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Eco-Superfinishing and Surface Hardening Treatment of Stainless Steel 410 Valve and Shaft for a Nuclear Power Plant

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1. Introduction

A high performance valve and shaft of a nuclear power plant is martensitic stainless steel which needs to high wear and corrosion resistances and smooth surface. In this study, eco-superfinishing and surface hardening treatment method based on ultrasonic vibration energy was applied to stainless steel valve and shaft for a nuclear power plant.

2. Experimental method

an eco-superfinishing and surface hardening treatment using ultrasonic vibration energy was applied to the stainless steel 410. The eco-superfinishing machine was designed and fabricated by DesignMecha Co, by its own technology. surface hardness, friction coefficient and roughness were determined by microhardness tester and surface roughness tester, respectively. Each surface was also observed by scanning electron microscopy.

3. Results

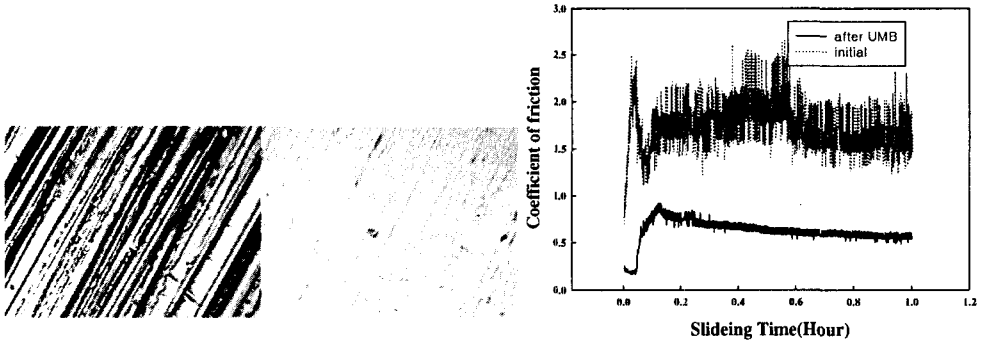

Fig. 1 Micrographs of surface and friction coefficent with sliding time (left) Mechanical grind (Ra=0.25 m), (middle) UMB (Ra=0.07 m) (left) friction coefficient

4. Summary

It was observed that the surface roughness, hardness and friction coefficient changed from Ra = 0.25㎛, Hv=240 and f= 0.2 to Ra = 0.07㎛, Hv = 390 and f=0.1 after 20 KHz micro-cold forging, which means almost equal to the 500 % improvement of life-time. This technique is well applicable to various parts to need both of high