When to Replace a Forklift Tire

First, please note that any “tire’s rated load carrying capacity and other physical properties” refer to new tires only. As the tire wears, theoretically it can no longer perform as when the tire was new.

It is not uncommon for a worn tire to begin to do some strange things, in both performance/ride and appearance. This is normal and does not indicate a warrantable defect in materials or workmanship. However, the question remains: how do we know when tires need to be replaced? Or when has a tire finally worn out and now poses either a potential safety hazard or is causing performance problems?

The following chart shows the approximate diameters (in inches) at which the tire should be replaced due to tread wear (past its useful service life).

Cushion Tires	Approximate New Tire OD	Recommended Replacement OD
14 x 4 1/2 x 8	14	12 1/2
16 x 5/6 x 10 1/2	16	14 1/2
16 1/4 x 5/6 x 11 1/4	16 1/4	14 3/4
18 x 6/7/8/9 x 12 1/8	18	16 1/2
21 x 7/8 x 15	21	19 1/2
22 x 8/9/10/12 x 16	22	20 1/2
28 x 12 x 22	28	26 1/2

Solid Pneumatic/Resilient Tires	Approximate New Tire OD	Recommended Replacement OD
600 x 9	21	19
700 x 12	26	24
700 x 15	29	27
750 x 15	30	28
825 x 15	33	31
28 x 9-15 (815 x 15)	28	26
250 x 15	29	27

Please note that this is only a wear guideline. Different tire brands, models and tread patterns may have distinct specifications for outside diameter and width. If tires are allowed to wear too far, then performance and safety issues may arise, along with the risk of unnecessary damage to the machine.

However, **solid pneumatic or resilient tires** may wear beyond the above guidelines, without sacrificing safety or performance. This is due to the fact that there is a large size variance between manufacturers. Please be careful when using the guideline for this type of tire. The technician must closely monitor tires worn beyond the above limits.

Pneumatic tires generally do not follow the above guidelines. Again, this is due to the large size variance between manufacturers, which can be even greater in the pneumatic tire world. The rule of thumb for pneumatic tire replacement is to replace tires before the tread wears out. This means that the center of the tire may be smooth and the outside portion may have some lug or tread showing. Pneumatic tires must be replaced if cuts show cord or frayed cord plies, and/or exposed tire cords.

General

There are plenty of other reasons beside a worn diameter for a tire to need replacement, including:

- Traction – Safety
- Ride quality – Increased fuel cost, maintenance and safety
- Clearance between floor and bottom of mast – Increased maintenance cost to equipment and work environment

All are very important and can severely affect a tire's useful service life in a particular application and must be considered equally in determining when to replace a tire.

Reflex Modulus

Reflex modulus is a calculation of the impact transmitted through the rubber of a typical cushion rubber press-on tire on a forklift. Another term for reflex modulus is shock transfer to load.

Effect of Reflex Modulus

Sample tire size: 18” overall diameter (new), 12.125" inside diameter

Resiliency factor: 3.0 (resiliency factor is a physical property of rubber. It is the amount of rebound - in this case 30% or 3.0 typical of a UN or blended rubber compound — measured on a resiliometer).

This table is a typical representation of what effects the rate tire wear has on a forklift using the reflex modulus model.

Recommended Replacement Worn Out

Percent of Wear	New	10%	20%	30%	40%	50%	60%	70%	80%
Rubber Thickness	2.6"	2.4"	2.1"	1.8"	1.6"	1.3"	1.1"	0.08"	0.05"
Worn Tire OD	18"	17.5"	17.0"	16.4"	15.9"	15.4"	14.9"	14.3"	13.8"
Reflex Modulus	-	4%	11%	30%	83%	229%	634%	1767%	4952%
Fuel Consumption Increase	-	3%	6%	10%	13%	17%	21%	26%	30%
Traction Loss	100	97.5%	94.1%	91.4%	88.3%	85.5%	82.4%	79.6%	76.5%

Measuring Rubber Press-on

Tire OD

Always measure overall diameter (OD) from 9 o'clock to 3 o'clock position or from 3 o’clock to 9 o’clock (see image). Record measurement from each tire position.

Heat

To measure heat in a hub, aim infrared digital thermometer at four separate spots: top, bottom, left, right on the hub from bearing to edge. Record the highest temperature reading.

To measure heat in the actual tire, aim infrared digital thermometer at several spots on the tread and sidewall of the tire. Unless there is a wide variance of temperature, record the highest temperature reading.

Hardness

To measure hardness of the rubber, find a smooth dry surface. Tire should be cool prior to measuring for hardness. Push hard on the durometer gauge and observe the dial. It should instantly read then slightly adjust itself. Once the dial settles, determine reading on the 'A' scale. Repeat in 2 or 3 other positions on the tire. If the readings are similar, record average reading. If the readings are different, record all readings and relative positions taken on the tire.

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