

# Calculated care brings efficiency gains

## Machinery Tyres

Speed, weight and its distribution, tyre design and inflation pressure all have an influence on how efficiently tractor power is converted into usable work. *CPM reports.*

*By Peter Hill*

**There's something magical about getting advanced tractor tyres to perform at their best.**

As the slip percentage drops to the 10-15% optimum with the implement cultivating the soil as its designer intended and fuel consumption wanes towards optimum cost-efficiency, the operator can feel comfortable that the tractor's maxing its capabilities while there's also best care for the soil.

Achieving that nirvana takes a bit of planning, a bit of equipment preparation and at least a basic understanding of how

advanced traction tyres work and what influences their performance.

### Sufficient air

The basics are these — it's not so much the tyres as the air inside them that supports the weight of the tractor and that of any implement it carries, so there must be sufficient air within the tyre to support a given load in line with the manufacturer's specifications.

But too much air stiffens the tyre carcass unnecessarily, reduces the contact patch area and generally makes the tyre less able to transmit power and torque.

With speed comes heat, generated by friction between the many and various components that form the finished tyre.

And while plenty of heat is needed in the tyre manufacturing process to fuse those components together, too much heat too frequently — when running under-inflated tyres for extended periods on the road, for example — can soon have them coming apart again!

Getting the balance right for different applications using different implements,

and exploiting the extraordinary advances in traction tyre capabilities made over recent years brings the rewards of optimum performance in terms of productivity, cost-efficient fuel use and minimised impact of weight and wheel slip on soils.

This is the broad message that Stephen Mills, Fendt brand manager at Lincs machinery dealership Peacock and Binnington, aims to get across to



*Modern high-performance tyres are remarkably tolerant of low inflation pressures, which allow the tyre to deform and lay the biggest possible contact patch on the ground.*



“Slapping on too much ballast is among the most common errors.”



of very supple tyres such as the new IF and VF designated designs, he points out, so it has to be worth making adjustments when tractors change from one task to another for a length of time.

## Soil compaction

“Over-inflation limits sidewall flexibility so you get a smaller footprint, resulting in less grip and greater soil compaction,” he explains. “Increased levels of tyre wear result from the lower traction, and you use more fuel because of the lower work rate.

“As a general rule of thumb, 20% over-inflation can result in a 30% loss of performance, and with the low inflation pressures we use today, 20% can be as little as 0.16 bar or 2.4psi.”

For starters, then, best get a good quality pressure gauge.

And then consider tractor weight management before tackling the tyres, Stephen advises, because getting overall weight and weight distribution right is just as valuable as managing tyre inflation pressures.

“Slapping on too much ballast, especially for higher speed operations that don’t really need it, is among the most common errors,” he points out.

Carrying insufficient weight and distributing ballast incorrectly also rank high in his list of wayward practices.

“All these scenarios result in fuel being wasted because the tractor is not being operated to its potential,” Stephen emphasises. “Soil damage through smearing or compaction are additional penalties.”

While the type of implement involved — whether it’s mounted, semi-mounted or trailed — clearly has an impact on the amount and distribution of weight carried by the tractor in addition to its own mass,



*Calculating the most appropriate tyre pressures must take account of each tyre’s load-carrying capability at different speeds and with the load on the tyre measured in the worst case scenario – with implement raised, in the case of rear-mounted equipment.*

the effect of working speed is less well appreciated.

“It’s true that power and weight go hand in hand — you generally need more weight to transmit more power as far as traction with draft implements is concerned,” says Stephen.

“But it’s also the case that greater speed mitigates the need for weight, so higher speed operations need less weight to achieve the same levels of traction.”

There’s a formula for calculating the impact of this effect and rule of thumb figures for tractor operating weight: multiply the tractor’s pto power in kilowatts by 650, then divide the result by the working speed in km/h.

Take a 240hp Fendt 724 Vario as an example; it delivers 158kW at the pto and has an unladen weight with a full tank of diesel of 8000kg.

When working at 6.5km/h, the formula above produces a target weight of 15,800kg and therefore a need for ▶

participants in his driver clinics.

Slight variations in tyre inflation pressures can make a significant difference to the resulting contact patch



Most tyre manufacturers now have an inflation management app that effectively digitises the tyre index tables to help users find the most appropriate pressures for the circumstances.



*Pulling ahead – the advantage of using more advanced tyres of a good size and correctly set up is illustrated within just a few metres as a 168hp Case IH Puma 155 on XeoBib VF 710/60R38 rear and VF 600/60R28 front tyres gains a lead on an identical tractor and subsoiler combination running 20.8R38 and 16.9R28 needing 1.72 and 1.37 bar (25psi and 20psi) respectively to cope with the loads imposed.*





*Over-inflation limits sidewall flexibility so you get a smaller footprint, resulting in less grip and greater soil compaction, says Stephen Mills.*

▶ 7800kg of ballast to achieve optimum heavy draft traction.

When the working speed increases to 9.5km/h, the total operating weight drops to 10,810kg and the ballast requirement to 2810kg.

Working faster still — operating a compact disc cultivator on stubbles at



*Sufficient ballast is needed to achieve optimum traction, but less is needed as working speeds increase.*

13km/h, for example, and the calculated figure falls to less than the tractor weighs, so any ballast is superfluous.

Having determined the appropriate weight of the tractor, the contribution of the implement to the load the tyres must support needs to be worked out.

The ideal method is to commit some time to hitching on the relevant equipment and running the outfit over a weighbridge — although some tyre manufacturers offer a service using portable weigh cells to gather this data.

### Worst-case configuration

The key thing here is to weigh each axle in the 'worst case' configuration; so that means with the implement up in the air in the case of rear-mounted equipment in order to measure the maximum weight the rear tyres will have to bear.

Conversely, placing the implement on the ground loads the front tyres to the most they will experience; and in both cases, remember to divide the results by two to get the weight per tyre before thumbing through the tyre manufacturer's data table.

Exploring the columns for the tyre and size concerned, as well as the target operating speed, will reveal the recommended inflation pressure, which should be tweaked upwards a touch to counter the added loading and sidewall stress that comes from working across hilly ground.

No weighbridge or friendly tyre adviser to hand? Then resort to rule-of-thumb methods for a quick fix before the job can be done properly.

These include measuring the static laden radius, which is from hard surface to the top of the loaded tyre, and adjusting the inflation pressure until that measurement matches the figure in the tyre manufacturer's data chart.



*Fendt 724 Vario weighing 8000kg bare needs 7800kg of ballast to get its tyres – Trelleborg TM800 in this case – working at optimum performance for heavy tillage at 6.5km/h. In this application, countering the weight of the rear-mounted power-harrow seed-drill combination is the main consideration when selecting inflation pressure.*

Alternatively, adjusting inflation pressure until a loaded tyre has three or four lugs in firm contact with a hard, smooth surface will also yield a broad-brush result. ■



*Stripping tractors of ballast when it's not needed saves fuel and tyre wear by reducing overall weight – linkage-mounted ballast blocks make that easier.*

## AVACAST GR Get Back Control



### Machine Key Features:

- Electronic rate control
- Fitted to rollers up to 16m
- 200L, 400L & 1200L hoppers
- High capacity hydraulic fan
- 0.5m nozzle spacings (no drift)
- Metering unit designed for Avadex
- Also apply OSR or slug pellets

T: 01353 862044 E: info@techneat.co.uk W: www.techneat.co.uk

