Measurement of Three-dimensional Shape of Minute Burr Formed through Punching Process of Circle Hole

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Abstract. Formation of minute burr through shearing process brings about some annoying problem relating to post-processing, accuracy of product and worker's safety and so on. Therefore, suppression or control of burr size and shape is considered as one of the critical issues in shearing process, and so a lot of researches mainly to control burr height have been conducted until now [1]. However, in order to develop efficient methods for controlling the burr height, it would be necessary to have understood the mechanism of burr shape formation beforehand. Previously, our research group had modeled a detailed shape of minute burr, which consisted of burr height, burr root radius, crack angle and die-side angle, and had investigated variations of these parameters using two-dimensional observation with increase of punching shots [2]. From these studies, a standard relationship between the way of burr shape formation in a meaning as an average pattern. Then, for deeper understanding of burr shape formation, it was thought that measurement of three-dimensional shape including distribution around the hole should be necessary. Therefore, in this study, three-dimensional measurement of minute burr shape was attempted using a laser microscope. Using a sample of mild steel sheet (SPCC) with a circle hole formed by punching process, angular distribution of a burr shape was measured three-dimensionally. By using laser microscope, height data of the specimen was obtained at lattice-like positions on planer orthogonal coordinates. On the bases of these data, noise-cancelling, coordinate transformation to cylindrical coordinates and re-discretization to the data with same angular and radial coordinates were conducted. Through these procedures, angular distribution of minute burr shape could have been finally obtained. The usefulness and problems of this measurement were discussed.

References

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