



## What are the key points about EM Tyre Bubbles & Bulges?

A bubble or bulge in an earthmover (EM) tyre is indicative of some form of internal damage to the tyre. However, a bubble is very different from a bulge; they can be most readily distinguished from each other – on a mounted tyre – by their location and shape.

**Bubbles** typically occur in the region from the end of the casing turn-up ply (of a radial ply tyre<sup>1</sup>) to the tyre shoulder; they tend to have a spherical dome shape. Bubbles are usually caused by casing breakup (the radial casing cords separating from the rubber casing matrix) – or sometimes a shoulder mechanical separation – leading to cracking between the casing cords. This crack propagates through the inner liner allowing inflation air to pass via the casing to the sidewall rubber – causing it to expand like a rubber balloon. A bubble indicates significant structural damage to the tyre which should be immediately removed from service.

**Bulges** typically occur on the sidewall of the tyre on or just above the rim flange line; they tend to be oval in shape with the longer axis running circumferentially (parallel to the flange). Bulges are usually caused by deflection stress in this area which can lead to a small lamination between layers of sidewall rubber or a small separation at the interface of the sidewall rubber and the bead chafer ply or casing turn-up ply. The bulge is formed by gas and/or abraded casing material generated by friction between the detached sections; it does not contain inflation air. A bulge will typically not cause any significant weakening of the tyre's structure providing it is properly managed.

A bubble (containing inflation air) is usually potentially far more dangerous than a bulge (which contains generated gas or abraded material). ***Beware of the potential for bubble burst causing serious injury – it is equivalent to a tyre burst in terms of released energy.***

Bubbles and bulges should be managed as follows. If there is any doubt whether the deformation is a bubble or a bulge, treat it initially as a bubble.

If a **bubble** (or suspected bubble) is identified, the tyre should immediately be deflated<sup>2</sup>, removed from the vehicle, stripped off the rim and inspected. The point or area of damage – which allowed inflation air to enter and traverse the tyre structure to form the bubble – will be found either in the inner liner of the inflation chamber or in the bead area (toe, sole or heel). If confirmed as a bubble, scrap the tyre.

If a **bulge** is identified, it should be treated as soon as practicable. Venting a bulge, releasing the contained gas, will generally restrict its growth and allow the tyre to continue to operate safely. An unvented bulge can grow to a very large size, necessitating early scrapping of the tyre.

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<sup>1</sup> Bias ply tyres can exhibit bulges, but rarely bubbles.

<sup>2</sup> Follow an established procedure to safely deflate a tyre with a bubble in case the bubble bursts with someone nearby.

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**ASK the EXPERT**

A bulge on a mounted tyre can be vented provided that the bulge is:

- no larger than a man's clenched fist
- located on or just above the rim flange line, extending circumferentially (not radially)
- limited to no more than three bulges around one sidewall.

If the bulge is larger than this, or is oriented radially, or is positioned further up the sidewall away from the flange (or appears to extend down under the flange), or if there are more than three bulges on one sidewall, then the tyre should be stripped from the rim and closely inspected taking particular note to check for:

- indication of inner liner cracking or underlying cracking between radial casing cords, or cord separation from the rubber casing matrix
- exposure of turn-up ply metallic cord in the bead sole, toe or rim flange contact area.

If the inspection shows no indication of damage to the inner liner or bead that could allow the ingress of inflation area into the tyre structure, then the bulge(s) can be vented. Otherwise, the tyre should be scrapped.

The purpose of venting a bulge is to allow the release of any gas build-up. The gas is not dangerous but if not removed will exacerbate growth of the separation and bulge. Venting the gas will cause the bulge to contract, although it may not contract fully.

***Never vent (drill) a bubble unless the tyre has been totally deflated to zero pressure.*** Use a power hand-drill with a 6mm bit, drilling no deeper than 50mm (for tyres of 49" or larger size). If the bulge does not deflate at 50mm drill depth, then find another suitable spot to drill; if after a maximum of three attempts the bulge has not deflated then leave it in place. Following venting, mark the drill hole(s) to facilitate locating them in future. Mount the tyre onto a rim and inflate the assembly. Check the drill holes for any indication of air leakage; if detected deflate the tyre and reinspect (it will almost certainly have to be scrapped). If no air leakage is detected the tyre may be returned to service and should be closely monitored.

Key points:

- Bubbles are very different (and more dangerous) than bulges.
- Bubbles occur between the end of turn-up ply and the shoulder; bulges occur between the bead and the end of turn-up ply.
- Bubbles are caused by inflation air passing through the tyre structure; tyres with bubbles should be immediately scrapped.
- Bulges are caused by bead area separation friction producing a gas pocket; tyres with bulges should be treated to minimise bulge growth.
- Never attempt to vent a bulge by drilling unless the tyre is fully deflated.

**Keywords:** *tyre bubble bulge venting drilling casing-breakup*

**References**

- Michelin Technical Bulletin – Venting Procedure for Bulges in the Lower Sidewall (Oct 2009)
- Bridgestone *Bead Bubble Drilling Procedure* (undated) – *Note: it is a 'Bead Bulge' (not Bubble) procedure, based on Otraco terminology*