

STRESS ERRORS ASSOCIATED WITH MINIATURIZATION OF PUSAI ASSEMBLY X-RAY STRESS ANALYZER

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There are many mechanical parts whose reliability heavily depends on their residual stresses. It is also true that most of these parts cannot be measured for residual stress because of the size limitations. Therefore, the miniaturization of an X-ray stress analyzer is one important subject in this field. Various efforts have been made, however, the current minimum size of an analyzer seems to be determined mainly by the miniaturization of the X-ray tube and the detector. Little discussion has been held on the size of the X-ray path from X-ray focus to detector through the collimator and specimen.

The author and a co-worker (1) have discussed the problems caused by the miniaturization of the goniometer from the view point of the stress measurement error caused by mis-setting the specimen and misalignments of the collimator and detector in the case of Omega assembly. As a conclusion, the combination of a goniometer of 30 mm in radius and collimator of 0.5 mm in width and 30 mm in effective length is proposed for the Omega (iso-inclination) assembly X-ray stress analyzer using a position sensitive detector, if the total error of 40 MPa is acceptable. The single exposure method at 45 deg in incident angle was also investigated.

In this paper, using the same procedure as mentioned above, the stress errors associated with the miniaturization of goniometer are discussed and the limit of the size of goniometer is presented for the case of Pusai (side-inclination) assembly analyzer.

(1) T. Goto and Y. Gong, "Stress errors associated with miniaturization of X-ray stress analyzer", *Advances in X-Ray Analysis*, **45** (2002) to be published