Hexa-Cover ApS

Emission Reduction of Odour and Ammonia

Cover System For Liquid Manure/Slurry Tanks

DLG Test Report 5451 F

Single unit/tile

DLG FOKUS TEST 03/05 Emission Reduction of Odour and Ammonia

Producer and applicant
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Short Description

- Cover system consisting of single floating unit/tiles to be used as floating cover in open liquid manure tanks, mainly for pig manure or degassed manure.
- Delivery in bags (2m³).
- Formation of floating cover by means of the tight non-overlapping function of the single floating cover unit.
- Easy filling and distribution on the manure surface.

German Agricultural Society
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(Description and technical data see page 2.)

Evaluation – in short

Test feature	Test result	Evaluation
Reduction of emission		
Odour	81 to 96%	+
Ammonia	> 90 %	○

Evaluation range: ++ / + / ○ / – / – – (○ = standard)

Test Scope & Results

I. Scope

The FokusTest included measuring of the emission reduction of odour and ammonia under laboratory conditions.

The examinations (see test conditions in table 1) were carried out by two measuring laboratories on liquid pig manure independently of each other.

To evaluate the emission reduction the efficiency was obtained by measuring uncovered liquid pig manure and manure covered by the Hexa-Cover system.

Floating Cover Units	
Form	hexagonal disc with starformed ribs on both sides
Material	recycled plastic, 100 % polypropylene
Dimensions	diameter: 228 mm, heigth: 80 mm
Coverage	~ 30 pieces/m²
Weight	280 g

II. Reduction of emission – Odour

The odour substance concentrations generated by the uncovered liquid manure ranged from 372 to 10.378 GE/m³ depending on temperature and ventilation. With the Hexa-Cover system the measured concentrations ranged from 70 to 803 GE/m³.

From this the efficiency shown in the tests was between 81 % and 96 % (see table 2).

The efficiency increases at higher odour substance concentrations (diagram 1).

This effect determined by the output concentration, has been simulated by higher temperature and less ventilation and is equivalent to the increased odour emission from liquid manure surfaces by calm weather during summertime.

Table 1: Test conditions

	MEASURING	
Experimental conditions	**Odour [1,3]**	**Ammonia [2,3]**
Storage tank		
– Number	2 units	
– Diameter/height	1,45 m/ 1,0 m	
– Height of filling	0,6 m	
Liquid manure test temperature		
	12, 14 and 18 °C	10 ± 3 °C
Ventilation		
	0, 120 and 240 m³/h	50 to 75 m³/h
Hexa-Cover covering system		
– number of floating cover units	46,5	48
– mechanical covering degree[4]	95%	98%
Liquid manure		
	pig manure	pig manure I (from piglets, value adjusted)
		pig manure II (degassed from biogas plant)

1 Test method: Measuring of smelling substance concentration according to DIN EN 13725

2 Test method: Bottle washing method for determination of ammonia contents

3 Achievement of results through comparison between containers covered by the Hexa-Cover system and uncovered containers.

4 Divided floating cover units were used in the marginal zone of the container.

Concerning the practical use of the Hexa-Cover cover system, the following can be concluded to determine the emission flow value:

Assumption:
– Flow value = 10 m^3/m^2h;
– container diameter = 15 m;

Example 1:
Summer 18°C

By a reduction of the odour concentration from 10.000 GE/m^3 to 700 GE/m^3 under the above assumptions a volume flow value of 1,2 MGE/h will be evident.

Example 2:
average annual temperature 12°C

By a reduction of the odour concentration from 2.000 GE/m^3 to 200 GE/m^3 under the above assumptions a volume flow value of 0,35 MGE/h will be evident.

III. Emission reduction – Ammonia

Measuring of the ammonia emission showed an emission reduction ranging from 96 to 99 % on liquid pig manure I and II by a covering of 98 % of the surface.

The obtainable degree of covering with the Hexa-Cover cover system is depending on the diameter of the manure container. Taking the results from diagram 2 into consideration, the following ammonia emission reduction values may be expected depending on the container diameter (see table 3).

Note:

To illustrate the connection between ammonia emission and the degree of covering, lower degrees of covering have been used in the laboratory test than what is normally to be achieved by the cover system.

By means of the hereby resulting mathematical combination (see diagram 2), the following figures can be established.

Table 2: Measuring results of the odour concentration

	Odour concentration (GE/m^3)			
	Ventilation (m^3/h)	uncovered	Hexa-Cover	Efficiency (%)
Temperature (12°C)				
	0	2203	285	87
	120	2062	317	85
	240	865	94	89
Temperature (14°C)				
	0	8520	803	91
	120	491	83	83
	240	372	70	81
Temperature (18°C)				
	0	10368	645	94
	120	5550	513	91
	240	5033	187	96

Table 3: Expected ammonia emission reduction values depending on container diameter

Container diameter (m)	Covering degree (%)	Ammonia reduction (%)
10	93	90
15	95	94
20	96	96
25	97	97
30	98	98

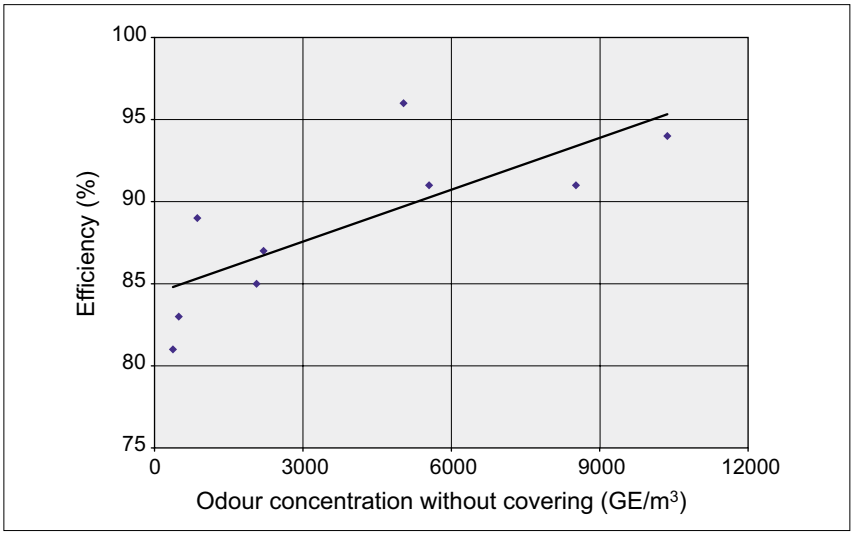

Diagram 1: Efficiency of the Hexa-Cover system on liquid pig manure

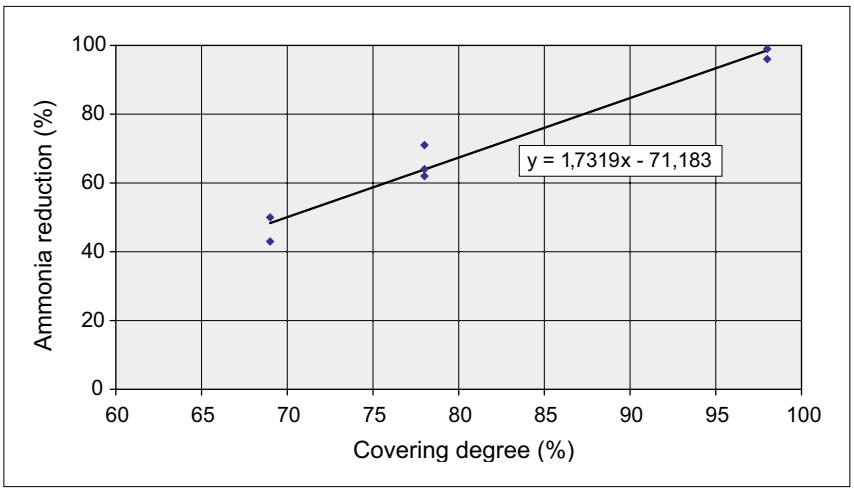

Diagram 2: Ammonia emission reduction

Test

The FokusTest consisted of technical measurings of odour and ammonia emission reductions from liquid pig manure under laboratory conditions. The cover system was not tested in practice.

On basis of the available results the Hexa-Cover cover system, in reference to the test criteria „Odour and ammonia emission reduction“, fulfils the demands (evaluation (○) or better) in order to achieve the DLG FokusTest label.

Other criteria have not been tested.

Testing

German Agricultural Society
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Special tests

– Odour emission reduction:
ECOMA GmbH,
D-24211 Honigsee

– Ammonia emission reduction:
LugtTek A/S,
DK-8830 Tjele,
Denmark

Reporter

Dipl.-Ing. W. Huschke,
Groß-Umstadt

Head of Animal Production

Dr. H.-J. Herrmann

Special tests

– Odour emission reduction:
Dipl.-Ing. D. Mannebeck

– Ammonia emisson reduction:
M. Sc. A. P. Adamsen

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