

Report on
Comparative Performance
of
Nail Hole Detection Equipment

October 20, 1998

Objective

My assignment was to evaluate the operation and effectiveness of the Electronic Tire Inspector device versus the Hawkinson NDT Casing Inspector.

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Methodology

1. I used an Electronic Tire Inspector, Model 15 and the following Hawkinson NDT models:
 - Hawkinson NDT Combo Unit
 - Hawkinson NDT – II
 - Hawkinson NDT – II B

2. Evaluation period September 15 through October 15, 1998.

3. Evaluation sites:
 - Sumerel Tire Co., Newport, Kentucky
 - Huber Tire Co., Jeffersonville, Indiana
 - ITRA Laboratory, Louisville, Kentucky

4. Evaluation methods involved:
 - a. Examine groups of radial truck tires first with NDT units and then with the Electronic Tire Inspector (ETI).
 - b. Reverse the procedure.
 - c. Time individual cycles.
 - d. Subjectively evaluate both units.

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Discussion

This assignment initially caused some concern because of the obvious size and weight difference between the NDT and ETI units.

The Hawkinson NDT II's are combination truck tire casing inspectors with mechanical controls to:

- Raise and lower tires into position.
- Revolve tire forward and backward.
- Arms to spread tire beads for internal examination
- Internal and overhead lighting complex plus an electronic device to automatically detect and mark nail hole penetrations during tire examination process.

On the other hand, the Electronic Tire Inspector is a compact wooden box, measuring 16"x13" and weighing about ten pounds. Inside the box is a 'wand' that is electronically activated by connection to a 110v circuit. Its operation is strictly manual by an operator.

The results of the nail hole detection effectiveness by each test unit while producing definitive results was not sufficient numerically to reliably quantify the difference between these units. There was a significant variable – the tire inspector using the 'wand'.

Our grouping of tires in a significant number was not possible under my scenario because it interfered substantially with daily production at Huber's and Sumerel's.

However, my observations of both units in operation in radial truck tires convinced me that even with a larger, defined, controlled grouping of tires, the NDT would consistently detect more nail hole penetrations than the ETI.

The question was, Why?

Evaluation of both procedures indicated that the results varied because of two reasons:

1. Mechanical
2. Operator differences

Mechanical:

The NDT employs an arm or head which measures 6” wide and has 32 strands of metal beads on the crown surface plus 4 integrated wire structures that contact the entire ‘target area’ for penetrations in a truck tire.

The target area comprises the crown or tread area plus the shoulder area. This area will vary between 8” and 10”, depending on tire size.

The Electronic Tire Inspector employs a hand held ‘wand’ with a 4” head that must be manually controlled to cover the 8” to 10” area, by at least two and practically three revolutions of a truck tire.

The NDT is able to cover the entire target area automatically in one pass.

Thus, it is my opinion that the NDT by virtue of its design and operation is more efficient in examining the internal cavity of a radial truck tire for nail hole penetrations because of its automation and target area coverage.

Operator difference:

As previously mentioned, the NDT is designed to accomplish two tasks – visual tire examination plus nail hole detection.

The ETI is a manual held ‘wand’ to detect nail hole penetrations.

The NDT accomplishes its objective by activating the operation for internal casing examination by the operator. As the operator is concentrating on and looking for tire casing defects, the nail hole detection system is automatically searching the 'target area' for penetrations. When one is located, the NDT stops and the operator examines the location targeted by the sparking mechanism.

Thus, NDT nail hole detection is automatic and does not depend on operator efficiency.

The Electronic Tire Inspector is manually controlled and depends solely on operator efficiency to cover the target area on each and every tire.

During my groupings of tires, the ETI wand missed nail hole penetrations particularly at the tread edge and shoulder locations. They were missed because the tire inspectors simply held the 'wand' in the center of the crown and thus missed the penetrations outside the 'wand' area of effectiveness.

The ETI would have appeal as a test unit. In my opinion it is not designed to be an integral part of daily truck tire examination without sacrificing productivity and thorough nail hole detection.

Under the best of conditions, a typical tire casing inspector would have to perform two separate functions:

1. Conduct a visual internal/external examination of the tire and,
2. Then manually utilize the ETI wand to detect nail hole penetrations.

Summary

While the Hawkinson NDT units and the Electronic Tire Inspector are categorized as capable of detecting tire body penetrations, there is a wide difference in function and results.

1. The Hawkinson NDT is a production unit for truck tire retreading operations that combine a highly sensitive electronic automatic nail hole detector that does not depend on operator techniques.
2. The Electronic Tire Inspector is a portable unit that depends solely on manual technique and target area coverage and its results can vary between different tire inspectors.



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Photographs



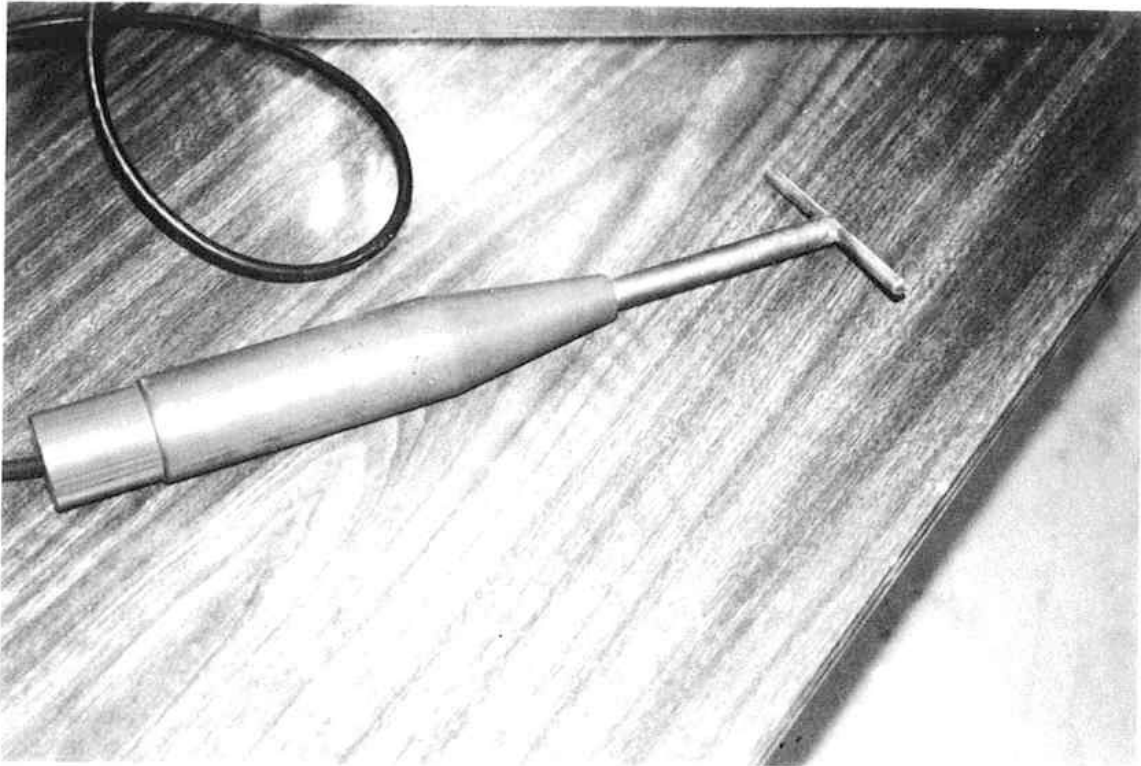
Typical Hawkinson NDT II unit



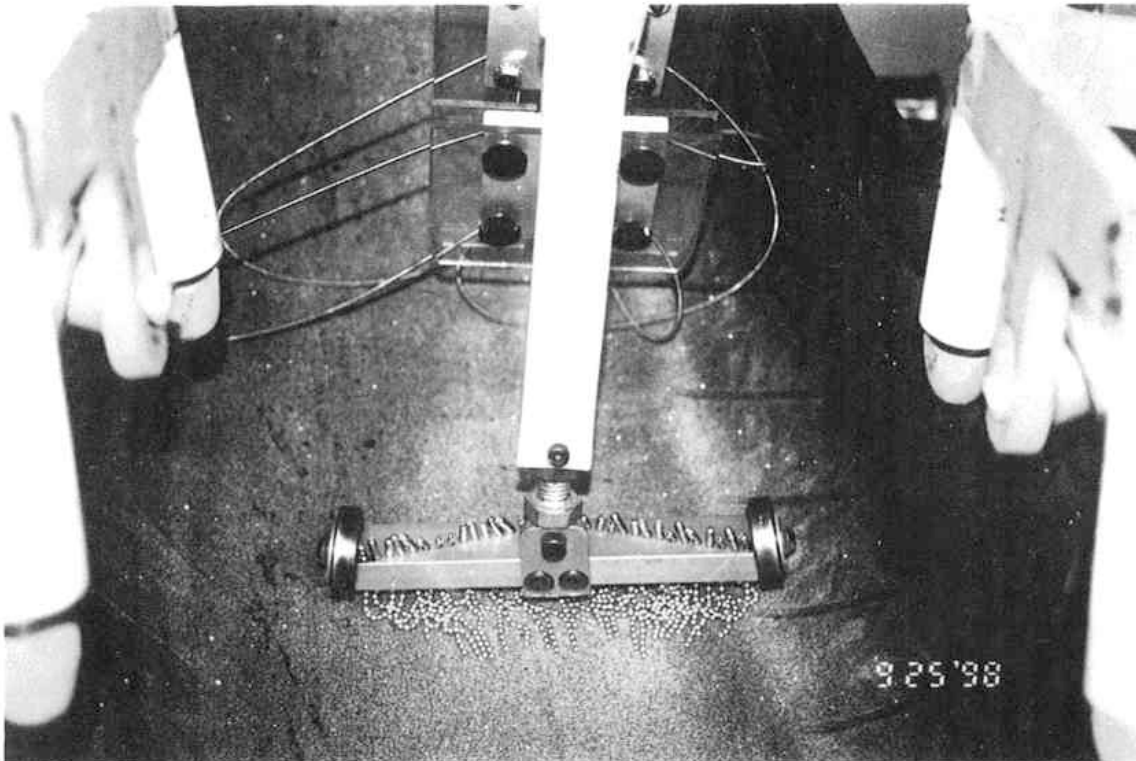
The Electronic Tire Inspector Box measuring 16"x13"



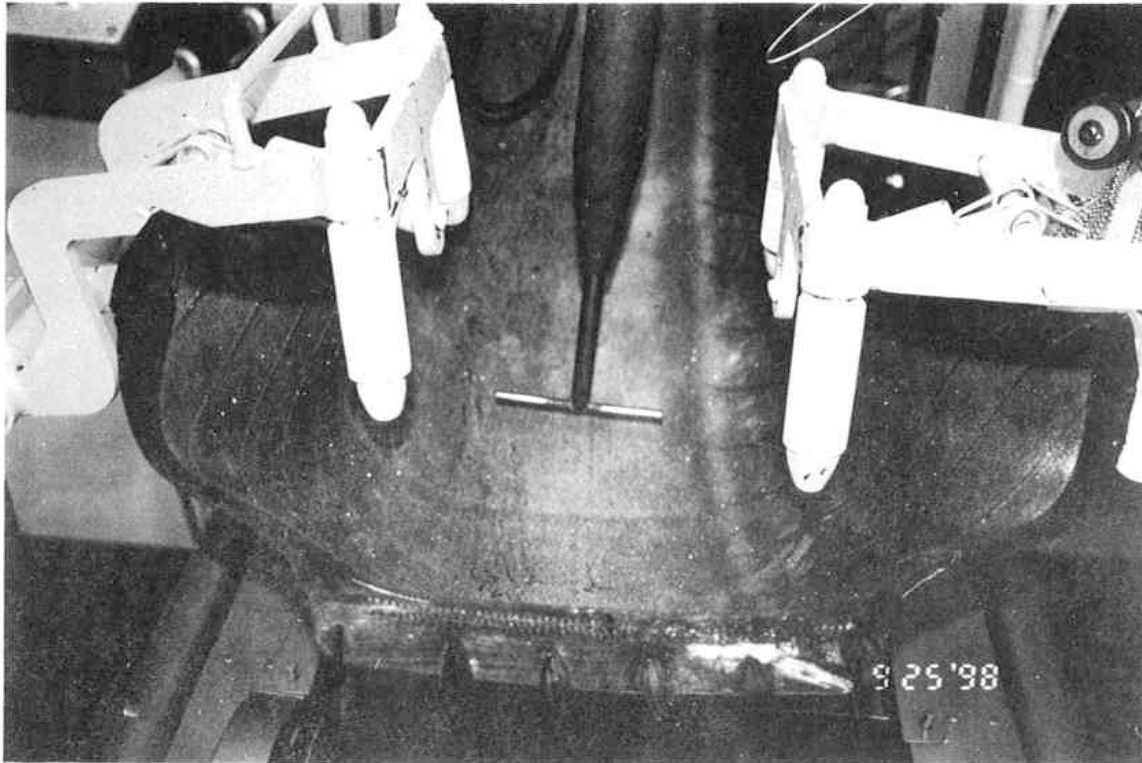
The Electronic Tire Inspector unit



The hand held 'wand' – 13" long



The NDT II automatic nail hole detector unit inside a tire cavity. Note the 6" head and metal bead chain plus the 4 integrated wires contacting the target area.



The Electronic Tire Inspector 4" wand head being held in position.

Note the lack of coverage in the target area.

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