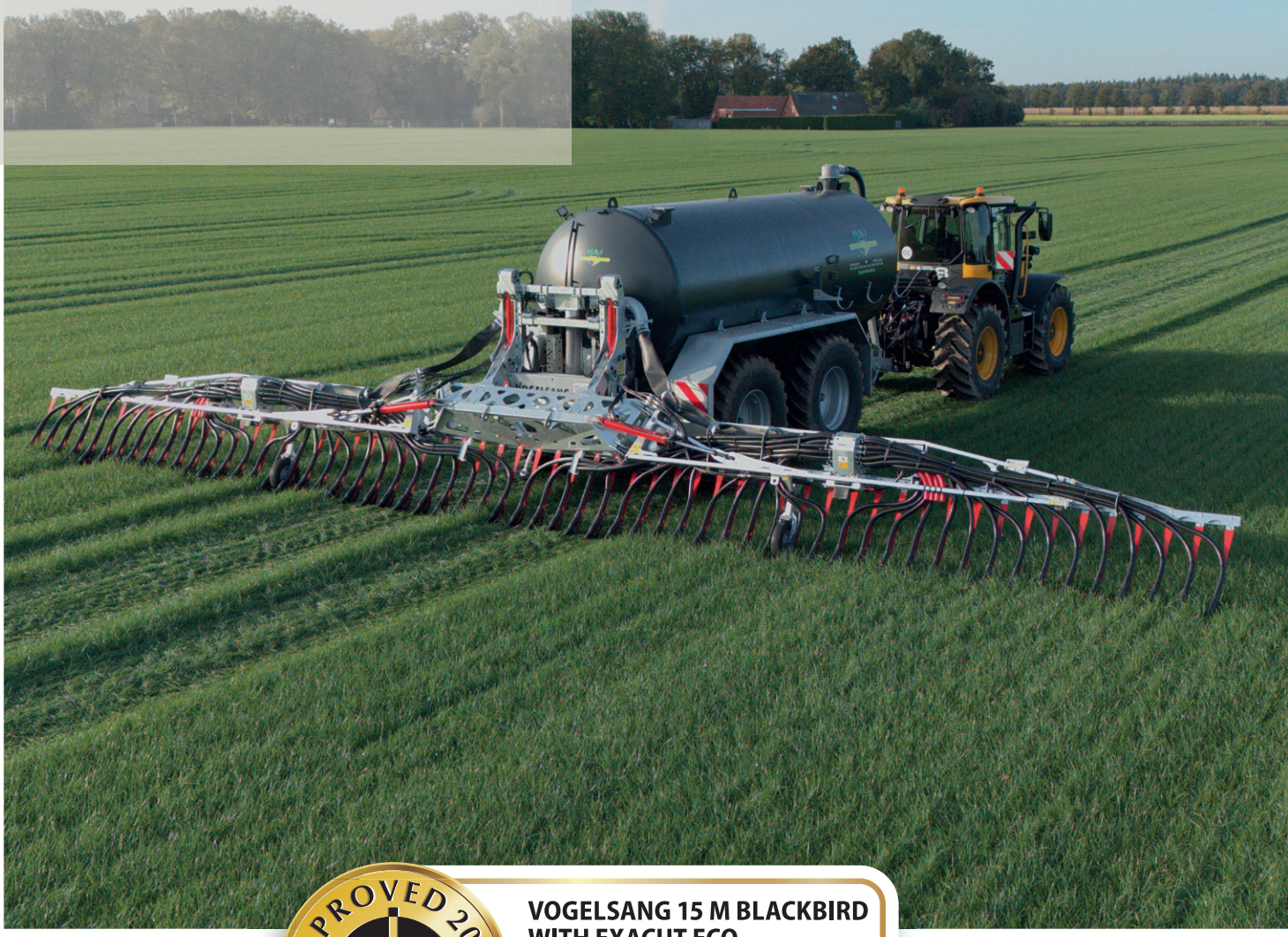
Vogelsang GmbH & Co. KG

15 m BlackBird trailing shoe applicator with ExaCut ECQ exact distributors

Functionality and quality of work
Handling, ease of operation, service and maintenance



VOGELSANG 15 M BLACKBIRD WITH EXACUT ECQ

- ✓ **functionality and quality of work**
- ✓ **handling, operation and maintenance**

DLG Test Report 7540

Overview

A test mark „DLG-APPROVED for individual criteria“ is awarded for agricultural products which have successfully fulfilled a scope-reduced usability testing conducted by DLG according to independent and recognised evaluation criteria. The test is intended to highlight particular innovations and key criteria of the test object. The test may contain criteria from the DLG test scope for overall tests, or focus on other value-determining characteristics and properties of the test subject. The minimum requirements, test conditions and procedures as well as the evaluation bases of the test results will be specified in consultation with an expert group of DLG. They correspond to the recognised rules of technology, as well as scientific and agricultural knowledge and requirements. The successful testing is concluded with the publication of a test report, as well as the awarding of the test mark which is valid for five years from the date of awarding.

The test carried out on a 15 m VOGELSANG BlackBird trailing shoe applicator with two VOGELSANG ExaCut exact distributors consisted of the following two modules from the DLG test framework on slurry application: “Functionality and quality of work” and “Handling, ease of operation, service and maintenance”.

The DLG test module “Functionality and quality of work” measures the quality of distribution across rows on level ground and the spreading performance at application start (V pattern). This test module is carried out on the test stand and simulates the application of two types of slurry at two different rates. In the second test module “Handling, ease of operation, service and maintenance”, the test persons execute typical machine functions and frequent service and maintenance jobs. These operations are timed and described in terms of ease and tools required.

Other criteria were not tested.

Assessment in brief

In both test modules, the 15 m VOGELSANG BlackBird trailing shoe applicator with two VOGELSANG ExaCut exact distributors met all the criteria stipulated by the DLG test framework.

DLG test module
“Functionality and quality of work”

In all cross distribution tests, the machine achieved the best DLG score (++) *. At application start, it never took longer than 2 seconds until all outlets were spreading slurry. This prompt delivery suggests that the full spading width is achieved very quickly.

DLG test module
“Handling, ease of operation, service and maintenance”

In this DLG test, four experienced operators carried out typical functions and repetitive maintenance jobs while the test engineers timed these operations and described the ease at which these were carried out. The system can be classified as very user-friendly. Stand-out details are the excellent accessibility to all grease points and both distributors as well as the simplified and fast exchange of the macerator blades inside the distributor.

Overview of results

DLG QUALITY PROFILE	Evaluation*
Functionality and quality of work	✓
Handling, operation and maintenance	✓

* Evaluation range:
Requirements fulfilled (✓) / Requirements not fulfilled (✗)

The product

Manufacturer and applicant

Vogelsang GmbH & Co. KG
Holthöge 10-14
49632 Essen (Oldenburg), Germany

Product:
VOGELSANG BlackBird trailing shoe applicator (15 m) with two VOGELSANG ExaCut ECQ exact distributors

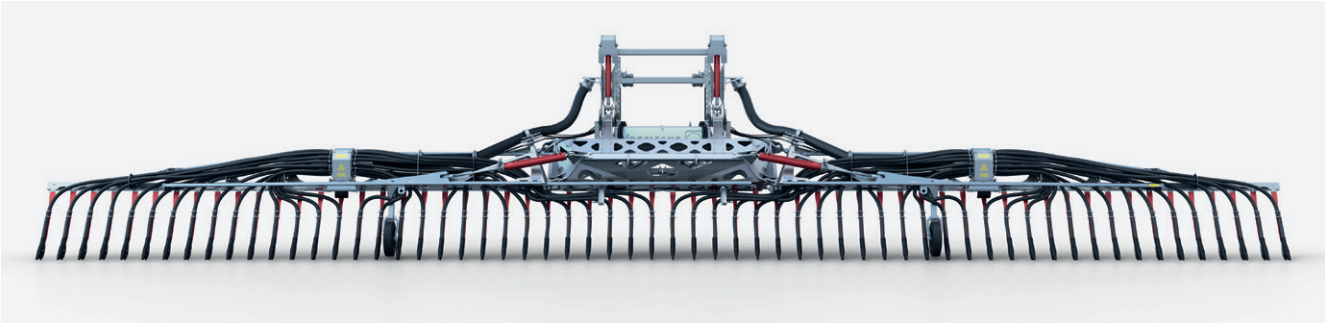


Fig. 2:
VOGELSANG BlackBird trailing shoe applicator

Description and technical data

Trailing shoe applicator

The VOGELSANG BlackBird trailing shoe applicator is marketed in 12 m and 15 m work widths. The hoses on both versions are spaced at 25 cm intervals. The DLG test was carried out using the 15 m linkage. The linkage is attached either directly to the slurry tank or to a 4-point linkage. Folded into transport position, it measures 2.95 m.

It has an integral holding and security device and there is a passive levelling system in the central frame.

The shoes are formed to long spouts that have a pointed wear strip for effective soil penetration.

Section control is either mechanical or hydraulic. In transport position, the linkage is folded up which prevents slurry leaking through the shoes.

The distributor

The VOGELSANG ExaCut ECQ exact distributor is available with 24, 30, 36, 42 and 48 outlets. The hose diameter is DN 40. The DLG test was carried out using the 15 m linkage with 30 outlets.

The machine is designed for simplified routine maintenance. This QuickService principle provides for a large ExaCut ECQ service port that gives convenient access to all elements inside the distributor that may need servicing and frees operators from removing neither the distributor nor its cover. This way, routine maintenance is carried out very quickly.

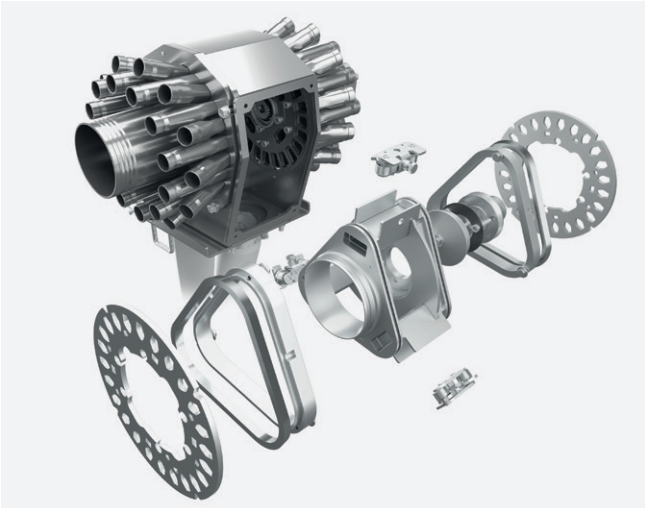


Fig. 3:
VOGELSANG ExaCut ECQ exact distributor

The method

DLG test module
"Functionality and quality of work"

Accuracy of cattle and
pig slurry distribution across rows

The accuracy of cattle and pig slurry application across rows at two different rates on level ground is measured on the test stand to DIN EN 13740-2 standards. In this test, slurry is applied during a specified period of time and collected into trays that are placed under each outlet and then weighed. These weighing results are used to determine the mean deviation (MD) and the coefficient of variation (CoV). The smaller these two parameters, the more accurate is the distribution across rows.

$$MA = 100 \cdot \frac{1}{n \cdot \overline{X}} \cdot \sum_{i=1}^{n} \left| X_i - \overline{X} \right|$$

The mean deviation is assessed by applying the following DLG assessment scheme.

Table 1:
Assessment of distribution across rows

Mean deviation	DLG evaluation
≤ 5 %	++
≤ 10 %	+
≤ 15 %	o

Determining V patterns
at application start

In this test, the testers time the seconds the applicator takes until slurry is flowing through all outlets. The shorter this delay, the quicker the applicator achieves full-width spreading.

Fig. 4:
The DLG test stand for measuring the distribution across rows (picture of the DLG test in 2019)

Slurry types applied in the test

The types of slurry that were used to carry out the test are characterised by dry matter content, ability to flow and density.

The dry matter content is determined gravimetrically in a lab. This is done by sampling the slurry as it is being applied in the test.

Its ability to flow is measured by means of a fluid meter. This is filled with slurry to a standardised volume. Then the fluid meter is emptied and the time this takes is measured. This parameter is used for computing the ability to flow of the liquid.

The density is determined by taking multiple samples and filling these into a measuring cup. Then the density of each individual sample is determined by using the volume filled into the cup and the weight of this particular sample. These two parameters are used to compute the average density of the slurry.

Fig. 5:
The fluid meter for determining the ability to flow of the slurry

DLG test module
"Handling, ease of operation, service and maintenance"

In this test module, the following typical machine functions and repetitive service jobs are carried out by experienced operators. Each operation is timed with a stopwatch:

- Changing from transport into work position
- Changing from work into transport position
- Lubricating all grease points:
  The number and accessibility of grease points is noted down and the time required for servicing these is measured. The operator uses a grease gun that is stored on a table next to the machine. Each grease point receives two shots of grease. After all nipples are serviced, the grease gun is placed back on the table trolley next to the machine.
- Inspecting the distributors for solid matter:
  The tools for maintaining the distributor are provided on a table next to the machine. The test persons open the service unit and inspect the distributor for fibrous or solid matter. Then they close the unit again as required.
- Replacing the macerator blades inside the distributor:
  The tools that would be required for maintaining the distributor are provided on a table next to the machine. At the beginning, the test persons are given a brief instruction. Timing starts the moment the test person takes the tool and stop as the person places the tool back on the table.

Each maintenance job is carried out by several test persons while a DLG engineer takes the timing. At the end, all timings are averaged. Each step and each maintenance job are described in terms of accessibility, ease of operation and tools required.

Detailed account of the test results

The test was carried out with a 15 m VOGELSANG BlackBird trailing shoe applicator with two VOGELSANG ExaCut ECQ exact distributors.

The applicator has 60 outlet spouts that are spaced at 25 cm intervals. Each of the two distributors has 30 outlets with 40 mm ID hoses. The linkage was mounted by a 4-point linkage directly to the tank. The required oil flow was about 35 l/min. The tanker was a 22 m³ trial tanker of VOGELSANG. This had a VOGELSANG VX186-368Q lobe pump. The pump is powered by the tractor's pto. The application rate was controlled by the pto speed. The test tractor was a FENDT 828 Vario.

Distribution across rows applying cattle and pig slurry

The distribution across rows was measured on the test stand on level ground. Table 2 shows the results for both types of slurry and various application rates.

The testers found that the deviations were very small ranging between 1.1 % and 2.2 %. All results

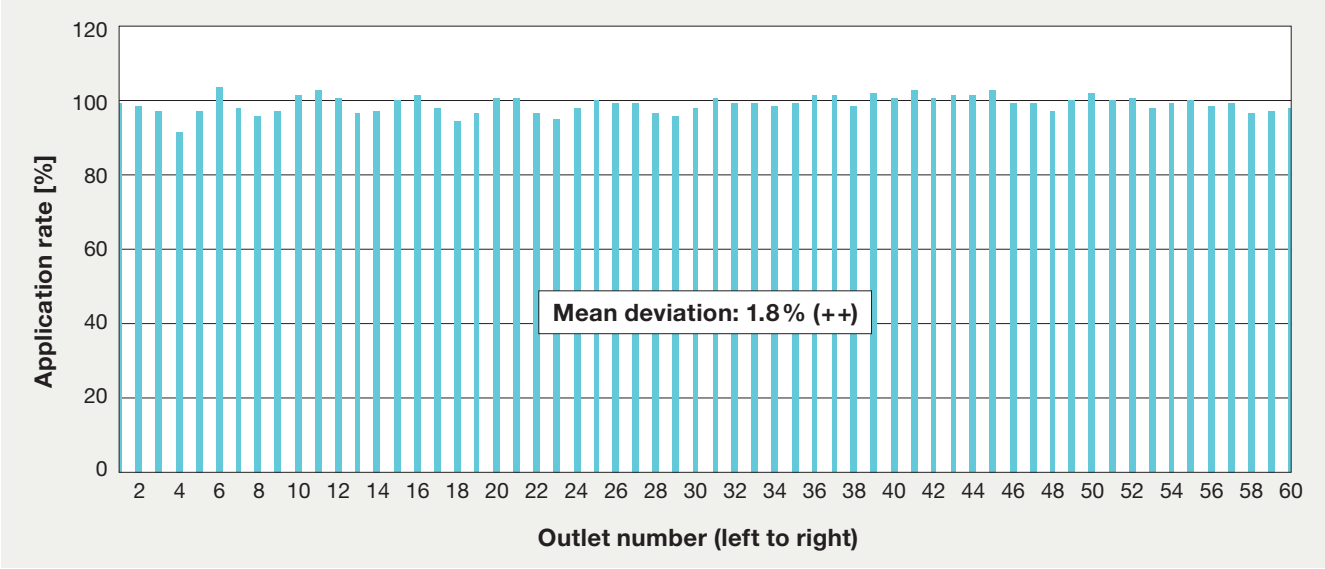


Fig. 6:
Cross distribution of cattle slurry on level ground at a 7,300 l/min flow rate (equates an application rate of 36.5 m³/ha at 8 km/h ground speed)

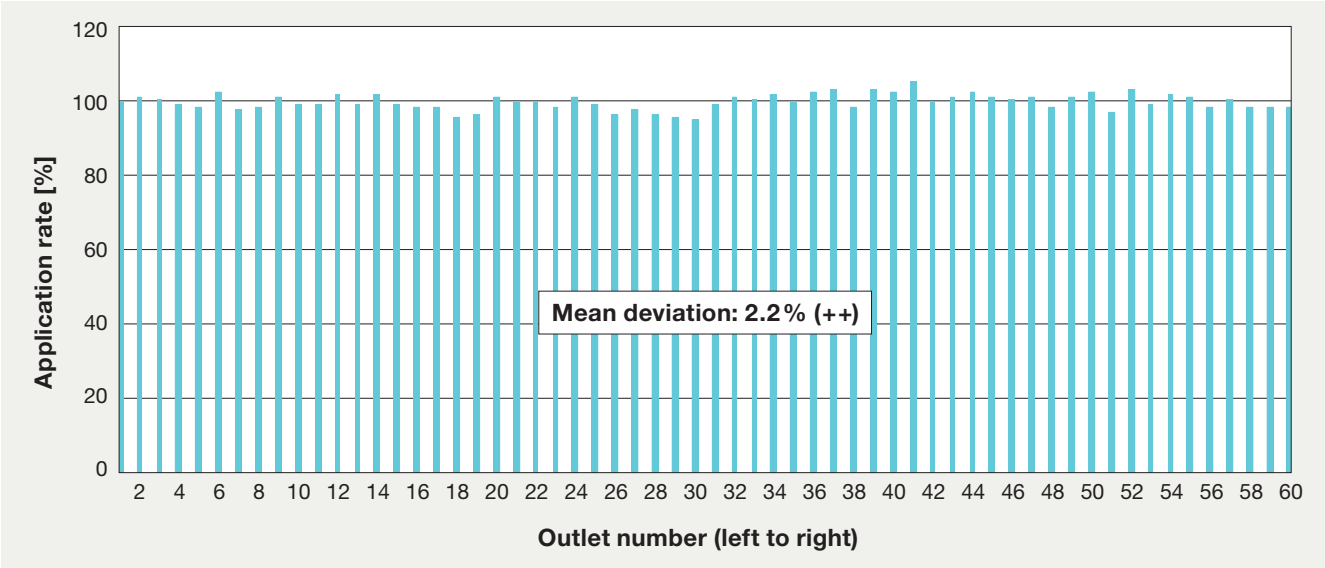


Fig. 7:
Cross distribution of cattle slurry on level ground at a 3,900 l/min flow rate (equates an application rate of 20 m³/ha at 8 km/h ground speed)

reflect a “very good” (++) score according to the DLG assessment scheme. The figures 6 to 9 show the results in cattle slurry and pig slurry and both application rates.

Table 2:
Results on level ground – distribution of cattle and pig slurry across rows

Type of slurry	Pto speed [rpm]	Flow rate [l/min]	Application rate at 8 km/h [m³/ha]	Coefficient of variation [%]	Mean deviation [%]	Evaluation*
Cattle	840	7,300	36.5	1.8	1.8	+ +
Cattle	420	3,900	20.0	2.8	2.2	+ +
Pig	840	7,300	36.5	1.4	1.1	+ +
Pig	420	3,900	20.0	2.1	1.8	+ +

* Assessment scheme for mean deviation : + + = ≤ 5%, + = ≤ 10 %, ○ = ≤ 15 %

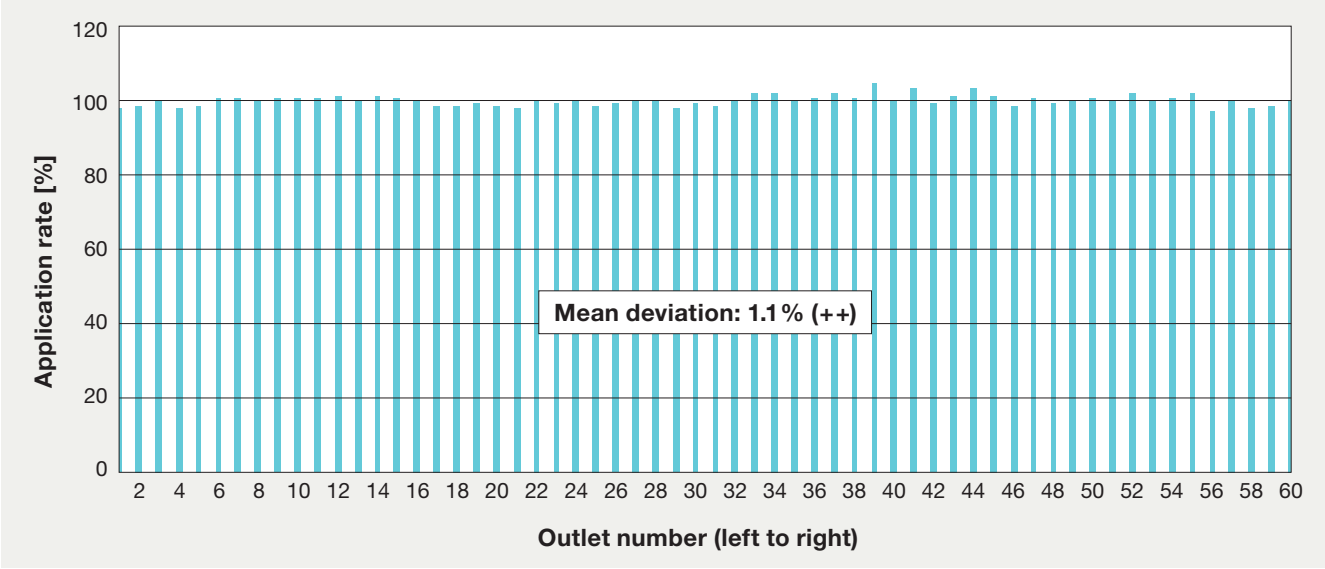


Fig. 8
Cross distribution of pig slurry on level ground at a 7,300 l/min flow rate (equates an application rate of 36.5 m³/ha at 8 km/h ground speed)

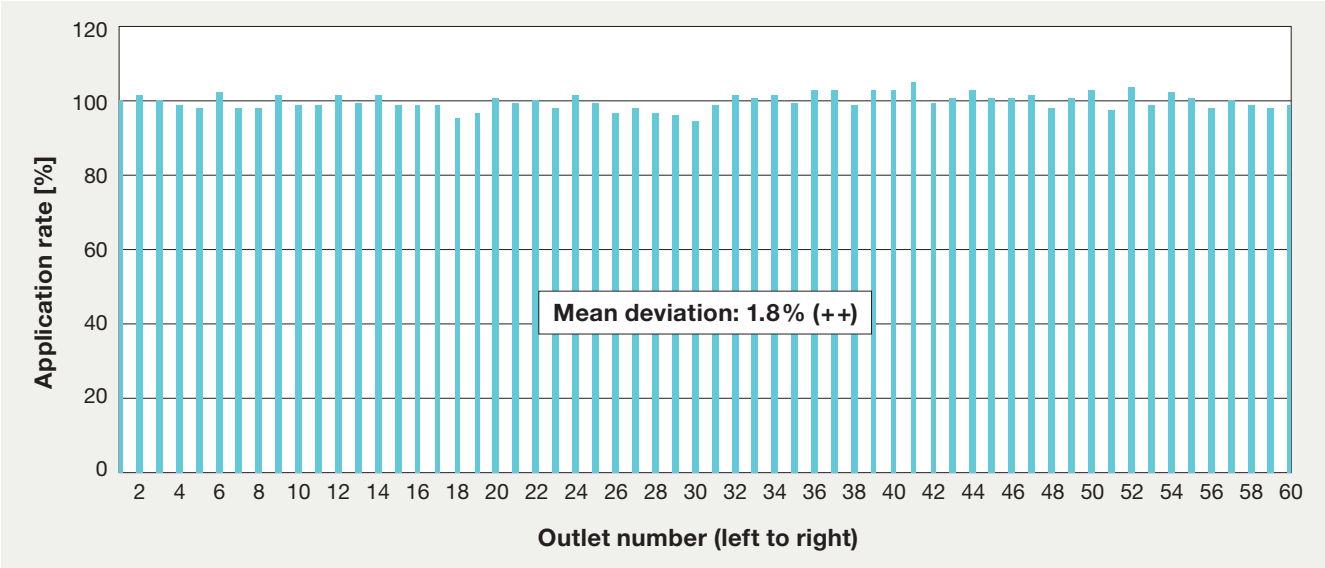


Fig. 9:
Cross distribution of pig slurry on level ground at a 3,900 l/min flow rate (equates an application rate of 20 m³/ha at 8 km/h ground speed)

Performance at application start

Table 3 lists the number of seconds that passed before all distributor outlets were supplying slurry. The higher the flow rates the sooner did the liquid arrive at the outlets. On the whole, all outlets were supplied very fast, which means the full application width was attained very quickly (short V pattern) after the application was started.

Table 3:
Time (seconds) taken until slurry flows through all distributor outlets

Test	Seconds
Cattle slurry, 7,300 l/min	0.9
Cattle slurry, 3,900 l/min	1.8
Pig slurry, 7,300 l/min	1.0
Pig slurry, 3,900 l/min	2.0

Table 4 shows details on the two types of slurry.

Table 4:
The slurry characteristics

Data	Cattle slurry	Pig slurry
DM content [%]	7.4	6.6
Ability to flow [s]	6.8	7.0
Density [kg/d]	0.9	0.9

Handling, ease of operation, service and maintenance

The following typical functions and routine maintenance jobs were carried out by four experienced operators. Table 6 summarises the results.

Changing from transport into work position

Changing from transport to work position is done from the cab-based operator terminal.

The first step is to unlock the linkage from this terminal. In a second step, the linkage is unfolded also from the terminal. This is done by the two linkages folding out before they are lowered into work position. The folding rate is restricted by safety requirements and standards.

The testers timed 38 seconds for the changeover.

Changing from work into transport position

Moving the linkage from work to transport position is also done from the cab-based operator terminal. As a first step, the linkages fold to the vertical and then fold in. Their catch hooks lock automatically into their transport positions (see fig. 10). Like the unfolding rate, the folding rate is also restricted by safety requirements and standards. The testers timed 44 seconds for the changeover.

Fig. 10:
One of the catch hooks on the VOGELSANG BlackBird trailing shoe applicator that secure the linkages in transport position.

Servicing all grease points

There are eight grease points that require regular attention on the VOGELSANG BlackBird trailing shoe applicator with two VOGELSANG ExaCut ECQ exact distributors: three nipples are on each linkage and one on each distributor. All grease points are easily accessible and serviced with the operator in a standing position and the linkages folded out yet not lowered into work. It took the testers 132 to 176 seconds to service all grease points, which involved opening and closing the caps on the nipples.

Inspecting the distributors for fibrous material

Inspecting the distributors for fibrous and solid matter can also be carried out easily and from a standing position with the linkage unfolded yet not lowered into work. The material is collected in a dip inside the distributor and drained through a hose. As a first step, the operator releases and opens

the lock, which is done without the need of tools. The material can then flow through the rubber hose (see figures 11 and 12).

Inspecting the traps for fibrous material took 20 to 29 seconds on average.

Replacing the macerator blades inside the distributor

To replace the macerator blades inside the distributor, the operator carries out the following steps:

- Remove the hose from the trap
- Remove four screws (M10) from the distributor port, then remove the port
- Fold down the O-ring on the service port (fig. 13)
- Release the eccentric adjuster (6 mm socket heads) to release the blades
- Remove the main screw (M8) from the deflector cap (fig. 14)

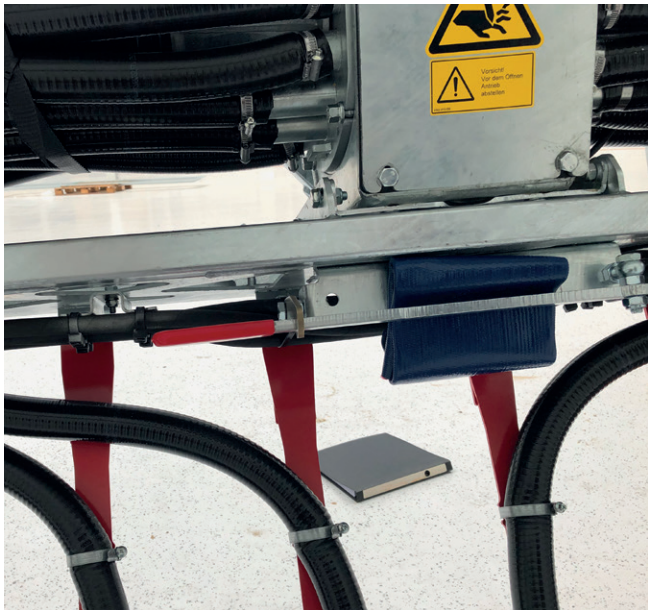


Fig. 11:
The trap is closed

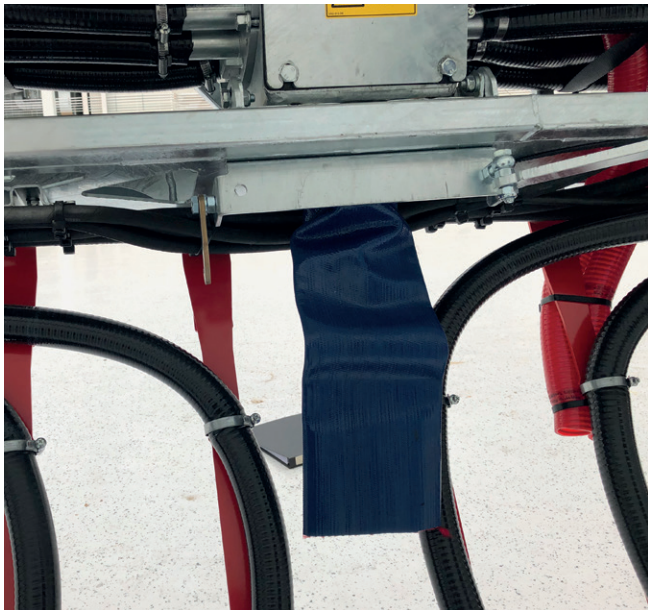


Fig. 12:
The trap is open

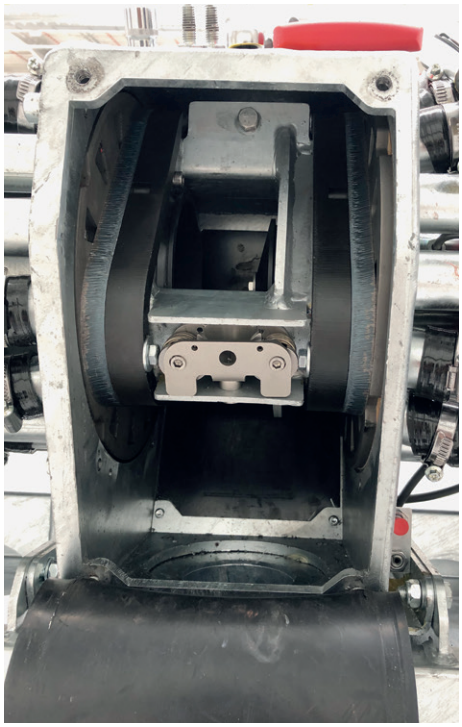


Fig. 13:
The opened distributor

Fig. 14:
Removing the screws

– Remove the deflector cap and the O-ring (fig. 15)
– Remove 3 retaining screws (8 mm socket heads) from the rotor adapter
– Remove 3 screws (6 mm socket heads) from the rotary union
– Push out the rotary union using a lever
– Remove the rotor that carries the blades (approx. 16 kg) (fig. 16)
– Lever out the left and right macerator rings and remove them (fig. 17)
– Clean the seats of the rings
– Fit two new macerator rings
– Remove the two macerator blades from the rotor (fig. 18)
– Fit new blades and grease the O-ring
– Re-install the rotor with the new blades in place
– Push in the rotary union and screw it down
– Re-install the rotor adapter and bolt it down
– Refit the O-ring and the deflector cap and screw it down
– Tighten the eccentric adjuster
– Close the service port and screw it down
– Close the hose on the trap

Fig. 15:
The deflector cap, O-ring and adapter

Fig. 16:
The rotor with the macerator blades

Fig. 17:
Removing the macerator ring

Fig. 18:
Replacing the macerator blades

None of these steps requires a special tool to be carried out. Blade replacement and all other service and maintenance jobs described above are straightforward and executed from a standing position with the linkage unfolded yet not lowered. The stand-out details here are that no hoses need removing from the distributor in order to swap the macerator blades and that all elements are removed and replaced conveniently through the service port. This advantage enabled the testers to swap the macerator blades on one distributor in less than 20 minutes.

Table 5 shows the individual results from the DLG test.

Table 5:
Operation and service times

Machine functions / servicing		Test person 1	2	3	4	Measured and averaged time
Changing from transport into work position	[s]					38*
Changing from work into transport position	[s]					44*
Servicing all 8 grease points	[s]	132	176	165	146	155**
Inspecting both distributors for fibrous material	[s]	20	28	29	26	26**
Replacing the blades in one distributor	[min:s]	19:02	16:30	17:34	21:07	18:33**

* measured value; ** averaged value

Summary

In the test applying cattle and pig slurry, the 15 m VOGELSANG BlackBird trailing shoe applicator with two VOGELSANG ExaCut exact distributors delivered indeed excellent distribution results. The averaged deviations that describe the quality of distribution were clearly less than 2 % in three out of four test runs, which means that all test results were assessed as “very good” (++). The time measurements reveal only a very short delay before slurry flows through the distributor outlets. This means that the applicator achieves its full working width very quickly after application start.

The VOGELSANG BlackBird trailing shoe applicator with VOGELSANG ExaCut ECQ also produced convincing results in the DLG test module “Handling, ease of operation, service and maintenance”. Access to all service points is excellent and most services are carried out standing. The various operations are straightforward and require no specialist tools. Swapping the macerator blades inside the distributor is relatively quickly.

Based on these test results, the VOGELSANG BlackBird trailing shoe applicator with VOGELSANG ExaCut ECQ is awarded the DLG APPROVED quality mark in the test modules “Functionality and quality of work” and “Handling, ease of operation, service and maintenance”.

Further information

Testing agency

DLG TestService GmbH,
Gross-Umstadt test site, Germany

The tests are conducted on behalf of DLG e.V.

DLG test framework

Slurry applicators (dated 05/2018)

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Photos and graphics

DLG and Vogelsang GmbH & Co. KG

DLG – the open network and professional voice

Founded in 1885 by the German engineer Max Eyth, DLG (Deutsche Landwirtschafts-Gesellschaft – German Agricultural Society) is an expert organisation in the fields of agriculture, agribusiness and the food sector. Its mission is to promote progress through the transfer of knowledge, quality standards and technology. As such, DLG is an open network and acts as the professional voice of the agricultural, agribusiness and food sectors.

As one of the leading organisations in the agricultural and food market, DLG organises international trade fairs and events in the specialist areas of crop production, animal husbandry, machinery and equipment for farming and forestry work as well as energy supply and food technology. DLG's quality tests for food, agricultural equipment and farm inputs are highly acclaimed around the world.

For more than 130 years, our mission has also been to promote dialogue between academia, farmers and the general public across disciplines and national borders. As an open and independent organisation, our network of experts collaborate with farmers, academics, consultants, policymakers and specialists in administration in the development of future-proof solutions for the challenges facing the agriculture and the food industry.

Leaders in the testing of agricultural equipment and input products

The DLG Test Center Technology and Farm Inputs and its test methods, test profiles and quality seals hold a leading position in testing and certifying equipment and inputs for the agricultural industry. Our test methods and test profiles are developed by an independent and impartial commission to simulate in-field applications of the products. All tests are carried out using state-of-the-art measuring and test methods applying also international standards.

The 15 m BlackBird trailing shoe applicator with ExaCut ECQ exact distributors has already been awarded the "DLG-approved" test mark in 2019 in the individual criteria "Functionality and quality of work" and "Handling, operation and maintenance". The results presented in this report are based on the DLG test report 7030. According to the manufacturer and following a review by a DLG test engineer, the product is manufactured with minor technical adjustments that have no effect on the DLG test results from 2019.

Internal test code DLG: 2502-0043

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