

1957

1967

1977

1987

1997

2007

FIFTY YEARS OF INNOVATION IN THE TIRE INDUSTRY

April 1979 – The first in the retread industry, Bandag introduces the NDI® Tire Casing Analyzer. Still in use today, this machine uses ultrasonic inspection technology designed to find hidden defects in the crown and shoulder areas of buffed tires.

What You Can't See Can Hurt You.

Detecting the quiet inside a tire casing.



This small, unassuming device is the heart of the Bandag NDI® Tire Casing Analyzer. Lyle Haylett, market research and government relations manager, Bandag, shows the ultrasonic transmitter that is a key part in finding invisible defects within tires.

We all know that truck tire retreads can be as reliable as new truck tires. Maintenance (particularly proper inflation) is the key to reliable truck tires. Behind the scenes of the success of retreading is proper inspection of the worn tires to ensure that only the best casings are used as the raw material for the retreading process. That's

right; casings are probably the most important raw materials for the retread industry. Simply put, without a viable casing, there can't be a quality retread.

Modern truck tires are incredible products of engineering that are designed to perform through well over 100,000,000 cycles and several tread lives. Pot holes, curbs,

and other hazards of the road can create damage within the tire. Inspection is necessary to detect this damage so the tire can perform reliably as a retread through second and third (or more) lives.

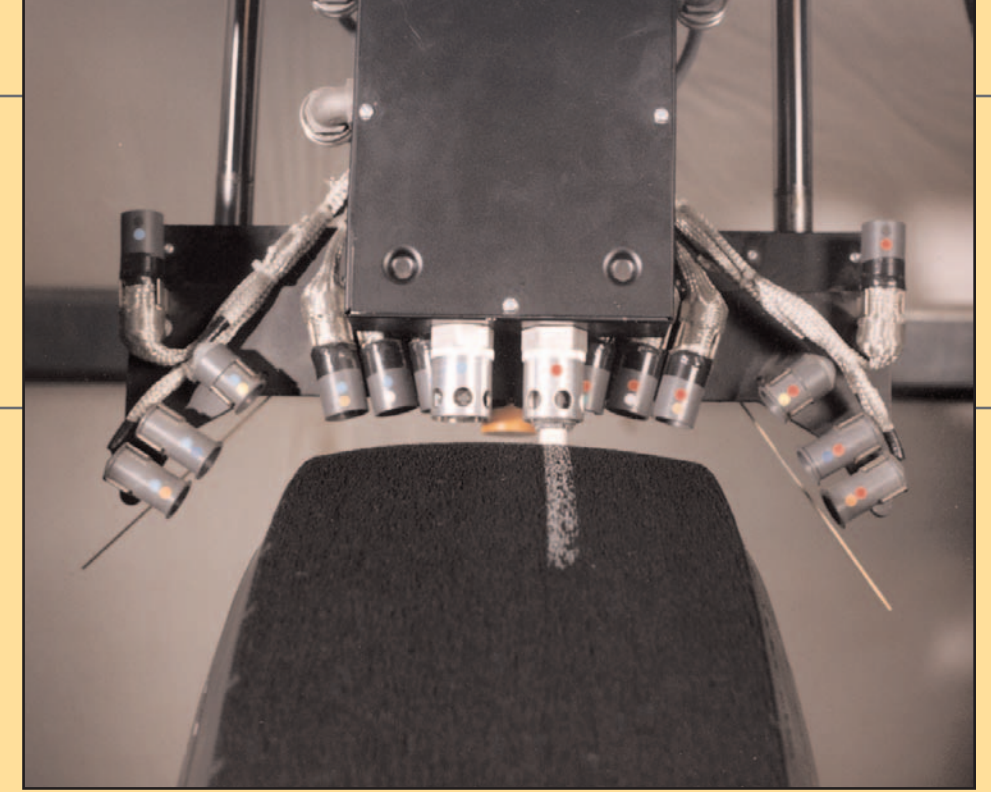
Some Defects are Invisible

Visible inspection was always, and still is, a very important step to ensuring that a casing is fit for retreading. How do you inspect a truck tire casing and be sure you're detecting things hidden from view that may cause problems for the retread later on?

When obstetricians need know that unborn babies are healthy, they frequently order sonograms or "ultrasound" tests. This method uses an ultrasonic beam that can safely image the structures inside the human body. In 1979, Bandag R&D Engineer Doyle Dugger along with Silicon Valley consultant Morris Ho invented the Bandag NDI® Tire Casing Analyzer. Using similar techniques to medical sonograms (see sidebar), the NDI uses ultrasound to "see" what's going on inside the truck tire casing.

Better Technology – Better Casings

Bandag received five U.S. patents for this new technology and introduced the Model 240 NDI® Tire Casing Analyzer to Bandag dealers. Since the technology requires the tread to be buffed off before the tire can be scanned, the 240 incorporated the ultrasonic scanner as part of a buffer. The original NDI model could scan 10 tires/hr. and allowed the operator to see the scan on a computer screen, one side of the tire at a time. Subsequent models improved the productivity up to 25 tires/hr., added an additional screen that would allow seeing the scans from both sides of the tire at once, further boosting productivity and improving the operator's ability to detect defects. These improvements to the technology mean that dealers can reduce their costs, keeping retreading economical, and that the casings used are more reliable and cost effective for the fleet.



How the NDI® Tire Casing Analyzer Works

You probably realize that sound can travel through air and that it can also travel through solid objects. But when sound has to cross a transition between two different materials, a little of the sound energy is lost. This loss is called attenuation, and it is very pronounced when sound passes between solid materials and air. This is the principle involved when you put insulation (with lots of trapped air) in walls to keep sound from going between rooms in your house.

The same principle also applies to ultrasound as used in the Bandag NDI® Tire Casing Analyzer. Ultrasound is sound of a frequency that is higher than humans can hear. When ultrasound passes through the belt layers of a radial tire casing, it is attenuated. If there is a belt separation (the predominant invisible problem that can crop up in a tire casing) that attenuation is even stronger and much less ultrasound makes it through the tire. The NDI measures this attenuation and thereby detects defects in tire casings that are invisible to the naked eye.

In the NDI, there is an ultrasonic transmitter (speaker) inside the tire. It broadcasts brief pulses of ultrasound through the tire. A series of transducers (microphones) on the outside of the tire listen for these pulses and measure how loud they are. If the pulse gets quiet over a particular area of the tire, the NDI sees this as a possible separation.

The NDI parted ways with the buffer in 1983 with the introduction of the model 357. Separating the NDI from the buffer allowed the dealer to further improve efficiency by operating both at the same time. There was also a wide base version of the model 357 that could handle the wider tires.

While NDI® Tire Casing Analyzers were never sold – they were always leased, in order to protect Bandag's proprietary technology – a total of 1,406 machines were built over the life of the product.

In North America they have now mostly been replaced by newer 7400 INSIGHT® Casing Analyzer, a shearography machine, as Bandag continues to improve inspection technology. Despite this, the technology in the NDI is still very effective at finding defects in tire casings. Today, there are still about 35 machines on lease in the U.S. and Canada and many more are being used in other countries.

By Lyle Haylett