

Fliegl Agrartechnik GmbH

ADS 120 push-off manure spreader with Profi V2 spreading unit

Stable manure distribution quality



FLIEGL ADS 120

✓ Verteilqualität
Stallmist

DLG-Prüfbericht 6292



Test Centre
Technology and Farm Inputs

www.DLG-Test.de

Overview

A test mark "DLG-APPROVED for individual criteria" is awarded to agricultural products that have successfully completed a reduced-scope usability test conducted by the German Agricultural Society (DLG – Deutsche Landwirtschafts-Gesellschaft) according to independent and recognised evaluation criteria. The aim of the test is to highlight particular innovations and key criteria of the test object. The test can contain criteria from the DLG test scope for full tests or focus on other value-determining features and properties of the test object. The minimum requirements, test conditions and procedures as well as the evaluation criteria for the test results are specified in consultation with a DLG group of experts.

These reflect the recognised rules of technology as well as the relevant scientific and agricultural findings and requirements. The successful test is concluded with the publication of a test report and the awarding of the test mark, which is valid for a period of five years from the date of award.

The DLG test of stable manure distribution quality was conducted with the Fliegl ADS 120 push-off manure spreader. The manure spreader was equipped with the Fliegl Profi V2 spreading unit. The distribution quality was measured with discharge rates of 10 t/ha and 30 t/ha. The stable manure employed for the test had a relatively dry matter content (34%) and a relatively low bulk density (306 g/l FM).



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When measuring the longitudinal distribution, the test examined the manual control of the push-off feed via a potentiometer installed in the tractor cab (which operates the control valve for the push-off hydraulics) as well as the spreader control system Fliegl VarioSens (FVS – automatic control of the push-off feed based on the spreader torque).

No other criteria were assessed.

Assessment in brief

In the DLG test, very good distribution quality is achieved for both discharge rates (10 t/ha and 30 t/ha). Both in transverse and longitudinal direction, the calculation variation coefficients are below 15%. At 67%, dilation within the tolerance zone for manual control is already at a high level, and can be increased to almost 90% in the case of automatic control with Fliegl VarioSens (FVS). Table 1 provides an overview of the results obtained in the DLG test.

Table 1:

Parameters for stable manure distribution quality

Spreading material	Stable manure	
Working width	12 m	
TARGET discharge rate	10 t/ha	30 t/ha
Travel speed	7.5 km/h	2.5 km/h
Transverse distribution		
– Coefficient of variation (CV)*	12.7%	++
– ACTUAL discharge rate	10.1 t/ha	30.0 t/ha
Longitudinal distribution with manual control		
– Coefficient of variation (CV)*	8.0%	++
– Dilation within tolerance zone	67.1%	
Longitudinal distribution with Fliegl VarioSens (FVS)		
– Coefficient of variation (CV)*	9.7%	++
– Dilation within tolerance zone	89.9%	

* DLG assessment scale:

CV > 20% to ≤ 25% = "o"; CV > 15% to ≤ 20% = "+"; CV < 15% = "++"

The product

Manufacturer and applicant

Fliegl Agrartechnik GmbH
Bürgermeister-Boch-Straße 1
84453 Mühldorf am Inn
Germany

Product:
Fliegl ADS 120 push-off manure
spreader with Profi V2 spreading
unit

Description and technical data

The Fliegl ADS 120 is a manure
spreader with push-off technology.

The main technical data of the tested
spreader is as follows (manufacturer
specifications):

Vehicle type: ADS 120

Year of manufacture: 2015

ID no.: WFDFLT113F2017089

Gross vehicle weight: 12,500 kg

Drawbar load: 2500 kg

Axle load: 10,000 kg

Net weight: approx. 5300 kg

Load volume: approx. 14 m³

Chassis:

- Single-axle, unsprung
- Drawbar with hydraulic
suspension

Brake type:

2-circuit compressed air with manual
control

Tyres: 23.1– 26 16PR

Design:

Conical steel body (H x W x L)
1600 mm x 2150 mm / 1300 mm
x 5000 mm

Req. hydraulic connections:

- With mechanical control valve or
electric potentiometer:
- 1 x single action;
2 x double action
- With FLIEGL VarioSens:
1 x LS and 2 x double action

Req. electrical connections:

- 12 V for lighting
- 12 V socket in driver's cab for
potentiometer
- ISOBUS for Fliegl VarioSens
operation

Spreading unit:

- 2 vertical milling drums
- 2 spreading discs, each
equipped with 3 slingers
- Powered via PTO
- Gate valve to separate load
space and spreading unit
- Outlet (H x W) 2000 mm x
2380 mm

Feeding technology:
hydraulically powered
moving panel

The method

The test is based on the DLG test
framework "spreaders for solid
organic materials" and the standard
DIN EN 13080 "Manure spreaders –
Environmental protection –
Requirements and test methods".

The transverse distribution is
determined using collecting
vessels
(50 cm x 50 cm x 10 cm), which are
arranged side by side on the test
area perpendicular to the direction
of travel. The spreader passes
through the test course a total of
three times. The material collected
in the vessels is weighed and the
results are used to calculate the
basic spreading pattern based on the
distribution area.

The quality of distribution is
expressed by the coefficient of
variation (CV). The CV value for the
transverse distribution reflects the
spreading accuracy across the test
area, taking into account the overlap
achieved after further passes. The CV
curve shows when the coefficient
drops below the accepted threshold
and highlights the range of the
optimum working widths (lowest
possible CV).

To determine the longitudinal
distribution, the mass flow is
assessed by continuously measuring
the stationary axle and drawbar
loads during complete discharge of a
load.

This is used to calculate the following
parameters: typical spreading rate
during unloading, dilation within the
tolerance zone (percentage of
unloading time during which the
discharge rate is within the accepted
tolerance), optimum overlap of the
subsequent pass and CV with
optimum overlap.

The lower the CV and the higher the
tolerance zone, the better the
distribution quality.

The test results in detail

The test

The test was conducted in October 2015 with the company-owned test stands of Fliegl Agrartechnik in Mühlendorf. Prior to the test, the weighing systems were calibrated by an accredited partner lab (Infraserv Gendorf Technik GmbH, Burgkirchen) under the supervision of the DLG and the test stands were inspected by the DLG with regard to their compliance with the relevant standards. Figure 2 shows the test facility for measuring the transverse distribution with collecting vessels on weighing cells, while figure 3 show the weigh bridge which measures the change in mass during the unloading process.

The spreading material employed for the test was cattle manure from a neighbouring farm. Due to the very dry weather conditions experienced over the year, the manure had a relatively high dry matter content (34%) and a relatively low bulk density (306 g/l FM).

The tractor used for the test was a Fendt 828 Vario. The manure spreader was filled with a telescopic loader.

Setup

On the Fliegl ADS 120, the spreading rate is determined by the feed of the moving panel and the travel speed. Unlike with manure spreaders equipped with scratch floors, the gate valve must always be fully open when spreading. In the case of push-off manure spreaders, the gate valve's only other function is to separate the load space and spreading unit. The push-off system is powered via a main cylinder and a cylinder package, which become active one after the other depending on the position of the moving panel, that is after approx. 30% and 60% of its travel. During this process, the push-off speed is regulated by the oil flow.

With the basic configuration, the oil flow rate is regulated by means of a mechanical control valve on the spreading vehicle (figure 4). With the mechanical control, a basic setting is defined before commencing work. During operation, the push-off feed can then be adjusted via the tractor hydraulics, provided that the tractor is equipped for this.

An optional electrical control for the gate valve is also available in the form of a potentiometer that can be installed in the tractor cab. This allows the push-off speed to be adjusted during the unloading process by operating the potentiometer from the driver's cab (figure 5).

For design reasons, different oil flow rates exist in the hydraulic cylinders which, in the case of a constant flow rate, can result in slight variations of the push-off speed as the different cylinders become active. By adjusting the preselected oil volume via the



Figure 2:
Test stand for transverse distribution



Figure 3:
FLIEGL ADS 120 on the test stand for longitudinal distribution

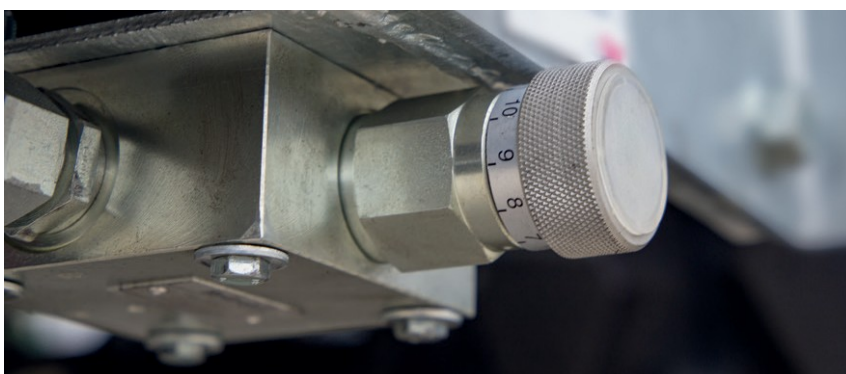


Figure 4:
Mechanical control valve on the FLIEGL ADS 120



Figure 5:
Potentiometer with adjustment scale

tractor hydraulics or the potentiometer, the smoothness of the discharge process can thus be improved directly from the driver's cab. In its operating instructions, Fliegl recommends reducing the oil flow rate after the moving panel has completed 30% and 60% of its travel. The spreading vehicle features corresponding markings, which indicate the position of the moving panel and thus inform the operator when he has to adjust the oil flow rate. On the potentiometer, the basic setting must be reduced by two scale marks in each case.

This requires a certain level of experience and familiarity with the system on the part of the operator.

On vehicles equipped with Fliegl VarioSens, these adjustments are made automatically. The system continuously measures the torque applied to the spreading unit and regulates the oil volume via the control valve on this basis.

The push-off speed is thus controlled via the torque. The operator merely has to enter a basic setting for the torque and can then devote his full attention to driving the vehicle (figure 6).

On the Fliegl ADS 120, the transverse distribution is primarily set via the PTO speed, i.e. the rotational speed of the spreading rollers with the spreading discs. In addition, the material flow on the spreading unit also influences the spreading pattern. A reciprocal effect therefore exists between the transverse distribution settings and the feed of the push off system.

For all vehicle configurations, information regarding the basic settings for different materials, required discharge rates and intended working widths can be found in the operating instructions. However, due to the very different properties of the various spreading materials, it is advisable to test the spreading settings in a trial run and optimise them as necessary.

Transverse distribution of stable manure

In the DLG test, both discharge rates (10 t/ha and 30 t/ha) were assessed with the same settings of the manure spreader. Overall, two optimisation steps were required during the tests in order to achieve the best possible distribution quality with a variation coefficient (CV) of 12.7% for a working width of 12 metres.

In this case, the PTO speed was set to 900 rpm and the feed set to 280 Nm with the Fliegl VarioSens (FVS) automatic control system, while the oil flow rate was restricted to a maximum of 35%. The spreading flap is always fully opened for the discharge of stable manure. By adjusting the travel speed from 7.5 km/h to 2.5 km/h, the predefined discharge rates of 10 t/ha or 30 t/ha were effectively maintained.

Figure 7 shows an example of the basic spreading pattern (quantity distribution after first pass) and the complete spreading pattern

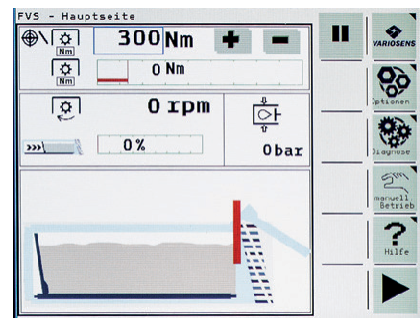
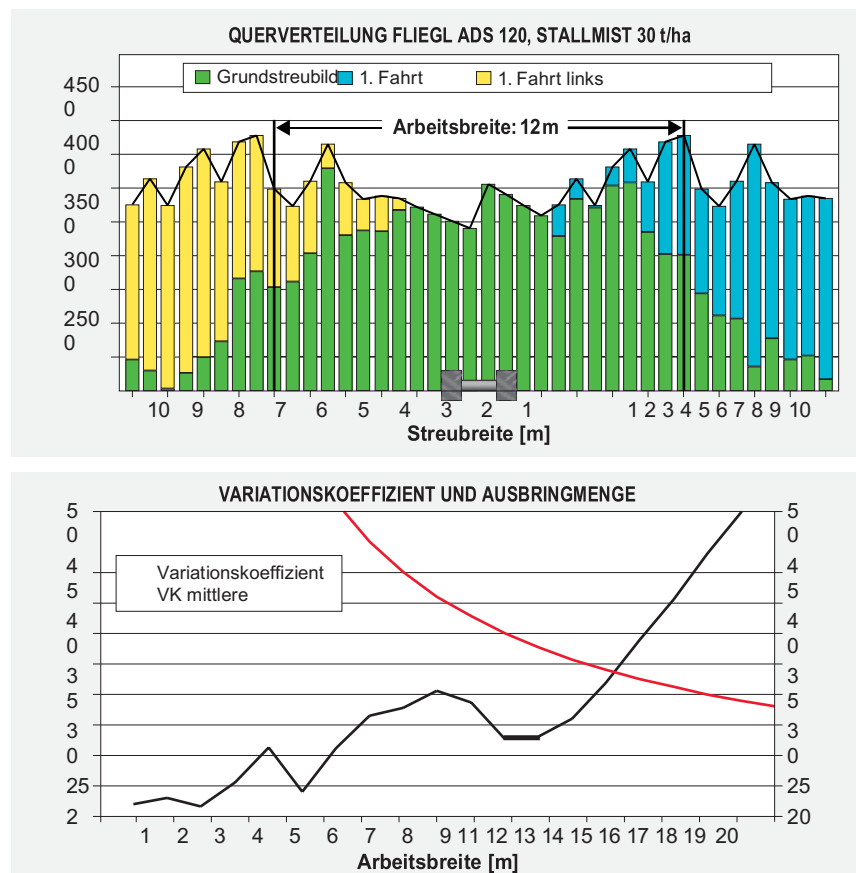


Figure 6:
Screenshot of FLIEGL VarioSens control terminal on FLIEGL ADS 120

(quantity distribution including overlaps) for a discharge rate of 30 t/ha of stable manure.

Figure 8 provides a graphical representation of the interdependence between the coefficient of variation and the working width. The progression of the CV curve illustrates that the CV reaches its optimum level at a working width of 12 metres, still approaches 15% at 14 metres and only passes the 20% mark at a width of 15 metres.



Bilder 7 und 8:

Grund- und Gesamtstreubild (oben) und Variationskoeffizient in Abhängigkeit von der Arbeitsbreite (unten) bei der Ausbringung von 30 t/ha Stallmist (Einstellungen – 2. Optimierung: Zapfwelle 900 U/Min; Vorschub: FVS 280 Nm/max 35%; Streuwerkklappe offen; Fahrgeschwindigkeit 2,5 km/h)

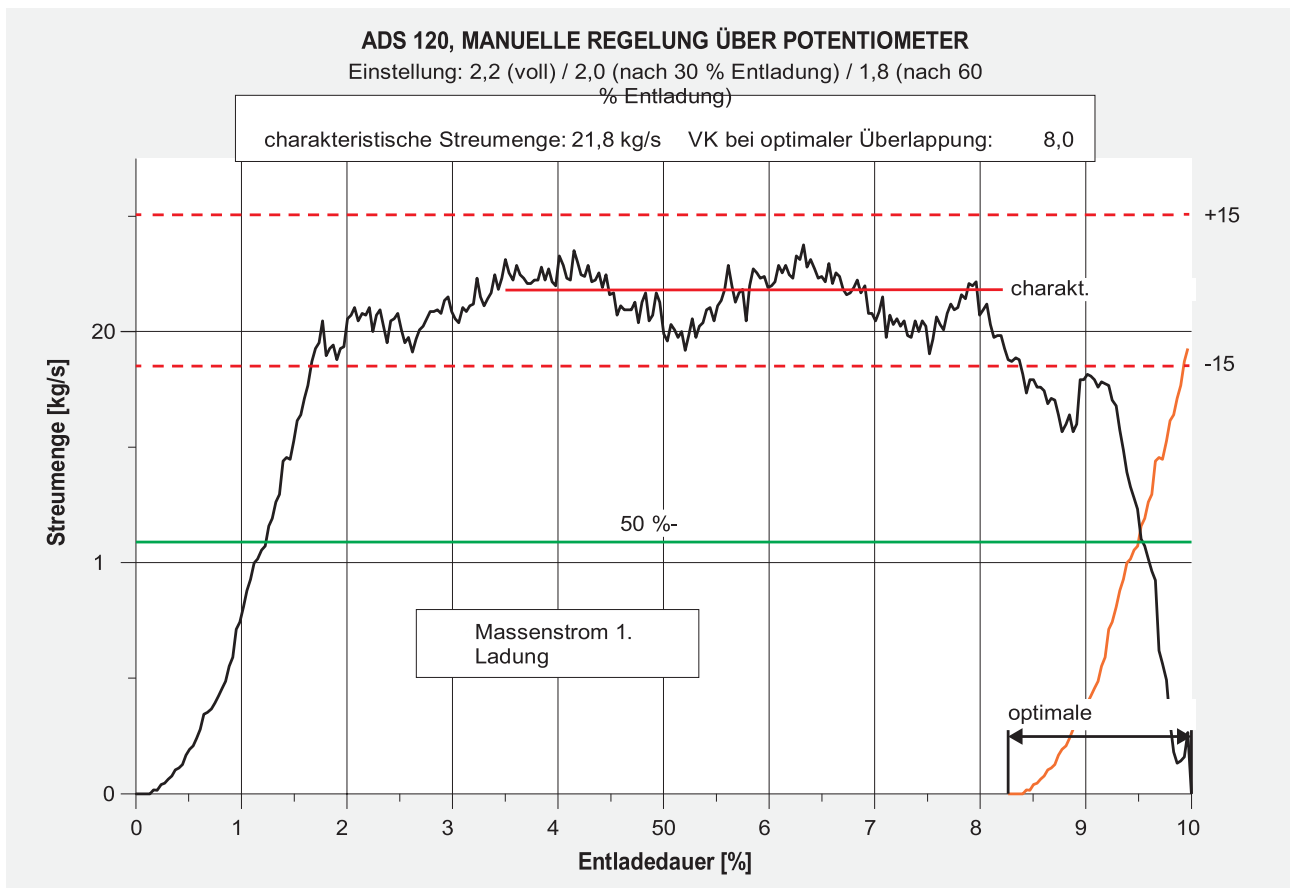


Figure 9:
 Longitudinal distribution of ADS 120 with manual potentiometer control

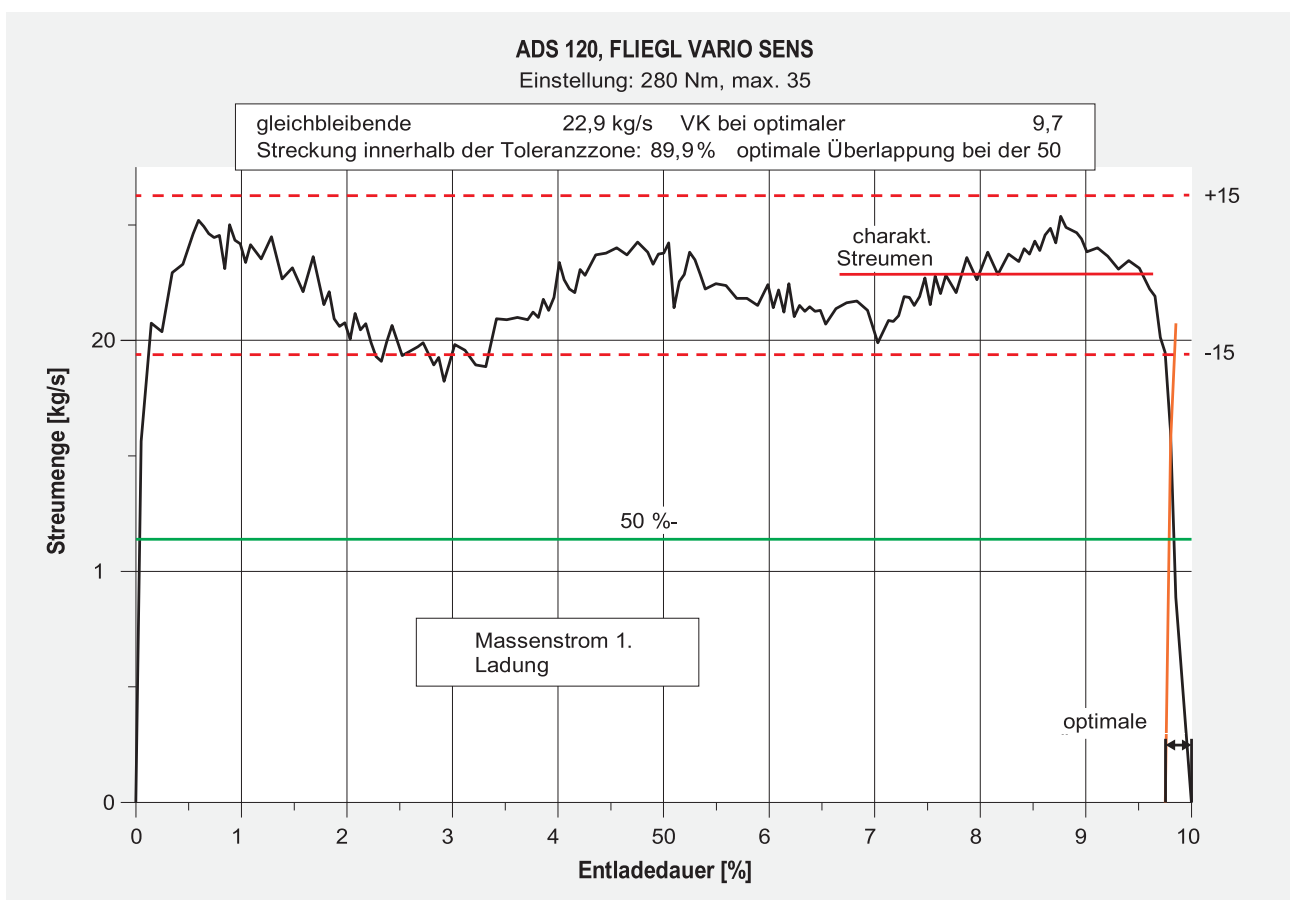


Figure 10:
 Longitudinal distribution of ADS 120 with Fliegl VarioSens

Longitudinal distribution of stable manure

Two equipment variations were tested on the Fliegl ADS 120 push-off manure spreader when measuring the longitudinal distribution: manual control of the push-off feed via a potentiometer installed in the tractor cab and the Fliegl VarioSens spreader control system.

Figures 9 and 10 provide a graphical representation of the discharge processes for both versions. Upon examination of these curves, the very steep rise at the start of the unloading process and the rapid decline of the spreading rate at the end of the process stand out as particularly positive.

While some

variations are apparent in the discharged material rates for each time interval, these are generally within the accepted tolerance range of $\pm 15\%$ around the typical spreading rate. This highly uniform performance can primarily be attributed to the push-off technology and is reflected in the resulting quality parameters.

For the distribution quality in longitudinal direction, the calculated coefficients of variation for both equipment versions achieve very good values of 8.0% (manual control) and 9.7% (FVS). At 67.1%, dilation within the tolerance zone for manual control is already at a high

level. The necessary adjustment of the feeds after

30% and 60% of unloading, however, requires a certain level of experience and familiarity with the system on the part of the operator. This is where the advantages of the Fliegl VarioSens spreader control system come to the fore.

In this case, the push-off feeds are adjusted automatically based on the torques on the PTO, thus greatly reducing the strain on the operator. As a result, dilation within the tolerance zone for the Fliegl VarioSens (FVS) system was increased to almost 90% in the DLG test.

Conclusion

In the DLG test, the Fliegl ADS 120 push-off manure spreader was examined with the Profi V2 spreading unit and with both electrical control of the push-off feed via a potentiometer in the driver's cab as well as automatic control with Fliegl VarioSens, in both cases for stable manure discharge rates of 10 t/ha and 30 t/ha.

Very good distribution qualities were achieved for both discharge rates. Both in transverse and longitudinal direction, the calculation variation coefficients are below 15%.

At 67%, dilation within the tolerance zone for manual control via the potentiometer is already at a high level, which can be further increased to almost

90% when using the Fliegl VarioSens (FVS) system. However, when controlling the push-off feed mechanically via the control valve on the spreader, without the ability to adjust the feed during the discharge process, some compromises have to be made when it comes to the distribution quality in longitudinal direction.

Moreover, the electrical adjustment of the push-off feed on the version with the potentiometer does require a certain level of experience and familiarity with the system on the part of the operator. With the Fliegl VarioSens system, these adjustments are made automatically.

This reduces the strain on the operator while significantly enhancing user comfort and overall functional safety.

For all spreader equipment versions, guide values for the basic settings based on the spreading material, required discharge rate and intended working width are provided in the operating instructions. However, due to the very different properties of the various spreading materials, it is advisable to test these settings in a trial run and optimise them as necessary.

Additional information

Additional tests of manure spreaders can be downloaded at www.dlg-test.de/duengung under "Compost and stable manure spreaders". Within the scope of the DLG's technical work, the DLG Committee for Technology in Crop Production has done extensive work in the field fertilisation technology. Information sheets and documents covering this voluntary technical work are available free of charge at http://www.dlg.org/technik_pflanzenproduktion.html (in PDF format).

Test execution

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DLG test scope

Test type:
DLG-approved – partial test

Test description: Stable
manure distribution quality

Specialist area

Technology in outdoor work

Project manager

Dr. Ulrich Rubenschuh

Test engineer(s)

Dr. Ulrich Rubenschuh*

* Reporter

The DLG

In addition to conducting its own well-known tests of agricultural technology, farm inputs and foodstuffs, the German Agricultural Society (DLG – Deutsche Landwirtschafts-Gesellschaft) acts as a neutral, open forum for knowledge exchange and opinion-forming in the agricultural and food industry.

Some 180 full-time employees and more than 3000 expert volunteers develop solutions to current problems. More than 80 committees, working groups and commissions form the basis for expertise and continuity in technical work. Work at the DLG includes the preparation of technical information for the agricultural sector in the form of information leaflets and working papers, as well as articles in specialist journals and books.

The DLG organises the world's leading trade exhibitions for the agricultural and food industry. In doing so, it helps to discover modern products, processes and services and to make these transparent to the public.

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The DLG Test Centre Technology and Farm Inputs

The DLG Test Centre Technology and Farm Inputs in Groß-Umstadt is the benchmark for testing agricultural products and farm inputs

as well as a leading testing and certification service provider for independent technology tests. The DLG test engineers precisely examine product developments and innovations by utilising state-of-the-art measurement technology along with practical, experience-based testing methods.

As an accredited and EU-registered testing laboratory, the DLG Test Centre Technology and Farm Inputs offers farmers and practitioners vital information and decision-making support for the investment planning of agricultural technology and farm inputs through recognised technology tests and DLG testing.

The results provided in the report were determined by means of the following DLG tests: 2015-0725 (stable manure distribution quality).

The validity of the award expires in November 2020.

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