Arbaz, 17th November 2021

EBC carbon sink certificate

General Data	ID of C-sink certificate = C-sink register ID	12PL00950031
	EBC ID	co-po-95
	EBC Batch ID	ba-po-95-1-1
	Production periode	25.06.21-24.06.22
	QR-Code of Biochar Batch Analysis	

Producer	OZEN Sp. o.o. Budowlanych 19 78-600, Wałcz Poland
GPS	N 53.27234849, E 16.499268256
	http://www.ozen.pl/
	marek.perczynski@ozen.pl

Biomass	Type of biomass (EBC-class)	Primary forest product	
	Total amount of biomass (dry matter) used for the certified batch	50300	t
	Emissions due to fertilization	0	t CO_2eq
	Transportation of biomass to pyrolysis site	263.97	t CO_2eq
	Preparation of feedstock	0.00	t CO_2eq
	Emissions for drying of feedstock	0	t CO_2eq
	Feedstock storage emissions	0	t CH_4
	Total biomass related GHG emissions without CH_4 per batch	**264.0**	**t CO_2eq**

Pyrolysis	Source of electric energy used on site	renewable	
	Emissions due to electricity consumtion for entire pyrolysis plant incl. post pyrolysis treatment	0	t CO_2eq
	Emissions due to LPG and other external fuel for reactor heating	216	t CO_2eq
	Emissions due to carrier gas	0	t CO_2eq
	CH_4-emissions of pyrolysis unit	5.43	t CH_4
	Total pyrolysis related GHG emissions without CH_4 per batch	**216.0**	**t CO_2eq**

Methane	Total methane emissions	5.43	t CH_4
	Amount of compensated methane emissions	0	t CH_4
	Type of methane compensation	-	
	Total non compensated CH_4 emissions per batch	5.43	t CH_4
	Total non compensated CH_4 emissions in CO_2eq per batch (@ GWP20 of 86)	**467.19**	**t CO_2eq**

Margin of security	**10% of total GHG emissions (incl. GWP20 of CH_4) per batch**	**94.7**	**t CO_2eq**

Total emissions	**Total GHG emissions in CO_2eq per batch**	**1041.9**	**t CO_2eq**
	Total GHG emissions in Ceq per ton of biochar (dry matter)	0.018	t C

Energy	Carbon neutral thermal energy per batch	106'968	MWh
	Carbon neutral electricity per batch	17'197	MWh

Biochar	Amount of biochar (DM) produced per certified batch	15706	t
	H/Corg ratio	0.33	
	C-content	89.5	%
	C-sink potential	**87.7%**	**of DM**

Data per ton of biochar	Total GHG emissions per t biochar (dry matter)		0.066	t CO_2eq
	CO_2eq-content per t of biochar (dry matter)	[gross C-sink]	3.28	t CO_2eq
	C-sink potential in tCO_2eq per t of biochar (dry matter)	[net C-sink]	3.22	t CO_2eq
	$Csink_{100}$ in tCO_2eq per t of biochar (dry matter) [persistent C of the sink after 100 years when applied to soil @ P_{100}=74%]		**2.38**	**t CO_2eq**

EBC Carbon Sink Certificate

Issued for Ozen SP, Walcz, Poland

The biochar batch ba-pl-95-1-1 produced by Ozen SP has a carbon sink potential of 87.7 %. Each ton of biochar from the certified batch has a carbon sink potential of 3.22 t CO_2eq. When applied to soil, the accountable fraction of carbon persistent after 100 years ($Csink_{100}$) is 2.38 t CO_2eq.

The carbon sink potential of 87.7% provides the percentage of a mass unit of biochar that, on a dry matter base, can be considered as a temporal carbon sink. For example, a big bag containing 150 kg biochar (dry matter) has a carbon sink potential of (150 kg * 87.7 % C_S) = 131.6 kg C which is the equivalent of 482 kg CO_2eq per bigbag.

The 131.6 kg carbon of a 1m^3 big bag of biochar is the amount of carbon that can be considered a carbon sink once the biochar is applied to soil, to compost, to digestate, to animal feed or to any other durable product or protective matrix.

The production of 1 t of biochar (dry matter) caused emissions of 66 kg CO_2eq due to feedstock production, transportation, storage, preparation and operation of the pyrolysis plant and methane emissions during both biomass storage and the combustion of the pyrolysis gases. These emissions were deduced from the carbon sink value of the biochar.

The CO_2 emissions of the combustions of the pyrolysis gases used for energy production are considered as carbon neutral as the feedstock for the pyrolysis originated from forest management residues.

The CH_4 emissions of the pyrolysis unit were measured during regular operation by IChPW, a Polish government accredited organization. The woody feedstock is never stored longer than 30 days before drying to below 20% water content, therefore no CH_4-emissions due to self-heating were considered. All electricity used for the production was provided as renewable, carbon neutral energy by the production site itself.

Neither the carbon expenditures necessary to transport the biochar from the production site to the location of the final C-sink (via a merchant and/or processor) nor the carbon expenditures when manufacturing or blending the biochar into a carbon sink product are considered so far. These emissions must be deducted as soon as a C-sink certificate or an offset service is generated for an end customer based on this C-sink potential certificate. Equally, when applied to soil, only the carbon fraction that is persistent after 100 years ($Csink_{100}$) or any other EBC-defined sequestration period should be traded as C-sink certificate.

During the annual biochar production of the batch, an estimated 107.000 MWh thermal and 17.200 MWh electric energy will be generated from the biomass. As all GHG emissions of the entire process were deduced from the biochar carbon sink potential, this thermal energy is completely carbon neutral. However, the thermal energy used for drying the biomass is included in the total amount of thermal energy. The total certified amount of carbon neutral heat and electricity will be provided at the end of the batch.

The present ***EBC carbon sink potential certification*** is valid for the entire biochar batch produced between 25/6/2021 and 24/06/2022 and can be used for carbon sink certification and trade procedures.

The present EBC carbon sink potential certification was issued by the Ithaka Institute (Switzerland) on 17th November 2021.

Hans-Peter Schmidt
Head of Ithaka Institute