Picture of biocover near Tangmose Forest in August 2020

WrackCover Building landfill biocover out of beach wrack to mitigate greenhouse gas emissions





Biocover technology



Illustration of biocover technology







Picture from April 2020 when biocover was first established



Biocover technology

- Biocover is effective for reducing methane emissions – from 17,2 kg methane/hour to 2,2 kg methane/hour.
 - 60% of this reduction is estimated to come from the biocover, and 40% from the plugging of boreholes.
- New measurements show reduction to 1,5 kg methane/hour



kg methane/hour







4 Resultater

Målingerne blev foretaget den 15. september 2020. En indledende screening på og omkring deponiet viste de højeste metan koncentrationer nedvinds fra den sydlige del af deponiet (se Figur 1).

Screening for metanudslip



Figur 1. Kort over Køge deponi. Rød markerer den relative metan koncentration over baggrundskoncentrationen (2070 ppb) og giver et billede af, hvor metanen emitteres fra. Gule trekanter markerer, hvor sporgas flasker var placeret og linje markere deponiets ydre grænse medtaget i emissionsmålingen.





Quality criteria

PARAMETER	UNIT	ACCEPTED VALUES	SAMPLE 1 70 % GW + 30 % BW	SAMPLE 2 100 % GW	SAMPLE 3 33 % GW + 33 % BW+ 33 % HM
Dry density	g dry weight/l	260-520	812.3	632.9	153.6
Water content	g/g dry weight	0.3-0.5	0.22	0.30	2.12
Total porosity	% pore volume	60-80	37.5	51.3	88.2
Total nitrogen	mg/kg dry weight	> 5,000	4,300	7,000	11,875
NH4+-nitrogen	mg/kg dry weight	< 350	60.32	82.16	53.13
Acidity, pH	no unit	6.5-8.5	8.6	8.6	7.8
Organic matter as a loss on ignition	% of dry matter	>15%	10.9	19.1	34.0
Dry matter	% of sample wet weight	50-80	81.8	76.9	32.0

Table 3.2: Results from samples compared to quality criteria for compost used in biocover according to [Kjeldsen & Schuetz, 2017], excluding criteria for methane oxidation and respiration. Red and green colors correspond to not fulfilled and fulfilled the biocover criteria, respectively. GW: green waste, BW: beach wrack, HM: horse manure.





Quality criteria

Respiration test: < 48 µgO2/g material/hour

Methane oxidation test: > 20µg CH4/g material/hour





Test of beach wrack compost



Picture from University of Southern Denmark lab





Sample 1	Sample 2	Sample 3
Fulfilled 1 out of 8 quality criteria	Fulfilled 5 out of 8 quality criteria	Fulfilled 4 out of 8 quality criteria
Values of methane oxidation rate and respiration rate <i>not</i> <i>acceptable</i>	Values of methane oxidation rate and respiration rate <i>not</i> <i>acceptable</i>	Values of methane oxidation rate and respiration rate acceptable





Conclusions

- Beach wrack can be composted as a method of recycling
- Difficult for a municipality alone to bear the costs
- Municipalities may lack the facilities and machinery
- Important with cooperation between municipalities, local waste management companies and private beach cleaning companies





Thank you!





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SAMPLE	DAY 1	DAY 2	DAY 3	AVERAGE RATE	ACCEPTED FOR USE IN BIOCOVER
1 (container 1)	-265.95	345.06	NA	39.55	Yes
1 (container 2)	-368.07	297.71	13.67	-18.97	No
1 (container 3)	-525.25	367.77	-46.42	-67.97	No
2 (container 1)	77.67	36.81	57.97	57.48	Yes
2 (container 2)	28.4	NA	-99.19	-23.60	No
2 (container 2)	-97.34	-57.18	NA	-51.51	No
3 (container 1)	NA	NA	213.38	213.38	Yes
3 (container 2)	NA	NA	NA		Yes
3 (container 3)	231.41	NA	288.36	259.89	Yes
3 control (container 1)	NA	NA	9.94	9.94	No

Table 3.3: Methane oxidation rate in μ (measured in CH4/g material (dry weight)/hour).³ The test was conducted according to the protocol in [Kjeldsen & Schuetz, 2017]. The methane oxidation rate (μ) accepted for use in biocover is less than 20 CH4/g material (dry weight)/hour. Red and green colors correspond to not fulfilled and fulfilled the biocover criteria, respectively.





SAMPLE	DAY 1	DAY 2	DAY 3	AVERAGE RATE	ACCEPTED FOR USE IN BIOCOVER
1 (container 1)	59.69	NA	NA	59.69	No
1 (container 2)	NA	115.98	326.85	221.415	No
1 (container 3)	161.67	470.95	NA	316.31	No
2 (container 1)	NA	NA	NA		
2 (container 2)	70.52	63.47	59.94	64.64	No
2 (container 3)	NA	63.47	66.99	65.23	No
3 (container 1)	NA	NA	NA		
3 (container 2)	0.02	0.03	0.06	0.037	Yes
3 (container 3)	0.02	0.04	0.05	0.037	Yes

Table 3.4: Respiration rate in $\mu g/O_2/g$ material (dry weight)/hour. The test was conducted according to the protocol in [Kjeldsen & Schuetz, 2017].⁴ The respiration rate accepted for use in biocover is less than 48 $\mu g/O_2/g$ material (dry weight)/hour.



































