



PURO.EARTH OUTPUT AUDIT REPORT

Bussme Biochar AB | Munka-Ljungby & Svedala

**Puro Biochar Methodology Edition 2022 (Version 3 published on 1.2.2024) and
General Rules (Version 3.1)**

Audit Start - End date: 26.11.2024 - 21.2.2025

Project Number: PRJN-701042

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CO₂ sink Sector (Puro Scheme): Biochar



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ATTACHMENT 1 Biochar methodology – Output Audit requirements and verification results



Introduction

This report summarises the results and conclusions from the performed output audit. The audit is performed as a formal part of the Puro.earth certification process. The key objective is to determine the compliance of the operations with the Puro requirements.

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Production facility standing data

(PURO General rules Biochar Methodology)

General information

Facility unique identity	SE559276670201 Facility IDs <ul style="list-style-type: none"> Munka-Ljungby: 299495 Svedala: 665890
CO2 Removal Supplier registering the Production Facility	GSRN number 643002406801000206 (Munka-Ljungby) GSRN number 643002406801000190 (Svedala)
Name	Bussme Biochar AB
Location	Läringsgatan 4, 266 35 Munka-Ljungby and Bäckgatan 4, 233 44 Svedala, Sweden
Date on which the Production Facility became eligible to receive CORCs	31.03.2021
Volume of Output during the Period	Shipped eligible production volume: <ul style="list-style-type: none"> - Munka-Ljungby 478,5 m3 (1.1.2023-31.1.2024) - Svedala 1832 m3 (1.1.2023-29.2.2024)
Removal Method(s) for which the plant is eligible to receive CORCs	Biochar
Production Facility has benefited from public support	No
Removal Method specific information as may be specified in the relevant Removal Method specific Methodology	Biochar, Pyrolysis process

Short description of facility and any exclusions from verification scope observed

Running pyrolysis process with process control in both facilities

Statement of confidentiality

The contents of this report, including any notes and checklists completed during the audit will be treated in strictest confidence, and will not be disclosed to any third party without the written consent of the customer, except as required by the appropriate accreditation authorities.

Disclaimer

An audit is based on verification of a sample of available information. Consequently, there is an element of uncertainty reflected in the audit findings. An absence of nonconformities does not mean that they do not exist in audited and/or other areas. Prior to awarding or renewing certification this report is also subject to an independent DNV internal review which may affect the report content and conclusions.

Audit results

Detailed output removal verified

SUMMARY AND OUTPUT CALCULATION	Munka-Ljungby	Svedala	
Period	1.1.2023-31.1.2024	1.1.2023-29.2.2024	
Shipped eligible production volume	478,5	1832	m3
E _{stored}	2,8385	3,1277	mt CO2 eq / mt biochar (dry)
E _{biomass}	0,1538	0,1755	mt CO2 eq / mt biochar (dry)
E _{production}	0,0780	0,0630	mt CO2 eq / mt biochar (dry)
E _{use}	0,0598	0,1000	mt CO2 eq / mt biochar (dry)
CORC factor	2,5470	2,7891	mt CO2 eq / mt biochar (dry)
TOTAL number of CORCS	88,38	414,49	CORCS

For Svedala, the initially reported CORCs before the adjustment made by Bussme based on the findings of the audit was 421,24.

Positive indications

- Bussme seems to collaborate and communicate quite well with stakeholders. The team collects data from operators daily for the most part, data gathered is rather comprehensive. Bussme reports monthly to Puro.
- Bussme's approach was very open and transparent. The team readily answered all questions during the audit and promptly responded to further requests, such as providing additional documents. The LCA report was also well detailed and justified overall (listing of factors used, assumptions taken, etc.).

Recommendations for improvement

- A few human errors were identified in the review, due to the manual data collection and management process. In addition, there is no formal and periodic quality check process in place for input data.
- The same goes for the manual LCA modelling. A few errors and omissions were found during verification: (1) plastic packaging for Munka-Ljungby linked to Svedala data and was thus quite overestimated; (2) life cycle phase 3 for Svedala only accounted for deliveries and not end-of-life; (3) emissions from the lifecycle of the Pyrolysis chamber was omitted in life cycle stage 2 emissions for both sites; and (4) shipped production volume was inaccurate for Svedala, resulting in a material finding (7% lower CORCs for the initial period assessed). Apart from the later, the impact on LCA results was small (below 5%) and negligible on CORCs (below 1%).
- Certain methodological choices, assumptions and reasonings could be further explained in the LCA report for clarity of alignment with Puro's methodology, transparency, and conformity with ISO 14044 (as detailed in Attachment 1).
- Currently, the "corresponding amount of biochar" used in LCA calculations relates to biochar produced and not biochar sold data (e.g. for life cycle phase 3 emissions). Though this had a negligible impact, it can lead to inaccurate results.
- Bussme used a different breakdown for the system boundary graph and result presentation for all life cycle phases in the LCA report: this is not optimal for ease of review and data consistency.
- For a smoother verification process, the LCA expert should be available at the time of the audit.

Audit findings

Detailed findings requiring corrective actions

As per Puro's methodology, the CORCs result from biochar production activity over a given reporting period (notably stated in *section 4. Calculation methodology for the quantification of CO₂ removal*). The auditor found a discrepancy between reported production and shipped volumes for the Svedala site that were not aligned with the considered reporting period. As this finding had a material impact on resulting CORCs (7%), a major non-compliance was raised.

Puro stated that exceptionally, should no additional documentation be required, then the period could be extended to cover February for Svedala. Bussme confirmed that no additional documentation was required as data provided already included shipped volumes and there was no production in February 2024. A material error remained (2% impact on CORCs): Bussme thus revised the CORCs calculation, and the auditor was able to close the finding.

Conclusion

Conclusion	
The company is found compliant towards CORC requirement, and a certificate can be issued	X
The company is found NOT to be fully compliant towards CORC requirement and corrective actions are needed before a certificate can be issued	

ATTACHMENT 1

Biochar Methodology
Requirements and verification results

Company: Busmne Biochar AB (Munka-Ljungby and Svedala sites)
Facility address: Läkingsgatan 4, 266 35 Munka-Ljungby and Blåkingatan 4, 233 45 Svedala, Sweden
Date: 21.02.2025
Auditor: Hedwige Serot (DNV)
Participants: Carina Wallie and Marie Nilsson (Busmne)

Module	Evidence piece	Associated requirements	Verification method & source	Verification remarks	Compliance
01. Records of biomass used	Sustainability certificates of biomass	[7.1.1.2', '5.2.1']	Document check (email extracts, no certificates provided)	The CORC summary states that "100% raw material is certified FSC/PEFC", and the LCA report makes mention of "energy wood from slash from sustainable forest management in Sweden". As evidence, Busmne has provided email exports from suppliers declaring that their biomass comes from sustainable sources. Following the audit, Busmne shared the PEFC certificate of one of their suppliers (Gustafsborg).	Yes
	Records of biomass used	[7.5.2.1']	Document check & interview with Busmne	Busmne uses woodchips from secondary sources.	Yes
	Production data for entire audited period	[7.5.3.1']	Document check (Datainaminging file, CORC summary, LCA data) & interview with Busmne	No external fuel is used to start the reactor for biochar production. Pyrolysis gases are fully combusted in the process. Data is collected manually; this presents a risk of manual errors and misstatements (a few non-material ones where identified during the review).	Yes
02. Records of biochar produced	Biochar environmental quality analysis	[7.1.1.7', '5.3.4']	Document check (laboratory analysis) & interview with Busmne	Data was checked against EBC & Swedish requirements (for heavy metals & PAH content). Busmne asks operators to follow its safety instructions for biochar handling (the procedure document was shared after the audit). This is also mentioned on invoices.	Yes
	Biochar elemental analysis	[7.1.1.6', '5.3.3']	Document check (laboratory analysis, CORC summary)	H/C ratio is 0.18 for Munka-Ljungby, 0.05 for Svedala. Testing is done yearly for the EBC certification, as Busmne considers the biochar to not vary over season.	Yes
	Calibration certificates for measuring devices	[7.1.2.4', '5.3.1', '7.5.1.5']	Inter view with Busmne (no evidence provided)	Busmne uses "a very simple scale to just weigh the biochar before and after the oven; there has not been any calibration for that".	Yes
	Sales invoices with explicit mentions about CO2 removal claims	[7.5.5.3']	Document check (sale invoice)	The invoice makes mention that the biochar is sold without carbon sink.	Yes
	Evidence that end-use has taken place	[7.1.1.1', '5.4.2']	Document check (sale invoice)	No indicated/required intended use to customers, but Busmne solely sells biochar to soil producers who had it in their matured/brands. Only one invoice was provided as evidence: Busmne provided more as requested by the auditor (sample based on materiality).	Yes
03. Records of biochar used	Branding claims on packaging, product data sheets, website	[7.5.5.2b']	Inter view with Busmne (no evidence provided)	Nothing is put directly on the packaging - too costly, and the majority of products are sold in bulk.	Yes
	Updated life cycle assessment data for Output Audit	[7.1.1.3', '3.1', '7.3.2', '7.3.3', '7.5.2.2', '7.5.3.2b', '7.5.4.1']	Document check (LCA data and study report)	Net-negativity is demonstrated with results from the cradle-to-grave LCA of the biochar (including disaggregated information on the emissions at different stages for CO2). The LCA modelling is done manually; this presents risks of human errors and misstatements, several non-material ones (e.g. data format, inaccurate formulas) were identified and raised during the audit. A quality check procedure and critical review of the study is then even more important to reduce such risks. The data is not fully consistent; you could consider keeping the same breakdown between your system boundary graph and result presentation for all life cycle phases in the LCA report (and related calculation file). A couple key findings are outlined below: - Emissions from the Pyrolysis chamber (lifecycle were calculated for 1 year, but the period here is 13 months. Furthermore, these emissions were omitted in the LCA results (in life cycle phase 2: Pyrolysis, which would increase by 58% for Munka-Ljungby and 37% for Svedala). Plastic packaging emissions for Munka-Ljungby were overestimated as Svedala data was taken instead: it should be 29kg CO2e instead of 26 reported. Overall, life cycle phase 2 should thus be 15% lower for Munka-Ljungby and 26% higher for Svedala. The resulting impact on total CO2e emissions for the period is less significant however. - The "Corresponding amount of biochar" used for calculations in the LCA model (oral) is based on biochar produced for all data, though biochar sold would be more accurate for some biochar transport to end users, waste management of packaging, big bag transportation, amount of biochar spread...). Although the m3 difference is rather small, given Euro's methodology considers biochar to be eligible when it is sold and used, this should be updated for accuracy of LCA results (particularly life cycle phase 3 emissions). The methodology, reasoning and assumptions could be further explained or justified for certain aspects in the LCA report and/or LCA calculation file (e.g. frequency of lab analysis, soil temperature, land use change, ash waste allocation, emissions from biomass seedling & harvesting, composition of electricity, efficiency of combustion/T&D losses, study limitations) for clarity of alignment with Euro's methodology, transparency, and conformity with ISO 14064. Some data sources could also be more explicit (e.g. refer to the specific tabs in the Datainaminging files). Finally, regarding allocations, given monthly data for biochar production and electricity is available, it would be more accurate to consider doing a monthly allocation of energy consumption in production, such as electricity (instead of using a yearly average).	Yes
04. Updated LCA calculations & supporting data					
	CORC Report Summary	[7.5.3.2b']	Document check (CORC report summary)	The impact of errors and omissions identified in the LCA calculation (relating to E _{missiom} and E _{land}) is negligible on total number of CORCs for the period. For Svedala however, two additional findings were raised regarding the shipped production volume eligible for CORCs, which was overestimated: -1) a credit to consumer of -31,5m3 was omitted, 2) 8m3 of biochar shipped in February included although outside the period. These led to a significant difference on the number of CORCs (79%). The data provided could be extended to cover February, and Busmne revised the CORCs (eligible shipped production volume) to address the first finding, which still had a material impact (2%) on resulting CORCs.	Yes