August 29, 2017

As various European countries have committed a great deal of resources to studying biochar we thought it beneficial to contrast the Emergent Biochar characteristics and the ATS technology specifications with the published European Guidelines:

> EBC (2012) 'European Biochar Certificate - Guidelines for a Sustainable Production of Biochar.' European Biochar Foundation (EBC), Arbaz, Switzerland. http://www.europeanbiochar.org/en/download. Version 6.2E of 04th February 2016, DOI: 10.13140/RG.2.1.4658.7043

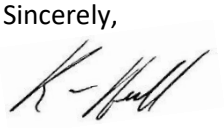
Firstly, the purpose of the Guidelines is as follows: "As both, biochar properties and the environmental footprint of its production are very much dependent on the technical control of pyrolysis and the type of feedstocks, a secure control system for its production and analysis needs to be introduced. The intention of the European Biochar Foundation in issuing these guidelines on how to gain biochar certification is to introduce a control mechanism based on the latest research and practices. The European biochar certificate (EBC) aims to enable and guarantee sustainable biochar production."

Secondly, the guidelines give us a definition of biochar: "Biochar is a heterogeneous substance rich in aromatic carbon and minerals. It is produced by pyrolysis of sustainably obtained biomass under controlled conditions with clean technology and is used for any purpose that does not involve its rapid mineralisation to CO_2 and may eventually become a soil amendment. Biochar is produced by biomass pyrolysis, a process whereby organic substances are broken down at temperatures ranging from 350°C to 1000 °C in a low-oxygen thermal process." Under this definition what EWS has produced is clearly biochar.

It is significant to note the following quote from the publication: "The European Biochar Certificate is a voluntary industry standard in Europe. In Switzerland it is obligatory for the use of biochar in agriculture." From this we see that compliance with the guidelines and actual certification under the program **is not mandatory** unless it is used in agriculture specifically in Switzerland.

From the table below the reader will doubtless conclude that ***Emergent Biochar is a premium grade product that compares very favorably with the most stringent guidelines in existence today.***

Sincerely,



Kevin Hull, CEO

230 – 3757 Jacombs Rd. Richmond BC, V6V 2R3 604.282-7329
www.ewscanada.com | info@ewscanada.com | facebook.com/EWSCanada | twitter.com/EWSCanada

Criteria	Comments
Feedstock	Our biochar is from only organic, sustainably sourced, wood fibre that is free of contaminants.
	EWS feedstock is waste material that would otherwise have been burned, releasing all the greenhouse gasses in that material.
	It is free from all non-organic material and free of paint, solvents and other organic, or non-organic, contaminants.
	Our feedstock is 100 km from our biochar plant. In Europe, it may be practical to enforce an 80-km rule, however in Canada, with our sparse population and vast areas, it is not always reasonable.
Manufacturing Specifications	Our thermolysis temperature does not fluctuate more than 20%. In fact, our temperature remains constant to within 1%.
	The composition of the biomasses does not fluctuate more than 15%.
	Complete production data, including temperature settings, are kept
Sampling Methodology	We are able to adhere to the sampling guidelines as presented in the source document.
Biochar Properties	The guidelines call for a carbon content greater than 50%: our Emergent Biochar is greater than 80% carbon.
	H/C ratio is mandated to be less than 0.7, whereas Emergent Biochar is less than .04.
	O/C ratio must be less than 0.4, whereas our Biochar is less than 0.15.
	A list of Volatile Organic Compounds can be made available. The high temperature steam component of our process captures the VOC's and drives them into the synthesized gas outlet, where they are filtered from the gas, which is used as a fuel source for reactor heating. Residual VOC are ≤ 0.5%
	Nitrogen, phosphorus, potassium, magnesium and calcium are not present in our biochar.

	Emergent Biochar stays below published thresholds for heavy metals as the feedstock contains only what is naturally found in wood fibre.
	pH value is 8.55, which is in the recommended range stated in the guidelines
	Ash content is 2.70% ± 0.756%
	Surface area is ≥ 413 m^2/g, significantly above the recommended minimum of 150 m^2/g.
	Water content is for safety reasons and can be dictated by the buyer if this is a concern Normal practice for EWS is for 5% moisture content
	Emergent biochar is well below the 4 mg/kg DM PAH content for premium grade biochar as specified in the guidelines
	PCB, dioxins and furans are not present in Emergent Biochar
Production Technology	The heat source for the reactors is the reclaimed and scrubbed synthesized gas produced by the system.
	The surplus synthesized gas is scrubbed and burned, not released to the atmosphere.
	We comply with emission thresholds for Canada.
	Surplus heat from the reactors is used as fuel for the boiler system.
Shipping & Handling	All safety regulations are followed.
	As noted, moisture is added to the biochar to ensure against dust generation or dust explosions.