



Role Of Shot Peening In Fatigue Life Improvement Of Metals

Overview

- Introduction
- Mechanical causes of fatigue failure
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- Shot peening control
- Shot peening applications
- conclusion

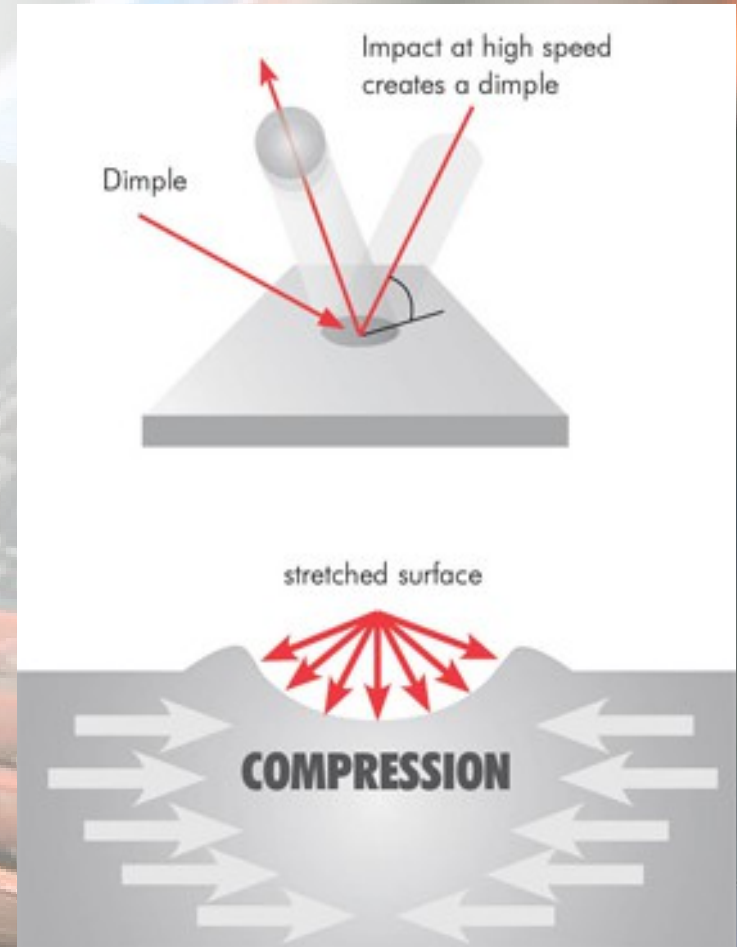




WHAT IS SHOT PEENING?

Introduction

- Cold working process.
- Used to produce a compressive residual stress layer.
- Modifies mechanical properties of metal like increasing strength & hardness.
- Done by bombarding shots.
- Prevents formation of



Mechanical causes of fatigue failure

➤ ***Residual Stresses from Surface Finishing***

Highly finished surfaces & fillets may lead to a false sense of security if the parts have highly residual stresses as the result of machining or straightening operations.

➤ ***Residual Stresses from Thermal Gradient***

Internal stresses may occur in components where instantaneous temperature in a thin

The background of the slide features a close-up, slightly blurred image of a crankshaft, showing its characteristic curved arms and central journal. The image is overlaid with several realistic water droplets of various sizes, some in sharp focus and others blurred, creating a sense of depth and texture. The lighting is soft, highlighting the metallic surfaces of the crankshaft.

➤ ***Residual Stresses from Processing***

Many parts such as crankshafts, camshafts require straightening. This is usually done at room temperatures & the parts are rarely stress relieved.

➤ ***Size & Distribution of Internal Defects***

➤ ***Environment***

Shot peening

Airless Peening Machine

High cost of plants but low cleaning cost

High maintenance

Lack of flexibility

High production rates

Use of limited size of media

Limitations: Distortion of material, Immobile

Mostly suitable for in-house operations

Pneumatic Peening Machine

Low cost of plants

Simple to operate & negligible maintenance

Extremely flexible

Low & medium production rates

Fine to very fine sizes of media can be used

Unlimited scope

Suitable for in-house & outdoor operations

Shot peening control

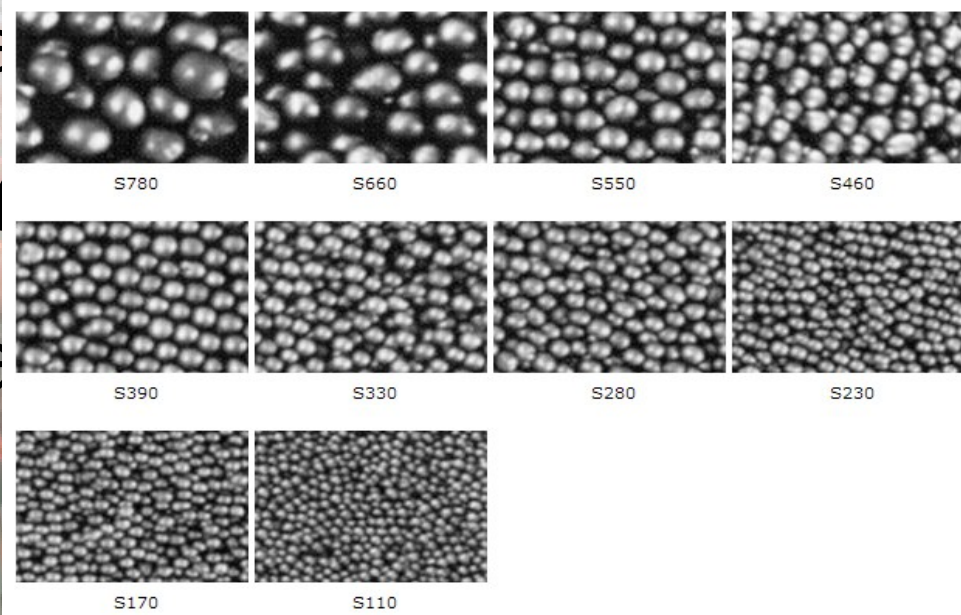
➤ *Shot Material & Its Hardness*

Shots used are usually of cast steel with hardness of 40-50 on Rockwell C scale

➤ *Shape & Size of Shot*

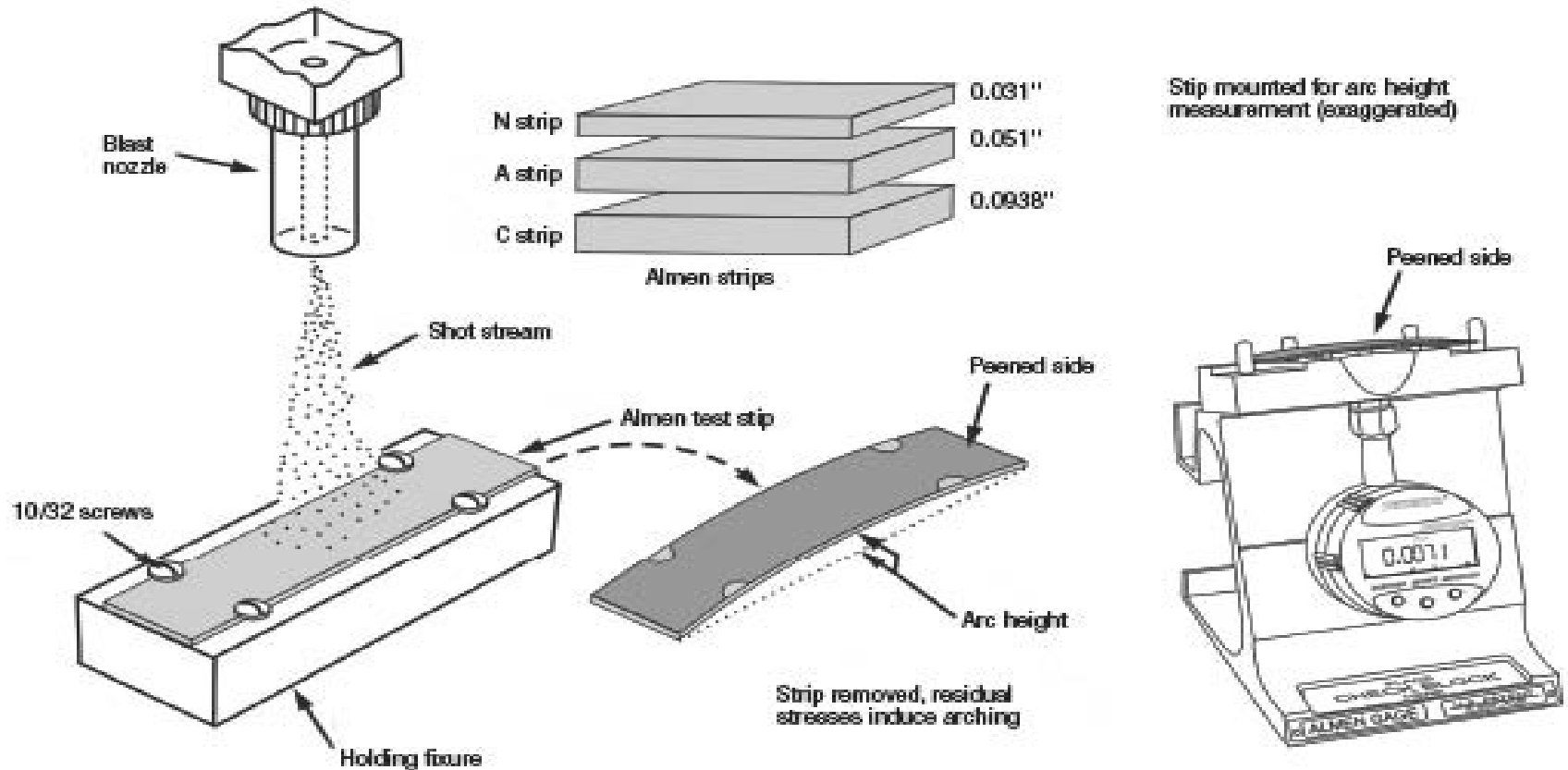
The shots or beads should

be free from sharp



➤ Shot Velocity & Impact Angle

Higher the shot velocity more will be the work done, & more will be the effect of shot peening process.



Shot peening applications

Some common fields of shot peening application are:

- Vehicles & agricultural machinery.
- Power drive & transmission system.
- Internal combustion engines.
- Steam & gas turbines.
- Aviation equipment.
- Chemical equipment.

Shot peening of gears

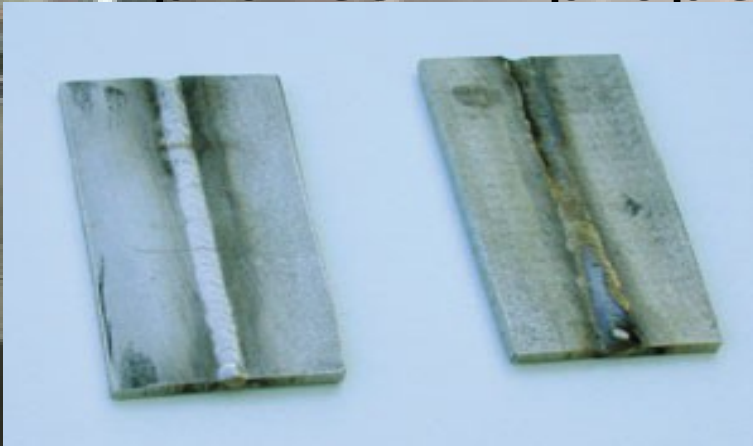
- Excellent means of increasing beam strength of gears with high load carrying capacity.
- Highest concentration of stress is in the tooth fillets at the gear roots.
- Subjected to bending fatigue failure.



Figure 3. Fatigue Crack in Gear Tooth Root Fillet.

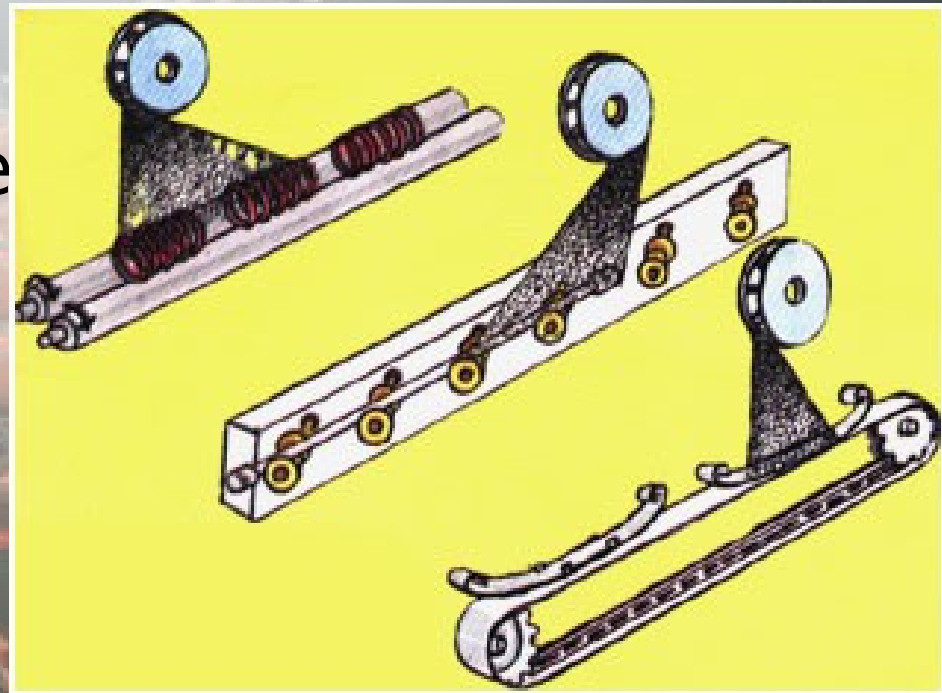
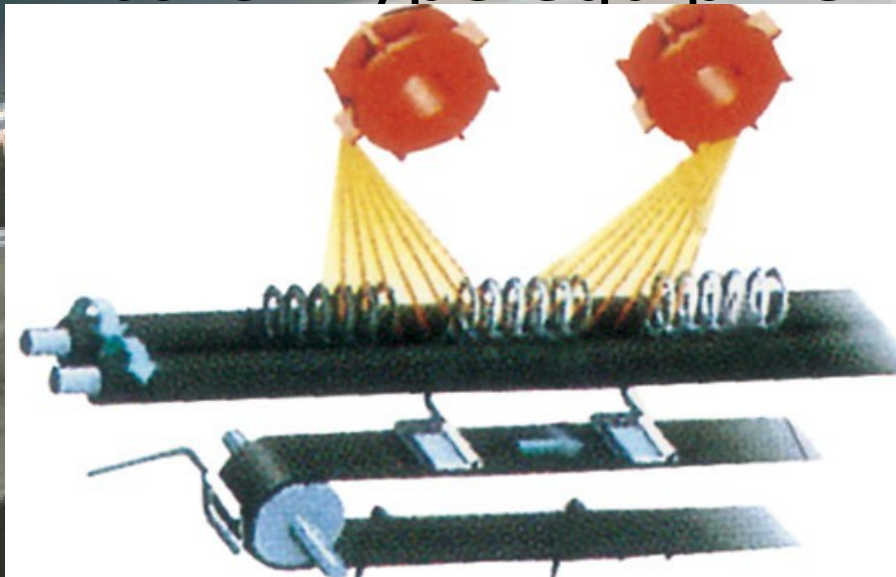
Shot peening of welds

- Regular welds fail after 250,000 cycles.
- Shot peened welds fail after 2.5 million cycles, that too outside the weld area.
- Popular operation with aerospace equipment parts.
- Improves property performance by introducing tensile stresses that relax as welds cool.



Shot peening of springs

- Fatigue tests on springs showed peened springs to have longer life than unpeened ones.
- Shot peening of springs is performed in batch type equipment



Shot peening of Stainless steel

- Excellent corrosion resistance, austenitic 316L SS is used in wide range of environments.
- Presents relatively low strength & poor wear resistance.
- Thus its treated with shot peening process to increase its strength & wear resistance, without any loss of corrosion resistance & ductility.

conclusion

Thus its concluded that shot peening results in increasing the fatigue life of components by inducing a layer of compressive stress on the surface of the metal.

The background features a complex, futuristic design. In the upper right, a large, cylindrical metallic structure with a glowing orange and blue light emanates from it. Below this, a series of horizontal, metallic, glowing bars or tubes are arranged in a fan-like pattern, extending from the left towards the center. The overall color palette is dominated by metallic greys, blues, and oranges. Numerous translucent, spherical bubbles of varying sizes are scattered throughout the scene, particularly in the top-left and bottom-right corners, adding a sense of depth and movement. The text 'Thank You' is centered in a bold, black, italicized font.

Thank You