



Carbon Char



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The Carbon Char is the residual solid that remains after processing organic material using EPI's unique technology. This residual solid is a high quality, energy rich, carbon char representing around 15% by weight of the original material, achieving an overall reduction of 85%.

The volume of the char might initially vary, due to changes in both density and composition of the different types of material to be processed, however, passing the char through compressive rollers subsequently reduces it to a fine powder, giving a final reduction in volume of 90% or more, when compared against the original feed material. Reducing the char to a powder presents the opportunity for secondary removal of any remaining metals that might have been entangled within the original feedstock, and not been fully removed by initial recovery processes.

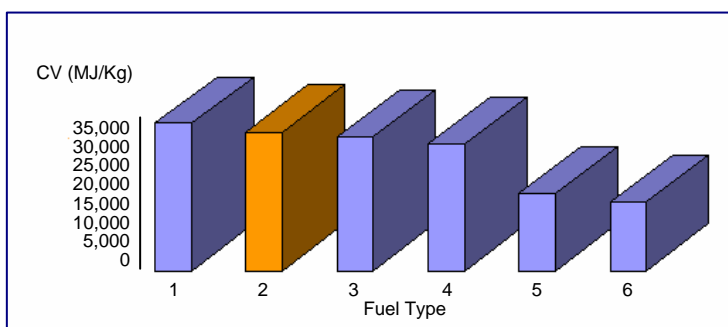
There is minimal variation in the composition of the residual char between most of the materials treated by the process. This is because the organic content will always be reduced to carbon. However, calorific values may well vary, as any inert material within the original waste stream will remain unchanged, thereby affecting the percentage of carbon within the remaining char and thus the overall calorific value.

The char offers a number of commercial possibilities, but even in its most basic form provides the opportunity for substantial energy generation. The char is very pure. Volatile matter (SVOC's & VOC's) that may have been present within the original feed material are either destroyed or driven off during the process, leaving a product that is inherently cleaner than its naturally occurring alternatives, e.g. coal.

How the char compares to some of the more traditional, established sources of fuel is demonstrated in the tables and graph shown below :

Typical Calorific Values (CV) of Carbon Based Fuels :

FUEL TYPE	CV. (MJ / kg)
1. Anthracite	32,500 - 34,000
2. EPI Carbon Char	30,700
3. Charcoal	29,600
4. Coke	28,000 - 31,000
5. Bituminous Coal	17,000 - 23,250
6. Coal	15,000 - 27,000



EPI's char compares favourably with the very best of the carbon based fuels in terms of heat and energy output. Furthermore, the added bonus of being classified as smokeless, offers substantial environmental benefits over the traditional, non-smokeless, coal based fuels.

The following table provides typical compositional data for the carbon char as produced direct from the process. The second table then provides a detailed analysis of the 9.1% residual ash left behind following combustion of the carbon char. The percentages shown in brackets are expressed as percentages of the whole. The collective balance being made up of compounds that are too small to measure.

Analysis of Carbon Char

	% Air dried basis	% Dry basis
Moisture	1.07	~
Ash	9.1	9.2
Volatile Matter	12.4	12.5
Sulphur	0.18	0.18
Chlorine	0.01	0.01

The above analysis shows that both the char and ash residues are exceptionally good. As a comparison raw wood contains almost 80% volatile material, with bituminous coal falling somewhere between 30 - 40%. Sulphur at 0.18 is regarded as little more than a trace, whilst Chlorine is considered at the limit of detection. The char is far cleaner than many naturally occurring alternative fuels and poses no environmental hazard either before or after combustion.

One tonne of mixed organic material produces around 150kg of high calorific value carbon char. A plant processing 40,000 tonne per annum will produce approximately 6,000 tonnes of char per annum. In real terms this gives the equivalent annual heat and energy output of almost 8,000 tonnes of the best quality bituminous coal.

Whilst it is abundantly clear that there is substantial value in the carbon char when used as a fuel, certain cellulosic material streams (i.e. wood or plant based), offer opportunities for enhanced value applications in the form of activated carbons, which are used extensively in the air and water purification industries.

Elemental Char - Ash Analysis (9.1 %)

Elemental Oxides	% m/m as analysed
Silica SiO ₂	31.1 (2.83 %)
Alumina Al ₂ O ₃	16.1 (1.46 %)
Iron Fe ₂ O ₃	3.9 (0.35 %)
Titanium TiO ₂	0.7 (0.06 %)
Calcium CaO	5.4 (0.49 %)
Magnesium MgO	2.1 (0.19 %)
Sodium Na ₂ O	1.3 (0.12 %)
Potassium K ₂ O	12.0 (1.09 %)
Manganese Mn ₃ O ₄	0.1 (0.01 %)
Phosphorus P ₂ O ₅	8.1 (0.74 %)
Sulphur SO ₃	9.0 (0.82 %)

