GETTING THE BEST FROM WHAT WE'VE GOT
Tyres and Traction

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SECTION 1 - TYRES

The old saying, "The best things in life are free" comes readily to mind when considering how to obtain the best performance from your tyres. I refer,of course, to the so-called "free-air" available at your local service station, because having your tyres correctly inflated is the single most critical item in ensuring you obtain the very best service from your tyres. It is also the cheapest (although not "free" of course) and easiest item to control provided you set up suitable procedures to do so.

I have inspected many hundreds of tyres that have failed in service and in over two thirds of them the failure has been either directly or indirectly related to incorrect air pressure - virtually always insufficient air pressure.

A tyre's biggest enemy is excessive heat - note I did not say heat - but excessive heat. By its nature, a tyre must generate heat when it is being used and this is taken into account when specifying the loads, inflations and speeds at which the various tyres can be operated. Under normal circumstances, these specified conditions will ensure that the tyre is operating at temperature not exceeding 90 - 95 deg. C. At this temperature the materials and compounds of which the tyre is made are relatively inert and as a consequence the strength and durability of the tyre is not affected.

Excessive heat is generated the moment one of the three parameters

Air Pressure
Load
Speed

is out of line. The one that is most commonly incorrect is Air Pressure. Low air pressure increases the deflection of the tyre causing more heat to be generated, which, because rubber is a very good insulator is unable to be dissipated quickly enough so that very high temperatures - in excess of 220 deg. C - can be reached very quickly. At these temperatures reversion of the rubber compounds occur and the tread separates from the carcass. Also, if the tyre has a fabric carcass it starts to melt and lose its strength so that it can no longer retain the air pressure and you'll end up with a "blow-out".

This is the extreme but low air pressure is like a rodent gnawing away in the background where it cannot be seen. Low air pressure

increases the rate of wear,
increases the rolling resistance,
increases the running temperature,
increases the deflection,
affects vehicle handling and stability.

Let us consider each of these in turn.

INCREASED TREAD WEAR

Figure 1 shows the generally accepted graph of the relationship between under-inflation and tread wear. Under-inflation also has the effect of altering the distribution of the load over the foot-print, increasing the pressure in the shoulder area causing excessive and uneven wear of this part of the tyre.

INCREASED ROLLING RESISTANCE

Because the deflection of the tyre has been increased greater force is required to rotate the tyre through its foot-print. Figure 2 has been generated from data presented in a paper by J.D. Walter and E.S. Conant of Firestone and gives an indication of the effect.

INCREASED RUNNING TEMPERATURE

As indicated earlier, an operating temperature of 90- 95 deg. C does not harm the tyre but the closer the temperature approaches the curing temperature of the rubber (150 deg. C) the more rapid the ageing process becomes with a consequent reduction in carcass durability.

INCREASED DEFLECTION

Although the carcass of a tyre is an elastic body designed to absorb the irregularities of the road surface by the flexing of the sidewall area, excessive bending of the cords in the body - be they the fabric of a bias tyre or the steel in a radial truck tyre, will significantly increase the likelihood of a "flex-break" developing. In addition, there is likely to be increased deterioration of the sidewall rubber which is more susceptible to oxidation when it is highly stressed, as is the case when the deflection is higher.

Radial steel cord tyres are particularly vulnerable to problems caused by excessive deflection.

HANDLING AND STABILITY

Although handling primarily relates to passenger tyres, it is a factor on modern trucks, and stability is an important factor on log stackers, front end loaders and the like. A major loss in stability can cause a safety problem. Low air pressure seriously affects both.

Those are the problems associated with inflation - so how do we control the problem.

(1) Ensure that everyone associated with the maintenance of the vehicle knows what the specified pressure for each tyre is. Probably the best way of achieving this is by painting it on a plate adjacent to the tyre.

(2) Make certain they have an accurate gauge available to check the pressure.

(3) Ensure that sufficient airlines are available with adequate pressure in them. You cannot satisfactorily inflate a tyre to 90 psi with a 100 psi airline.

(4) Ensure all valves have valve caps on.

(5) Set up a standard procedure for checking the pressure on a regular basis. How often they should be checked depends a lot on the type of service. Modern tyres hold their pressures very well unless they develop a puncture, so probably a weekly check on actual pressure is sufficient provided a check, such as a "hammer check" is made twice daily to check against punctures.

(6) Carry out "pressure build-up" checks on each of your major pieces of equipment, that is, check the pressure when the tyre is cold and check it again when it is at its normal operating temperature (after 2 - 3 hours use, say).

As a rule of thumb, the difference between the two figures should be 70 kpa to 90 kpa. If the build-up exceeds 100 kpa then you are operating in the danger zone and action should be taken to reduce the strain on the tyre. This can but be done by reducing the load or speed, or by increasing the cold inflation pressure provided there is room to do so without exceeding the manufacturer's recommended maximum pressure for that particular size and ply rating.

This rule of thumb is true for bias truck and earthmover tyres. Tractor tyres and radial steelcord truck tyres normally have a lower pressure build-up probably in the 50 to 70 kpa area.

SECTION 2 - TRACTION

This is such a complicated subject that there is no way I can write a paper that would be of specific assistance. There is such a large variety of equipment and an even greater variation in operating conditions that such a task is impossible. I can, however, provide you with some guidelines which should assist you in determining what is best for your operation.

Perhaps the first point to remember that you obtain the best wear from a tyre which has what we call a "plain tread", that is, no tread pattern on it. The moment you mold a pattern into the tyre you remove some of the rubber and as a consequence you have less rubber to wear off so it wears out more quickly.

So-called "traction tyres" have less rubber than other types, hence give even less wear. Therefore, from a cost point of view you should always buy tyres that have the least traction consistent with getting the job done.

Then you have to consider - is it really traction I want or is it flotation - in other words, is the tyre sinking so far into the surface that it needs wider spaced lugs just to pull itself out of its own hole - maybe a wider section tyre operating at a lower pressure is what is required.

Remember, a wide arc tyre, such as a "Duplex" tyre, gives better flotation than a pair of duals - but is not normally as good for wear.

Some tyres require to penetrate the surface before they provide traction. This is particularly so for rear tractor tyres and, under some conditions, the addition of "dual" wheel to a tractor reduces the traction rather than increasing it, because it reduces the pressure in the foot-print area to such an extent that the tread pattern does not penetrate the surface.

Remember also that all your motive power is transmitted through the tyre. Hence the tyre must be able to do the job without excessive spinning and have a tread design that will not distort or tear when full power is being transmitted; otherwise, the tyre will tear itself to pieces and give very poor service.

Tread designs for use in mud and snow must be "self cleaning" if they are to be effective. A good effective traction tread does not just happen, nor is it just an artists idea of what a traction tyre should look like. It is developed over a long period of practical testing under operating conditions and modified as indicated by the results of the tests until the manufacturer is satisfied that he has a viable design which will perform well under the majority of service conditions.

As mentioned earlier, there is such a variety of equipment and conditions that no one design can be the best under every condition. There will always be times when the conditions will for some reason or other exceed the capabilities of that particular design. Don't discard a particular tyre because you get stuck once - it may well be that the next design may not be any better - give it a fair trial under all conditions before deciding on its suitability.

Gentlemen, this is not a scientific paper - I am not a scientist and you, I believe, are practical people who need practical ideas to help you do your job efficiently at the lowest cost.

The way to get the best out of your tyres is really very simple:

(1) Buy the right tyre for the job. Premium tyres are normally better value for money.

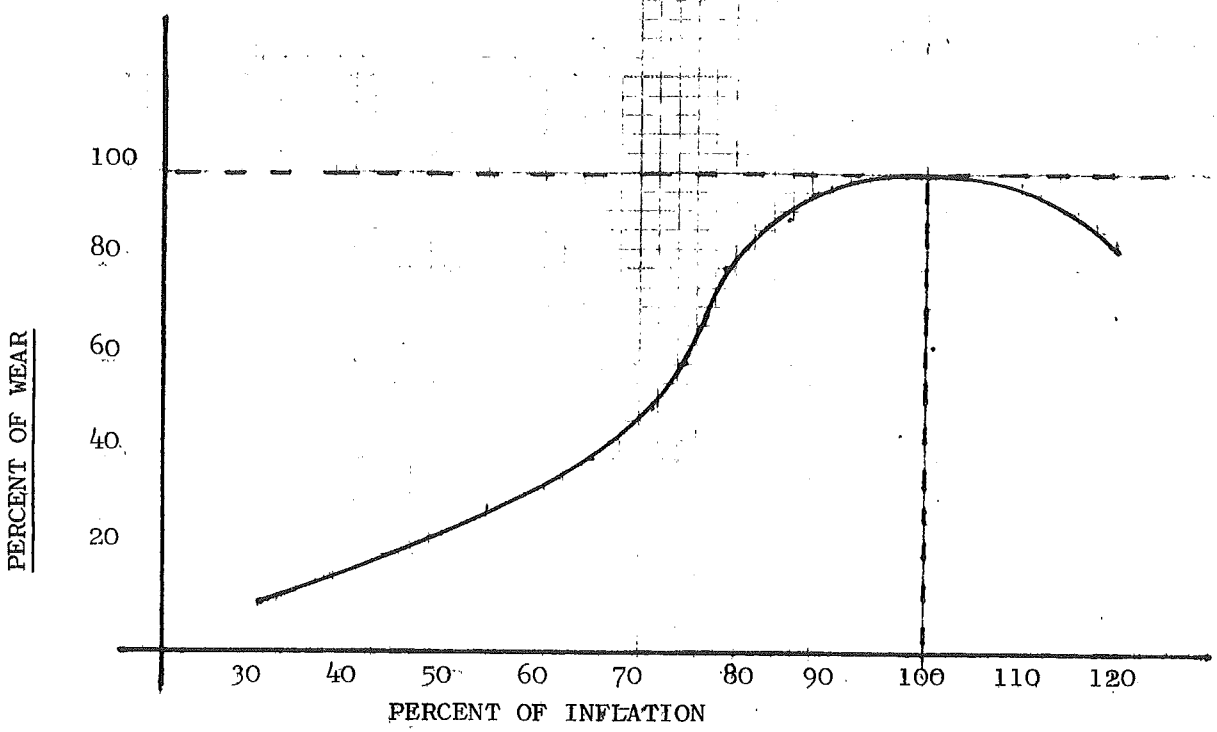
(2) Maintain it correctly -

    (a) Correct pressure
    (b) Repair any cuts or snags.

(3) Check that the pressure build-up is within safe operating limits.

(4) Remove it while there is still adequate tread remaining if you wish to have it retreaded.

EFFECT OF INFLATION ON TYRE MILEAGE



EFFECT OF INFLATION ON ROLLING RESISTANCE