1.5.30. A STUDY OF THE FATIGUE CRACK PROPAGATION BEHAVIOR ACCORDING TO THE LOAD CHANGE USING INFRARED THERMOGRAPHY

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Infrared thermography is a thermometric technique based on the IR radiation emitted from object surface. IRT generate real-time colorful images of specimen that local changes in surface temperature of each point on the surface indicate subsurface defects. It is a non-destructive, non contact, non-intrusive method to thermal contact which made by measurement of IR radiation. Applications of this method have been expended into the stress analysis, thickness measurement, fatigue limit analysis, defect detection, electronic plant flame measurement and medical diagnosis. Since most IRT applications depend on a temperature difference between defect and health area.

It is important that thermal parallel condition must be maintained during the test for the correct thermo-analysis. In this study, the thermal parallel condition is guaranteed on the specimen by repeatedly applying the constant frequency and also an adiabatic chamber is designed in order to keep constant surrounding temperature and constant emissivity.

Infrared thermographic images at each area during the fatigue test are shown in fig. 1. From this result, we can know the surface temperature of the specimen is raised. Also, the position of maximum temperature is changed. The fatigue crack propagation was expressed according to the temperature variation.

The result of temperature variation by the loads through infrared thermographic images is shown in fig. 2. The temperatures according to the loads rise linearly at 1st, 2nd and 3rd positions. However, at the 4th position, the temperature barely changes because the temperature was influenced by the effect on the fatigue crack propagation velocity more than the forces. The slope line according to the force (20 ~ 30 kN) at each position is shown in fig. 2.

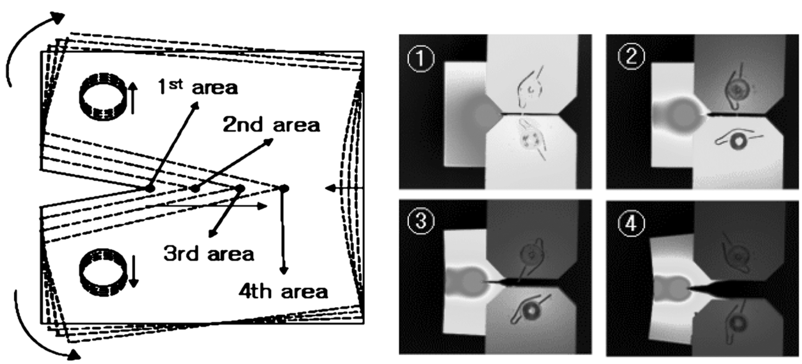

Fig. 1. Thermography image of each location

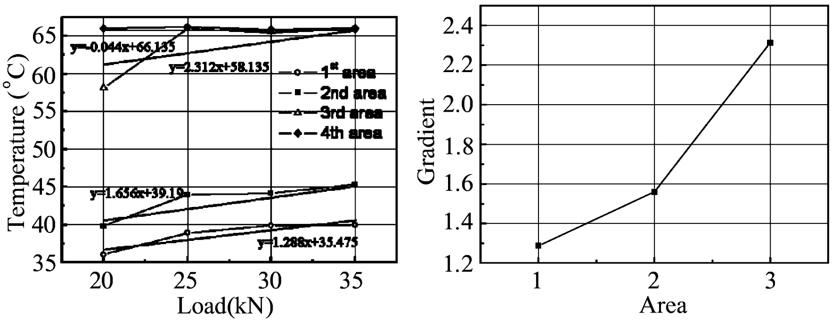

Fig. 2. Temperature and gradient of area by load condition

This paper measured crack region of the fatigue specimen which in load change. Measurement result leads, evaluated a temperature distribution and a slope quality. Tracks a maximum temperature will be able to measure the fatigue crack region at real-time. Also, a load predicted by fatigue crack region temperature distribution and gradient. In future, improvement of resolution and sampling leads, research of case fatigue crack growth speed is necessary

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Summary. In this paper, fatigue crack was caused via the fatigue experiment with repeated load on the CT specimen that is made up of STS304. Fatigue specimen was measured by tracing the position of the maximum temperature according to the load change using infrared thermography.