Julius Kühn-Institut
Federal Research Centre for Cultivated Plants

ENTAM

ENTAM - Test Report

Sprayer type: Self propelled Field Crop Sprayer
Trade mark: Agrifac
Model: Condor Endurance 2

Manufacturer:
Agrifac Machinery B.V.
Eesveenseweg 15
8332 JA Steenwijk
Netherlands

Test report: D - 2263
November 2021

Assessment table

Table 1: Assessment table

Number	Contents	Assessment
1	spray tank surface roughness	++
2	spray tank over volume	+
3	volume of total residual	+
4	spray tank contents gauge from 10% to 20% filling	+++
5	spray tank contents gauge from 20% filling	+++
6	effectivity of agitation system	++
7	width of nozzle bar section	+++
8	boom height adjustment range	+++
9	accuracy of pressure gauge	++
10	accuracy of flow meter, see no.14	
11	regulation speed	+++
12	even transverse distribution	++
13	size of rinsing water tank	+
14	deviation of volume/hectare adjustment device from desired value	not measurable while stepless
15	repeatability of volume/hectare adjustment device	+
16	pressure drop between manometer and nozzle	++
17	deviation of single nozzle output from table	++

Assessment keys are listed at the end of the report.

Note:
The layout of German ENTAM reports has changed because German federal authorities are directed to publish only documents accessible for people with a disability on their internet pages.

Technical data of sprayer

Tanks + pumps:
- 7900 liter tank
- Electronic contents indicator
- 768.52 liter rinsing water tank
- 39.60 liter hand wash tank
- 1 pumps Altek P500 with 322 liter per minute at 4 bar for agitation and spraying
- 1 pump Hypro centrifugal pump 9343P as filling pump

Spray boom:
- 36 meter working width, 7 mechanical segments
- Single nozzle switching
- Infinitely variable from 300 mm to 2900 mm
- 9.2° pendulum device
- Pressure recirculation system for spray liquid

Frame + chassis + drive:
- All-wheel steering and 2000 mm to 3100 mm adjustable rack width
- Ground clearance 1150 mm with tyres 480/80R50
- Hydraulic suspension
- Stepless hydraulic drive

Dimensions + weights:
- Total length 11200 mm
- Height 3960 mm
- Width 3000 mm
- Empty weight 14500 kg

Description of sprayer

The field sprayer consists of a steel profile frame with mounted tank. Self-propelled sprayer has all-wheel steering, pneumatic suspension and hydraulically adjustable track width. The axles have an adjustable track width from 2000 mm to 3100mm. The field sprayer is approved for a road speed of up to 40 km/h. 50 km/h is possible as an option. The machine is powered by a 195 kilowatt diesel engine.

The spray tank with a nominal volume of 7900 l is made of fibre-reinforced plastic. The tank has an excess volume of 5.76 % for foam retention. The field sprayer is equipped with two pumps, one for spraying and agitation and another for filling. For internal tank cleaning, five rotating nozzles are fitted in the centre section of the tank. In the tested version, the field sprayer is equipped with the Altek P 500 pump for spraying and agitation and a Hypro 9343P pump for filling. The intensity of the agitation adjusts automatically to the tank level or can be controlled manually via the terminal (depending on the amount of remaining spray liquid). The recirculation system allows all the liquid in the spraying system to be diluted (up to the nozzles), which ensures that the target concentration is present at the nozzles immediately at the start of application.

The fresh water tank with a capacity of 768 litres is also made of fibre-reinforced plastic and is located at the rear of the field sprayer. The content is shown on the display in the driver's cab. The fresh water tank can be filled via the suction line of the cleaning pump or directly.

The boom consists of 7 foldable segments made of steel. The outer sections are equipped with a mechanical obstacle avoidance function. The boom is folded hydraulically to the side of the sprayer. The lateral boom sections can also each be individually raised by up to 7.3° against the horizontal or lowered by 5.5°. The height adjustment is infinitely variable hydraulically via the parallelogram from 240 to 2900 mm. The pendulum range is up to 8.5° against the horizontal. The tested device is equipped with a slope compensation system that can compensate for slopes of up to 15 %. Four ultrasonic distance sensors automatically take over the height control of the boom, whereby the boom is automatically raised and lowered when it is lifted and reinserted at the headland. The desired distances between the nozzles and the target level can be specified by the user.

All spraying, GNSS steering, vehicle data, operating and job management relevant data are displayed, selected and set via the terminal. All necessary parameters are entered in the terminal via the touch display and function keys. The cab is fully air-conditioned and complies with cab category 2 (optionally cat. 4). For a better overview, several cameras are placed on the machine, which can be controlled via the terminal.

Result table

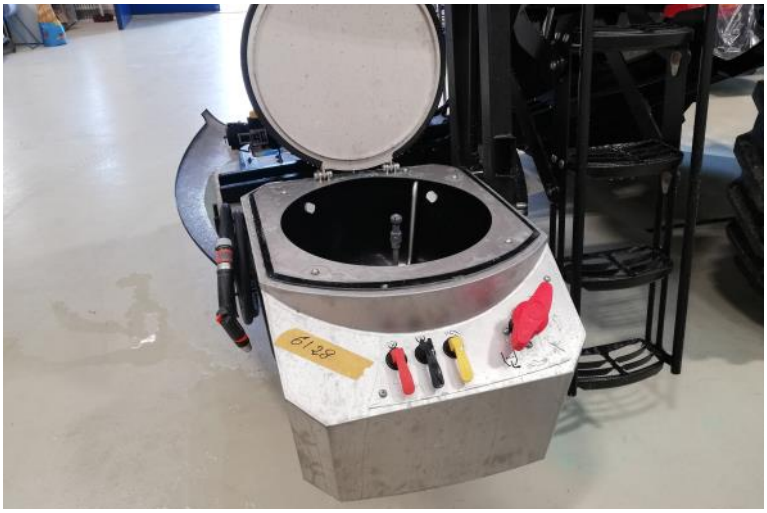
Table 2: Result table

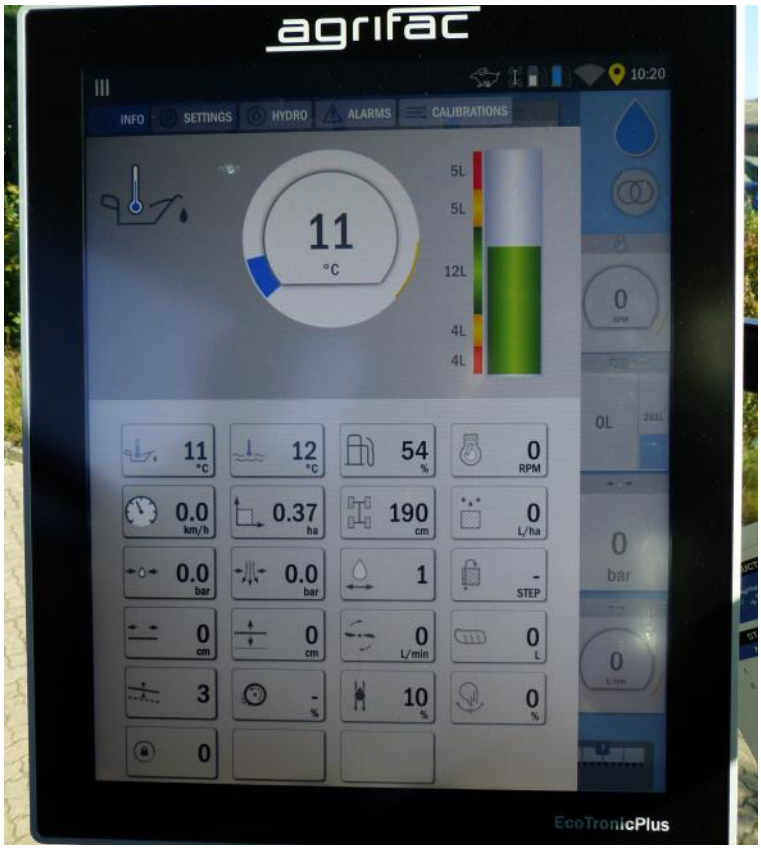
Requirement	Result
spray tank over volume	5.76 %
spray tank contents gauge graduation marks	electronical display
spray tank contents gauge deviation between 10 - 20 % tank filling	1.64 %
spray tank contents gauge deviation over 20 % tank filling	1.65 %
spray tank surface roughness	0.04676 mm
rinsing tank volume	768.52 liter
rinsing and dilution possible?	yes
cleaning performance of tank (cleaning effectivity)	96.61 %
rinsing efficiency of can rinsing equipment	0.0046 %
manometer graduation marks	0.10 bar
manometer deviation	0.10 bar
agitation system performance (deviation from even concentration)	9.27 %
dilutable residual in spray tank (on level ground)	63.99 liter
non dilutable residual in spray tank	non
spray boom height adjustment range from - to	300 - 2900 mm
spray boom nozzle ground contact protection?	yes
spray boom pressure loss between manometer and nozzle at 5.0 bar	4.8 %
spray nozzles dripping after switch off	non
maximum deviation of single nozzle flow rate from table	- 4.9 %
maximum deviation of single nozzle flow rate from mean	3.9 %
spray boom transverse distribution with nozzle: TeeJet XR 12004	
transverse distribution at 40 cm and 3 bar	4.65 % CV
transverse distribution at 50 cm and 3 bar	4.12 % CV
transverse distribution at 60 cm and 3 bar	5,23 % CV
volume/hectare adjustment device - spray computer	
spray computer repeatability of adjustment deviation, ascending maximum	- 5.98 %
spray computer repeatability of adjustment deviation, descending maximum	- 5.68 %
spray computer regulation speed, switching on/off single sections	2.2 seconds
spray computer regulation speed, switching on/off complete sprayer	4.4 seconds
spray computer reaching steady state in varing conditions, changing gear	stepless drive

Explanation on testing:
Testing takes place according to the Technical Instructions for ENTAM-Tests of Field Crop Sprayers (Rel.5). This procedure was developed by the competent testing authorities of the European countries participating in ENTAM and is based on the standard EN ISO 16119. This test is only a technical performance test which takes place without an accompanying field test. The test results apply only to the tested appurtenances of the sprayer. Statements on the behaviour of the sprayer with different appurtenances cannot be derived from these results.

Pictures of sprayer

Pictures of sprayer





Assessment keys for assessment table

Table 3: Assessment keys for table 1 Assessment table

assessment point	unit	+	++	+++
1	mm	> 0.070 - 0.1	0.030 - 0.070	< 0.030
2	%	5 - 8	> 8 - 12	> 12
3	of allowed value	> 2/3	1/3 - 2/3	< 1/3
4	%	7.5 - 5.0	< 5.0 - 2.5	< 2.5
5	%	5.0 - 4.0	< 4.0 - 2.0	< 2.0
6	%	> 10 - 15	5 - 10	< 5
7	m	4.5 - 6	> 3 - 4.5	3 or less
8	m	1 - 1.5	> 1.5 - 2.0	> 2.0
9	bar	> 0.10 - 0.20	> 0.05 - 0.10	0.00 - 0.05
10	%	4 - 5	2 - 4	0 - < 2
11	% or seconds	> 7 - 7.5	> 3 - 7	0 - 3
12	CV	> 7 - 9	4 - 7	< 4
13	% of nominal tank volume	10 - 12	> 12 - 15	> 15
14	s	> 4 - 7	2 - 4	< 2
15	deviation %	> 4 - 6	2 - 4	< 2
16	%	> 7 - 10	3 - 7	< 3
17	%	> 7 - 10	3 - 7	< 3

Pictures:
Page 6, top: Left side of the sprayer.
Page 6, middle: Unfolded boom, Right boom side of the Self propelled Field Crop Sprayer.
Page 6, bottom: Tank interior after the agitator test.

Page 7, top: bowl at the front under the cabin.
Page 7, middle: Induction bowl.
Page 7, bottom: Terminal with multifunction lever in the right corner of the cabin.

Responsibility and recognition

Performing competent authority
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This test is recognized by the ENTAM members

HBLFA Francisco Josephinum BLT Wieselburg (Austria). Recognition number BLT ProtNr. 022/21

CMA-Administració de la Generalitat de Catalunya, Centre de Mecanització Agrària (Spain). Recognition number PHP 05/21

ENAMA Ente Nazionale per la Meccanizzazione (Italy). Recognition number ENTAM „Rapporto di prova prestazionale" 05/2021

INRAE - Institut National De Recherche en Agriculture, Alimentation et Environnement (France). Recognition number INRAE/CEMAGREF/21/033

ŁUKASIEWICZ-PIMR – Sieć Badawcza Łukasiewicz – Przemysłowy Instytut Maszyn Rolniczych (Poland). Recognition number Ł-PIMR-320/ENTAM/21

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