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Standard Practice for Field Evaluation of Automotive Polish[1]

This standard is issued under the fixed designation D4955; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice covers the evaluation of the performance properties of automotive polishes. This practice is applicable to products that are commonly referred to as car/auto wax, cleaner wax, polish, and the like. This practice is limited to a comparison among test polishes, with a standard polish, or both, under the conditions of the individual test. The comparative results are indicative of absolute performance only insofar as the test conditions are representative of all normal application and use conditions.

1.2 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Terminology

2.1 *Definitions of Terms Specific to This Standard:*

2.1.1 *automotive polish*—substance which aids in cleaning and improving the appearance of automotive finishes.

3. Significance and Use

3.1 This practice is intended to define the range of properties to be tested, the apparatus to be used, and the comparisons of automotive polish performance to be made. Since conditions, products, and apparatus vary, considerable discretion must exist among formulators and marketers in these areas and on what properties or performance characteristics are most significant for their products. This practice is intended to be flexible enough to honor this fact within the description of automotive polish in Section 2.

3.2 The test methods are subjective and empirical in order to conform to the basic characteristics of the class of products and to allow flexibility in testing. This also conforms to typical consumer experience.

3.3 The practice also allows for flexibility in choice of environmental characteristics under which the durability testing is done. This allows discretion to be exercised by those testing the products in order to provide greatest significance for the products being tested as they are intended for various marketplace needs.

4. Apparatus and Materials

4.1 *Sample of Polish* to be tested.

4.2 *Sample of Control Polish*—A control polish should be selected for comparison to the test polish. It should be recognized that automotive polishes are formulated to perform different functions. The control polish should be selected with a clear justification in mind, such as, test and control polish should be designed for same function (high durability, ease of application, or other performance features). These factors should be taken into account when interpreting results and choosing the control polish. All results are reported with the clearly identified control comparison.

4.3 *Test Substrate*—Since this test is designed to test automotive polish performance under natural and normally occurring environmental conditions, the substrate chosen shall be one for which the test polish was intended on a vehicle which can be subjected to the chosen environmental conditions in a manner meeting these criteria. The test surface shall be in good physical condition, not badly cracked, scratched, or otherwise damaged so as to interfere with evaluation of polish properties. The test surface for each sample is intended to be one half of the surface area of the vehicle to be polished. In no case should the area polished for each product be less than 1290 cm^2 (200 $in.^2$). The surface is divided as described later in the method. (Procedures evaluating more than two polishes per vehicle may be done as a screening technique; however, results are not sufficiently reproducible to be covered by this method.)

NOTE 1—New vehicle paints (paints with service life less than one year) give properties such as, water beading and high gloss, very similar to those being evaluated for the polish. Therefore, evaluation of appearance and durability due to the polish formulation are minimized. Some paint types, such as metallic paints, may also give atypical results.

4.4 *Polishing Cloth*—The same type and size of polishing cloth shall be used with each sample tested. Separate cloths shall be used for each sample. Materials such as washed cheesecloth, rumple cloth, flannel, cotton diaper cloth, and nonwoven fabrics are suitable for this purpose. Felt or paper shall not be used.

[1] This practice is under the jurisdiction of ASTM Committee D21 on Polishes and is the direct responsibility of Subcommittee D21.04 on Performance Tests.

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4.5 *Automobile Washing Product*—The formula given below is a mild anionic surfactant-based solution sufficient to remove surface soils while having a minimum detrimental effect on polish properties. When properly rinsed, it will not leave a residue that might affect performance attributes of the polishes.

	% by weight
Sodium salt of linear dodecyl benzene sulfonate	5.0 %[A]
Sodium lauryl ether sulfate	2.5 %[A]
Water (0–150 ppm hardness)	qs

[A] Percent active ingredient

This is a stock solution which can be diluted to approximately one ounce per gallon of wash water (0–150 ppm hardness).

4.6 *Wash Water*—The water source used for washing and rinsing should be evaluated for hardness, dissolved minerals, pH, and other similar properties. It should be chosen or modified so as to minimize adverse effects on polish properties.

4.7 *Washing and Drying Appliances*—These appliances should be nonabrasive and clean. The washing appliance should be typical to the automotive washing operation, such as a sponge, soft cloth, or soft bristle brush. The drying appliance should also be typical for automotive drying (chamois, soft terry cloth, cotton flannel, and the like).

NOTE 2—Complete drying is important to ensure that no residue from the washing or rinsing process is left on the car surface.

5. Precautions

5.1 Weather conditions at the time of polishing should be consistent for all polish applications of the test. These conditions should be recorded and compared with directions given with polish used.

5.2 The substrate should be prepared in accordance with polish application recommendations but should not differ between test polish and control polish.

5.3 Unusual conditions during the test should be recorded and reported in the final report.

6. Personnel and Instructions

6.1 For each test application, one individual shall apply both test polish and control polish. There may be as many individuals as there are test applications. The individuals shall be physically capable of applying the polishes in an equivalent manner and shall be capable of making discriminating judgments of subjective physical and aesthetic properties. Training and orientation to specific product application and performance characteristics may be required.

6.2 The individuals shall apply the polishes to designated areas without knowledge as to the actual identity of the formula other than a code matching sample and area to be polished. Each individual will assess application characteristics and results in order to compare performance and to ensure that both polishes are equivalently applied.

6.3 A minimum of five evaluators will provide a subjective assessment of the test surfaces at the specified intervals. The assessment will include those physical properties chosen for monitoring. The individual must be capable of making discriminating judgments of those properties.

6.4 All personnel who participate in application or evaluation should be unaware of product identities and should not be able to deduce those identities by technical or personal understanding atypical of an average consumer of the products being tested. Every effort should be made to ensure that those who apply the polish and those who evaluate durability are representative of typical consumers.

7. Procedure

7.1 *Surface Subdivision*—There are two plans that can be used for dividing the car surface for application of the test and control polishes side by side for comparative evaluation. In either case, using several vehicles and regularly varying the pattern used increases the accuracy of the test results by minimizing the effect of a unique paint, surface condition, weathering pattern, or wear pattern.

7.1.1 The surface should be divided longitudinally so that the test polish and control polish are applied parallel to each other separated by the midline of the vehicle. One polish is applied to the driver's side and the other to the passenger side. Normally the entire side of the vehicle is polished. In no case should the area polished be less than 1290 cm^2 (200 $in.^2$). Since wear patterns of auto polishes are known to vary by position on the vehicle, there should be several vehicles tested with half of the vehicles having test polish applied to the driver's side and the other half having test polish on the passenger side (control polish vice versa).

7.1.2 *Checkerboard Pattern Surface Subdivision*—Each of the horizontal surfaces of the vehicle can be divided so that there are four equal sections with one dividing line being the longitudinal midline of the vehicle. The test polish and control polish are then applied so as to resemble a checkerboard design: test polish on driver's side front corner and passenger side back quarter on the first car and passenger side front quarter and driver's side back corner on the second car. In no case should each section polished be less than 1290 cm^2 (200 $in.^2$). The same pattern should be repeated on each horizontal surface (hood, roof, and rear deck) if more than one is to be used.

NOTE 3—Screening procedures can be done comparing more than two polishes by" checkerboarding" the car with polish areas so that areas of higher wear and lower wear are used for each polish. The front of the car receives more wear than the back; driver's side more than passenger side; horizontal surfaces more than vertical, especially in intense sun areas.

7.2 *Application of Polish*—Assuming the test polish or the control polish is a commercially available product, follow the directions on the container insofar as possible. When in doubt as to the method to use, the directions for similar products may be used. Equal volumes of control and test polish shall be used to avoid excessively thin or heavy coats of polish. One or two applications may be used depending upon the substrate and the discretion of the tester. The same number of coats must be used for both the test polish and the control polish.

7.3 *Durability Test Conditions*—The test vehicles should be subjected to typical environmental conditions. If desired, a variable such as an automatic car wash cycle can be scheduled between evaluation cycles.

7.4 *Cycle of Evaluation*—Periodic evaluation for effect of environment on the polish properties should be done. Depending on the environmental conditions and the durability of the polish properties being evaluated, the periodicity of the cycle of evaluation may be adjusted. A recommended period is one week.

7.5 *Durability Evaluation Procedure*—At the periodic evaluation procedures, the vehicles are washed with a mild surfactant solution (see 4.3) to remove surface soil and provide a standard pre-evaluation treatment. The vehicles are then dried. After the vehicles have been prepared, they are evaluated by a team of five or more evaluators who respond to a questionnaire detailing properties of interest. After an evaluation of the properties of the dry polish film, the vehicles can be sprayed with water to evaluate water runoff and size, shape, and contact angle of water drops on the finish.

7.5.1 There are a number of properties which can be monitored over the service life of the polish to determine polish durability (see 8.4). No single property would be adequate as the sole criterion of polish durability. Polish durability must also be measured for a sufficiently long time to understand the rate of decay in polish performance. Loss of polish performance cannot be assumed to be linear. Thus, polishes shown to have significantly different performance at some point in their service life might become more similar at other points. A recommended minimum monitoring period is twelve weeks of weekly evaluation. This will give enough comparative data for meaningful comparisons with the control. Products should be monitored as to what is judged to be a failure; if failure occurs before 12 weeks for the product of interest the test can be terminated.

8. Evaluation

8.1 *General*—Comparison is made between the test polish and the control. Both may be rated subjectively on a numerical scale so as to allow statistical comparison of data for each polish.

8.2 *Application Properties*—The individuals who apply both polishes can provide an evaluation of application features of the polishes. In each case compare the test polish with the control. Evaluate all or any of the following properties:

8.2.1 *Ease of Application*—During the application of the polishes note spreadability and absence of drag.

8.2.2 *Cleaning*—Following the application of the polishes inspect the discoloration, if any, on applicators (towels). Also note the effect of applying the polishes on the test surfaces.

8.2.3 *Drying Rate*—Take readings of time in minutes for each polish to dry.

8.2.4 *Ease of Wipe-Off*—Note effort necessary to wipe off each of the polishes from the test substrate.

8.2.5 *Powdering*—Note the degree of powdering, if any, during the wipe off of polishes from test substrate.

8.2.6 *Ease of Rub-Up to Maximum Gloss*—During application of the polishes, note the time and ease with which each product develops maximum gloss.

8.3 *Final Properties After Application*—An evaluation of the polish appearance properties may be made 10 to 30 min after application. The properties evaluated at this time should be the same as those evaluated for polish durability (see 8.4).

8.4 *Durability of Properties*—All properties can be assessed by evaluators and can be recorded versus time. Examples of properties which may be monitored are as follows:

8.4.1 *Gloss*—Gloss of both test and control polishes may be monitored periodically over time. Gloss is evaluated as depth of gloss.

8.4.2 *Distinctness of Image*—Clearness or sharpness of an image in the polished surface. This is appropriate for mirror-like finishes only.

8.4.3 *Uniformity*—The surface should be observed for streaks, unpolished spots, mars, smeariness, and general uniformity.

8.4.4 *Water Beading*—The polished surface can be judged for quickness of water run-off, size of water drops, contact angle with the surface of water drops, and uniformity of water beading on the surface.

9. Report

9.1 This practice allows the rating of a number of different properties over time. Because the properties chosen, method of rating, and conditions of comparison may vary, there is no standard for the reporting of results. It is suggested that results be recorded on a standardized scale (for example, 1 to 9) with the highest value on the scale being very, very good performance for the property under consideration and the lowest value being very, very poor performance. The panelists are then asked to evaluate by assigning a value on that scale based on their personal preference. Since the individuals rating the properties do not know the identity of the products, each performance feature is rated "blind" without possibility for bias.

9.1.1 Fig. 1 shows an example of a form by which coded test samples might be evaluated for application properties and properties immediately after application. It is only an example and need not be rigidly adhered to. However, it has some features which could be considered in developing such a questionnaire. Some of the questions provide demographic information for the panel, some monitor variables which are important to observe as test conditions, the remainder of the questions give performance ranking scales either using descriptors for each rating step or a numerical scale with only the ends defined.

9.1.2 Numerical scales can be utilized to develop statistical description of the data, for example, standard deviation and mean. Also, ratings for products may be compared by statistical tools to determine whether the ratings are distinguishable, for example "t" test or Newman-Keuls statistical analysis.

9.1.3 Fig. 2 shows an example of a form used to rate properties at periodic intervals during the test. There are both numerical scales with unforced ranking (same rating may be