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Application of Ultrasonic Vibration Energy on Eco-superfinishing and Surface Hardening Treatment of Cold Work Roller

초음파 진동에너지를 이용한 냉간 압연롤러 표면의 환경 친화적 초정밀
사상 및 표면 경화 처리 및 시험

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Abstract

In order to improve wear and fatigue resistance of the structural materials, especially cold work roller for 304 stainless steel, an eco-super-finishing and surface hardening treatment using ultrasonic vibration energy was developed and applied to the SKD-11 roller. The eco-super-finishing machine was designed and fabricated by DesignMecha Co, by its own technology. It was observed that the surface roughness, hardness and residual stress were changed from $R_a = 0.25\mu\text{m}$, $H_v=710$ and $\sigma = +400$ MPa to $R_a = 0.16\mu\text{m}$, $H_v = 1200$ and $\sigma = -610$ MPa after 20 KHz micro-cold forging, which means almost equal to the 300 % improvement of life-time.

Keywords : cold rolling work roll, ultrasonic vibration, residual stress