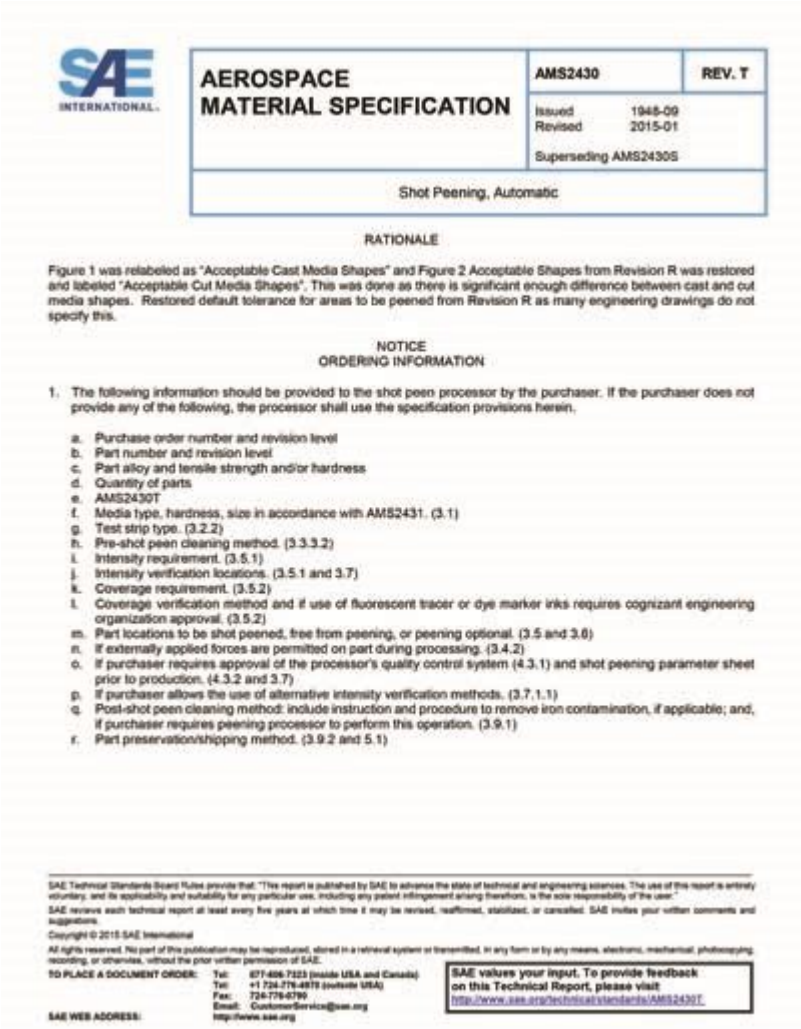
Ams 2430 Shot Peening Sdocuments2



AEROSPACE MATERIAL SPECIFICATION

AMS2430 REV. T

Issued 1948-09
Revised 2015-01

Superseding AMS2430S

Shot Peening, Automatic

RATIONALE

Figure 1 was relabeled as "Acceptable Cast Media Shapes" and Figure 2 Acceptable Shapes from Revision R was restored and labeled "Acceptable Cut Media Shapes". This was done as there is significant enough difference between cast and cut media shapes. Restored default tolerance for areas to be peened from Revision R as many engineering drawings do not specify this.

NOTICE
ORDERING INFORMATION

1. The following information should be provided to the shot peen processor by the purchaser. If the purchaser does not provide any of the following, the processor shall use the specification provisions herein.

   a. Purchase order number and revision level
   b. Part number and revision level
   c. Part alloy and tensile strength and/or hardness
   d. Quantity of parts
   e. AMS2430T
   f. Media type, hardness, size in accordance with AMS2431. (3.1)
   g. Test strip type. (3.2.2)
   h. Pre-shot peen cleaning method. (3.3.3.2)
   i. Intensity requirement. (3.5.1)
   j. Intensity verification locations. (3.5.1 and 3.7)
   k. Coverage requirement. (3.5.2)
   l. Coverage verification method and if use of fluorescent tracer or dye marker inks requires cognizant engineering organization approval. (3.5.2)
   m. Part locations to be shot peened, free from peening, or peening optional. (3.5 and 3.6)
   n. If externally applied forces are permitted on part during processing. (3.4.2)
   o. If purchaser requires approval of the processor's quality control system (4.3.1) and shot peening parameter sheet prior to production. (4.3.2 and 3.7)
   p. If purchaser allows the use of alternative intensity verification methods. (3.7.1.1)
   q. Post-shot peen cleaning method: include instruction and procedure to remove iron contamination, if applicable; and, if purchaser requires peening processor to perform this operation. (3.9.1)
   r. Part preservation/shipping method. (3.9.2 and 5.1)

TO PLACE A DOCUMENT ORDER: Tel: 877-606-7323 (inside USA and Canada)
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
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http://www.sae.org/technical/standards/AMS2430T

AMS 2430 Shot Peening: An In-Depth Overview

Shot peening is a mechanical process that enhances the fatigue resistance and durability of materials, especially metals. The process involves bombarding the surface of a component with small, spherical media known as shots, which induce compressive residual stresses on the surface. The Aerospace Material Specification (AMS) 2430 outlines the standards and guidelines for shot peening processes used in aerospace applications, ensuring consistency, reliability, and performance. This article delves into AMS 2430, its importance, the procedures involved, and its implications in various industries.

Understanding AMS 2430

AMS 2430 is a specification developed by the Society of Automotive Engineers (SAE) that serves as a guideline for the shot peening process applied to aerospace components. The specification covers various aspects, including the types of shots used, peening intensity, coverage requirements, and process control.

Key Objectives of AMS 2430

- To standardize shot peening: Establishing uniform procedures and criteria to be followed across different manufacturers and applications.
- To enhance fatigue strength: Providing guidelines that ensure components have improved resistance to fatigue failure, which is crucial in high-stress environments like aerospace.
- To ensure quality control: Defining inspection techniques and quality assurance measures to ensure that the peening process meets industry standards.

The Importance of Shot Peening

Shot peening is vital in enhancing the performance and lifespan of components used in critical applications. The importance of AMS 2430 shot peening can be summarized as follows:

1. Improved Fatigue Resistance

Compressive residual stresses induced by shot peening help counteract the tensile stresses experienced by components in service. This enhancement is crucial in parts subjected to cyclic loading, reducing the likelihood of crack initiation and propagation.

2. Increased Component Lifespan

By improving fatigue resistance and surface integrity, shot peening can significantly extend the lifespan of components. This is especially important in aerospace, where the cost of failure can be extraordinarily high.

3. Enhanced Performance

Components that undergo shot peening often exhibit improved performance characteristics, such as higher load-bearing capabilities and reduced deformation under stress.

4. Cost-Effectiveness

While shot peening involves initial investment in equipment and training, the long-term savings derived from reduced maintenance and lower failure rates can lead to significant cost savings.

Shot Peening Process as per AMS 2430

The shot peening process involves several critical steps, each of which must be executed in accordance with AMS 2430 specifications to achieve the desired outcome. Below is an

overview of the essential stages of the shot peening process.

1. Preparation of Components

- Cleaning: Components must be thoroughly cleaned to remove any contaminants, oils, or residues that could interfere with the peening process.
- Inspection: Visual inspection and dimensional measurement are conducted to determine the initial condition of the components.

2. Selection of Shot Media

The choice of shot media is crucial and can significantly affect the outcome of the peening process. Factors to consider include:
- Material: Common materials include steel, ceramic, glass, and plastic shots.
- Size: The size of the shot affects the intensity of peening and should be selected based on the specific application and desired peening intensity.
- Hardness: The hardness of the shot must be appropriate to ensure effective impact without damaging the component.

3. Peening Parameters

AMS 2430 specifies various parameters that need to be controlled during the shot peening process:
- Peening Intensity: Measured using the Almen strip method, peening intensity is critical for ensuring adequate compressive stress is induced.
- Coverage: The percentage of the surface area that must be impacted by the shots should meet the specified requirements to ensure uniform treatment.
- Distance and Angle: The distance from the shot nozzle to the component surface and the angle of impact can influence the effectiveness of the peening process.

4. Monitoring and Control

Continuous monitoring of the shot peening process is essential to ensure compliance with AMS 2430. Techniques include:
- Almen Strip Testing: Used to measure the intensity of the peening process.
- Coverage Measurement: Assessing the percentage of surface coverage to confirm adherence to specifications.
- Quality Assurance: Regular inspection and documentation of process parameters to maintain consistency.

5. Post-Peening Treatment

After shot peening, components may require additional treatments, such as:
- Cleaning: Removal of residual shot media and debris.
- Heat Treatment: In some cases, heat treatment may be conducted to further enhance the mechanical properties of the component.

Applications of AMS 2430 Shot Peening

The applications of AMS 2430 shot peening span various industries, with aerospace being the most prominent. Below are some key sectors where shot peening is critical:

1. Aerospace Industry

In aerospace, shot peening is extensively used on components such as:
- Aircraft landing gear
- Engine components
- Structural elements

2. Automotive Industry

Shot peening is increasingly adopted in the automotive sector to enhance the durability of:
- Crankshafts
- Transmission components
- Suspension systems

3. Energy Sector

Components used in energy applications, such as turbines and pressure vessels, benefit from shot peening due to the high-stress environments they operate in.

4. Medical Devices

Certain medical devices and implants also utilize shot peening to improve surface properties and fatigue resistance, ensuring long-term reliability.

Challenges and Considerations

While AMS 2430 shot peening offers numerous benefits, there are challenges and considerations that must be taken into account:

1. Equipment and Training Costs

Investing in high-quality shot peening equipment and training personnel can be costly, particularly for small and medium-sized enterprises.

2. Process Control

Maintaining precise control over the shot peening parameters requires diligence and

expertise. Any deviations can lead to suboptimal results, potentially compromising component integrity.

3. Environmental Concerns

The use of certain shot media and the disposal of used shots can raise environmental concerns, necessitating compliance with relevant regulations and guidelines.

Conclusion

AMS 2430 shot peening is a crucial process that significantly enhances the fatigue resistance and durability of components used across various industries, especially aerospace. By adhering to the guidelines established in the AMS 2430 specification, manufacturers can ensure consistent quality and performance in their products. Although challenges exist in terms of cost and process control, the long-term benefits in terms of component longevity and reliability far outweigh the initial investments. As technology continues to evolve, the applications and methodologies associated with shot peening will likely expand, further solidifying its role as an indispensable process in modern manufacturing.

Frequently Asked Questions

What is AMS 2430, and why is it important in the shot peening process?

AMS 2430 is a specification that outlines the requirements for shot peening processes used to enhance the fatigue resistance of metallic components. It is important because it provides standardized guidelines that ensure consistent quality and performance of shot peened parts.

What materials are commonly treated using AMS 2430 shot peening?

AMS 2430 shot peening is commonly applied to a variety of materials including aluminum alloys, titanium, and high-strength steels, which are often used in aerospace and automotive applications to improve their durability.

How does shot peening according to AMS 2430 improve the lifespan of components?

Shot peening according to AMS 2430 introduces compressive residual stresses on the surface of components, which helps to delay the initiation of fatigue cracks and improves overall fatigue life, thereby extending the lifespan of the components.

What are some key parameters that must be controlled during the shot peening process as per AMS 2430?

Key parameters include shot size, shot hardness, intensity of the peening process, coverage, and the duration of exposure. Controlling these parameters is crucial to achieving the desired surface properties and ensuring compliance with AMS 2430 standards.

What equipment is typically used for shot peening in compliance with AMS 2430?

Equipment used for shot peening in compliance with AMS 2430 includes air blast machines, wheel blast machines, and robotic systems that can precisely control the shot trajectory and intensity, ensuring uniform coverage and effective peening.

How is compliance with AMS 2430 verified during the shot peening process?

Compliance with AMS 2430 is verified through various inspections and tests, including measuring the intensity of the peening process, assessing shot cleanliness, and conducting surface hardness tests, as well as visual inspections to ensure proper coverage.

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