

HISTORICAL ASPECT OF SHOT PEENING

Kisuke Iida
 Mechanical Engg. Dept. Meiji University,
 Higashimita, Tama, Kawasaki, Japan.

1. INTRODUCTION

Shot Peening technique have been used in the world. In this paper, from historical aspect the term was divided into three i.e. past, now and future as shown in Fig.1 and main techniques was picked up.

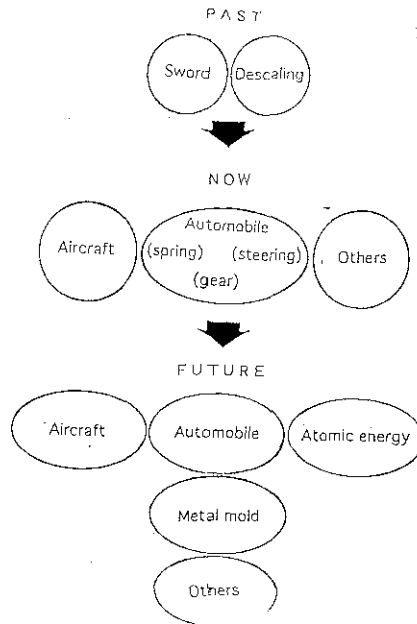


Fig. 1. Shot Peening : Past, Now and Future

2. PAST

Long time ago, shot peening was used by blacksmiths as a technique for descaling or as a strengthening method of sword in the Occident and Asia. Descaling is a plane technique for blacksmiths, which was easily performable, but strengthening of sword may rather be a high technique. After hot forging, a blacksmith repeatedly peened a sword by a pointed hammer to make it more strong.

In Japan, the name of Japanese sword is *Katana* or *Nihontoh*, as shown in Fig.2, and it was worn by Samurai persons until 19th century as traditional weapon. But samurai and this custom was finished by the revolution in 1868.

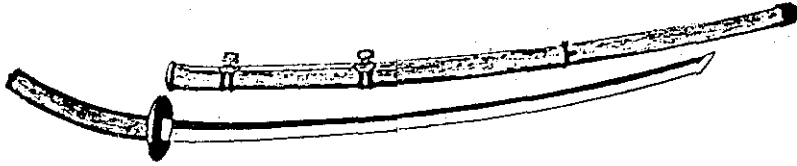


Fig. 2. Japanese Sword : *Katana* or *Nihontoh*

In the production of the *katana*, a blacksmith performed a technique named 'Mizuuchi' or 'Kuro-uchi'. This technique was hammering after quenching. 'Mizu-uchi' means hammering on sword-work wetted by water and the 'kuro-uchi' means hammering on black sword-work covered with black scale : 'mizu' means water, 'kuro' means black, 'uchi' means hammering. This hammering produces transformation of austenite remaining after quenching and makes the sword more hard.

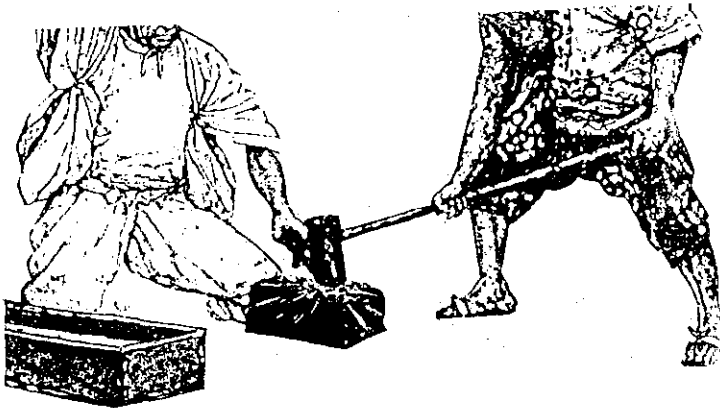


Fig.3. Blacksmith in Japan (10 - 19 century)

3. NOW

As well known, shot peening is used in various fields, and the main industries are shown in Fig. 1.

In aircraft production, all parts are peened to increase fatigue strength. In

automobile production, steering parts, all springs and main gears are peened to increase fatigue strength and to prolong wear, and to produce light weight car.

In other production, welding, die-casting and forging etc., all or several products are peened for various purposes.

Peening effects and its causes are shown in Fig.4, produced from peened surface and affected layer.

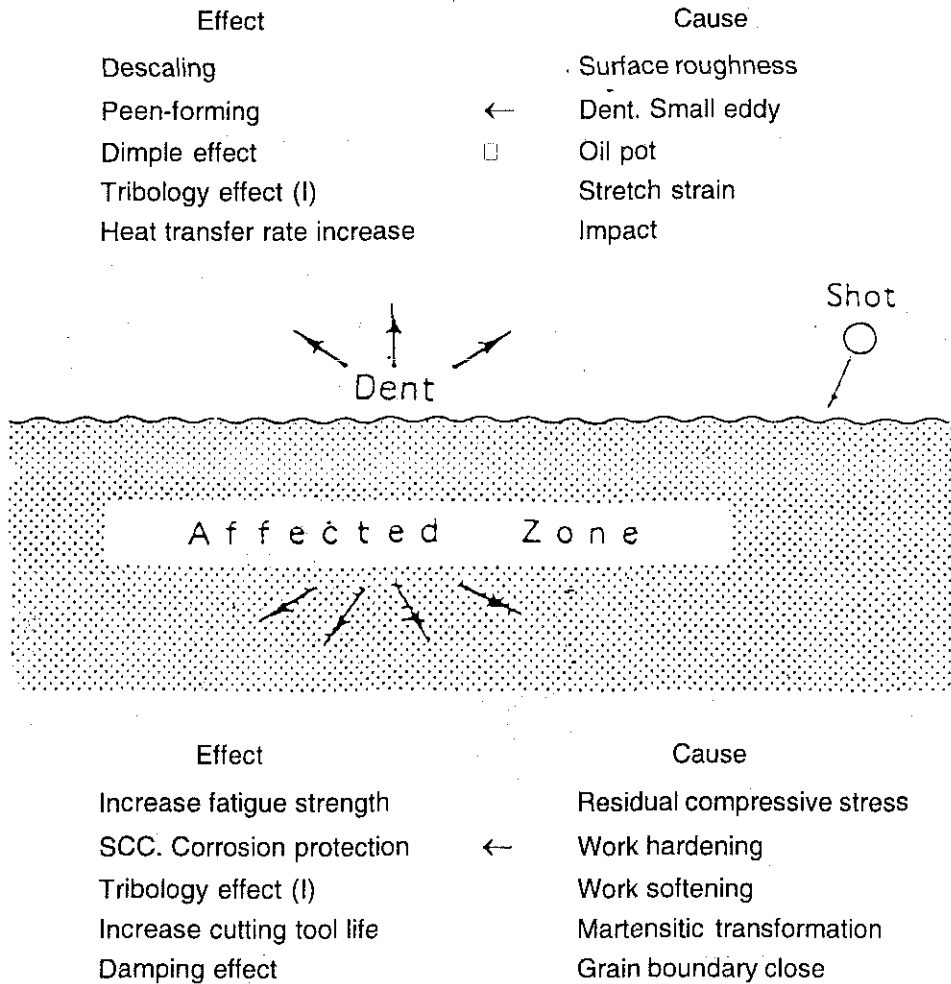


Fig. 4. Peening Effect and Cause

4. FUTURE

Peening effects are not yet fully understood, because its causes and its mechanisms are not always clear. The main causes are residual stress and work

hardening, but after removing these two factors, some peening effects are remained.

The quality of metals may be getting better after several years further, then various peening effects may appear on them. Before ten years, residual stress was not appreciated in increasing fatigue strength owing to involved impurities in steels and other metals, therefore fatigue strength was not constant. In atomic industry, constructional metals are almost stainless steels, and increase of endurance limit or resistance of stress corrosion cracking (scc) are very important factors. Shot peening is the most effective process for them. Stainless steels produce highly compressive residual stress by shot peening which endure from relaxation by heating. But shot peening effect for atomic energy endure from relaxation by heating. However, shot peening effect for atomic energy apparatus is not well known yet for persons concerned, therefore, may be available in the future. In metal mould industry, metal quality is low and therefore peening effects don't appear on them. The quality may increase in future, and shot peening may be useful.