

OPTIMUM METHOD, INTENSITY, AND COVERAGE OF MECHANICAL PRESTRESSING
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Methods - I feel that surface rolling may be preferable for those parts of circular section which are produced in quantities sufficient for establishment and surveillance of correct tooling. For parts of irregular shape, shot peening is obviously better, and for parts of circular shape in small quantities, I feel that shot peening, controlled by Almen intensity measurements, can be specified and checked with more confidence than a rolling setup.

I also feel that for small quantities the use of existing versatile shot peening equipment will be more economical than the use of rolling devices.

Speaking of versatile shot peening equipment, I would add that air blast not only is more economical in smaller quantities, but also able to reach areas which could not be blasted by a wheel; the insides of holes or of pressure vessels are typical examples of such areas.

Choice of Intensities - We have good guides in the data given in various specifications (such as Military Specification 13165) and by John Straub in this symposium. The establishment of true optimum values will have to wait until the results of Professor Beebe's tests or of similar tests on permissible core tension are available; when we produce skin compression, we obviously also produce core tension. The optimum intensity is achieved at the point where the inferior properties of the skin have been raised by compression to the same life to which the superior properties of the core are reduced by tension.

Coverage - It seems to me that measurement by values such as "90 visual coverage" are not significant. Two extreme examples of different distributions, both amounting to about 80% coverage, are given in Fig. 1. It seems obvious that the 80% coverage shown on the left will give better life than that shown on the right. I would like to submit a definition of satisfactory coverage along the following lines: "No point in an area not covered by peening impressions shall be more than 'X' inches distant from the nearest peening impression."

The distance "X" will vary, depending on peening intensity and hardness of the workpiece. Any distance larger than the estimated depth of the compressive stress would presumably be excessive; a distance smaller than 1/8 this depth would seem safe to me.

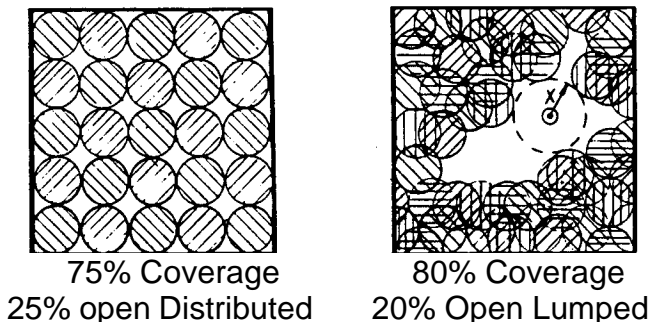


Fig. 1 - Definition of coverage