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The evolution of microstructure and micro-mechanical properties in the repeatedly renovated QHZ punch in fine-blanking

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Abstract: As a kind of high speed steel, QHZ has been widely used in industry for fine-blanking punches. However, because of complicated working conditions of fine-blanking, the service life of punches decreases as the number of repair increases. In this paper, the evolution of QHZ punches with different numbers of renovations was studied at the micro-scale level to investigate the influence of impact accumulation on their service life. The force condition and life of the punch during fine-blanking process were studied through finite element method. Electron backscatter diffraction was applied to investigate the microstructural evolution with the assistance of a scanning electron microscope. And the punch's micro-mechanical properties such as hardness and Young's modules were characterized by nano-indentation technique. It was found that the service life is closely related to the micro-evolution of QHZ during punching process. The deterioration of microstructure paralleling to the punching direction, such as the increase of grain size, the decrease of ∑3 grain boundary fraction, and the

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