SAE INTERNATIONAL

SURFACE VEHICLE RECOMMENDED PRACTICE

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Superseding J443 JUN2010

(R) Procedures for Using Standard Shot Peening Almen Test Strip

RATIONALE

A new procedure for developing correlation charts for both sub-size Almen strips and shaded Almen strips.

1. SCOPE

1.1 Purpose

This SAE Recommended Practice Specification provides the procedures for using test strips per SAE J442 for peening processes.

1.2 Application

1.2.1 Test strips are used to generate saturation curves in order to determine intensity as a means of verifying the repeatability of a peening process.

1.2.2 The process of shot peening or other peening processes cannot, at present, be adequately controlled by nondestructive inspection of the peened parts; therefore, it is necessary to control the process itself to achieve consistent, reliable results. The use of Almen test strips with this recommended practice is a method of measuring and verifying the peening process.

2. REFERENCES

2.1 Applicable Documents

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

2.2 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.

AMS2590 Rotary Flap Peening of Metal Parts

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

SAE J2277 Shot Peening Coverage Determination

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
SAE WEB ADDRESS: **http://www.sae.org**

SAE J2597 Computer Generated Shot Peening Saturation Curves

SAE HS-84 “SAE Manual on Shot Peening,” (Warrendale, Society of Automotive Engineers, Inc., 2001).

3. TECHNICAL REQUIREMENTS

3.1 Peening Intensity

Intensity is a function of the mass, the hardness, the velocity and the impingement angle of the shot and the distance traveled by the shot stream to the peened surface of an Almen test strip. For each set of peening parameters with a given media, an intensity value can be derived and documented.

3.2 Saturation Curve

A saturation curve, which is a plot of test strip arc heights versus the duration of the exposure to the shot stream, is used to derive the peening intensity for a set of peening parameters. The saturation curve is developed from data points obtained by peening a series of Almen test strips while varying only the exposure. The exposure may be time-based (minutes, seconds, or inverse feed rate) or increment-based (number of passes, rotations or cycles). In general, these points define a typical curve with a shape as exemplified in Figure 1 (Type 1). In some cases, saturation curves can appear as exemplified in Figure 2 (Type 2) and occur only when process variables do not permit the attainment of earlier data points.

The arc height value on the curve that increases by 10% when the exposure time is doubled is declared to be the intensity. The exposure time associated with the intensity value is designated as ‘T’. The exposure time at which the arc height increases by 10% is designated as ‘2T’. The use of computer-generated saturation curves that comply with SAE J2597 is recommended.

In cases where it appears that a data point is erroneous, it is permissible to repeat that test. If the same erroneous value is achieved, then the machine parameters shall be evaluated and adjusted as needed and a new saturation curve shall be generated.

Test strips exposed for extended periods can exhibit arc heights significantly greater than the “intensity” value. This does not imply that extensively long duration peening treatments are in violation of intensity requirements. Intensity is a value derived from a saturation curve and is constant for a given set of machine parameters, regardless of peening time.

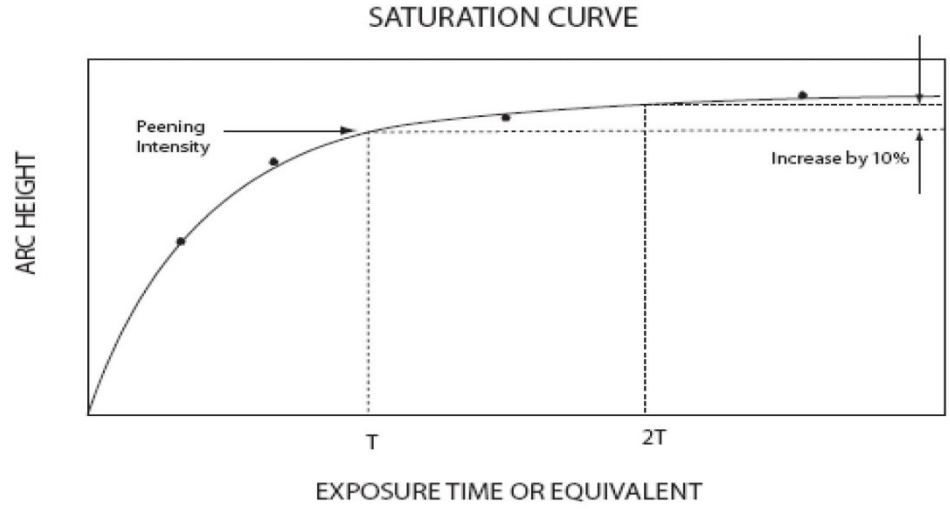

Figure 1 - Time based saturation curve (Type 1)

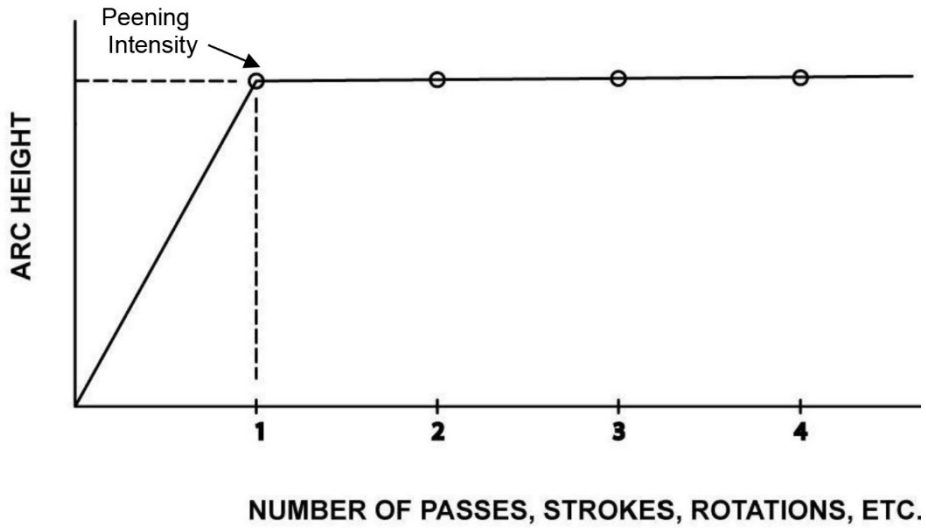

Figure 2 - Incremental based saturation curve (Type 2)

3.3 Intensity Determination Procedure

3.3.1 General

Prior to use, the zero position of the test strip gage shall be checked with the zero block per SAE J442 and adjusted if necessary. The test strips, holder, and gage shall meet the requirements of SAE J442. Pre-bow measurements may be documented prior to peening and then used to provide net arc height measurements after peening.

3.3.2 Verify that the test strip holder meets the flatness requirements of SAE J442. Fasten the test strip tightly and centrally to the test strip holder. Avoid entrapment of any foreign material beneath the test strip.

3.3.3 Expose the outer (top) surface of the test strip (see SAE J442) to the peening stream to be measured. Record the time of exposure or its equivalent.

3.3.4 Remove the test strip from the holder and verify that the peened side of the test strip exhibits uniformly distributed (see 5.4) dents to assure that the test strip surface area within the hold-down screws has not been blocked from the peening stream. The test strip area under the hold-down screws does not require denting.

3.3.5 Measure the test strip arc height with the indicator tip touching the unpeened side of the test strip. Record the arc height measurement and, if using pre-bow compensation for net arc height response, correct the final arc height by subtracting the pre-bow measurement from the measured arc height (see 5.2.2). When sub-size strips are used, pre-bow compensation must be used due to the relatively low final arc height values.

3.3.6 Using different exposure times or equivalents, without changing any other parameters, repeat 3.3.1 to 3.3.5 using a minimum of 4 test strips to construct a saturation curve similar to Figures 1 or 2. The graph shall be constructed by using a minimum of four arc height measurements (data points) other than zero. Plot the data points and then draw a smooth curve representing the best fit of the data points. Alternatively, the use of computer-generated saturation curves which comply with SAE J2597 is recommended.

3.3.7 Peening intensity is determined by interpreting the saturation curve.

3.3.7.1 For Type 1 saturation curves, the intensity is defined as the arc height value on the curve that increases by 10% when the exposure time is doubled. For Type 2 saturation curves, the intensity is defined as the arc height value of the first data point (i.e., at the minimum possible exposure time, T) provided that the arc height increases by no more than 10% when the exposure time is doubled to time 2T.