

Tyre Selection & Management

Practical Guide



The increased weight of modern farm machinery has made it more important than ever to select the right tyres at the optimum pressure for specific operations. This will help to protect farm soils, improve efficiency and in turn, reduce the farms carbon footprint. Incorrect tyre selection and management risks damaging soil structure, increasing fuel usage and could present a road safety issue.

Time should be taken when replacing machinery or renewing tyres to consider what the machine is expected to do and whether the tyres are suitable for the job, both in the field and on road.



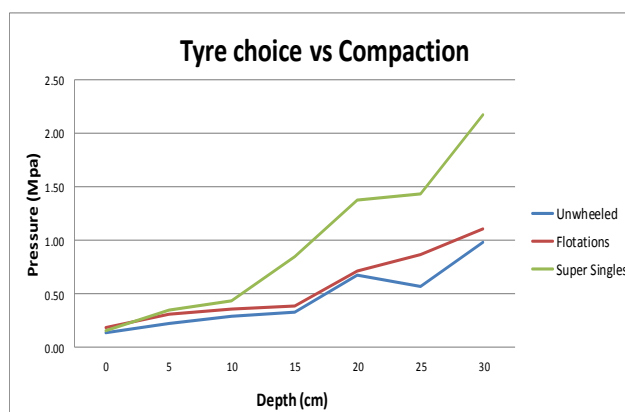
480/70R28 140D Tyres

Understanding tyre sizes

A typical setup on a 150hp tractor would be **480/70R28 140D** on the front and **520/85R38 155A8/155B** on the rear. The 480 is the nominal section width or the width from one sidewall to the other, in mm. The 70 relates to the measurement of the sidewall which is 70% of the nominal width of the tyre. The R indicates the tyre is of radial formation and the 28 is the rim diameter in inches. The 140 indicates the maximum load of the tyre in kg and the D indicates the speed rating. The tyre load and speed rating can be found in the manufacturer's guidance. On the front, each tyre can carry 2,500kg at a maximum speed of 65km/h. On the rear each tyre can carry 3,875kg at 40km/h. The second letter B does indicate the tyre can be used up to 50km/h.

Trailer tyres

We compared a flotation tyre on one side of a laden trailer to a super single tyre on the other. The flotation tyre is designed to run at much lower pressures and still be capable of doing road work. The flotation tyre was inflated to 24psi, the super single road tyre was inflated to 70psi, and the unwheeled was a piece of undisturbed soil between the tyre tracks. The graph highlights the difference in pressure required to penetrate the soil using a penetrometer from 0-30cm. The soil run over by super single required almost twice the force at 30cm to penetrate the soil compared with the soil run over by the flotation tyre. The compaction and rutting caused by the super single was extremely visible.



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Spot the difference: Trailer with 11 tonne payload running on 500/60R22.5 (left) 385/65R22.5 (right)



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Working out axle loads

In order to make the most of your tyres, increase your footprint and reduce compaction risk, the correct tyre pressure must be used, based on the tyre load index and axle loads. In this worked example we used mobile weigh scales and a tractor with one pass drill and front press. Each axle was weighed with and without ballast to get a separate weight for the implements. When working out total axle load you need to know:

- unladen tractor axle weight (A)
- implement weight (B)
- tractor wheelbase
- distance between the axle and the centre of mass on the implement/ballast (rear and/or front mounted).

To work out axle load you must weigh the front axle unladen, add on the weight of the front implement/ballast and then add on the load transfer. The load transfer is important; if the machine projects further out from the front or the rear of the tractors axle this will add more load to the tyres. To work out load transfer you must take the front implement weight and multiply it by the distance from its centre of mass to the front axle, and divide it by the tractors wheelbase.

In this worked example, the front implement weighed 1,570kg, the distance from centre of mass of the implement to the front axle was 2,200mm, and the wheelbase was 2,850mm. Therefore load transfer was $1570 \times 2200 / 2850 = 1,212\text{kg}$. The same calculation was worked out on the rear for the drill assuming 1,000kg of seed in the hopper.

To work out the total axle load, the weight of the unladen tractor axle must be added to the implement weight and the load transfer weight of the implement. The total axle load is then divided by 2 in order to calculate the load per tyre (see table). When travelling on the road care should be taken to ensure that the maximum permissible tyre load is not exceeded as uneven wear and tyre failure may occur.



	Front	Rear
Unladen tractor axle weight (kg) A	2,930	4,200
Implement weight (kg) B	1,570	3,231
Load transfer (kg) C	1,212	2,711
Total axle load (kg) (A+B+C)	5,712	10,142
Load per tyre (kg) (A+B+C)/2	2,856	5,071

Table 1. Example axle load calculation

Working out tyre pressures

From working out the total axle loads by using a weighbridge or looking up manufacturers standard data on weights, the optimum tyre pressure can now be calculated.

Each tyre manufacturer will have tables for a range of tyre sizes which give different brackets for tyre load and speed. This will give you an optimum inflation pressure. In the above set up, the recommendation was a pressure of 20psi on the front and 25psi on the rear. Due to the tyre configuration and axle loads this would limit the tractor to a speed of 10km/h. In order to lower tyre pressures, reduce compaction and achieve safer increased speed on the road, wider tyres with increased load capacities would be necessary.

A calculation like the one above should be considered when replacing tyres or renewing a tractor. New tyre technologies, such as increased or very high flexion, have the ability to either carry more load at the same pressure or carry similar loads at reduced pressures. This has the benefit of increasing tyre footprint spreading weight over a bigger area, thus reducing the pressure tyres are imprinting on the soil and minimising compaction risk.



Other considerations

- Reduce tyre pressures as per axle loads and tyre capabilities
- Consult manufacturer guidelines to ensure safe load capacity is not exceeded.
- Make sure tyres are capable of converting power into traction