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The Detection of Internal Fatigue Crack Using X-Ray Stress Measurement

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The purpose of this investigation is to clarify the influence of an internal fatigue crack on surface actual stresses in the circumferential distribution. The cantilever rotary bending fatigue tests were conducted on shot-peened ductile cast iron specimens. The actual stress distributions in the surface at the maximum tensile applied stress were dynamically measured by the X-ray stress measurement based on single exposure technique during fatigue testing. The circumferential distribution changed with increase in the number of cycles. Residual stress distributions were also measured under unloading. The possibility to detect the internal crack using change in these distributions was discussed.

As a result, from observation of fracture surfaces, it was confirmed that the peak position in the actual stress distribution agreed with the internal crack position. The internal crack causes the peak in the distribution. The method proposed in this study is useful for detecting a position of an internal crack on specimen circumference. On the other hand, the residual stress distributions showed no significant change even where the internal crack existed, whereby the internal crack could not be detected by change in the residual stress distribution.