DLG Test Report 6800

Vredestein

Traxion Optimall

Efficiency advantages
by VF technology?

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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 recognized 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 valuation bases of the test results will be specified in consultation with an expert group of DLG.

They correspond to the recognized 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 series “Efficiency advantages by VF technology” includes tests on the efficiency of high-flexion tractor tyres in various application areas. By using defined constant traction force values the resulting speed as well as the fuel consumption on the field were determined. This was done under comparable ground and slip conditions and provides an indication about the specific fuel consumption related to the power supplied. The kappa/slip curve for each tyre was also determined on the field. It allows an indication of the traction force transferred with similar slip depending on the tractor’s weight.

The measurements were carried out with the Vredestein tyre type Traxion Optimall originating from the segment of VF tyres in comparison to an IF tyre and VF tyres of European premium competitors. The here tested sizes: 650/65 R34 respectively 600/70 R34 on the front axle and 710/75 R42 on the rear axle. Details can be found subsequently in Table 2.

For the assessment of the measurement results tyre sets of similar, respectively available sizes of two additional well-known European tyre manufactures from the premium segment were tested under the same conditions. Here the tyre pressures of all test candidates were set based on the manufacturer specific tyre pressure tables and based on the actual wheel loads determined immediately before the test.

The Product

Manufacturer and applicant

Apollo Vredestein B.V., P.O. Box 27,
7500 AA Enschede, The Netherlands

Product: Vredestein Traxion Optimall

Description and Technical Data

Technical instructions and data can be found on the manufacturer's website:

http://www.vredestein.com

Assessment – Brief Summary

In the "kappa/slip ratio" category the Traxion Optimall performed best in comparison to its competitors. This might not be surprising in the direct comparison with an IF tyre, but it also proved its better performance in comparison to another VF tyre. This effect is most noticeable in the main working range of 5-20 % slip.

In the second sub-test on the specific fuel consumption under constant working conditions the test candidate demonstrates under the given conditions that it is able to use the fuel most efficiently. This results in a better area output und subsequently in a cost reduction per area worked.

Table 1:
Results of the Traxion Optimal, Overview

Test criterion	Evaluation*
Fuel consumption	+ +
Area output	+ +
Kappa/slip behaviour	+ +

* Evaluation range: + + / + / ○ / – / – – (○ = standard)

Figure 2:
Towing tractor and braking tractor in use

The Method

The sets of tyres to be tested were first mounted on the test vehicle, in this case for the field work a Claas Axion 950 C-Matic with continuously variable transmission. The load was simulated by means of a braking tractor, here a Claas Xerion 4000, also with continuously variable transmission. For the field test the two tractors were connected by a steel cable with integrated traction load cell. In addition, a Peiseler wheel was attached to the towing vehicle. This provided the actual driving speed across ground during the test. The wheel slip was determined from the measurement of the towing tractor's wheel speed and the rolling circumference of the tested tyres. The fuel consumption for the determination of the energy efficiency was recorded using a volumetric measurement system on the towing tractor. The test sequence was identical for each set of tyres. In the first sub-test the fuel consumption was determined with a constant speed setting on the towing vehicle as well as a constant traction load from the braking vehicle. This was based on load data measured on a cultivator during standard stubble cultivation in the field. In the second sub-test, the aim was to calculate the kappa/slip curve under the ground conditions given at the test location. For this purpose a constant speed was set on the towing vehicle and the traction requirement was continuously increased via the braking vehicle up to a wheel slip of 40 %. With respect to moisture, the prevailing ground conditions at the time of the test were recorded by random sampling over the whole test field.

Figure 3:
Ground conditions test field
(winter wheat; shallow stubble cultivation with disc harrow; black earth from loess; average soil moisture 21 % in approx. 10 cm depth)

Table 2:
Test details

	Vredestein VF		Reference IF		Reference VF	
	FA	RA	FA	RA	FA	RA
Test combination	Traxion Optimall	Traxion Optimall	– –	– –	– –	– –
Dimension	VF 650/65 R34 NRO	VF 710/75 R42	IF 650/65 R34	IF 710/75 R42	VF 600/70 R34	VF 710/75 R42
Load index	170D	184D	161D	176D	167D	181D
Average tread depth [mm]	65	71	64	72	62	73
Number of tread lugs	20	21	20	21	20	21
Tyre tread width without load [mm]	625	677	601	654	543	637
Load per axle test vehicle field [kg]	7121	10636	6981	10814	6782	10785
Max. measured load capacity test vehicle field [kg]	3560	5318	3490	5407	3391	5392
Min. test pressure field according to manufacturer	0.65	0.65	1.00	1.10	0.80	0.85

The Test Results in Detail

In the first sub-test the specific fuel consumptions shown in Figure 4 were measured with an approximately constant traction requirement of 70 kN. This implies that according to the work done under the test conditions the fuel requirement of the Vredestein tyre was clearly better in comparison with the reference products. Compared with the IF technology this is certainly not surprising. However, the measurements showed that even with similar ones, namely in comparison with another VF tyre an additional improvement was achieved.

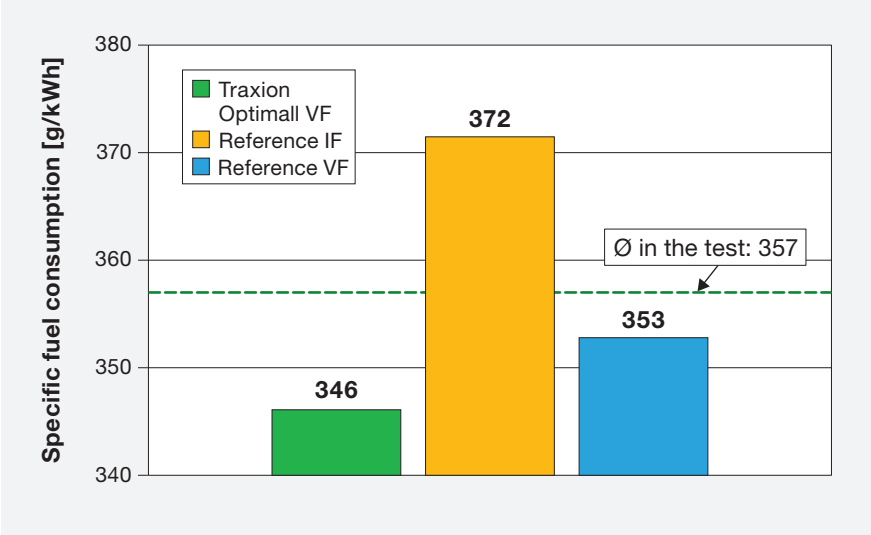


Figure 4:
Specific fuel consumption

Based on the boundary conditions of the reference attachments, which were taken as a basis for the tractor settings, in this case a cultivator with known work width and depth, the area in hectares worked per hour was calculated. The results are shown in Figure 5.

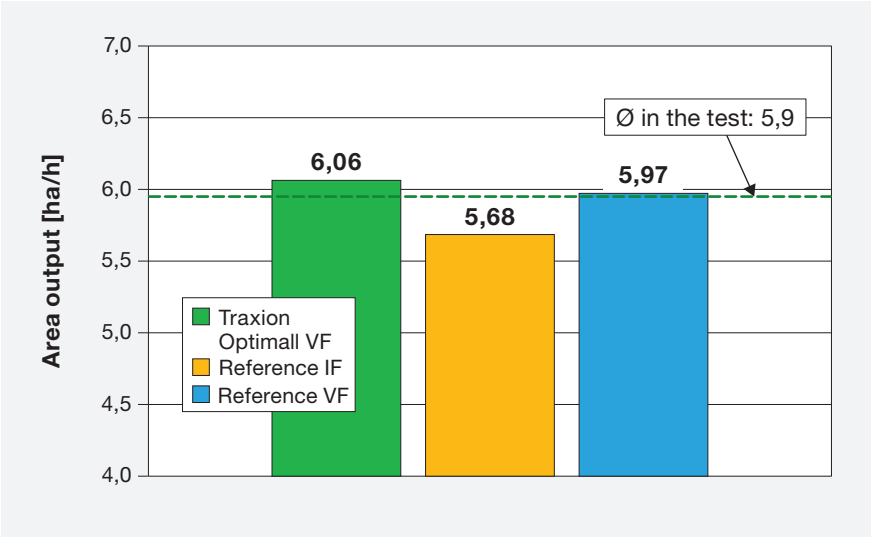


Figure 5:
Result for the resulting area treated

The differences in the specific fuel consumption also become clear here. The work output of the Traxion Optimall on a similar area is approximately 7 % faster than of the third placed. The advantage to the second placed VF candidate still is 1.5 %. The resulting work speeds influenced this result as a consequence of the varying slip conditions.

Based on the area efficiency, as shown in Figure 6, a comparison of the absolute fuel consumption/fuel consumption related to land usage can be performed. The total result also reflects the advantage for the Vredestein tyre.

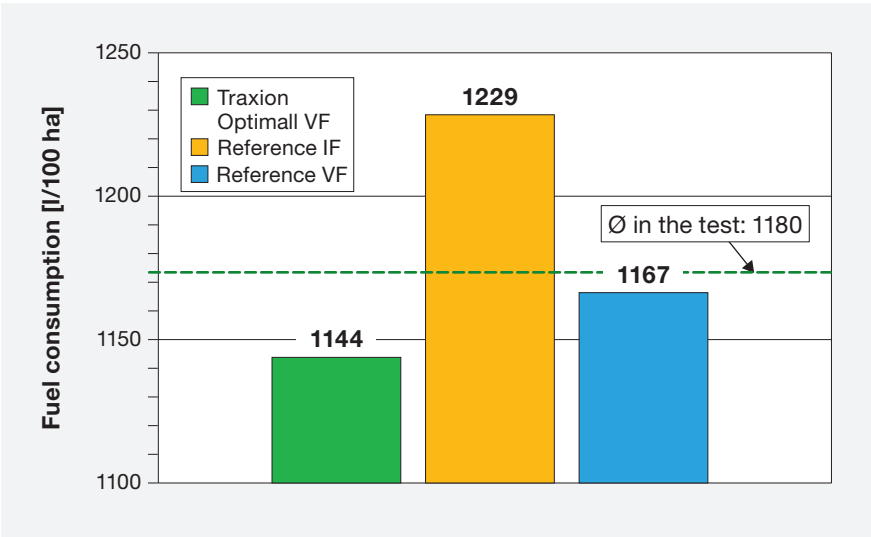


Figure 6:
Result for fuel consumption per 100 ha

The economic added value becomes even clearer under consideration of the costs based

on two main factors, fuel and driver. Of course, the relevant area size and a long-term observation have to be carried out. The results are shown in Figure 7. The saving in comparison to an IF tyre is approximately 7 % or 162 € per 100 ha, whereas even to a VF competitor a cost advantage of 1.7 % or 40 € per 100 ha can be observed.

In the measurements of the kappa/slip behaviour we calculate the maximum transferable traction force depending on the slip and in relation to the total tractor weight used. This relation is shown by the kappa traction force coefficient without unit. The maximum possible efficiency value would be achieved with kappa=1.

The results in Figure 8 have been shown in scaled format for a better and more detailed overview. It shows the load efficiency under defined slip conditions. Due to the relation between working speed and driving speed a direct relation between the area output and subsequently the fuel consumption efficiency exists. In all areas, the Traxion Optimall performed best. The major reason for this is that the active tyre contact area under the set pressure conditions was created most efficiently by the Traxion Optimall tyre. Herewith a significant difference came up from the test, but the determined actual tyre tread widths without load from the overview table should be considered for the interpretation of the results.

The overview in Figure 9 shows the absolute kappa/slip curves in the range of 5-40 % as a supplement.

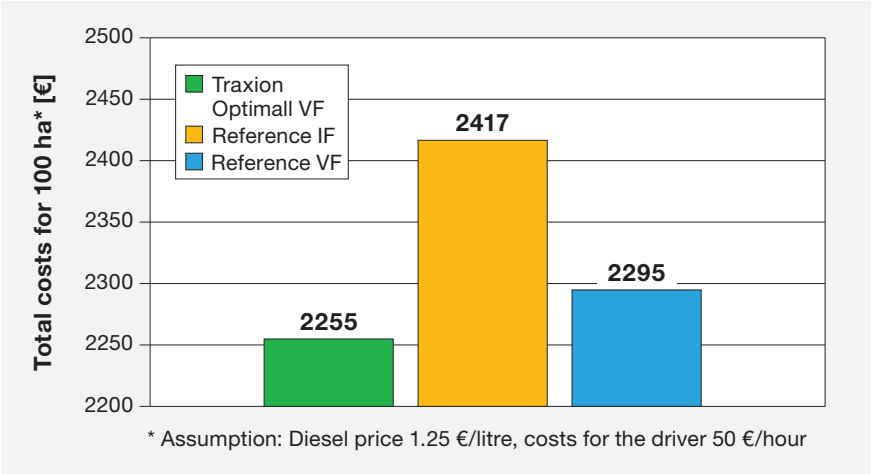
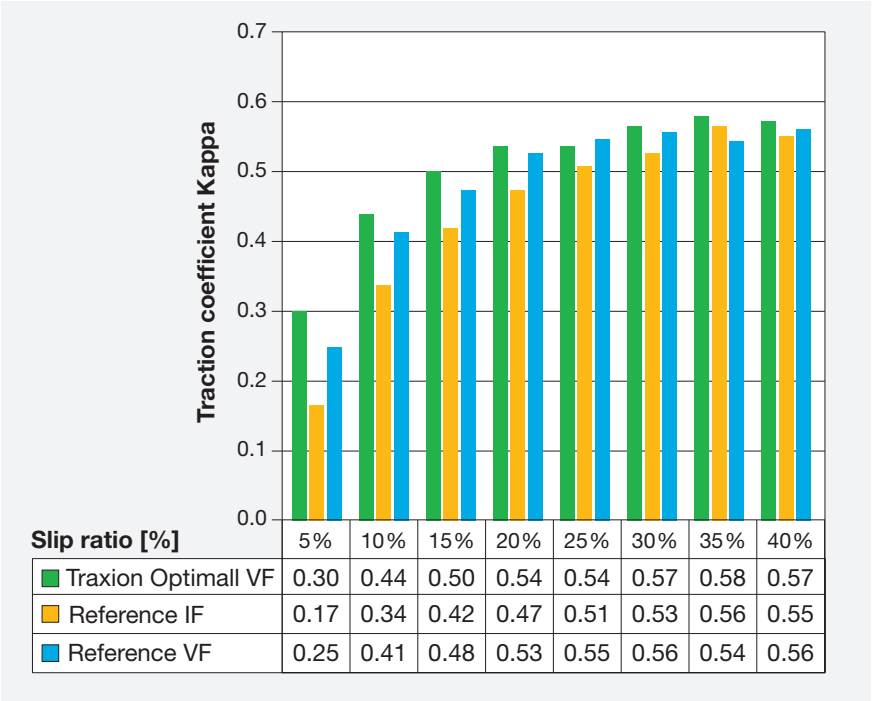


Figure 7:
Result of the costs resulting from the measurement results based on two important factors



Slip ratio [%]	5%	10%	15%	20%	25%	30%	35%	40%
Traxion Optimall VF	0.30	0.44	0.50	0.54	0.54	0.57	0.58	0.57
Reference IF	0.17	0.34	0.42	0.47	0.51	0.53	0.56	0.55
Reference VF	0.25	0.41	0.48	0.53	0.55	0.56	0.54	0.56

Figure 8:
Result of kappa/slip curve scaled

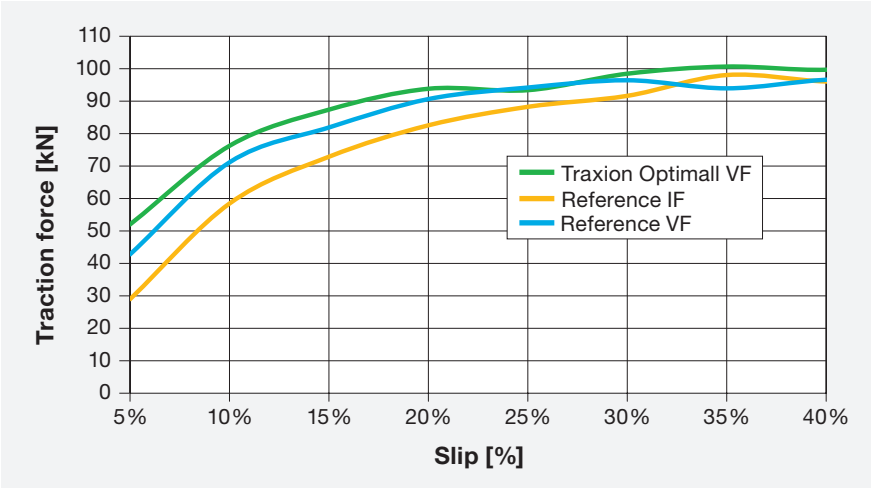


Figure 9:
Results of traction force curve total

Summary

With regard to efficiency during the simulated traction work, the tested tyre combination of the Vredestein Traxion Optimall with VF 650/65 R34 on the front axle and VF 710/75 R42 on the rear axle is the best performer in all shown areas. In the lower slip range until 20 % a significantly more positive behaviour can be observed when assessing the single values. Certainly the differences of the tyre tread widths, especially in direct comparison with the VF tyre, have an impact on these results. This should be considered during the evaluation of the results.

Of course, the results are reflected in the measurements of the specific fuel consumption during the constant drive. The differences are obviously approximately 7 [g/kWh] lower compared to the direct VF competitor under the given conditions. Naturally this implies increasing economic advantages with increasing sizes of the area worked, namely: 7 % to IF and 1.7 % to VF. Especially as with a similar area size, following the higher area output, e. g. the cost for the driver will be reduced.

The Vredestein Traxion Optimall demonstrates clearly the advantages of the VF technology for the field cultivation. However, the precondition is always the adjustment of the tyre pressure according to the relevant load situation.

More information

Further tests on agricultural tyres are available for download under **www.dlg-test.de**.

The DLG committee for work management and process engineering has published two instruction leaflets on the topic “automatic steering systems” titled “GPS in the agricultural sector” (leaflet no. 316) and “Satellite positioning systems” (leaflet no. 388).

The leaflets are available free of charge in PDF format under **www.dlg.org/merkblaetter.html.**

Test performed by

DLG e.V., Test Center Technology and Farm Inputs, Max-Eyth-Weg 1, 64823 Groß-Umstadt, Germany

Area of expertise

Vehicle engineering/vehicle testing

Project director

Dipl-Ing (FH) Andreas Ai

Test engineer(s)

Dipl-Ing (FH) Niels Conradi*

* Author

The DLG

In addition to being the executing body of well-known tests for agricultural engineering, farm inputs and foods, the DLG is also an open forum for the exchange of knowledge and opinions in the agricultural and food industry.

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The DLG Test Center Technology and Farm Inputs

The DLG Test Center Technology and Farm Inputs in Groß-Umstadt is the benchmark for tested 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 utilizing state-of-the-art measurement technology and testing methods gained from practice.

As an accredited and EU registered testing laboratory the DLG Test Center Technology and Farm Inputs offers farmers and practitioners vital information and decision support for the investment planning for agricultural technology and farm inputs through recognized technology tests and DLG testing.

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DLG e.V.
Testzentrum Technik & Betriebsmittel
Max-Eyth-Weg 1 • 64823 Groß-Umstadt
Telefon: +49 69 24788-600 • Fax: +49 69 24788-690
Tech@DLG.org • www.DLG.org