DLG Test Report 6293

Fliegl Agrartechnik GmbH

ASW 271 push-off manure spreader with Profi V2 spreading unit

Stable manure distribution quality

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 ASW 271 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).

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

For the transverse distribution, a good (+) distribution quality with a variation coefficient of 18.5% was achieved for the discharge rate of 10 t/ha, while very good results with a variation coefficient of 13.2% were attained for the discharge rate of 30 t/ha. In longitudinal direction, variation coefficients of close to 10% represent very good results for both discharge rates with the tested equipment versions (manual control via potentiometer or FLIEGL VarioSens).

Dilation within the tolerance zone is also at a high level, with close to 70% achieved for all tested versions.
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	6 km/h	5.5 km/h	
Transverse distribution			
– Coefficient of variation (CV)*	18.5%	13.2%	+ / ++
– ACTUAL discharge rate	10.3 t/ha	29.7 t/ha	
Longitudinal distribution with manual control			
– Coefficient of variation (CV)*	11.4%	9.8%	++ / ++
– Dilation within tolerance zone	73.7%	73.6%	
Longitudinal distribution with Fliegl VarioSens (FVS)			
– Coefficient of variation (CV)*	10.6%	9.5%	++ / ++
– Dilation within tolerance zone	69.3%	70.2%	

* DLG assessment scale:
CV > 20% to ≤ 25% = "○"; 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 ASW 271 push-off manure spreader with Profi V2 spreading unit

Description and technical data

The Fliegl ASW 271 is a manure spreader with push-off technology.

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

Vehicle type: ASW 271 Gigant

Year of manufacture: 2014

ID no.: WFDFLT221E2014375

Gross vehicle weight: 21,000 kg

Drawbar load: 3000 kg

Axle load: 2 x 9000 kg

Net weight: approx. 6800 kg

Load volume: approx. 30 m_3

Chassis:
- Tandem axle, parabolic suspension
- Drawbar with hydraulic suspension

Brake type:
2-circuit compressed air with

ALB

Tyres: 750/45R26.5"

Design:
Steel body (H x W x L) 2000 mm x 2380 mm x 6300 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

The test was conducted in October 2015 with the company-owned test stands of Fliegl Agrartechnik in Mühldorf. 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 ASW 271, 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 unloading, 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:
FLIEGL ASW 271 on the test stand for transverse distribution

Figure 3:
FLIEGL ASW 271 on the test stand for longitudinal distribution

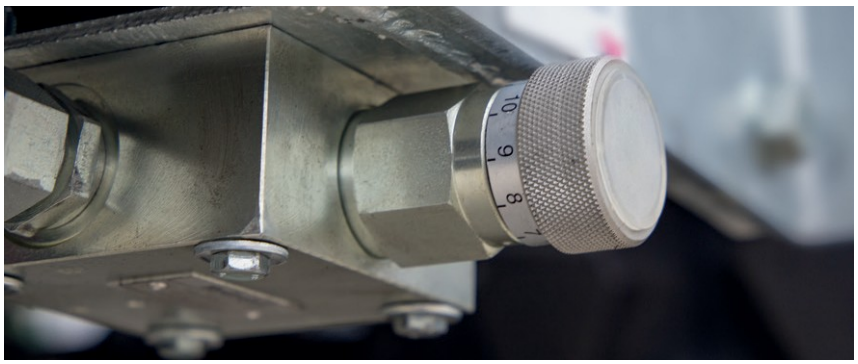


Figure 4:
Mechanical control valve on the FLIEGL ASW 271

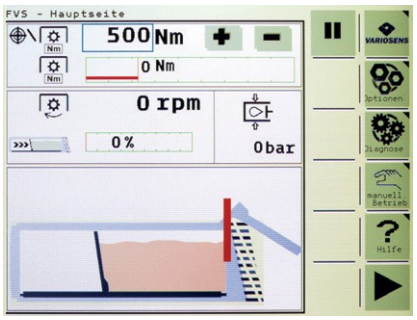
Figure 5:
Potentiometer with adjustment scale

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 ASW 271, 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 equipment versions, information regarding 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.

Transverse distribution of stable manure

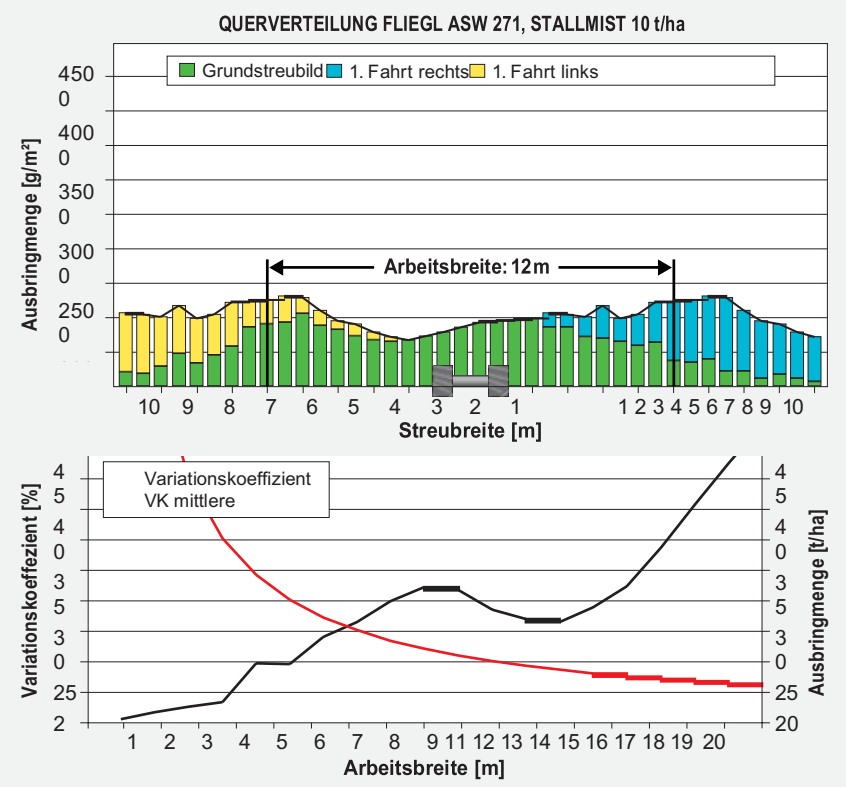
Figure 7 shows the basic spreading pattern (quantity distribution after first pass) and the complete spreading pattern (quantity distribution including overlaps) for a discharge rate of 10 t/ha of stable manure. Figure 8 provides a graphical representation of the interdependence between the coefficient of variation and the working width for this discharge rate. For a working width of 12 m, good (+) distribution quality was achieved with a variation coefficient (CV) of 18.5%, and the prescribed target rate was effectively maintained with a travel speed of 6 km/h (ACTUAL = 10.3 t/ha). The progression of the CV curve illustrates that
the CV reaches its optimum level of 16.4% at a working width of 14 metres and passes the 20% mark at a width of 16 metres.
The spreader settings were based in the information in the spreading table. The PTO speed was set to 900 rpm and the feed set to



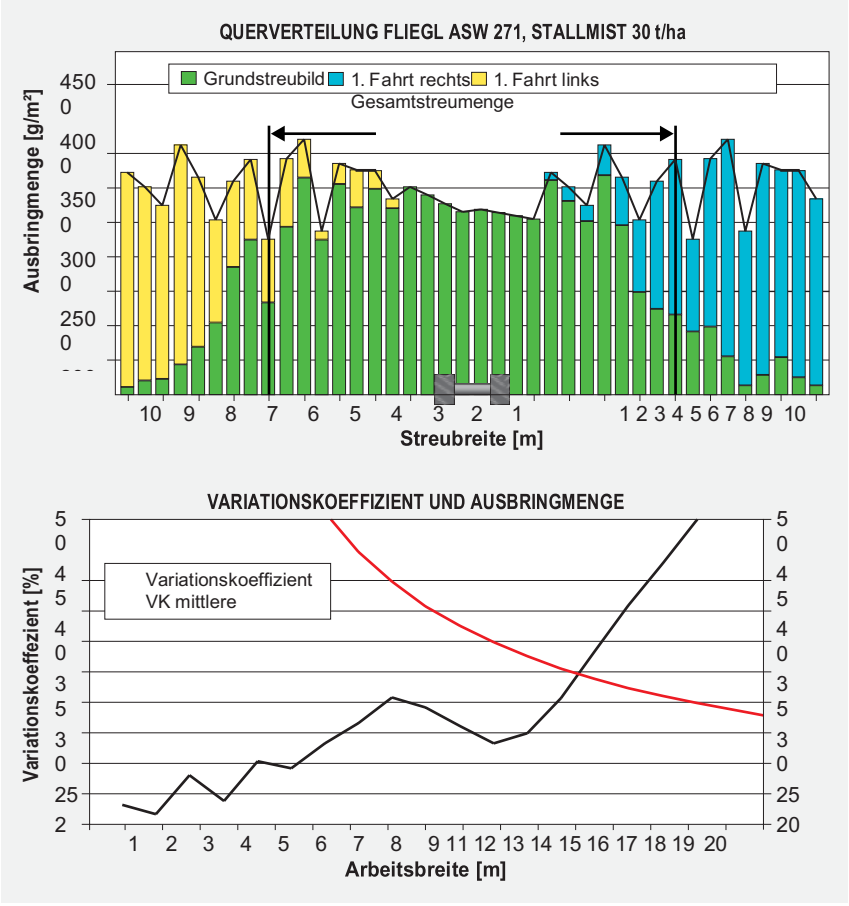
350 Nm with the Fliegl VarioSens (FVS)

Figure 6: Screenshot of FLIEGL VarioSens control terminal on FLIEGL ASW 271

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. For the higher discharge rate of 30 t/ha of stable manure, two optimisation steps were required in the DLG test in order to achieve very good (++) distribution qualities with a CV of 13.2%.



Figures 7 and 8:
Basic and complete spreading pattern (top) and coefficient of variation relative to the working width (bottom) with a stable manure discharge rate of 10 t/ha (settings as per manual: PTO 900 rpm; feed: FVS 350 Nm / max. 35%.; spreading flap open; travel speed 6.0 km/h)



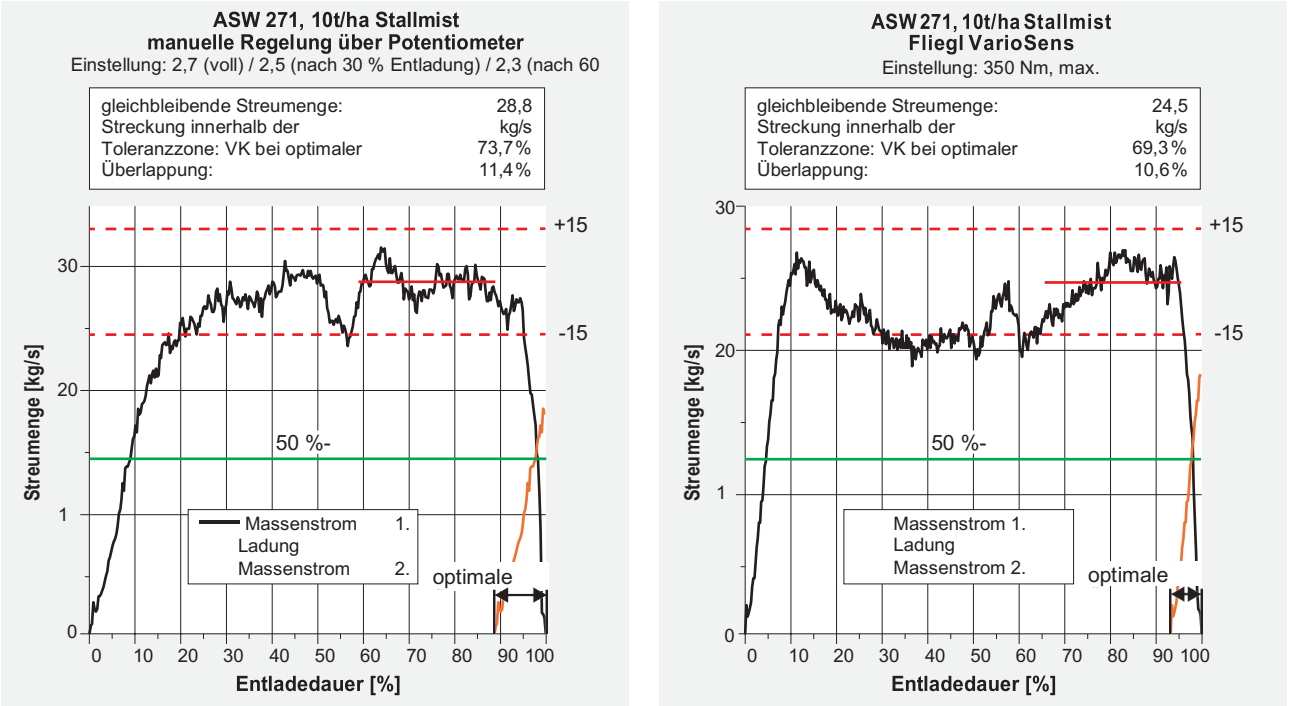
In this case, a PTO speed of 700 rpm and feed of 500 Nm (FVS) were identified as the ideal settings. The CV for transverse distribution reaches its optimum level at a working width of 12 m and then rises as the working width increases (see figures 9 and 10). The predefined target rate of 30 t/ha was also effectively maintained at a travel speed of 5.5 km/h (ACTUAL = 29.7 t/ha).

Longitudinal distribution of stable manure

Two equipment variations were tested on the Fliegl ASW 271 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.

The figures below provide a graphical representation of the discharge processes for both versions, with figures 11 and 12 covering the discharge rate of 10 t/ha and figures 13 and 14 showing the results for 30 t/ha.

Figures 9 and 10:
Basic and complete spreading pattern (top) and coefficient of variation relative to the working width (bottom) with a stable manure discharge rate of 30 t/ha; settings with 2nd optimisation: PTO 700 rpm; feed: FVS 500 Nm / max. 35%; spreading flap open; travel speed 5.5 km/h.



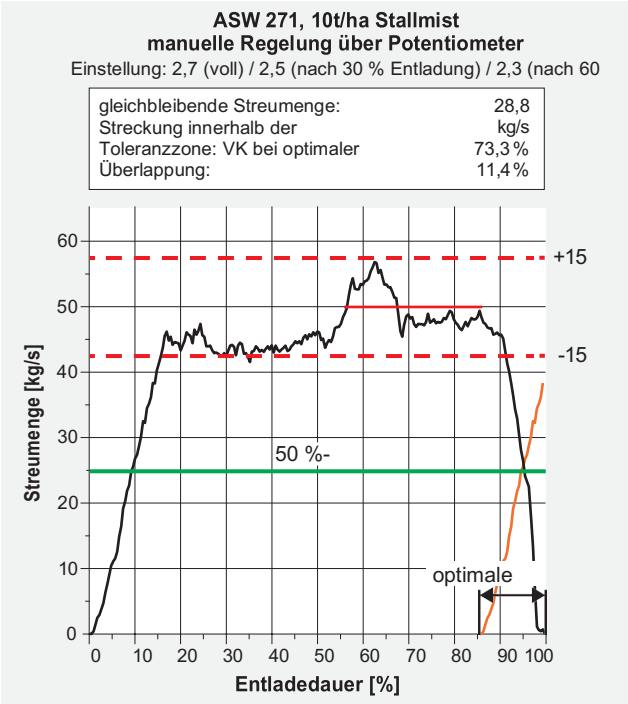
Figures 11 and 12:
Longitudinal distribution of ASW 271 for 10 t/ha of stable manure – manual control via potentiometer (left) / automatic control with Fliegl VarioSens (right)

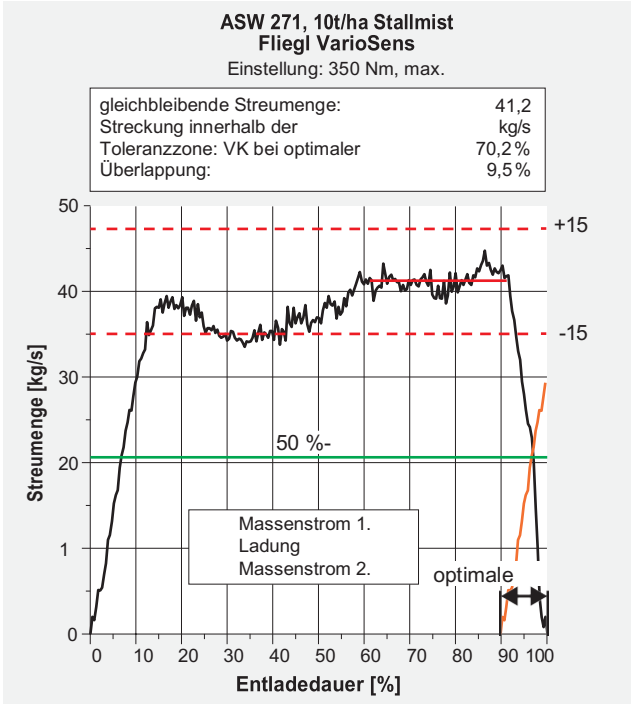
Upon examination of these curves, the very steep rise at the start of the unloading process and the rapid decline of the spreading rate at the end of the process stand out as particularly positive. While some variations are apparent in the discharged material rates for each time interval, these are generally within the accepted tolerance range of ± 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.

In longitudinal direction, the calculated coefficients of variation achieve very good values of close to 10% (++) in the DLG test for both equipment versions and discharge rates.
In each case, dilation within the tolerance zone is around 70%, which represents a high level.

The necessary adjustment of the feeds via the potentiometer 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.





Figures 13 and 14:
Longitudinal distribution of ASW 271 for 30 t/ha of stable manure – manual control via potentiometer (left) / automatic control with Fliegl VarioSens (right)

Conclusion

In the DLG test, the Fliegl ASW 271 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. In transverse direction, good results (CV = 18.5% / +) are attained for the lower discharge rate, with very good (++, CV = 13.2%) distribution qualities achieved for the higher discharge rate. In longitudinal direction, the calculated coefficients of variation are in the very good range (++), with values approaching 10%.

For both equipment versions and discharge rates, dilation within the tolerance zone is at a high level, with values close to 70%.
However, 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

DLG e.V.
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Max-Eyth-Weg 1
64823 Groß-Umstadt
Germany

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 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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