2001181

International Conference on Shot Peening and Blast Cleaning.

SHOT PEENING IN MAINTENANCE OF STEEL STRUCTURES

Salko Djozic
Senior Mechanical Engineer
2, Ravnice 24
10000, Zagreb Croatia.

PREFACE

Guidelines for choosing appropriate intensity for the desired results of Shot Peening originated from car design and shot peening was found to impart 40% greater efficiency to car structures (SAE 1973). Saving on the weights of valves, gears, shafts, chambers, pressure vessels and steel weights made car design more competitive.

SHOT PEENING IN SHIP BUILDING

A ship as a whole is considered as a floating body and the positioning of its internal equipment, keeping in mind the total permissible load on water is crucial for normal drive-floating; watertight bulkheads and girders are prominent ship body weights. Shot Peening addresses liquid transfer and sand and grain spills on ships. Oiltankers have more effective and stiffened corrugated plates. Shot Peening is more effective on materials with long fatigue lives and high strength and on specimens that are notched or have crack-prone surface (e.g. decarburized or chromium-plated than on nicely finished ones).

ESTIMATIONS RELATED TOSHOT PEENING MEASURES ARE

1. Interpolation between fatigue strength at 10 million cycles (prominent influence of Shot Peening observed and at 1000 cycles (negligible influence) gives strength at intermediate fatigue lives.

2. Steady as well as alternating stress effect computations.
3. Compressive stresses, induced by Peening on notched parts, prevents crack growth.
4. Compressive stresses, induced by Peening on smooth parts, delay the appearance of crack.

   Even if a crack appears by repeated yielding on a Shot Peened part subjected to10 million cycles or more it will not propagate below the notch root and compressed regions at lower applied stress will be safe. Thus, no stress concentration factor is used.

   Free surfaces exposed to corrosion and scratches are most vulnerable to yielding but yielding of subsurface material at sufficiently high load stresses should also be prevented by suitably relating the Peening intensity and depth of compressive self-stresses. Higher intensity involves more time for full saturation. Tensile and compressive stresses are comparable at the surface and the core. Optimum Peening condition arrives when yielding at the surface is equally likely as yielding at the surface of the Peened item.

OBSERVATIONS LEAD TO THE FOLLOWING CONCLUSIONS

1. Harder shots are more effective on harder steel than softer shots of same intensity.
2. Aluminium parts respond better to large shots.

   Magnitude and distribution of compressive stresses depends on the Shot Peening treatment and so does the surface roughness. Larger or softer shots produce smoother for the same depth of compressive stress but drain more material and time. Small thickness or high intensity might involve distortion. Thus Shot Peening of notched parts of hard and durable materials gives good estimates of relatively unnotched, soft parts with shorterlives and aids the design

of structures involving many parts with unequal mechanical properties.

REFERENCES

1. Sunobe Yoshio : High Technology Royal Wakaba 1-22 Wakaba Japan.
2. Schneider, C., Prague, W.: "Tailored Blanks" ein Werksteaff fur neue Formen der Konstruktion. Thyssen Technische Berichte Duisberg Germany 1992.
3. Koch, M., Frings, A.: Untersuchung zum Lasserstrahlschweissen und Schneiden von Warmband Thyssen Technische Berichte Duisberg Germany 1992.
4. V. Raghovan : Materials Science and Engineering, Prentice Hall of India New Delhi 1982.
5. Design and Application of Small Standardized Components : Stock Drive Products Canada 1983.
6. The Procedure hand book of Arc Welding Lincoln Electric Company Ohio USA.
7. Authors personal many years visit and observation of Stork Area in North Croatia and talk with inhabitants in villages where storks visit.