



Standard Practice for Linear Tire Treadwear Data Analysis¹

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1. Scope

1.1 This practice describes the elementary linear regression analysis of basic treadwear data as obtained according to Test Method F 421 and Practice F 762.

1.2 The basic treadwear data are obtained as groove depth loss measurements by procedures described in Test Method F 421 after a series of test cycles (test distances under specified conditions) according to Practice F 762.

1.3 A linear regression analysis is performed for the relationship between average tire tread depth and the test distance traveled by the test vehicle, on which the test tires are mounted. From this analysis a rate of wear is determined: groove depth loss per unit distance.

1.4 Linear treadwear is defined as an essentially constant rate of wear, after break-in, which results in a linear regression coefficient of determination, R^2 , equal to or greater than 0.95 when obtained for a data set where the number of measurement intervals, n , is at least 3. Each measurement interval represents a specific test distance.

1.5 This practice is not applicable to the prediction of treadlife for tires that exhibit non-linear or irregular treadwear.

1.6 Evaluation parameters are given for both SI and inch-pound units; either may be used. The evaluation parameters as defined are ones typically used in the tire testing industry and no special claim is made for superiority of these parameters and terms over other terms and parameters that may be developed.

2. Referenced Documents

2.1 ASTM Standards:

F 421 Test Method for Measuring Groove and Void Depth in Passenger Car Tires²

F 538 Terminology Relating to the Characteristics and Performance of Tires²

F 762 Practice for Determining Change in Groove (or Void) Depth With Distance Traveled for Passenger Car Tires²

¹ This practice is under the jurisdiction of ASTM Committee F-9 on Tires and is the direct responsibility of Subcommittee F09.30 on Laboratory (Non-Vehicular) Testing.

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² Annual Book of ASTM Standards, Vol 09.02.

3. Terminology

3.1 Definitions:

3.1.1 *average tire tread depth*, [L], n —the average of all tire groove (void) depth measurements.

3.1.2 *break-in*, [L], n —one or more periods of initial standardized tire operation during which tire is brought to the state which will lead to more consistent test results.

3.1.3 *groove, average depth*, [L], n —the average of all tire groove depth measurements in a single groove.

3.1.4 *projected treadlife*, [L], n —the test distance that gives h as the average tread depth; where h is the height of treadwear indicator above groove (or void) base.

3.1.5 *test distance*, [L], n —distance traveled by a vehicle after tire break-in.

4. Summary of Practice

4.1 This practice provides a calculation procedure for linear regression analysis of treadwear data to be used in the tire industry for assessing tire treadwear performance.

4.2 No specific mathematical formulas are given for the customary least-squares calculations used for linear regression parameter evaluation since these calculation algorithms are readily available with electronic hand calculators or statistical software for personal computers, or both. Terms are defined for slope, intercept, and coefficient of determination.

5. Significance and Use

5.1 The purpose of this practice is to standardize the meaning and derivation of some terms and indexes that are commonly used to characterize treadwear.

5.1.1 There is no intent to recommend either of the two treadwear performance indexes: distance per unit loss of tread depth or loss of tread depth per distance unit.

6. Calculation

6.1 Use the following calculations and terms to report treadwear:

6.1.1 The percentage tread (depth) loss (PTL) expresses the loss of tread depth as a percent of the initial tread depth (to the tread-depth indicators), as follows:

$$PTL = \left[\frac{\bar{X}_i - \bar{X}_k}{\bar{X}_i - h} \right] 100 \quad (1)$$

where: