

DISCUSSION

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This paper is very complete engineering-wise for the detailed calculations, graphs, and tabulated data. The authors should be proud of their endeavors.

Our comment to the text of the paper will have to be based upon our turbine wheel experience. Over the past 10 years we have made welded turbine wheels about 6½ in. and 7½ in. in diameter using a 19-9DL hub, Stellite #21 blades, and fusion welded automatically with Hastelloy W welding wire. We have found through experience that for the weld thickness of 3/8 in. a radiographic exposure of 210–230 kv was necessary to secure a sensitivity of 2 per cent or less. Our focal spot is 3.5 mm with film to tube distance of 36 in. We realize that the paper covers different alloys and greater kv might be required for the thicknesses involved.

We have had greater difficulty with porosity in the welds with lower lack of fusion problems than listed in the paper. The differences in alloys may account for some of the reasons. When the penetration is faulty we alter the heat input of the welding to correct the trouble, but not increasing too greatly, as cracking from cooling will result.

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Authors' Closure

The authors wish to thank Mr. Potenski for his comments. The radiography reported by the authors was done with readily available equipment and no inference is made that this equipment was optimized for the job. The conclusions about the relations between wheel strength and the nature and extent of the defects were based on examination of the fracture surfaces and not on the radiographs.

The authors assume that Mr. Potenski's remarks are further amplified in reference [9], which gives an excellent description of the use of radiography in the production inspection of welded turbine wheels. Mr. Potenski's statement, "We have had greater difficulty with porosity in the welds with lower lack of fusion problems than listed in the paper," is interpreted to mean that his radiography indicated porosity to be a more serious manufacturing problem than lack of fusion. The authors wish to emphasize a different point of view, namely, that quantitative correlation between service or simulated service tests and nondestructive tests must always be established before satisfactory standards can be written for production inspection.

Reference

- 9 Albert R. Potenski, "Radiographic Inspection of Welded Turbine Wheels for Jet Starters," *Nondestructive Testing*, vol. 17, no. 1, January-February, 1959, pp. 29–31.