

	SURFACE VEHICLE RECOMMENDED PRACTICE	SAE	J443 JUN2010
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(R) Procedures for Using Standard Shot Peening Almen Strip			

RATIONALE

Substantial revisions have been made to this document and the (R) symbol to the left of the document title indicates a complete revision.

Figure 1 - Eliminate "or less" from the arc height increase criteria so one and only one numeric answer can be derived from a given saturation curve. Use of "or less" may allow extremely long exposure times with corresponding increases in arc heights to erroneously qualify as intensity.

Figure 2 - Demonstrates that special cases exist where some peening techniques are accomplished with incremental number of passes through a machine, rotations of a turntable, strokes of a reciprocating nozzle or other methods and due to configuration and machine control constraints the Almen strip is saturated at the first exposure (least amount of exposure available) to the shot stream and additional passes do not significantly increase the arc height further.

Section 7.3 - It is common to use a fixture with multiple Almen holders for intensity tests. The peening intensity at each holder position must meet the requested values. The "saturation times" for each holder will be unique. When performing intensity verifications (one strip at saturation time) each holder must be exposed individually to its own saturation time and its arc height must be within the requested tolerance band. An alternative method is allowed by establishing "target arc heights" for use in intensity verification whereby the fixture can be used with all holders simultaneously and the obtained arc heights (within tolerance band) at each location must repeat the arc heights obtained in their respective saturation curve.

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1. SCOPE

This SAE Recommended Practice provides uniform procedures for using the standard shot peening Almen strips reported in SAE J442. Standard Almen strips are used to establish saturation, determine intensity, monitor repeatability of the shot peening machine operations, and can be used to predict a desired result on a part. It is recommended that the standard Almen strip A be used for intensities that produce arc heights of 0.10 mm A (0.004 in A) to 0.60 mm A (0.024 in A). For intensities below 0.10 mm A (0.004 in A), the standard N strip is recommended, and for intensities above 0.60 mm A (0.024 in A), the standard C strip is recommended. Use of SAE 2597 Computer Generated Shot Peening Saturation Curves is voluntary, existing shot peening processes that do not take advantage of computer generated saturation curves need not be changed to meet the requirements listed herein.

The process of shot peening, in common with many other 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.

2. REFERENCES

2.1 Applicable Publications

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.

2.1.1 SAE Publications

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

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

SAE J2277 Shot Peening Coverage Determination

SAE J2597 Computer Generated Shot Peening Saturation Curves

3. PEENING INTENSITY

Intensity is a function of impacting shot particle properties: mass hardness, velocity, angle of impingement and distance traveled to the surface of the Almen strip

4. SATURATION CURVE

A saturation curve is a plot of arc heights of peened standard test strips versus exposure times and is used to derive intensity. The saturation curve is developed from these data points obtained by peening a series of Almen strips while varying exposure times. Exposure time may be time-based (in minutes, seconds, inverse feed rate) or incremental-based (number of passes/rotations). In general these points define a typical curve with a shape as exemplified in Figure 1 (Type I). In some cases saturation curves may appear as shown, schematically, in Figure 2 (Type II). This will occur only when process variables do not permit attaining earlier data points.

The procedure for producing a saturation curve is detailed in Section 5.

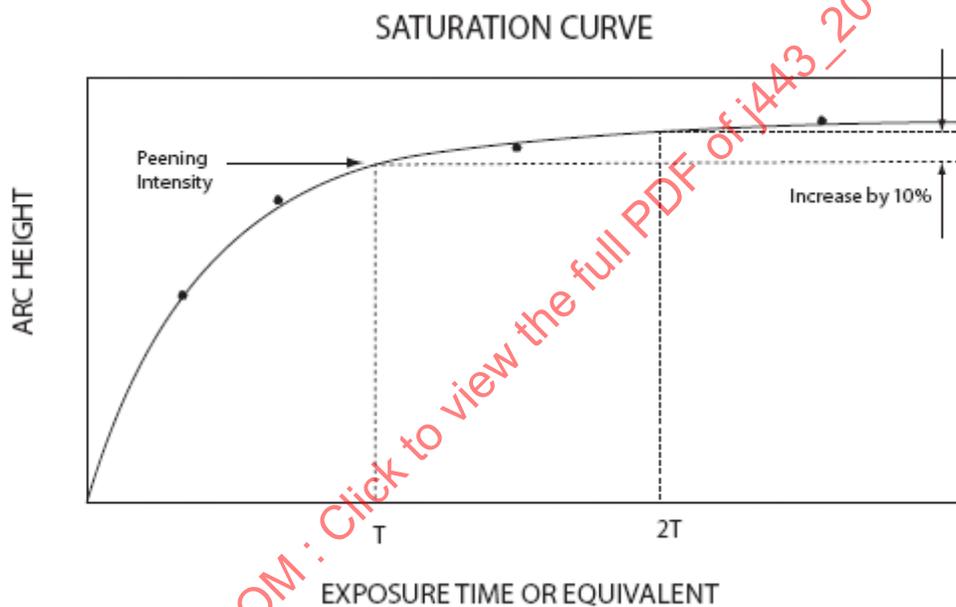


FIGURE 1 - TIME BASED SATURATION CURVE

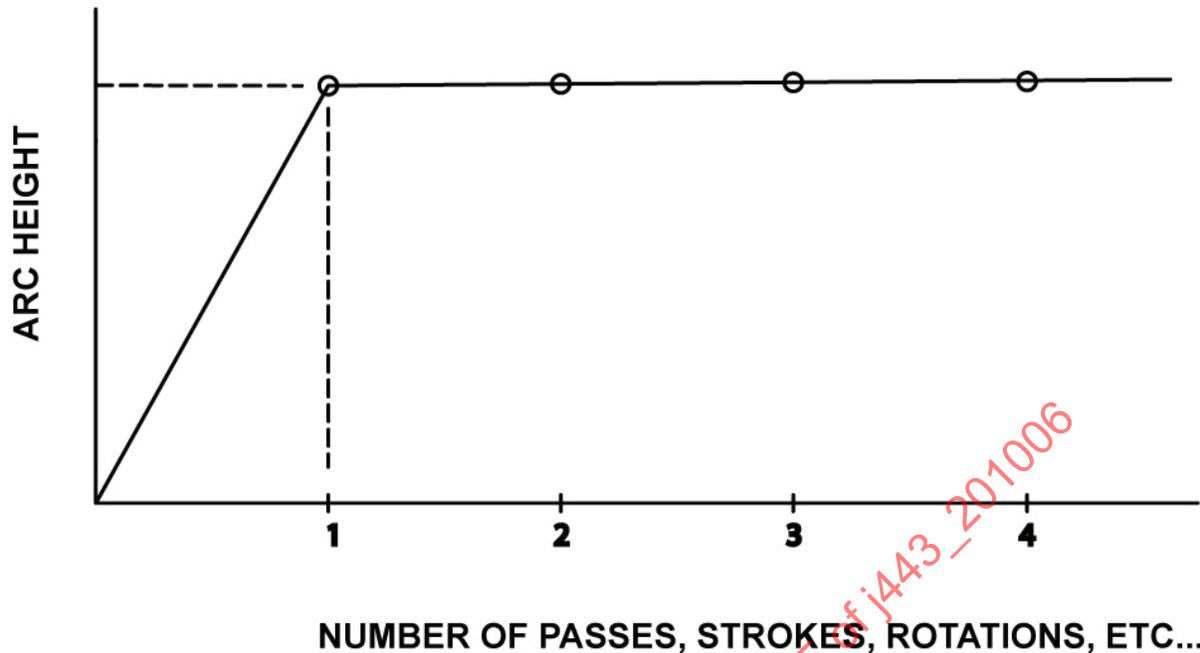


FIGURE 2 - SCHEMATIC REPRESENTATION OF SPECIAL CASES

The point on the curve where the arc height 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 which comply with SAE J2597 is recommended.

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

It should be noted that Almen strips exposed for extended periods may 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.

5. INTENSITY DERIVATION PROCEDURE

General—Prior to use, the zero position of the gage shall be checked with a flat calibration block (see SAE J442) and, if necessary, adjusted. Almen strips and holder shall meet the requirements of SAE J442.

- 5.1 Fasten the Almen strip tightly and centrally to the Almen strip holder, avoiding entrapment of any foreign material..
- 5.2 Expose surface "X" (SAE J442) of the Almen strip to the peening stream to be measured. Record the time of exposure or its equivalent (number of passes, inverse federate, etc.).
- 5.3 Remove the Almen strip from the holder and measure the arc height on the gage, ensuring that the indicator stem contacts the unpeened surface of the Almen strip.
- 5.4 Using different exposure times or equivalents, repeat steps 1, 2, and 3 sufficiently (minimum of 4 Almen strips) to construct a saturation curve similar to Figure 1 or 2.
- 5.5 Peening intensity is determined by interpreting the saturation curve. Intensity is the value of the arc height at time T , which increases by 10% when the exposure time is doubled – time $2T$. The graph shall be constructed by using a minimum of four points other than zero.