

## Tire Creep

For hot kiln, or dryer, applications consideration must be given to the maximum differential temperature between the tire and the shell.

To illustrate, follow the example below:

Let us assume:

- All components are carbon steel.
- The shell is operating at 600° F
- The tire is at 250° F.

If the kiln is brought up to temperature to quickly, the differential temperature could be as high as 450 °.

The coefficient of linear expansion (in/ft)	temperature (° F)
0.0076	100
0.0157	200
0.0244	300
0.0334	400
0.0431	500
0.0532	600
0.0638	700
0.0748	800

Say we have shell pad OD/tire ID= 12' nominal

Expansion of the shell will be =  $12 \times 0.0532 = 0.64''$

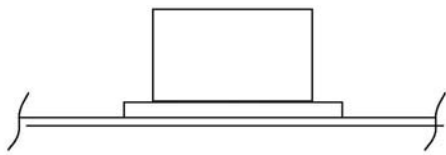
Expansion of the tire ID =  $12 \times 0.020 = 0.2406''$

Or an interference of =  $0.64 - 0.24 = 0.4''$

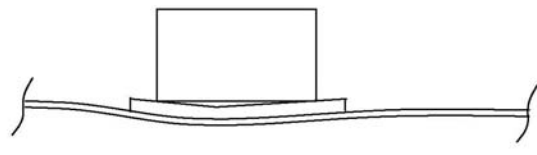
Thus the radial gap between the shell and tire must be at least =  $0.4/2 = 0.2$  inches

**We recommend that you measure and record shell and tire temperatures at startup, cold and high wind condition, new refractory, & worn refractory. You will need this information for setting the proper clearance later.**

If adequate clearance is not allowed for between the tire and tire pad the shell will be permanently deformed the shell, in others words make its own permanent clearance, damaging the shell and refractory or other internal and increasing “creep”..



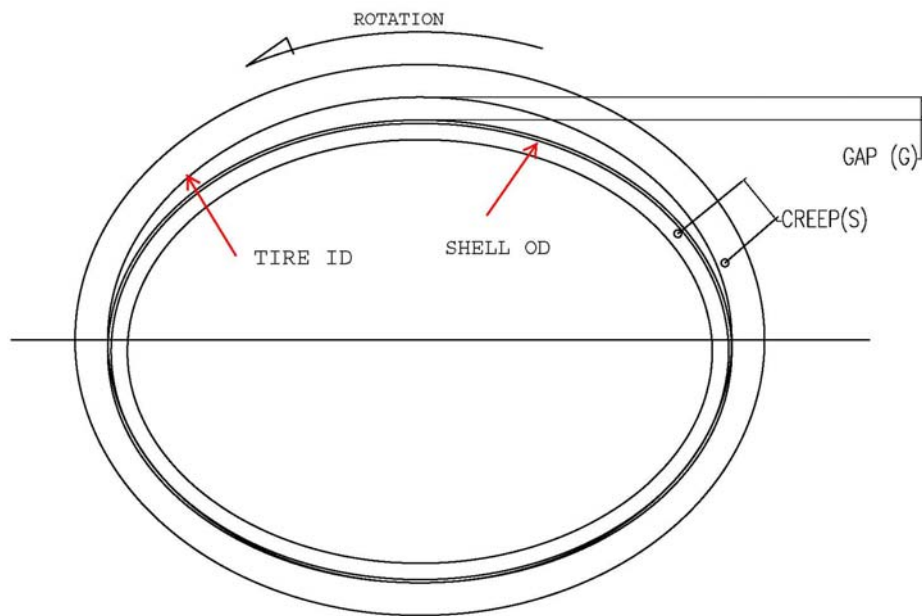
NORMAL SHELL AT TIRE



PERMANENT DEEFORMED SHELL

**If adequate clearance is allowed, the tire will “creep” or appear to slip on the shell**

With a clearance between the tire and shell, the shell becomes a driver like a pinion in internal gear set. Since the circumference of the ID of the tire is larger than the circumference of the shell, the tire will not make a complete revolution when the shell does. The difference is called tire "creep".



Creep and shell tire gap.

**How to calculate the “Tire Creep”**

Example:

- Tire ID is 144.4” (notice the .4 difference to handle the thermal expansion)

- Shell is 144" OD
  - In one revolution the **shell** goes= $\pi \times 144=452.39''$
  - The tire will travel the same amount but its circumference is  $=\pi \times 144.4''=453.65''$
  - The difference is  $= 453.65-452.39=1.25''$
  - This works out to  $= \pi \times \text{clearance on the diameter}= 3.1416*0.4=1.25''$

Note:

This is the theoretical number. Tests have shown the actual number to be (Gap= $\pi \times 2.5$  to  $\pi \times 2.0$ ). The number decreases as the kiln gets larger

**Creep values of  $\frac{1}{2}''$  to  $\frac{3}{4}''$  per revolution seem to be acceptable , however, these values depend on the unit is operated.**