

Carbon Emissions And Gasification For The Layman

A short paper discussing the issues of the carbon emissions modelled on the emissions of the proposed BCB incinerator at Tockwith

“Greenhouse gas” is a term used to refer to CO² because of its capacity to retain heat. Most measurements of pollution ask how many tons of CO² are produced. This paper will attempt to calculate the likely emissions of CO² from the proposed BCB plant. The author is happy to receive comment or further information at
co2@expertpc.org

Based on figures provided within the BCB application, the total quantity of gases which will be emitted from the flue every year (assuming only 351 days' operation) are approximately 1,217,251,152 (1.2 billion) cubic metres per annum.

Normal air contains the following elements

Gas	% of Earth Atmosphere at sea level (dry air)
Nitrogen	78.08
Oxygen	20.95
Argon	0.93
Carbon dioxide	0.03

Note how low the carbon dioxide content is.

However, as part of the combustion process, Carbon from the fuel being burned binds to the Oxygen molecules at the rate of one Carbon molecule to two Oxygen molecules – creating carbon dioxide. In addition, some Carbon can bind at the rate of one Carbon molecule to one Oxygen molecule – creating carbon monoxide.

Although processes such as gasification starve the material being burned of Oxygen to prevent this combustion, when the resultant ‘syngas’ created in the gasifier is burned in the boilers to produce the steam to drive the generator, it has to be mixed with air in order to achieve combustion and CO² is produced which will exit out of the flue.

Oxygen entering a combustion process is then used up so that the gas exiting the flue may contain 11-15% carbon dioxide. It should be noted that this is an assumption based on best available external evidence on O² to CO² conversion during combustion.

Thus the gases exiting a flue will contain far more CO² than the gas entering the process. Depending on the precise consequences of combustion, the process is likely to produce between 134 million and 182 million cubic metres of CO².

One kilogram of CO² occupies approximately 509 litres of space at ground-level atmospheric pressure. Thus, the weight of CO² produced by the plant will probably be between 263,000 tonnes and 358,000 tonnes.

These are the plant's greenhouse gas (CO²) emissions.

In equivalence terms, the emissions are the same as you would get by driving a Mini between 1.25 and 1.7 BILLION Miles per annum

But how do these emissions compare with other forms of energy production ?

In order to assess these, it is necessary to compare the typical CO² emissions per kilowatt/hour of other generation systems with those of the proposed BCB gasification plant. The BCB application shows that it will provide sufficient thermal energy to supply an 11 Megawatt/hour generating plant. On the basis of a 351-day operating year, the plant would generate 92,664,000 kilowatt/hours of electricity.

Given a calculated output of 263 thousand and 358 thousand tonnes of CO² for the BCB plant, this suggests that the plant creates between 2,838 and 3,870 grams per kilowatt/hour of power generated in the plant.

On 1/9/2005 figures were provided to the House of Commons Select Committee on Environmental Audit indicating that the CO² emissions per kilowatt/hour for different fuels were as follows:

Coal	790 – 1,017 grams per Kilowatt/hour
Gas	362 - 575 grams per Kilowatt/hour

These figures are a direct comparison and do not attempt to take account of the CO² costs associated with producing the fuel and transporting end-product.

Thus it may be seen that the syngas used by BCB generates almost 400% of the CO² emissions of Coal and between 700% and almost 800% of the CO² emissions of Gas for the production of 1 kilowatt of power.

They are however open to further discussion by interested parties. I invite comment.

co2@expertpc.org