SAE INTERNATIONAL

SURFACE VEHICLE INFORMATION REPORT

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Metallic Shot and Grit Mechanical Testing

RATIONALE

The target material of test machines can vary based on current manufactured machines. Note was edited to include this information for analyzing results.

FOREWORD

Shot testing machines differ in detail, but are alike in the fundamental principle that a sample of shot is subjected to repeated impacts on a target. The percentage of breakdown is readily determined by means of a screen analysis. These data can be used to check the uniformity of shipments or to determine the relative fatigue life. The results obtained from testing machines are not intended to be used in establishing consumption or cost in production machines because of other considerations not duplicated in the laboratory. However, the machines can be used to test incoming shot for consistency and comparative life with previous shipments of the same type of shot from the same manufacturer under laboratory conditions. Some machines can be fitted with standard test strips[1] to measure energy transfer.

NOTE: Shot particles may be subject to multiple impacts in a test machine. The target material of test machines can vary based on current manufactured machines. These target materials will affect the laboratory test results, therefore care must be exercised when analyzing results from different accelerated laboratory testing.

1. SCOPE

This SAE Information Report is intended to provide users and producers of metallic shot and grit[2] with general information on methods of mechanically testing metal shot in the laboratory.

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1 Refer to SAE J442 and SAE J443.
2 Shot and grit will be hereafter referred to as shot.

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https://www.sae.org/standards/content/J445_202205/

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this specification to the extent specified herein. Unless otherwise specified, the latest issue of SAE publications shall apply.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

SAE J442 Test Strip, Holder, and Gage for Shot Peening

SAE J443 Procedures for Using Standard Shot Peening Almen Test Strip

2.1.2 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM B215 Methods of Sampling Finished Lots of Metal Powders

3. SAMPLING

Samples for testing shall be representative of each shipment or production lot. The method of sampling shall be ASTM B215, Method B.

4. CALIBRATION

Because results can be influenced by the condition of a test machine, the machine must be recalibrated according to the machine manufacturer's recommendation. This may be accomplished by reserving an adequate amount of shot of known life, and comparing the results obtained on tests with that of the "standard shot." The machine must be repaired or adjusted as necessary when off-standard conditions are observed.

5. EXAMPLES OF TEST PROCEDURES

5.1 Average Life by Measurement of the Area Under the Breakdown Curve

If a representative sample of shot is observed as it is broken down in a testing machine, and the percent of the sample retained on a control sieve is plotted against the number of cycles, on rectangular coordinate paper, a breakdown curve typical of the shot is obtained. The control sieve aperture should be approximately equal to the removal size in the blast operation. The area under this curve is a measure of the average number of cycles required to reduce the size of the shot particles which pass through the control sieve. This average number of cycles, commonly referred to as the average life of the shot, is a complete evaluation of the life of the shot under the conditions of the test.

5.1.1 Example Procedure

a. Place 50 to 100 g of the sample to be tested into the test machine.

b. Run until about 20% passes through the control sieve.

c. Screen, weigh, and plot the percent retained on the control sieve against the number of cycles, using rectangular coordinate paper.

d. Return the sample retained on the control sieve to the machine and continue running.

e. Repeat steps (c) and (d) at intervals dictated by the rapidity of breakdown of the sample, until less than 5% of the sample is retained on the control sieve.

f. Draw the breakdown curve, extrapolating to 0% at the end of the next test interval. The breakdown curve, using the data from the following example, with trapezoids inscribed, is shown in Figure 1.

g. Measure the area under the breakdown curve. For example, use a planimeter or sum the areas of the individual trapezoids inscribed under the breakdown curve. Record the value as average life, in cycles.

5.1.1.1 Example

a. Initial Charge—100 g of S660

b. Control Sieve Opening—600 µm

c. Test Intervals—500 cycles