



WEST VIRGINIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF AIR QUALITY
601 57th Street, SE
Charleston, WV 25304
Phone: (304) 926-0475
www.dep.wv.gov/daq

**PERMIT DETERMINATION FORM
(PDF)**

FOR AGENCY USE ONLY: PLANT I.D. # _____
PDF # _____ PERMIT WRITER: _____

1. NAME OF APPLICANT (AS REGISTERED WITH THE WV SECRETARY OF STATE'S OFFICE):
Noble Energy, Inc.

2. NAME OF FACILITY (IF DIFFERENT FROM ABOVE):
Sand Hill 4 (SHL 4) Tank Pad

3. NORTH AMERICAN INDUSTRY CLASSIFICATION SYSTEM (NAICS) CODE:
2 1 1 1 1 1

4A. MAILING ADDRESS:
1000 Noble Energy Drive
Canonsburg, PA 15317

4B. PHYSICAL ADDRESS:
1587 Golden Ridge Road
Dallas, WV

5A. DIRECTIONS TO FACILITY (PLEASE PROVIDE MAP AS ATTACHMENT A):
From Interstate 70, take Dallas Pike Road Exit (Exit 11), at bottom of ramp, make a right if traveling east or left if traveling west onto CR 41 (Dallas Pike Road), and travel Dallas Pike Road approximately 5.2 miles to the town of Dallas, make a right onto CR 28 (Number Two Ridge Road), travel Number Two Ridge Road approximately 2.7 miles to CR 26/2 (Golden Ridge Lane), make a right onto Golden Ridge Lane and travel approximately 0.7 miles CR 32 (Golden Ridge Lane), make a left onto Golden Ridge Lane and travel approximately 0.7 miles to lease road straight ahead.

5B. NEAREST ROAD:
Golden Ridge Road

5C. NEAREST CITY OR TOWN:
Dallas, WV

5D. COUNTY:
Marshall

5E. UTM NORTHING (KM):
538300.1311

5F. UTM EASTING (KM):
4424064.8771

5G. UTM ZONE:
17N

6A. INDIVIDUAL TO CONTACT IF MORE INFORMATION IS REQUIRED:
Clayton Murrall

6B. TITLE:
Sr. Environmental Specialist

6C. TELEPHONE:
724-820-3077

6D. FAX:

6E. E-MAIL:
clayton.murrall@nblenergy.com

7A. DAQ PLANT I.D. NO. (FOR AN EXISTING FACILITY ONLY):

7B. PLEASE LIST ALL CURRENT 45CSR13, 45CSR14, 45CSR19 AND/OR TITLE V (45CSR30) PERMIT NUMBERS ASSOCIATED WITH THIS PROCESS (FOR AN EXISTING FACILITY ONLY):

7C. IS THIS PDF BEING SUBMITTED AS THE RESULT OF AN ENFORCEMENT ACTION? IF YES, PLEASE LIST:

8A. TYPE OF EMISSION SOURCE (CHECK ONE):
 NEW SOURCE ADMINISTRATIVE UPDATE
 MODIFICATION OTHER (PLEASE EXPLAIN IN 11B)

8B. IF ADMINISTRATIVE UPDATE, DOES DAQ HAVE THE APPLICANT'S CONSENT TO UPDATE THE EXISTING PERMIT WITH THE INFORMATION CONTAINED HEREIN?
 YES NO

9. IS DEMOLITION OR PHYSICAL RENOVATION AT AN EXISTING FACILITY INVOLVED? YES NO

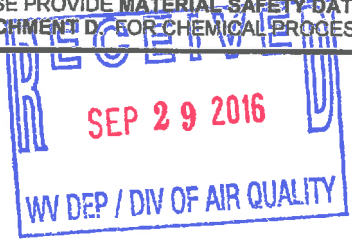
10A. DATE OF ANTICIPATED INSTALLATION OR CHANGE: _____/_____/20____.

10B. DATE OF ANTICIPATED START-UP: _____/_____/20____.

11A. PLEASE PROVIDE A DETAILED PROCESS FLOW DIAGRAM SHOWING EACH PROPOSED OR MODIFIED PROCESS EMISSION POINT AS ATTACHMENT B.

11B. PLEASE PROVIDE A DETAILED PROCESS DESCRIPTION AS ATTACHMENT C.

12. PLEASE PROVIDE MATERIAL SAFETY DATA SHEETS (MSDS) FOR ALL MATERIALS PROCESSED, USED OR PRODUCED AS ATTACHMENT D. FOR CHEMICAL PROCESSES, PLEASE PROVIDE A MSDS FOR EACH COMPOUND EMITTED TO AIR.



13A. REGULATED AIR POLLUTANT EMISSIONS:

⇒ FOR A NEW FACILITY, PLEASE PROVIDE PLANT WIDE EMISSIONS BASED ON THE POTENTIAL TO EMIT (PTE) FOR THE FOLLOWING AIR POLLUTANTS INCLUDING ALL PROCESSES.

⇒ FOR AN EXISTING FACILITY, PLEASE PROVIDE THE PROPOSED CHANGE IN EMISSIONS BASED ON THE PTE OF ALL PROCESS CHANGES FOR THE FOLLOWING AIR POLLUTANTS

PTE FOR A GIVEN POLLUTANT IS TYPICALLY BEFORE AIR POLLUTION CONTROL DEVICES AND IS COLLECTED BASED ON THE MAXIMUM DESIGN CAPACITY OF PROCESS EQUIPMENT.

POLLUTANT	HOURLY PTE (LB/HR)	YEARLY PTE (TON/YR) (HOURLY PTE MULTIPLIED BY 8760 HR/YR) DIVIDED BY 2000 LB/TON
PM		
PM ₁₀		
VOCs	1.22	5.36
CO		
NO _x		
SO ₂		
Pb		
HAPs (AGGREGATE AMOUNT)	0.00	0.01
TAPs (INDIVIDUALLY)*	0.00	0.01
OTHER (INDIVIDUALLY)*		

* ATTACH ADDITIONAL PAGES AS NEEDED

13B. PLEASE PROVIDE ALL SUPPORTING CALCULATIONS AS ATTACHMENT E.

CALCULATE AN HOURLY AND YEARLY PTE OF EACH PROCESS EMISSION POINT (SHOWN IN YOUR DETAILED PROCESS FLOW DIAGRAM) FOR ALL AIR POLLUTANTS LISTED ABOVE INCLUDING INDIVIDUAL HAP'S (LISTED IN SECTION 112[b] OF THE 1990 CAAA), TAP'S (LISTED IN 45CSR27), AND OTHER AIR POLLUTANTS (E.G. POLLUTANTS LISTED IN TABLE 45-13A OF 45CSR13, MINERAL ACIDS PER 45CSR7, ETC.).

14. CERTIFICATION OF DATA

I, RJ Moses (TYPE NAME) ATTEST THAT ALL THE REPRESENTATIONS CONTAINED IN THIS APPLICATION, OR APPENDED HERETO, ARE TRUE, ACCURATE, AND COMPLETE TO THE BEST OF MY KNOWLEDGE BASED ON INFORMATION AND BELIEF AFTER REASONABLE INQUIRY, AND THAT I AM A RESPONSIBLE OFFICIAL** (PRESIDENT, VICE PRESIDENT, SECRETARY OR TREASURER, GENERAL PARTNER OR SOLE PROPRIETOR) OF THE APPLICANT

SIGNATURE OF RESPONSIBLE OFFICIAL: _____

TITLE: Operations Manager

DATE: 9 / 23 / 16

** THE DEFINITION OF THE PHRASE 'RESPONSIBLE OFFICIAL' CAN BE FOUND AT 45CSR13, SECTION 2.23.

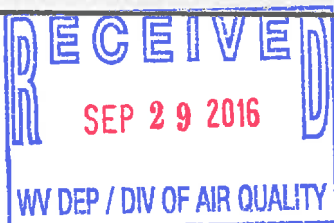
NOTE: PLEASE CHECK ENCLOSED ATTACHMENTS:

ATTACHMENT A ATTACHMENT B ATTACHMENT C ATTACHMENT D ATTACHMENT E

RECORDS ON ALL CHANGES ARE REQUIRED TO BE KEPT AND MAINTAINED ON-SITE FOR TWO (2) YEARS.

THE PERMIT DETERMINATION FORM WITH THE INSTRUCTIONS CAN BE FOUND ON DAQ'S PERMITTING SECTION WEB SITE:

www.dep.wv.gov/daq



Noble Energy, Inc.
SHL 4 Water Storage Facility
Permit Determination

INTRODUCTION NARRATIVE

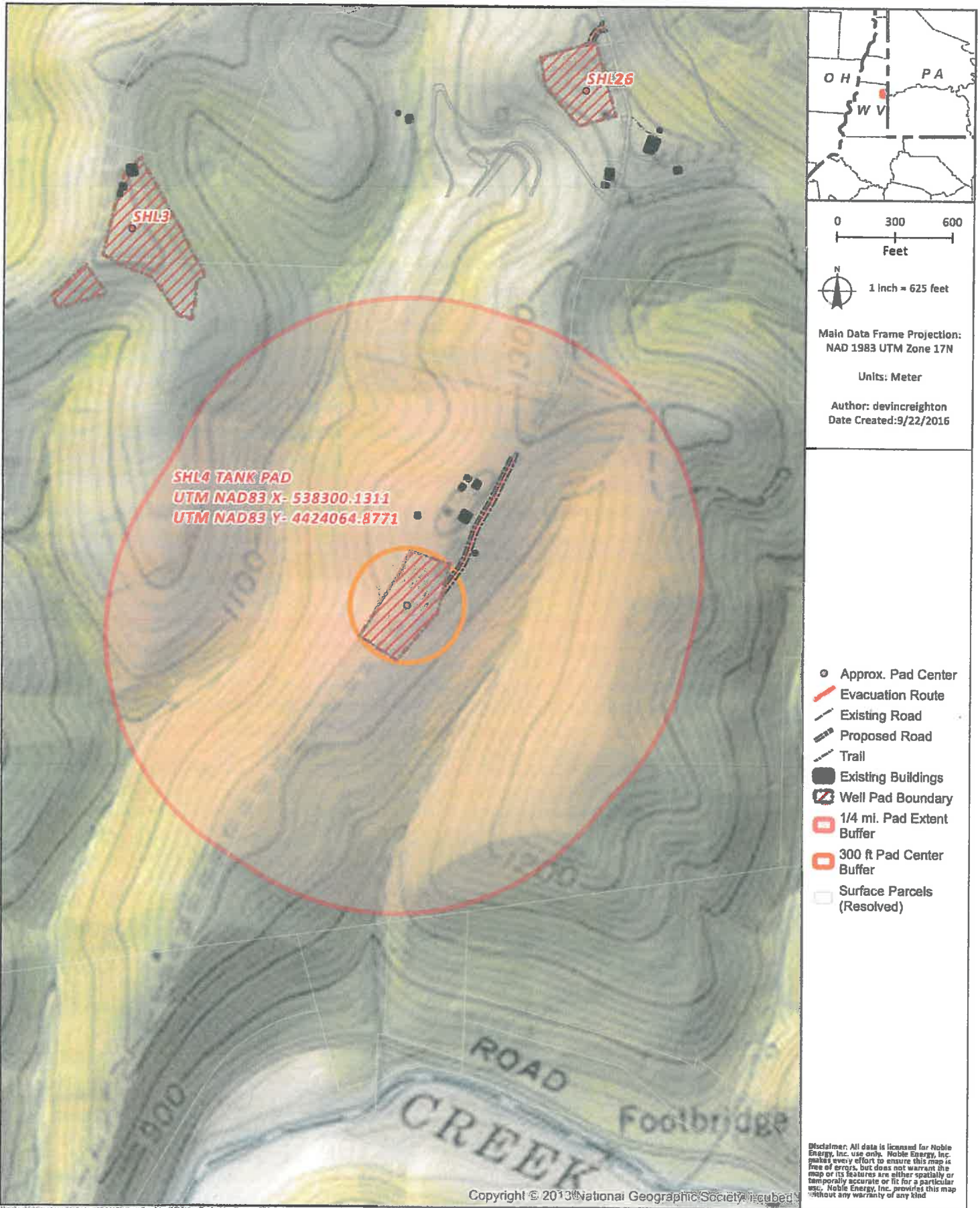
The SHL 4 Tank Pad is a water storage facility. Water is pumped from freshwater sources and wellsite storage tanks to the tank pad for storage until needed for the development of future wells. Any flash emissions from separators to tanks are accounted for at the wellpad(s) and therefore not attributed to this facility.

The methodology used to calculate emissions utilizes ProMax modelling of VOC constituents liberated at a temperature increase from 70°F to 90°F based on maximum potential annual water throughput.

**SHL 4
Permit Determination**

ATTACHMENT A

MAP OF SHL 4 WATER STORAGE FACILITY



**SHL 4
Permit Determination**

ATTACHMENT C

SHL 4 PROCESS DESCRIPTION

The SHL 4 Tank Pad is a water storage facility. Water is pumped from freshwater sources and wellsite storage tanks to the tank pad for storage until needed for the development of future wells. Any flash emissions from separators to tanks are accounted for at the wellpad(s) and therefore not attributed to this facility.

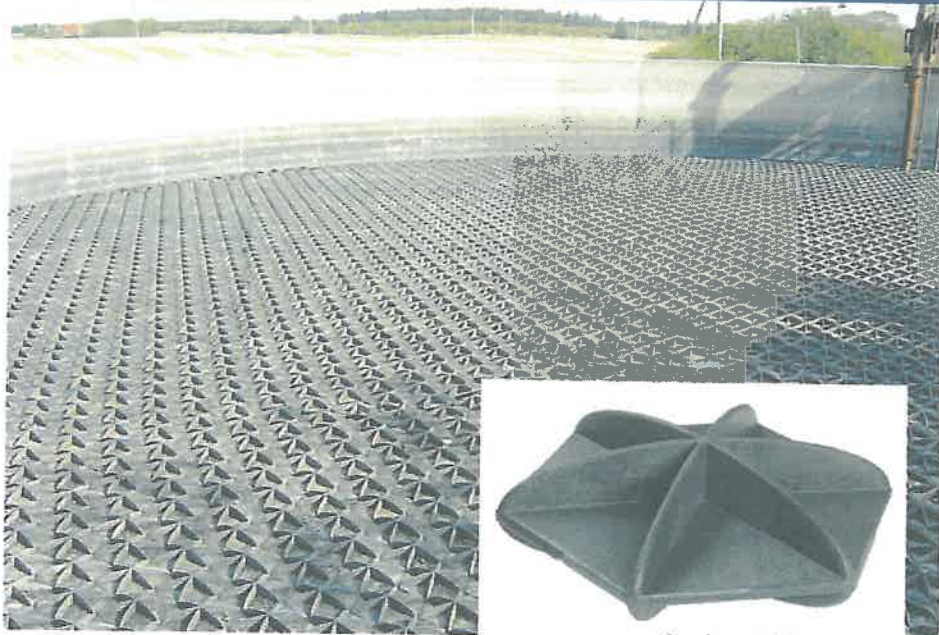
Water is transferred on an as-needed basis in support of well development.

All eight tanks are outfitted with HexaCover floating tiles, reducing surface area exposure.

Hexa-Cover ApS Emission Reduction of Odour and Ammonia

Cover System For Liquid Manure/Slurry Tanks

DLG Test Report 5451 F



Single unit/tile



Producer and applicant
Hexa-Cover ApS
Vilhelmsborgvej 5
DK -7700 Thisted
Telefon: + 45 96 177800
Telefax: + 45 96 177800
E-Mail: info@hexa-cover.dk
Internet: www.hexa-cover.dk

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
Test Center
Technology & Farm Inputs

(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, height: 80 mm
Coverage	~ 30 pieces/m ²
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

Experimental conditions	MEASURING	
	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 m ³ /h	50 to 75 m ³ /h
Hexa-Cover covering system		
- number of floating cover units	48,5	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 = $10 \text{ m}^3/\text{m}^2\text{h}$;
- container diameter = 15 m ;

**Example 1:
Summer 18°C**

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

**Example 2:
average annual temperature 12°C**

By a reduction of the odour concentration from $2.000 \text{ GE}/\text{m}^3$ to $200 \text{ GE}/\text{m}^3$ under the above assumptions a volume flow value of $0,35 \text{ MGE}/\text{h}$ 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

Temperature (12°C)	Odour concentration (GE/m ³)			
	Ventilation (m ³ /h)	uncovered	Hexa-Cover	Efficiency (%)
0	2203	285	87	
120	2102	315	85	
240	665	94	89	
Temperature (17°C)	0	8520	803	91
120	491	88	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

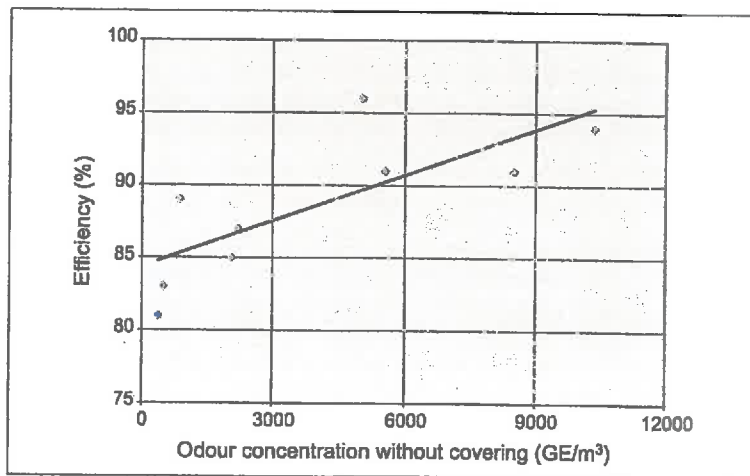


Diagram 1: Efficiency of the Hexa-Cover system on liquid pig manure

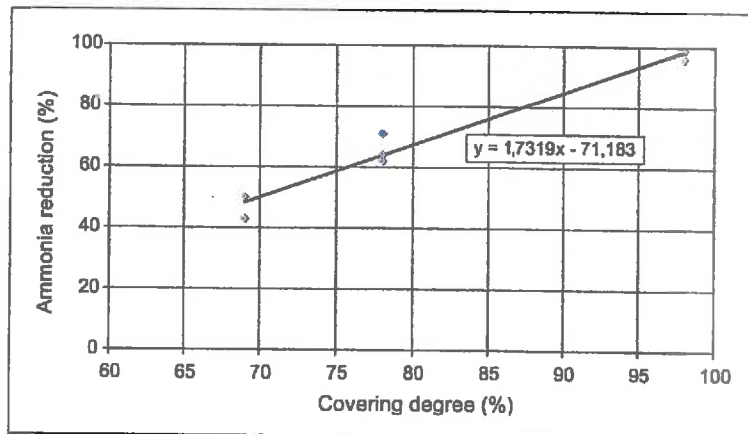


Diagram 2: Ammonia emission reduction

Test

The FokusTest consisted of technical measurements 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 (o) or better) in order to achieve the DLG FokusTest label.

Other criteria have not been tested.

Testing

German Agricultural Society
Test Center
Technology & Farm Inputs
Max-Eyth-Weg 1
D-64823 Groß-Umstadt

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 emission reduction:
M. Sc. A. P. Adamsen



ENTAM – The European Network for the Testing of Agricultural Machines, is the organization of European test centres. The aim of ENTAM is to communicate test results to European farmers and agricultural machinery dealers and manufacturers.

Further information about the Network is available from: www.entam.com or from the e-mail address: info@entam.com

6/2005
© DLG



German Agricultural Society
Test Centre Technology & Farm Inputs

Max-Eyth-Weg 1, D-64823 Groß-Umstadt, Telefon: 06078 9635-0, Fax: 06078 9635-90
E-Mail: Tech@DLG-Frankfurt.de, Internet: www.dlg-test.de

Downloading of all DLG-test reports from: www.dlg-test.com!

SHL 4
Permit Determination

ATTACHMENT E

SUPPORTING CALCULATIONS

**SHL 4 Tank Pad
Tank Detail Sheet**

Source ID Number	TANKS 1 - 8
Equipment ID	
Tank Description	8 - Prod Water Storage Tanks
Tank Usage	Produced Water Storage
Tank Capacity	37,763 bbl
Tank Contents	Produced Water
Emission Controls	None
Potential operation	8760 hr/yr
Maximum potential throughput	6,000,000 bbl/yr
Emission Factor	0.0018 lb/bbl VOC emissions *
VOC Control Efficiency	0 %

Potential Emissions

Pollutant	Weight % of VOC	Estimated Uncontrolled Emissions ¹		Source of Emission Factor
		(lb/hr)	(tpy)	
VOC		1.22	5.36	ProMax Model
Benzene	0.0829	0.001	0.0044	ProMax Model
Ethylbenzene	0.0051	0.000	0.0003	ProMax Model
Toluene	0.1248	0.002	0.0067	ProMax Model
Xylenes	0.0411	0.001	0.0022	ProMax Model
N-Hexane	0.0230	0.000	0.0012	ProMax Model
Total HAPS	0.28	0.00	0.01	

*Emission factor from ProMax saturation model - mass balance liberation @ 90° F

NO.	DESCRIPTION	UNIT	QTY	PRICE	TOTAL
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100

Item No.	Description	Quantity	Unit	Price	Total
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100