DLG Test Report 7256

Ludwig Bergmann GmbH

Universal Spreader TSW 2140 E with V-Spread

Distribution quality in manure

www.DLG-Test.de

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 BERGMANN TSW 2140 E with V-Spread was submitted to a DLG test that assessed the quality of distribution in cattle manure. The machine's spreading system consists of two wide-spreading discs and two horizontal beaters. The test examined the quality of distribution as the machine was spreading cattle manure at rates of 10 t/ha and 30 t/ha. The manure had a dry matter content of 29.9 % and a bulk density of 736 kg/m³. The criteria tested were the quality of distribution across rows and along rows. Other criteria were not tested.

Assessment in brief

Spreading at rates of 10 t/ha and 30 t/ha in the DLG test, the BERGMANN TSW 2140 E with V-Spread achieved very good (++) and good (+) results in distribution quality across and along rows. Table 2 is a synopsis of all results.

Table 1:
Overview of results

DLG QUALITY PROFILE	Evaluation[1]
Distribution quality in manure	✓

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

Table 2:
Parameters defining the distribution quality in manure

		Cattle manure			
Work width	[m]	19	37	24	38
Target rate	[t/ha]	10	10	30	30
Forward speed	[km/h]	3.2	3.2	1.3	1.3
Distribution across rows					
– Coefficient of variation (CoV)	[%]*	10.0 (++)	13.7 (+)	9.4 (++)	14.6 (+)
Distribution along rows using ExaRate					
– Coefficient of variation (CoV)	[%]**	10.3 (+)		8.8 (++)	
– Dilation within the tolerance zone	[%]***	65.97 (+)		76.32 (++)	

* In line with the DLG assessment scale that has been effective from May 2020 (distribution across rows): CoV > 15 % to ≤ 20 % = "○"; CoV > 10 % to ≤ 15 % = "+"; CoV ≤ 10 % = "++"
** In line with the DLG assessment scale that has been effective from May 2020 (distribution along rows): CoV > 15 % to ≤ 25 % = "○"; CoV > 10 % to ≤ 15 % = "+"; CoV ≤ 10 % = "++"
*** In line with the DLG assessment scale that has been effective from May 2020 (dilation within the tolerance zone): > 45 % = "○"; > 55 % = "+"; > 75 % = "++"

In May 2020, the DLG test commission on fertilisers and spreaders laid down revised and stricter standards for assessing the test results for this type of machinery. The revised standards reflect the technical progress that has been made in this field. These new standards supersede the previous standards applied by DLG in all its tests and in all DLG Test Reports prior to May 2020.

The product

Manufacturer and applicant

Ludwig Bergmann GmbH
Hauptstraße 64-66
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Germany

Product:
Universal Spreader TSW 2140 E with V-Spread

Description and technical data

The BERGMANN TSW 2140 E with V-Spread is a universal spreader that features a moving floor and two spreading discs. The key specifications of the tested spreader are listed below (manufacturer information):

Model	TSW 2140 W with V-Spread
Year of manufacture	2018
ID no.	1352101M
Gross weight	14,000 kg
Tongue load	4,000 kg
Axle load	10,000 kg
Kerb weight	5,840 kg
Capacity	approx. 17.6 m^3
Running gear	single axle, unsprung; drawbar with hydraulic suspension and K80 hitch
Brakes	Dual-line air brake
Tyres	VF 480/95 R50
Body dimensions	1,420 mm x 1,800 mm (conical) x 5,900 mm (h x w x l)
Tractor spool requirement	3 load-sensing couplers (feed, return, control) for the slurry gate, the tailgate and the moving floor (further functions available); 2 (double-acting) lines for the drawbar suspension system;
Electric sockets required	ISOBUS connector; 7-pin light connector
Spreading system	Two horizontal 550 mm diameter beaters; Two 1,000 mm diameter spreading discs; 4 adjustable vanes per disc; frame-mounted, hard-wearing and interchangeable deflector plates; pto-driven (max. 1,000 rpm); slurry gate separating the load area from the spreading unit
Material feed	Hydraulic moving floor (4 chains with 60 channel-steel slats) (infinitely variable advance speed control)

The method

The test method is based on the DLG test framework “Organic fertiliser spreaders” and the DIN EN 13080 standard “Manure Spreaders – Environmental Protection Requirements and Test Methods”.

The distribution across rows is measured with the help of 50 cm x 50 cm x 10 cm trays that are placed next to each other transversely to the test course. Then the tractor spreader combination travels down this test course, spreading the material. As the next step, the material collected in the trays is weighed and related to the area spread to determine the spread pattern without overlaps. The quality of distribution is expressed by the coefficient of variation (CoV). This reflects the accuracy of spreading the material across the rows, taking into account the rate of overlaps as the machine matches up with the previous pass. The CoV curve shows the point at which the accepted CoV threshold is undercut and also the range of the optimum work widths (smallest possible CoV).

The distribution along rows is assessed by measuring the mass flow. This is done by continuously measuring the load changes on the stationary machine as it is being emptied. These measurements are used to compute the following parameters: typical spreading rate during unloading, dilation within the tolerance zone (percentage of unloading time during which the spreading rate is within the accepted tolerance range), the optimum overlap at match-up and the CoV at optimum overlapping levels.

The smaller the CoV and the greater the dilation inside the tolerance zone, the better the distribution quality.

Detailed account of the test results

Fig. 2:
The mobile test stand for measuring the distribution across rows

Fig. 3:
BERGMANN TSW 2140 E with V-Spread is unloading the material during the measurements on application along rows

Test

The test was carried out in March 2022 on a harvested silage maize field in the Wolgast region (Mecklenburg-Western Pomerania). Figure 2 shows the mobile test stand set up for measuring the distribution across rows by collecting the material in trays placed on the ground. Figure 3 shows the stationary spreader during emptying. This part of the test measures the mass flow changes during the unloading process. This was done using the integral weighing cells of the spreader which were validated by the DLG test engineers before the test. The cattle manure applied had a dry matter content of 29.9 % and a bulk density of 736 kg/m³ DM.

The spreader was operated by a Fendt Vario 724 and filled by a telehandler.

Setting up the spreader

The spreading rate of the BERGMANN TSW 2140 E with V-Spread is controlled by three factors: the speed at which the moving floor advances, the degree to which the slurry gate is opened and the forward speed of the tractor. The feed rate of the moving floor is set steplessly between 0.2 m and 7 m per minute.

The floor chains are driven by a hydro motor. The aperture of the slurry gate is also controlled steplessly from the operator terminal. A slurry gate that is controlled relative to the distance travelled allows operators to enter the target aperture of the gate to the ISOBUS terminal and then retrieve the setting with a press of a button. The current position of the gate is indicated on the display screen and the information is used for controlling the application rate. If the spreader doesn't have ISOBUS, the operator reads the current position of the gate on a scale which is mounted on a headboard and shows heights from 0 to 1.4 metres (fig. 5).

The spreading system on the BERGMANN TSW 2140 E with V-Spread is pto powered (max. 1,000 rpm). The distribution across rows is controlled by the spreading discs which are arranged in chevron formation (the so-called V-Spread) (fig. 6). Each spreading disc has four vanes that swing into and out of position. Each of these vanes can be set to one of seven angles, which is done by refitting it in one of seven holes. The spreading angle is set manually by undoing an M12 screw on each vane. Which setting is suitable for which material is explained in the operators' manual. The impact point on the discs is set with the help of a pendulum. The position of the pendulum in direction of travel (the impact point) is adjusted on a screw. The height of the pendulum from the spreading discs is also adjusted on a screw.

The manual also specifies the base settings for individual materials and various application rates. As the properties of the various materials usually vary greatly, operators are recommended to test the settings in an extra run and adjust them as necessary.

ExaRate

ExaRate is a rate compensating system which is integrated in the Isobus software. Its weighing cells measure continuously the changing load as the machine is being emptied. This information is sent to the software which compares the measurements with the default target application rate (t/ha).

The actual rate is adapted to the target rate by controlling the feed rate of the moving floor automatically, thereby achieving an exact spread rate in varying conditions. ExaRate is also suitable for precision farming technology applications using application maps.

Fig. 4:
The CCI 1200 terminal for BERGMANN TSW 2140 E with V-Spread

Fig. 5:
This scale on the headboard indicates the current aperture of the slurry gate upstream of the beaters

Fig. 6:
The V-Spread discs in chevron-style arrangement

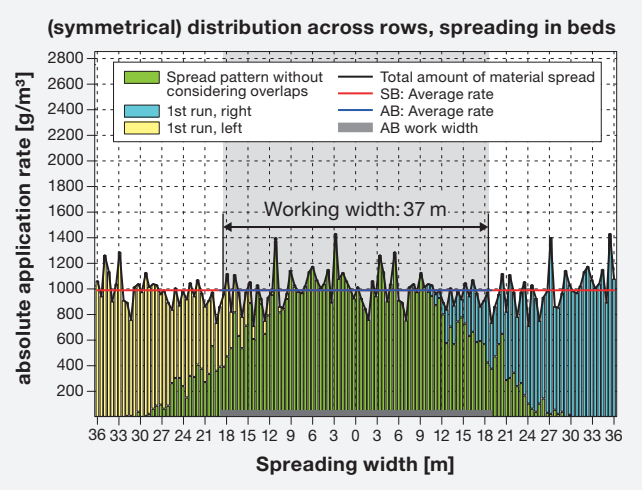
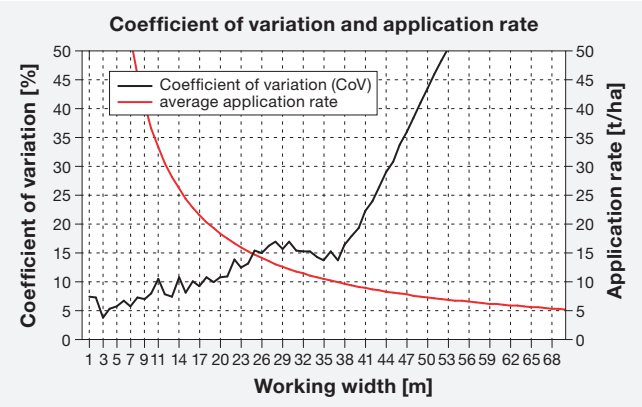


Fig. 7:
Manure spread patterns without and with overlaps; the application rate is 10 t/ha



Settings
1st test run (no optimisation required)
Feed rate: 0.8 metres per minute
Pendulum: 10 mm/Pendulum position: forward
Vane settings per disc: 2 times in hole 1;
2 times in hole 3

Fig. 8
Coefficient of variation relative to the work width when applying manure at 10 t/ha

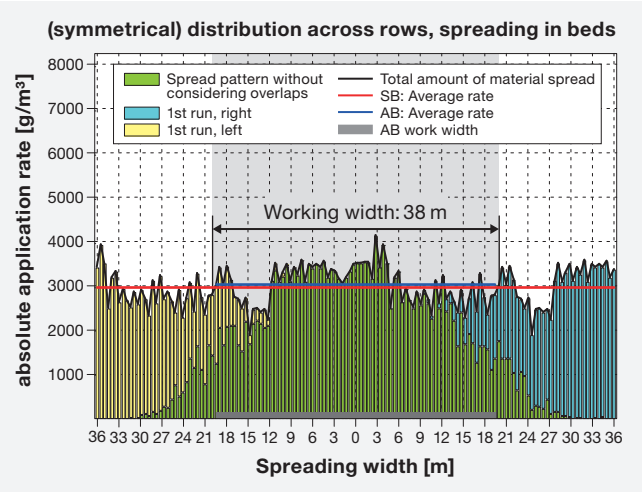


Fig. 9:
Manure spread patterns without and with overlaps; the application rate is 30 t/ha

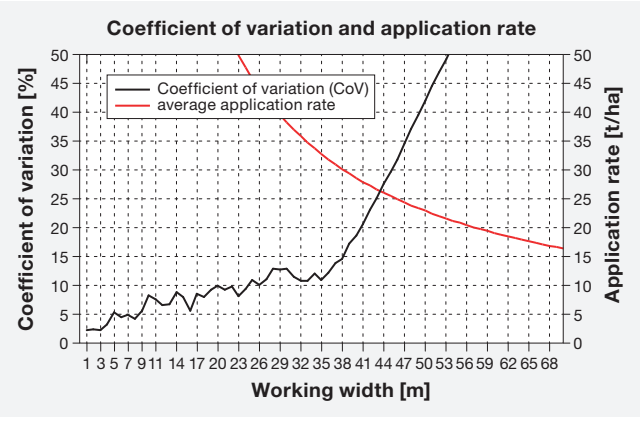
Distribution across and along rows spreading cattle manure

To apply manure at a rate of 10 t/ha and a workrate of 3.2 km/h and to accommodate further parameters and properties of the spread material, the advance rate of the floor chains was set to 0.8 m/min by the BERGMANN control unit. In the first run during which the work width was set to 40 metres, the CoV on the quality of distribution was smaller than 20 %.

Figure 7 shows the spread pattern for cattle manure applied at a rate of 10 t/ha without considering overlaps (distribution quality after two passes) and with considering overlaps.

The graph in figure 8 shows the relationship between the coefficient of variation and the work width for cattle manure spread at a rate of 10 t/ha. The CoV curve shows that the CoV is 10.0 % when the work width is set to 19 metres. This CoV percentage is very good (++). The CoV is 13.7 % (good, +) when the machine is spreading at a width of 37 metres. The CoV increases beyond the 20 % mark only when work width exceeds 40 m.

To apply manure at a rate of 30 t/ha and a workrate of 1.3 km/h and to accommodate further parameters and properties of the spread material, the advance rate of the floor chains was set to 1.0 m/min by the BERGMANN control unit. In the first run during which the work width was set to 40 metres, the CoV on the quality of distribution was smaller than 20 %.



Settings
2nd Test run (no optimisation required)
Feed rate: 1 m/min
Pendulum: 10 mm/Pendulum position: forward
Vane settings per disc: 2 times in hole 1;
2 times in hole 3

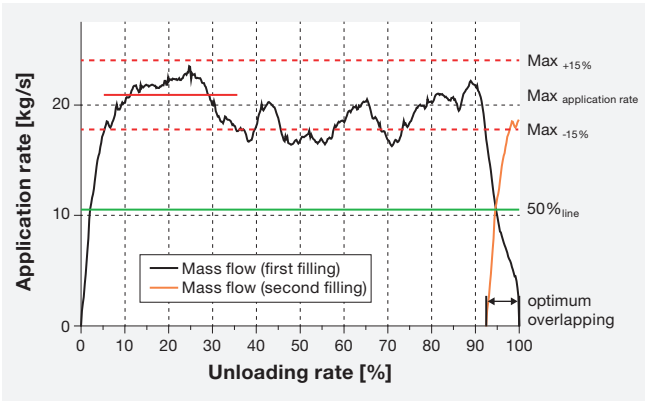
Fig. 10:
Coefficient of variation relative to the work width in muck spread at a rate of 30 t/ha

Figure 9 shows the spread pattern for cattle manure applied at a rate of 30 t/ha without considering overlaps (distribution quality after two passes) and with considering overlaps.

The graph in figure 10 shows the relationship between the coefficient of variation and the work width for cattle manure applied at a rate of 30 t/ha. The CoV curve shows that the CoV is 9.4 % when the work width is set to 24 metres. This CoV percentage is very good (++). The CoV is 14.6 % (good, +) when the machine is spreading at a width of 38 metres.

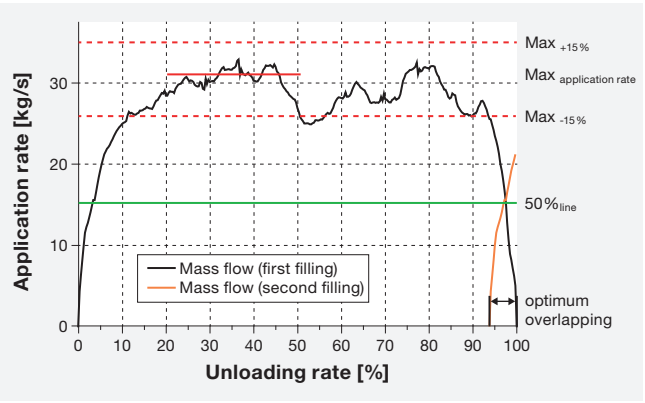
The CoV increases beyond the 20 % mark only when work width exceeds 40 m.

Assessing the quality of distribution of muck along rows, the computed coefficients of variation at both rates were 10.34 % at 10 t/ha (good, +) and 8.84 % at 30 t/ha (very good, ++). The dilation within the tolerance zone was 65.97 % (good,+) when spreading muck at 10 t/ha and 76.32 % (very good, ++) when spreading muck at 30 t/ha. The results in the test on application along rows are shown in figures 11 and 12.



1st test run (no optimisation required)
Consistent application rate: 20.92 kg/s
Dilation within the tolerance zone: 65.97 % (good, +)
CoV at optimum overlaps: 10.34 % (good, +)
optimum overlap on 50 % line 7.53 %

Fig. 11:
Application of cattle manure along rows (10 t/ha) using ExaRate



1st test run (no optimisation required)
Consistent application rate: 30.47 kg/s
Dilation within the tolerance zone: 76.32 % (very good, ++)
CoV at optimum overlaps: 8.84 % (very good, ++)
optimum overlap on 50 % line 6.25 %

Fig. 12:
Application of cattle manure along rows (30 t/ha) using ExaRate

Summary

The DLG test measured the universal spreader BERGMANN TSW 2140 E with V-Spread in cattle manure applying the material at rates of 10 t/ha and 30 t/ha. All tests on the accuracy of distribution across rows produced coefficients of variation of less than 20 %. Spreading cattle manure at a rate of 10 t/ha, the quality of distribution across rows was very good (++) when the work was 19 m and good (+) when the work width was 37 m. Spreading cattle manure at a rate of 30 t/ha, the distribution across rows was very good (++) at a work width of 24 m and good (+) at a work width of 38 metres. The results in the DLG tests on the quality of distribution of cattle manure along rows at rates of 10 t/ha and 30 t/ha are very good (++) and good (+). The dilation within the tolerance zone was 65.97 % (good, +) when the application rate was 10 t/ha. The coefficient of variation was 10.34 % (good, +) when overlapping was optimal. The dilation within the tolerance zone was 76.32 % (very good (++) when the application rate was 30 t/ha. The coefficient of variation was 8.84 % (very good, ++) when overlapping was optimal.

The manual specifies the base settings for various materials and application rates. As the properties of the various materials usually vary greatly, operators are recommended to test the settings in an extra run and adjust them as necessary.

Based on the above test results, the BERGMANN TSW 2140 E with V-Spread universal spreader is awarded the DLG APPROVED quality mark after passing the partial test ‘Quality of distribution in cattle manure’ in 2022.

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

Manure spreaders and secondary nutrient fertiliser spreaders (effective from May 2020)

The DLG panel of experts

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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.

Internal test code DLG: 2204-0004

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