



SPRAY APPLICATION MANUAL FOR GRAIN GROWERS

Module 15 Weight, balance and tyres

Impact on sprayer performance and safety

Graham Betts

Key points

- The load index of the sprayer's tyres will determine the weight that it can carry at any given speed, so having a tyre with an inappropriate load index may require the tyre pressure to be increased to carry the load
- Increasing the inflation pressure in the tyre to its maximum can affect the sprayer's handling, operator comfort and the life of the tyre
- The weight and balance of the sprayer needs to be taken into account when selecting tyres and determining appropriate tyre pressures
- Always consider the sprayer manufacturer's recommendations for weight and balance (ballast limits) and the tyre manufacturer's recommendations for installation and load index





Introduction – sprayer weight, balance and tyres



Remote systems for checking tyre pressure

1. Introduction

Tyre selection for sprayers can be quite different to other pieces of farm machinery. A spray rig can go through a cycle of having either a full spray tank or an empty one, having the boom folded or unfolded, and may be travelling at different spraying speeds or road speeds. All of these can place different demands on tyres, particularly inflation pressures.

The weight and balance of the sprayer must be taken into account when selecting a suitable tyre. If the sprayer's weight is not correctly balanced, this can make the choice of a suitable tyre and inflation pressure very challenging.

Weight, balance and tyre pressure may affect the performance of functions such as auto-steer and auto height control, and will impact on the operator's comfort. Weight, balance and tyre pressure may affect the performance of functions such as auto-steer and auto height control, and will can also have a significant impact on tyre wear, traction and fuel economy.

When the tyre type is not matched to the sprayer that it is fitted to, the tyre pressure may need to be set at the tyre manufacturer's maximum pressure to be able to carry the loads required of a full sprayer. At the maximum inflation pressure, the tyre wall's flexing ability can be compromised, and the shape of the tyre tread contacting the soil could be a 'V' shape, rather than being flat. Running the tyres at maximum pressure can lead to damage to the wheel tracks.





Tyre information – importance for purchase

2. Terminology used to describe tyre specifications

Every tyre has a lot of information stamped on the side wall that describes the it's specific capacity, operating criteria and requirements for its installation onto the wheel rim.

This information is also available in the manufacturer's technical literature. For example, the information included in Table 1 is supplied by Michelin for the sprayer tyre SprayBib, VF380/90 R46, R-1, 173D

Tyre acronyms, symbols and terms used

10LT	low torque, maximum speed 10km/h	LSI MFWD	load speed index mechanical front-wheel drive
10HT	high torque, maximum speed	psi	pounds per square inch
	10km/h	OD	overall diameter
В	high rim flange	ΡΤΟ	power take-off
CTI	controlled tyre inflation	PR	ply rating
CVT	constantly variable	RC	rolling circumference
	transmissions	RCF	rolling circumference front
DTR	drive train ratio	RCI	rolling circumference index
DW	drop well, drop well shaped rim	RCR	rolling circumference rear
FR	free rolling	SH	section height
FWA	front-wheel assist	SLR	static load radius
HP	horsepower	SLW	section loaded width
IAR	inter axle ratio	SRI	speed radius index
IF	increased flexion	SW	section width
IVT	infinitely variable transmissions	VF	very high flexion
L	low rim flange	W	well, wide drop centre,
lbs	pounds		single well shaped rim



Table 1 Michelin VF 380 90 R46 specification sheet.

VF 380/90 F	380/90 R46 173D TL SPRAYBIB							
MSPN: 273	58	CAI: 198604	CAI: 198604					
Load per ty	re (single)	* All load value * 30 km/h: high	* All load values are for maximum indicated sp * 30 km/h: high torque work or max. road spee					
65 km/h	Pressure	* All load value	* All load values for ground slopes up to 20% (above 20% consult Michelin).					
4375kg	2.2 bar		Tire Tec	chnical data		"Rims		
4625kg	2.4 bar	Unloaded Dim	ensions	Loaded dimen	isions	(preterred in bold)		
4810kg	2.6 bar	Overall	Overall	Loaded	Rolling	DW 13A W 13A		
5110kg	2.9 bar	WIDTN	diameter	radius	circumterence	W 13 DW 12A		
5450kg	3.2 bar	383mm	1842mm	848mm	5530mm	DVV 12		
5800kg	3.6 bar		"Rolling Cir Inde	cumference x 46"				
6375kg	4.3 bar		"Number of Lu	ıgs 32 x 2"				
6500kg	4.4 bar					Minimum		
Tube MSPN	Tube CAI	Gross flat plate		100% Tyre volume	Centreline tread depth	Dual/Iriple Spacing		
		1720sq. cm		411 litres	38mm	510mm		

Michelin: the tyre manufacturer's name

SprayBib: the tyre model (in this instance also describes the tread pattern)

- **VF:** the tyre category, e.g. very flexion (VF). There are several tyre categories discussed after this overview.
- 380: tyre tread width in millimetres (mm)
- **90:** is the ratio/percentage of section height from the bead to the top of the tread (e.g. 90% of 380mm = 342mm). This ratio will change as the tyre wears, which will have an effect on the rolling circumference, which is particularly important for the lead or lag for four-wheel drive tractors.

R: 'radial'

46: indicates the rim size in inches that the tyre must be fitted to

173: the load index, 173 = 6500 kilograms. This figure is the metric version of ply, star rating that can be seen on some tyres.

D: the speed symbol, 'e.g. D = 65kilometres per hour'.

DW13A: Approved rim, permissible rims: W13A, W13A, W13, DW12A, DW12, W12A, **Rolling circumference:** 5530mm

Load per tyre (single): maximum of 6500kg at the maximum pressure of 4.4 bar (64 psi) at 65km/h.

A specific code for the tyre tread pattern is not included here, but this code may need to vary for different situations. Often it may be listed as R-1, R-1W, R2, R3 or R4. Tread patterns are discussed further in section 2.5 of this module.



2.1 Tyre categories

Standard tyres generally have an 'R' for 'radial' stamped onto them and no other symbols or codes.

Increased Flexion (IF) or Advanced Deflection Design (AD2[™]) are tyres that have sidewall flexibility which allows them to carry loads that are 20 per cent greater than a standard tyre inflated at the same pressure.

Similarly, the IF and AD2 tyres can carry the same load as a standard tyre, but at a 20 per cent lower inflation pressure. By reducing the ground-bearing pressure by 20 per cent, better flotation and less compaction will occur, while still maintaining traction in wet soil conditions.

Very Flexion (VF) technology offers even greater sidewall flexibility than 'IF': Increased Flexion (IF), allowing for a 40 per cent increase in load capacities at the same inflation pressure as a standard radial, as well as the ability to carry the same load at 40 per cent lower inflation pressures than a standard radial.

Unlike standard sprayer tyres, there are no additional load bonuses allowed for IF and VF tyres at slower speeds.

2.2 The load index and corresponding weights the tyre can carry

Tyres will display a 'Load Index', typically as a three-digit number that corresponds to the weight that each tyre can carry at the recommended operating speed (see Table 2).

Load index	Weight in (kg)	Weight in (Ibs)	Load index	Weight in (kg)	Weight in (lbs)
149	3250	7150	167	5450	12,000
151	3450	7600	168	5600	11,300
157	4125	9100	170	6000	13,200
158	4250	9350	172	6300	13,900
159	4375	9650	173	6500	14,300
161	4625	10,200	175	6900	15,200
164	5000	11,000	177	7300	16,100
165	5510	11,400	179	7750	17,100
166	5300	11,700	187	9750	21,500

Table 2 Examples of the load index and the weights able to be carried by the tyre.



2.3 Load bonuses and self-propelled sprayers

The following information has been supplied by the Titan Tire Corporation, Iowa.

Typically, metric radial drive tyres that are rated for 25.0/30.0 miles per hour (40.2/48.3km/h) transport and service speeds can receive a 'load bonus' when travelling at slower transport speeds, for example:

- at 32.2 kilometres per hour (20 miles per hour), +7% can be added to the load rating for transport and service;
- at 24.1km/h (15mph), +11% can be added to the load rating for transport and service; and
- at 16.1km/h (10mph), +34% can be added to the load rating for transport and service.

These load bonuses DO NOT apply to self-propelled sprayers for transport and service speeds.

The tyres used on self-propelled sprayers are treated differently to normal metric radial drive tyres.

Self-propelled sprayer tyres that are rated for speeds of 40.2km/h (25mph) or 48.3km/h (30mph) for transport service **DO NOT** receive load bonuses for slower transport speeds.

The load bonus is only applicable for field service (spraying speeds or use in the paddock).

For a self-propelled sprayer tyre rated for 40.2km/h (25mph)/48.3km/h (30mph) , the load bonus at different spraying speeds (field service) would be:

- at 40.2km/h (25mph), +7% can be added to the load rating (for in-field use);
- at 32.2km/h (20mph), +14% can be added to the load rating (for in-field use); and
- at 24.1km/h (15mph), +22% can be added to the load rating (for in-field use)

In summary, the operator can gain a 22 per cent load increase for in-field use, if operating a 40.2km/h (25mph)/48.3km/h (30mph) tyre at 24.1km/h (15mph).

However, you would not get the load bonus if you were transporting the same load down the road at 24.1km/h (15mph).



- The operator must carefully assess the information provided by the tyre manufacturer regarding load bonuses before purchasing tyres, particularly for self-propelled sprayers.
 - Unlike standard sprayer tyres, there are no additional load bonuses allowed for IF and VF tyres at slower speeds.



2.4 Speed symbols used on sprayer tyres

The speed symbol is an abbreviation of operating speed: speed for a given load index An example is provided in Table 3.

Table 3 Examples of speed symbols and load indexes used on tyres.

Speed symbol (km/h)	Load index (km/h)
A6 = 30	B = 50
A8 = 40	D = 65

2.5 Tread patterns for sprayer tyres

There are four tread patterns that are commonly used for sprayer tyres, which are given the codes R1, R1W, R2, R3 and R4.

Choosing the Right Tyre



Source: Kenneth N. Brodbeck (2004) 'Choosing the Right Tire'

Summary of tread patterns available:

R1 Drive wheel, regular tread

The R1 tread is used for general farming and typically provides the best traction in most soil conditions. The tread is an aggressive pattern for developing traction in hard to soft soil conditions. The tread void area is approximately 70 per cent of the total footprint for good cleaning in wet soils and good penetration in firmer soils.

R1W Drive wheel, wet traction tread

This tread pattern originated in Europe and has a 20 per cent deeper skid depth than R1. European tractors often spend a higher percentage of time on paved surfaces and the deeper tread increases tyre life. This tread depth is popular in Europe and is becoming more prominent in North American markets.



R2 Drive wheel deep tread

A tread pattern used in wet farming applications where the machine must run through mud and standing water. Typical applications are rice, sugarcane and high-value vegetable crops. The tread is twice as deep as the standard R1 tread. While R2 looks extremely aggressive, the typical 45° bar angle is maximised for cleaning in wet soils and is not as efficient for developing traction as R1 in general farming conditions.

R3 Drive wheel, shallow tread

This tread pattern is a non-aggressive pattern where minimal ground disturbance is required, such as for airports, golf courses, cemeteries, roadside maintenance, dryland combining, and on large heavy trailers such as manure and grain carts. The tread typically has a relatively closed tread pattern to evenly distribute the load, with void area in the 30 per cent range.

R4 Drive wheel, intermediate tread

A tread pattern typically designed for construction and light industrial equipment, such as backhoes and small end loaders. The tread depth is approximately 70 per cent of the R1 tread, and is designed for good wear on roads and reasonable traction on soils at a construction site. The tread-to-void ratio is typically 50/50.



The article 'Choosing the Right Tire' can be found at: <u>elibrary.asabe.</u> <u>org/data/</u> <u>pdf/6/crt2004/</u> <u>Lecture28.pdf</u>

1	 PS

- It can be a good option to look at tyres with an R3 or R4 tread pattern. The R4 tyre has less impact on the soil because the lugs are approximately 50% contact and 50% void (not touching the ground). Less aggressive tread patterns also displace less air, which may improve deposition near wheel tracks.
- One strategy that has been employed by a number of operators is turning the tyres around on self-propelled sprayers, which results in pulling soil under the tyre, which can reduce soil damage, improve flotation and may make it easier to reverse out of a sticky spot.

2.6 Rolling circumference index

The rolling circumference index (RCI) is a number that corresponds to a specific rolling circumference (in millimetres). The rolling circumference is important for establishing the correct 'lead' for FWD: front-wheel assist and MFWD: mechanical front-wheel drive tractors. For more information on determining the 'lead', see section 5 of this module.

The rolling circumference may also be useful for calibrating wheel-based speed sensors.



RCI index	Rolling circumference (mm)	Revolutions per km	RCI index	Rolling circumference (mm)	Revolutions per km
43	4745	211	47	5850	171
44	5000	200	48	6165	162
45	5270	190	49	6495	154
46	5550	180	50	6845	146

Table 4 Conversion from RCI index to actual rolling circumference (millimetres).

2.7 Rim size and type

All sprayer tyres must be fitted onto an appropriate rim type, ideally the rim that is recommended by the tyre manufacturer. For some sprayers it may be necessary to change the rim types to match the type of tyre that is required to carry the sprayer's weight at the inflation pressures and speeds required by the operator.

Rim numbering information





Photo: Graham Betts

Rim information explanation

42: refers to the rim size (42") that the tyre is to be fitted to

DW: double well shaped rim (or drop centre contour). 'W' stands for single well shaped rim.

The different well types may make it harder or easier to install and remove the tyres.

- **16:** is the width of the rim e.g. 16.0". Tyre manufacturers recommend an approved rim, or permissible rim that their tyres are to be fitted to.
- A: describes the rim flange height and contour. Tyres are manufactured to fit onto particular rim's flanges (see Table 5).



Table 5 Flange codes and flange heights for selected rims.

Flange code	Flange height	Flange code	Flange height	Flange code	Flange height
L	25.4mm	J	17.3mm	E	19.8mm
К	19.7mm	F	22.2mm	D	17.5mm

2.8 Tyre beading pressure

Some tyres may have a symbol for the 'tyre beading pressure' moulded into the tyre to advise the tyre fitter what the recommended beading pressure is.

Bead pressure warning



Ideally the tyre will be left inflated at the recommended beading pressure for 24 hours (at least overnight) before the tyre is put under a load. This time allows the raised lines on the tyre bead to mould into and grip onto the rim.

For more information go to: <u>www.arianaring.</u> <u>com/en/</u> <u>terminology-en/</u> <u>agriculture-</u> <u>machines-rim</u>

Do not inflate tyres above the bead pressure warning. Allow them to stand overnight at this pressure before placing a load on them.

Source: Michelin

For more

information go to: agricultural. michelinman. com/us/Properlyuse-your-tires/ Fitting-andremoving-tyres



3. Establishing the sprayer's weight per axle

Before attempting to establish the sprayer's weight per axle (load per tyre), the spray operator should measure and record the current tyre pressures using a calibrated tyre air pressure gauge.

TIP

• Make sure the gauge is accurate. Take your tyre air pressure gauge to a tyre outlet and check it against one of their calibrated gauges. If it is not accurate, replace the gauge.

3.1 Weighing the sprayer

Weighing the sprayer (self-propelled, tractor with linkage, or tractor with trailing sprayer) to establish the weight per wheel, or weight per axle, should be done when the sprayer has the fuel, oil, main spray and flush tanks full.

The weight should only be checked when the sprayer is level, by using a weighbridge or single weigh pad.

It is ideal if the sprayer can be weighed per tyre, to see if there is any difference between left and right-hand-side tyres on the sprayer.

Record the following weights per tyre:

- main tank empty with boom folded, front and rear axle;
- main tank empty with boom unfolded, front and rear axle;
- main tank full with boom folded, front and rear axle; and
- main tank full with boom unfolded, front and rear axle.

Sprayer tyre on a weigh pad





Importance of matching tyre pressure to weight on each wheel.

Y)

Weigh the machine per tyre, allow the load and tyre type to be determined.

Photo: Graham Betts



TIP

• When purchasing tyres, you need to tell the tyre dealer what loads the tyre is expected to carry, the rim numbering and the size of the tyre required.

3.2 Case study of weights per wheel for a self-propelled sprayer

The information in Table 6 was obtained from a self-propelled sprayer. An analysis of the data and implications for tyre selection and operating pressure are discussed below.

Parameters measured	Left front	Right front	Left rear	Right rear	TOTAL	
Main tank empty, boom folded, kg	2740	2690	3300	3075	11,805kg	
Total axle weight, kg (lbs)	5430 (11,946)	6375 (14,025)		25,971lbs	
Percentage difference between front and rear axle	46	%	54%			
Main tank empty, boom unfolded, kg	2260	2120	3790	3645	11,815kg 25,993lbs	
Total axle weight, kg (lbs)	4380 (9636)		7435 (16,357)			
Percentage difference between front and rear axle	37%		63	3%		
Main tank full, boom folded, kg	2960	2885	5025	4680	15,560kg 34,232lbs	
Total axle weight, kg (lbs)	5845 (*	12,859)	9715 (21,373)			
Percentage difference between front and rear axle	38%		62	2%		
Main tank full, boom unfolded, kg	2450	2225	5785	5300	15,760kg	
Total axle weight, kg (lbs)	4675 (10,285)		11,085 (24,387)		34,672lbs	
Percentage difference between front and rear axle	30	1%	70)%		

Table 6 The recorded weights of a self-propelled sprayer.

Tyres fitted to the sprayer

The above self-propelled sprayer has had Michelin, SprayBib, VF380/90 R46, R-1, 173D tyres fitted onto rim number DW13A (when the original tyres had worn out).

Michelin recommended information for the above tyre: approved rim DW13A, rolling circumference 5530mm, maximum load 6500kg, maximum pressure of 4.4 bar (64 psi) at 65km/h.

Before weighing the above sprayer, the suggested cold tyre pressure was 2.1 bar (30 psi) for the tyres on the front axle, and 2.4 bar (35 psi) for the tyres on the rear axle.



1 2

Tyre pressure calculators: <u>agricultural.</u> <u>michelinman.</u> <u>com/us/pressure</u> <u>calculator/default</u> or <u>www.tirepressure</u> <u>calculator.com</u> After weighing the sprayer and using an appropriate tyre pressure tool, such as the Michelin Ag website (<u>http://www.michelinag.com/pressure_calculator/default</u>) or <u>www.</u> <u>tirepressrecalculator.com</u>, the suggested cold tyre pressure was 1.2 bar (17 psi) in the tyres on the front axle, and 3.6 bar (52 psi) in the tyres in the rear axle.

Note: If the sprayer was balanced e.g. 15,760kg $\div 2$ axles = 7880kg per axle, the front and rear cold tyre pressure could be 1.8 bar (26 psi) with the tyres fitted.

In this example, using the same tyres and an unbalanced sprayer, the cold tyre pressure could be 1.2 bar (17 psi) front tyres and 3.6 bar (52 psi) rear tyres. If the sprayer was balanced the cold tyre pressure could have been 1.8 bar (26 psi) all the way around.

As a guide, whatever the cold tyre pressure is, the operator should add about 2.0 psi to determine the pressure that is being put on the ground.

Working the tyre at its maximum load capacity and cold pressure rating could have an impact on the soil.

Recommended 1	Tire Pressure
17	PSI / 120 KPA
	Recalculate
Application Detai	ls
Application:	Spraying
Connedi	15mph

Calculating tyre pressure using web based tools



4. Weight and balance requirements for tractors towing trailing spray rigs

To determine the most appropriate tyres and inflation pressures the operator needs to know the weight of the tractor with linkage (including nose tank if fitted) or with the trailing sprayer connected.

Steps to check the weight and balance of a tractor and trailer

One: Check the tractor has suitable power for the task

Check the manufacturer's tractor manual or technical information for the recommended weight to horsepower ratio (or use Table 7 as a guide) to ensure the tractor is suited to the task.

Tractor type	< 7 km/h	8 km/h	> 9 km/h
2WD & MFWD	60kg/HP (132lbs/HP)	56kg/HP (123lbs/HP)	49kg/HP (108lbs/HP)
4WD	30kg/HP (66lbs/HP)	4 kg/HP (99lbs/HP	41kg/HP (90lbs/HP
		Source: 'Tractor ba	allasting' Hanna <i>et al</i> (2010)

Table 7 Recommended weight to horsepower ratio.

Two: Determine the optimum weight distribution for the tractor with spray rig

Once you have determined the tractor is suitable for the task, check tractor manufacturer's manual for the recommended weight distribution, or use Table 8 as a guide.

Table 8 Recommended weight distribution for various tractor types.

Tractor	Towed drawbar		Semi-mounted		Fully mounted	
type	Front	Rear	Front	Rear	Front	Rear
2WD	25%	75%	30%	70%	35%	65%
MFWD	35%	65%	35%	65%	40%	60%
4WD	55%	45%	55%	45%	60%	40%
				о с і	1 11 12 1 1 1 1	1 1 (0010)

Source: 'Tractor ballasting', Hanna, et al. (2010)



Alternatively, you may be able to use the information in Table 9 to determine an appropriate weight distribution for the tractor type.

 Table 9 Percentage of weight on the front axle for various tractor types and tasks.

Tractor type	Total tractor weight	Percentage of weight on the front axle
4WD	85 to 125 lbs per engine HP	For towed implements, use 51 to 55%. This is very important to help in the control of power hop. With no hitch, PTO or ballast, the front may be 60% or more out of the factory. For hitch mounted implements, use 55 to 60%. For towed implements with very high downward loads on drawbar, use 55 to 65%.
MFWD/FWA	120 to 145 lbs per PTO HP	35 to 40% for all types of implements. Power is easier to control as the front split is reduced.
2WD row crop	Same as MFWD	25 to 35%. Use higher percentage with heavy hitch mounted implements.

Source: Titan Tire Corporation website

Three: Establish the tractor weight per tyre

With the recommended weight distribution at hand, weigh and record all the tractor weights 'per tyre' with all tanks empty, boom folded and unfolded, then again with all the tanks full, boom folded and unfolded.

Four: Analyse the results

After weighing the tractor on a 'per tyre' basis, the operator can determine if the weight and balance of the tractor can be adjusted to suit existing tyres and inflation pressures, by checking the tyre manufacturer's recommendations.

If the current tyres are not able to carry appropriate ballast on the tractor or the total weight with the sprayer when full (at the desired spraying and travel speeds), the operator may need to consider purchasing new tyres that will match the tractor's ideal weight and balance.

It is also useful to double-check the capacity of the tyres fitted to the spray rig to ensure they are suited for the load they will carry at the desired operating speeds, and that they are inflated correctly.

 It is better to put weights on the front or rear of the tractor, rather than water in the tyres to adjust the balance. Wheel weights or linkage weights are also a good option to help balance the tractor.



5. Determining and adjusting the 'lead' or 'lag' for front-wheel assist and mechanical front-wheel drive tractors

When front-wheel assist (FWA) and MFWD tractors are working in tilled soil the front wheels operate more efficiently at a higher slip rate (lead) than the rear wheels, which are tracking in the soil consolidated by the front wheels.

Lead occurs when the front tyres are rotating slightly faster than the rear tyres. Lag occurs when the front tyres are rotating at a slower rate than the rear tyres.

Lead makes MFWD and FWA tractors easier to steer, and also allows them to operate more efficiently. Always check what the tractor manufacturer's recommended lead percentage is.

Steps recommended by many manufacturers for checking

- Always check with the manufacturer for the specific method they recommend for checking the lead or lag.
- Before performing the lead or lag exercise, you may choose to have the spray tank half full.
- Check the required cold tyre pressure is matched to the potential load
 using websites such as www.tirepressurecalculator.com and
- Always check and record the current tyre pressures before starting.
- Step 1: Set up the tractor as it would be used with an implement and/or loader. Use the normal tyre pressure and optimum ballast distribution.
- Step 2: Locate a suitable smooth, hard, flat, level surface about 75 to 100 metres long. Park the tractor at a start point and mark the front tyre and rear tyres at the bottom of the tyre (at the 6 o'clock position). Mark the ground adjacent to the same position on the tyres (front and rear).

Marking the tyre before measuring the FWD tractor lead



Determining the 'lead' is very simple, and may help the operator get the best out of their tractor.

Photo: Graham Betts



- Step 3: Disengage the MFWD/FWA and drive the tractor forward at walking speed in a straight line until the front tyre has made exactly 10 revolutions and the position of the mark on the tyre at '6 o'clock' has returned to the ground.
- Step 4: Engage the MFWD/FWA and reverse the tractor along the same path to the starting point. Count the revolutions of the front tyre, and stop the tractor when the 6 o'clock position on the rear tyre returns the original position (mark on the ground from the start of the test).

Measuring the 'lead'





Photo: Graham Betts

Interpreting the results of the lead or lag test

If the mark on the front tyre has gone one-quarter of a turn past the 6 o'clock position, the lead is 2.5 per cent.

Note: The tractor would have lag if the mark on the front tyre has not returned to the 6 o'clock position.

Refer to the tractor manufacturer's technical information for the recommended lead, e.g. ideally it will be around 2 to 3 per cent, although anywhere from 1 to 5 per cent is generally acceptable.





reverse direction

If the lead is too low, consider increasing the tyre pressure in the front tyres, or decreasing the pressure in the rear tyres (or a combination of both), within tyre manufacturer's limits. Generally this can make a 1 to 1.5 per cent change to the lead (and vice versa).

If changing tyre pressures alone is not sufficient to increase the lead, changing the size of the front or rear tyres (or both) may be an option.

If changing the tyre size, you may need to purchase different brands of front and rear tyres to increase or decrease the rolling circumference to improve the lead.

TIPS

- Generally, tyre pressures are quoted as cold tyre pressure.
- It is important to check the MFWD/FWA lead as there could have been an incorrect gear installed in the transmission, or a replacement transmission may have been installed into the tractor.
- As a quick guide only: with one tyre lug on the ground 'at 6 o'clock' the tyre pressure is about correct if there are 3 lugs touching the ground.



Drawing of tyre lead percentage



Tyres – tips for assessing tyre pressure

Tyre gauges require calibration

Being able to monitor the tyre pressure and temperature in cab is a good starting point. There is no need for

wiring, the sensor communicates with the screen.

Photo: Graham Betts

For more

information on

www.tyredog.

com.au/store/

the TYREDOG™ system, visit:

6. Monitoring tyre pressure

To improve tyre wear and boom stability, the operator needs to do whatever is possible and practical to have a well-balanced sprayer, ideally fitted with tyres that can carry the load at about 20 to 25 psi.

Tyre pressure needs be monitored on a regular basis. Having a calibrated pressure gauge that is regularly checked for accuracy is an essential tool for the spray operator.

There are systems available that will allow the tyre pressure to be monitored from inside the spray cab, such as the TYREDOG[™] system. This system operates a wireless sensor on the tyre valve stem, coupled with a receiver and screen in the cab.

TYREDOG[™] screen in self-propelled sprayer cab



TYREDOG[™] wireless sensor on valve stem



6.1 Controlled tyre inflation systems

The optimum set-up for the spray operator would be to have a system that can do both pressure monitoring, and automatic inflation or deflation, from the cab. Controlled tyre inflation (CTI) systems allow this to be done.

Where CTI is installed, adjusting tyre pressures for different load requirements, or travel speeds could be less of an issue, particularly if the sprayer is NOT using higher load rated tyres or the VF or IF type tyres.





CTI is the optimum way to get the best out of tyres, as pressure can be adjusted as required.

Photo: Graham Betts

Self-propelled sprayer tyre with controlled tyre inflation (CTI)



Close-up of self propelled sprayer set up (wireless device on the valve cap)





Photo: Graham Betts





Tyre tip – aligning tyre centres to improve auto steer function

7. Summary

To help with reducing wheel track issues in the paddock and improving boom stability, the spray operator should be aiming to use tyres that have the highest load rating, and also consider using VF or IF tyre types.

The tyre pressure needs to be as low as possible in the paddock e.g. 1.4 to 1.7 bar (20 to 25 psi). Being able to monitor this from the cab can be a great advantage to the operator.

Using IF and VF type tyres (or equivalent) that can handle the same weight at 20 to 40 per cent lower tyre pressures will improve the tyres 'footprint', improve sprayer handling and auto-steer functioning, and will help minimise the impact on the wheel tracks.



NEXT MODULE

SPRAY APPLICATION MANUAL FOR GRAIN GROWERS Module 16 Overview of the spraying systems available Strengths and limitations



