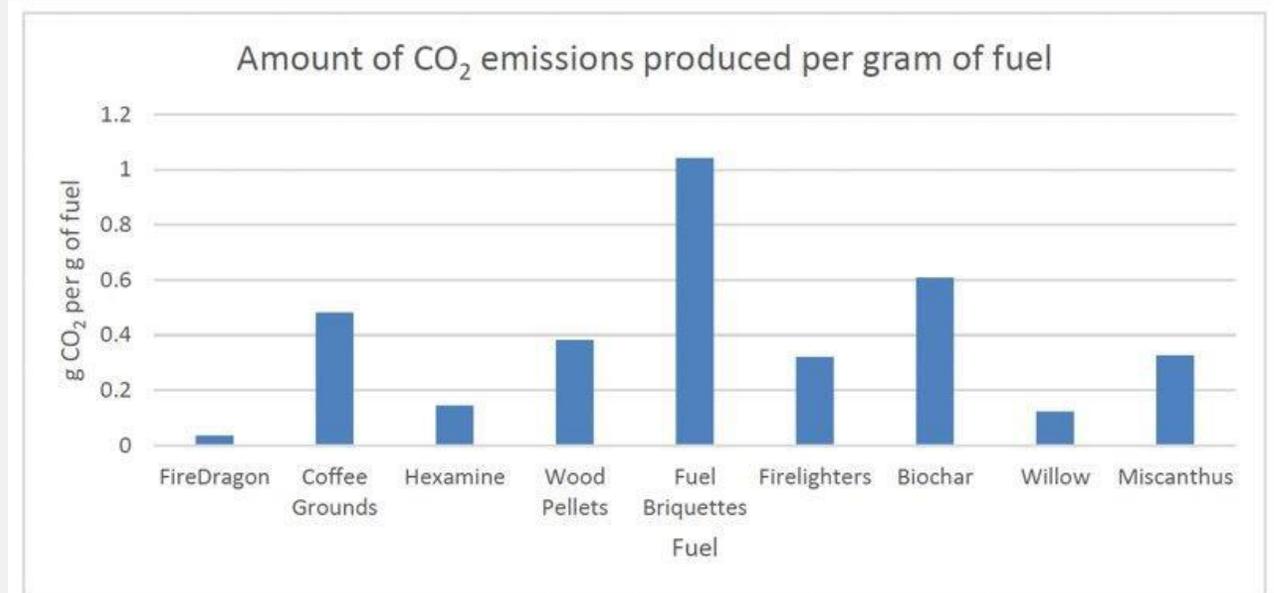


Figure 64 Amount of CO₂ emissions in grams produced by a gram of each fuel

"The FireDragon was the only fuel that produced fewer emissions and less particulate matter than both the control fuels. This makes it the only viable fuel to replace collecting fuelwood. It produced 5.734 x10⁻³ grams of carbon monoxide and 0.03632 grams of carbon dioxide for each gram of fuel combusted. No methane was detected throughout the experiment and only 0.16% of the initial mass was recorded as particulate matter. However, the cost of the fuel may be a barrier to successfully switching fuels and there needs to be further research into other pollutants."

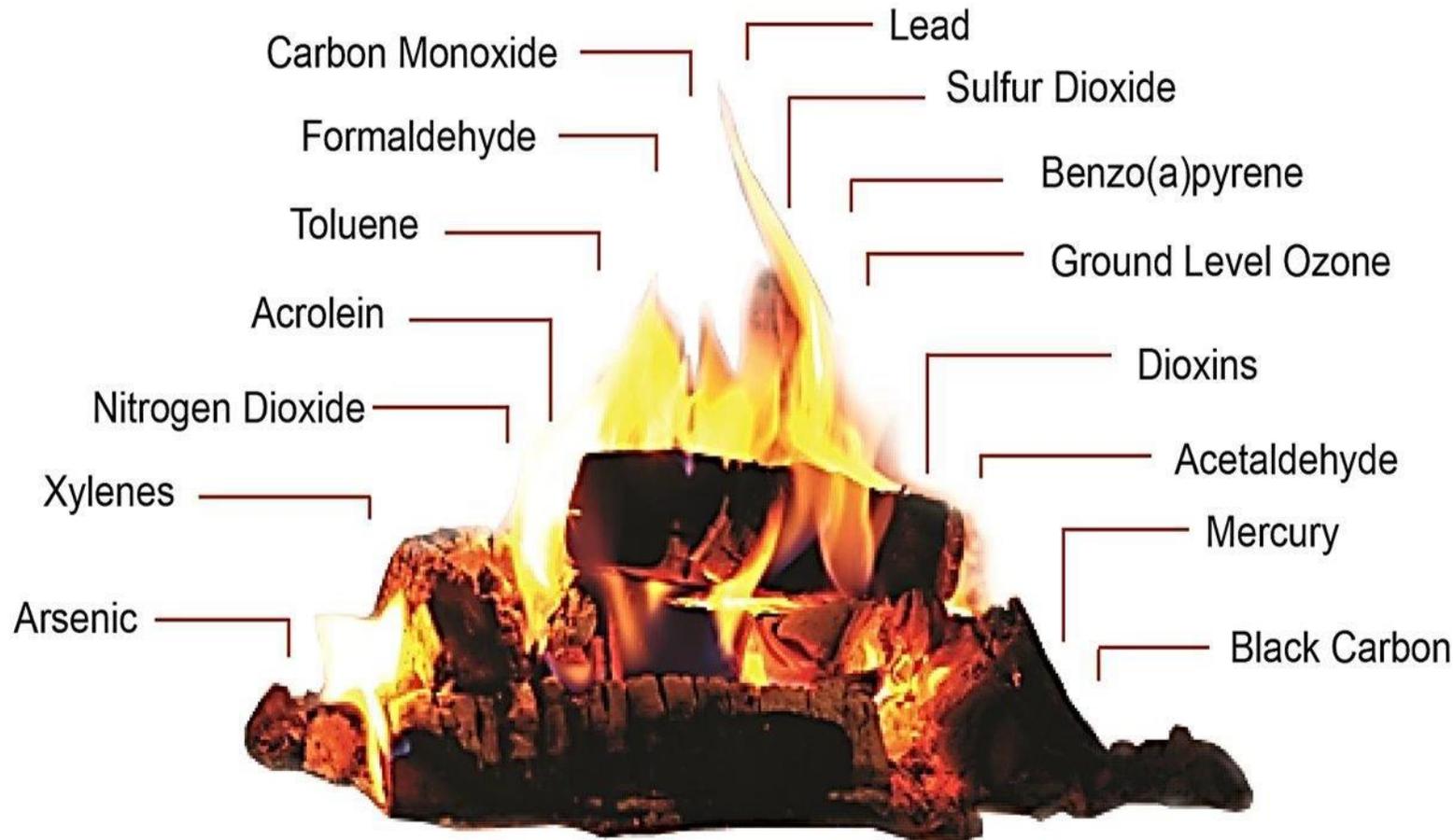
Don't be fooled

Burning wood is not eco-friendly.

Eco-Friendly

- The organic gaseous compound and particulates (PAH's) from wood smoke are bad for the individual and the environment.
- Charcoal is worse still.

Wood Produces



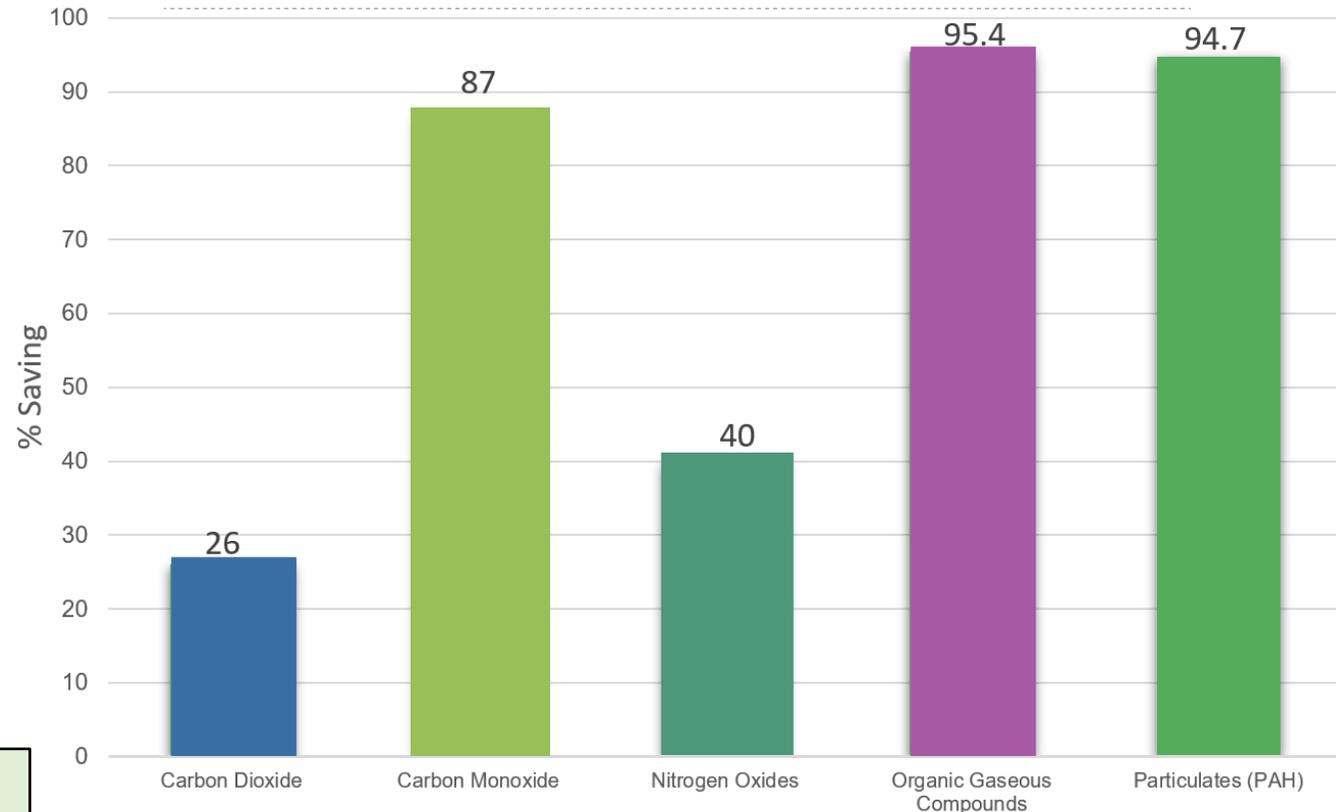
- Wood is precious.
- Trees should not be cut down even if planted for cultivation.
- Fallen trees should be left to keep the CO2 locked in.

FireDragon compared to hardwood

- 1 kilogram of wood burnt gives off the same amount of level 1 (the worst) PAH carcinogenic compounds **as 27,333 cigarettes**.
- The compound, benzo (a) pyrene, can travel 1,000 Km and once deposited can remain in land and/or water for years
- FireDragon **reduced CO2 emissions by 26%**
- FireDragon **reduced CO emissions by 87%**
- FireDragon **reduced the amount of organic gaseous compounds by 95.4%**
- FireDragon does not give off any methane.

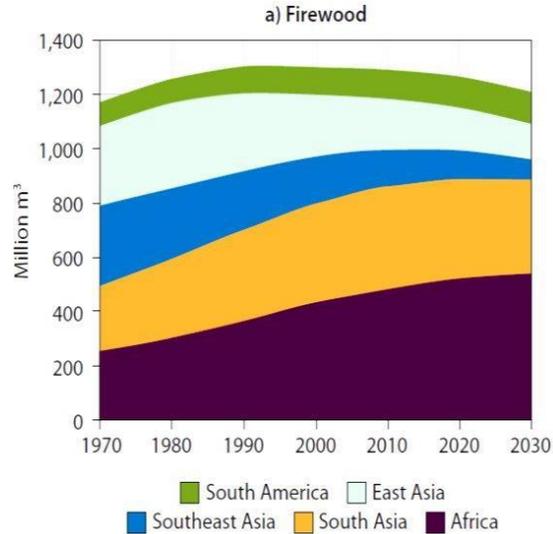
The American EPA estimates that a fire burning for 1 hour will burn at 4.5 kilos of wood and will generate **4,300 times more carcinogenic polyaromatic hydrocarbons than 30 cigarettes**

Greenhouse Gas Emissions % of savings of using FireDragon compared to hardwood



500 grams of FireDragon has the same heat output as 1,100 grams of hardwood

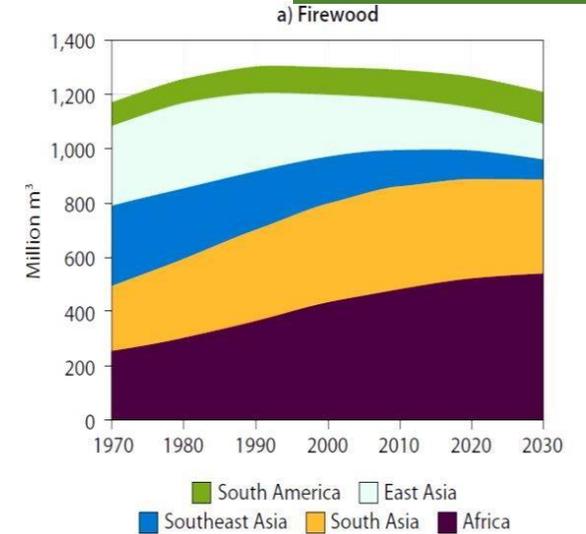
The Burning Issue; wood is precious.



Wood smoke particulate matter generates **more DNA damage** than road traffic – generated particulate matter per unit mass in human cell lines.

P.H. Danielsen et al.

Source: Hofstad, Kohlin & Namaalwa 2009



Projections of future firewood & charcoal use in developing regions

Charcoal use is expected to increase over the next 20 years.

Annual deforestation is estimated at 13.7 million hectares – the size of Greece. WWF 2019

There are approximately 8 million hectares of tree plantations designated to be burnt as wood fuel.

We could be saving 1 ton of wood, burnt releases 1.8 tons of HO₂. Haberl et a 2012

It takes 40 years for 1 tree to sequester 1 ton of CO₂

FireDragon is the first solid form of ethanol available. It takes the proven eco fuel ethanol and makes it; Easy and practical to use. Can be used in most existing cook stoves; though may need a slight modification to the cooker which is low cost. Changing cookers is expensive.



3 stone fire

Chitetezo mbaula

Charcoal stove

Safer to transport and store

FireDragon is very powerful. It does not lose its high calorific concentration. It also delivers its energy quickly; which is important for cooking.

Great to handle. Get it into people's hands especially where hygiene is poor. So people clean their hands prior to cooking and eating.



Low Carbon Footprint

Safe & Clean

- Firedragon is produced from waste vegetation bi products which are distilled, to produce pure ethanol. The CO₂ released when burning firedragon is equal to the amount of CO₂ absorbed by the plants during their own growth.
- Hence firedragon has a very low carbon footprint and is sustainable form of energy, unlike traditional fossil fuels such as gas, kerosene (as used for most firelighters) coal, and oil.
- Firedragon is clean burning, smokeless, odourless and ash free. It undergoes a double rectification process, ensuring its high purity. Firedragon is 97% bioethanol plus denaturants and solidifiers.
- The bioethanol we use in FireDragon is a plant based, bio renewable alcohol. It is produced from waste agricultural crops in a sustainable fermentation process. This means the crops are fully utilised and leave no waste by-products.
- International regulations do not allow ethanol in pure form to be sold for purposes other than human consumption. All of our FireDragon range is therefore denatured according to commission regulations (EC) No 3199/93 so they are not intended for human consumption. They would may you sick if consumed.
- Ethanol burns cleanly, giving off mainly water vapour and carbon dioxide. Both are produced in safe quantities and the CO₂ given off is compared to the amount produced while breathing normally. The chemical output when ethanol burns is $C_2H_6O + 3O_2 = HEAT + 2CO_2 + 2H_2O$.



As ethanol burns so cleanly and without smoke, it is ideal for use in fuels such as for indoor and outdoor fires and BBQ`s.

Firedragon is certified according to the European Standard for storing and transportation of UN products.

Clean burn

All containers come with the correct safety labelling and warnings. Firedragon bioethanol products are safe for both humans and the environment when used in accordance with the instructions.



Safe & Clean



Firedragon is 96-97% ethanol (high purity), with denaturants and our special firedragon extras added to make the fuel unpalatable and solidify it to help make it safer and more practical for you to use, safely and in a sustainable way.

Bioethanol is classified as a flammable liquid class 1B (for flammability) and subject to various regulations relating to storage, transportation, and resale which you need to familiarise yourself with.



Methane has more than 80 times the warming power of carbon dioxide over the first 20 years after it reaches the atmosphere. Approx 60% of today's warming is driven by methane from human actions.

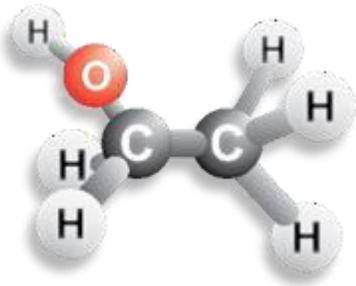
FireDragon has a greater energy density and higher calorific value at **37.344 MJ/Kg** charcoal at **30.0 MJ/Kg**.



The clean burn, with very little smoke or soot, shows the complete burn of FireDragon

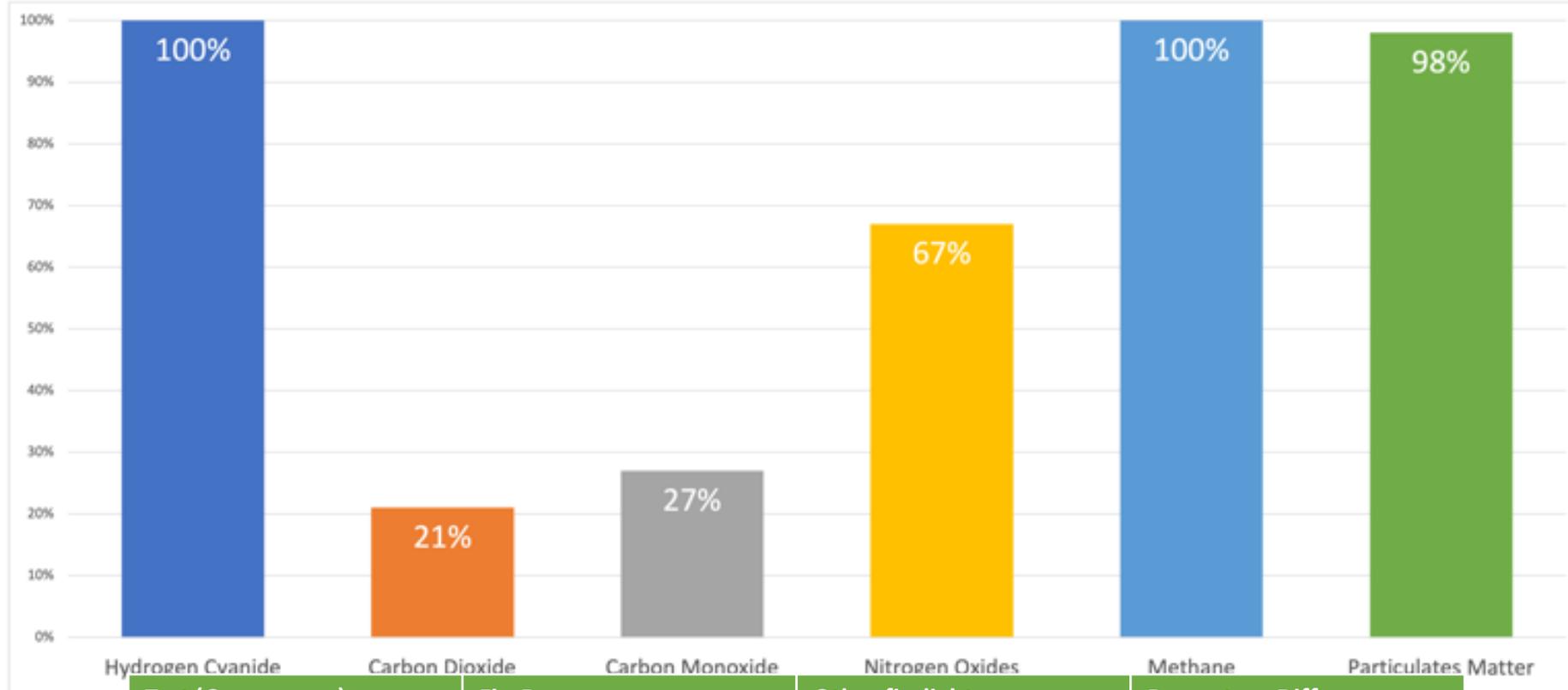
<https://www.youtube.com/watch?v=xyKPLHtGdSU>

Ethanol is very powerful. It has a high calorific concentration. It also delivers its energy quickly; all is important cooking.



It is all in the science The small molecular chain takes a small amount of energy to release more energy. Also the Oxygen molecule helps its combustion

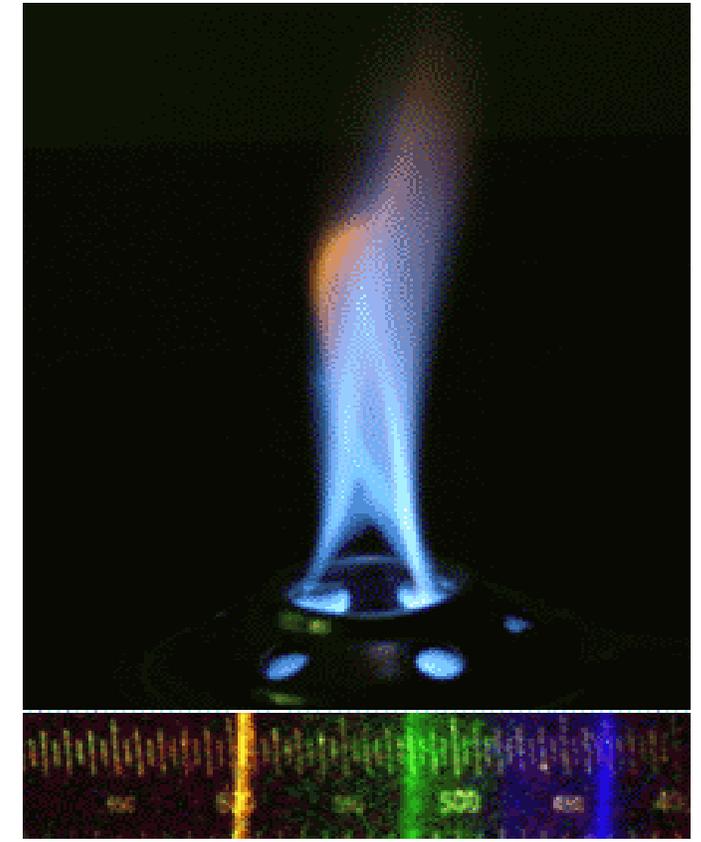
Greenhouse Gas Emissions % of savings of using FireDragon compared to other firelighters



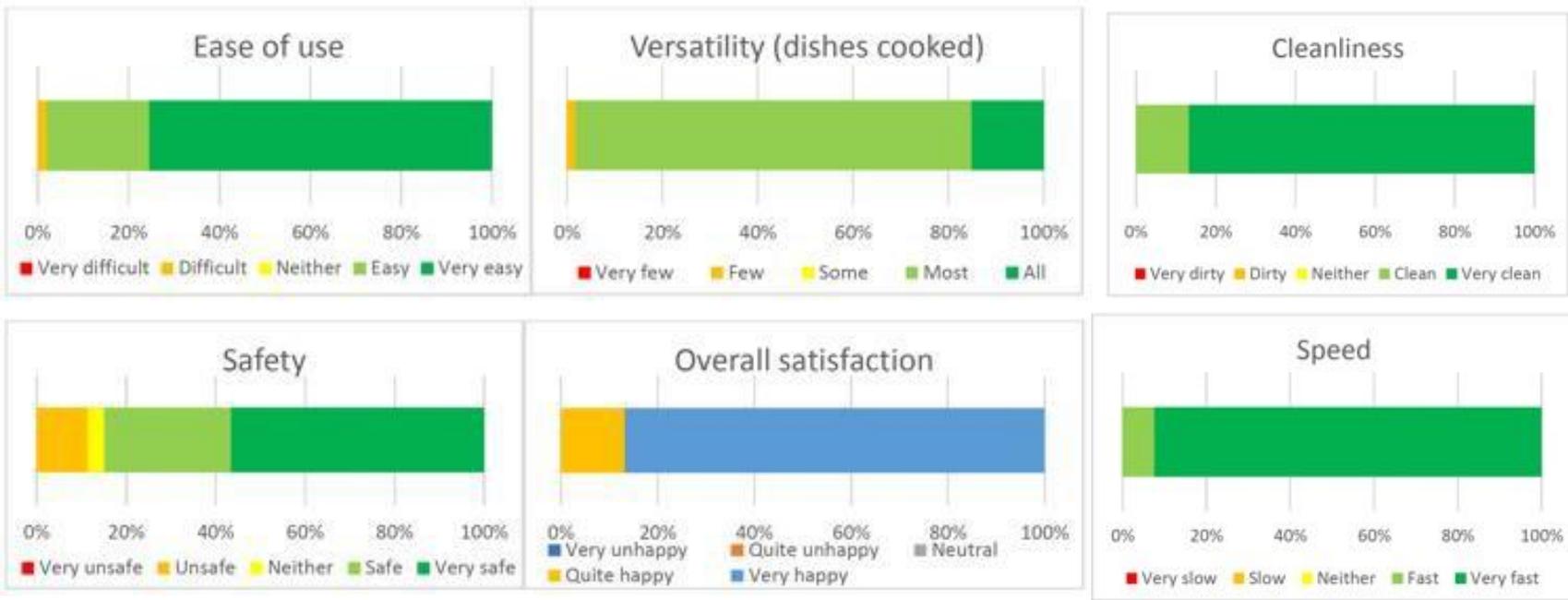
Test (Gram per gr)	FireDragon	Other firelighters	Percentage Difference
Hydrogen Cyanide	0	0.05	+100%
Carbon Dioxide	37997	48244	+21.24%
Carbon Monoxide	34.78	47.95	+27.47
Nitrogen Oxides	1.68	5.13	+67.25
Methane	0	0.0059	+100%
Particulate Matter	0.0032	0.3062	+98.95%

The findings from the FGD study were;

- ..supported by user responses from the survey where 100% thought FireDragon was clean or very clean, as well as fast or very fast.
- 98% of users thought it was easy to use and cooked most of their dishes.
- 85% of respondents thought FireDragon was safe to use.
- 87% were very happy with the fuel, while the remaining 13% reported being “quite happy” using FireDragon.



Ethanol burning with its spectrum depicted.



Effective hand sanitiser

Safe & non-toxic to handle

FireDragon is safe to handle and is even a proven highly effective hand sanitiser, killing 99.999% in viable bacterial counts.

FireDragon being a natural disinfectant gives you the opportunity to kill bacteria and/or viruses on your hands before handling food and lighting your fire.

Disinfecting your hands before handling food is essential to:

- Prevent food poisoning
- Prevent the spread of viruses and bacteria through food
- Make sure your food is safe to eat.

Safe to handle and pack with food

FireDragon is **waterproof** and will **burn when wet**

FireDragon Solid
Can be used as a disinfectant block to disinfect hands.



What about Kerosene?

Current advice from the World Health Organisation (WHO) says:

"Kerosene is a polluting fuel: WHO recommends that governments and practitioners immediately stop promoting its household use."

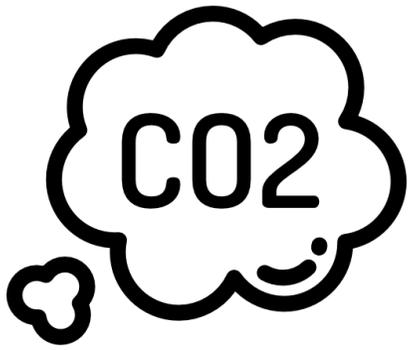
"Particulate emissions from kerosene are almost 100% black carbon."

"...use of kerosene was associated with elevated risk of cancer, respiratory infections, asthma, tuberculosis, cataract, adverse pregnancy outcomes and ALRI in children"

"Unintended ingestion of kerosene is one of the most common causes of child poisoning worldwide"

"kerosene is a ripe candidate for rapid replacement."

Kerosene is a fossil fuel. It is smelly and a highly polluting food and can cause health issues if fumes and/or smoke is inhaled – therefore it is NOT safe for use with food. It needs to be replaced.



What about wood?

We need to stop burning wood. Any wood. Even if they are from FSC certified schemes – FSC certified wood-based firelighters claim to be “natural” and “eco-friendly” but in reality they are highly polluting and it’s still cultivating trees when there are true eco-friendly alternatives on the market.

Surely leaving the trees growing – even if they were planted for “cultivation” is wrong and we have to learn this and stop this “greenwashing”.

Wood, even fallen wood, should be left to rot slowly, to keep the sequestered carbon dioxide locked up for as long as possible. It is also great for improved biodiversity, and forest regeneration.

Wood when it burns is highly polluting.



Tried & Tested



<https://www.youtube.com/watch?v=1SoDn9toXDk>

Videos



<https://www.youtube.com/watch?v=xyKPLHtGdSU>



<https://www.youtube.com/watch?v=Rpa4qKXX8Zw>



<https://www.youtube.com/watch?v=2lsDD-qMDIU&t=1s>



https://www.youtube.com/watch?v=n9V_9jFbrS0



<https://www.youtube.com/watch?v=UNKylcQ1KKU>

Tried & Tested

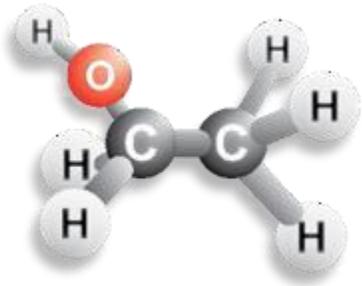
Videos



https://www.youtube.com/watch?v=iD8TaRcG_d0



<https://www.youtube.com/watch?v=Z-plQSMQ2Fo>



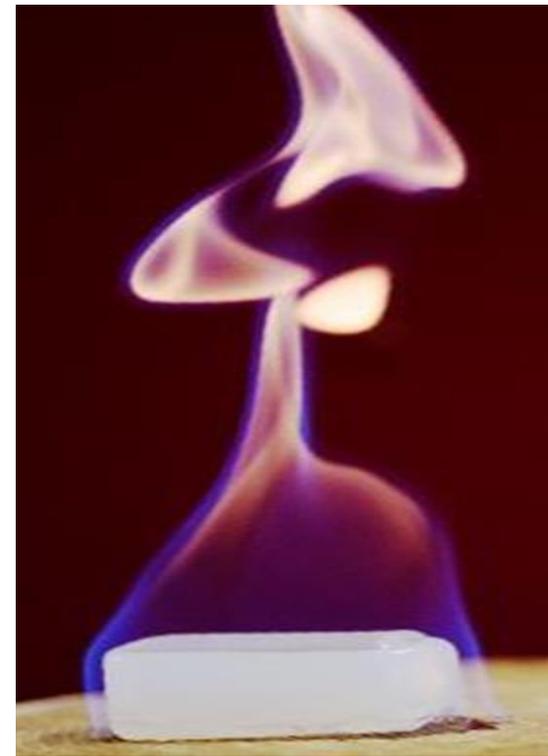
<https://www.youtube.com/watch?v=6FJIWiCxoPY>



FIREDRAGON

Firedragon will light in 1 to 2 seconds with an ordinary match.
Other firelighters can take up to 20 seconds to light.

A burning issue which will not cost the earth.



Ethanol is approx. 25% higher in calorific density than its nearest rival.



DG Transport classification UN 1325 Class 4.1 Packaging Group III

✓ Air transportable

www.firedragonfuel.com

