

Tossaporn Nimitbunchar 2014: Effects of Heat Treatment on Residual Stress and Fatigue Properties of Deep Rolled Martensitic Stainless Steel AISI 420. Master of Engineering (Materials Engineering), Major Field: Materials Engineering, Department of Materials Engineering. Thesis Advisor: Assistant Professor Patiphan Juijerm, Dr.-Ing. 66 pages.

Martensitic stainless steel AISI 420 is widely used in automotive industry, high-loading and cyclic-loading condition. Thus, its surface should be modified to enhance performance. Thermo-mechanical surface treatment such as heat treatment after deep rolling process attributed to the formation of compressive residual stress and strain hardening in near surface layers to enhance fatigue properties. Therefore, the optimization of heat treatments on a deep rolled martensitic stainless steel AISI 420 has been investigated. The annealing process was performed in the temperature range of 200-300°C with soaking times between 5-35 min. Residual stresses and FWHM-values were determined using X-ray diffraction method. The fatigue tests were performed using a rotating bending fatigue machine. It was found that the residual stresses and FWHM-values decrease with increasing annealing temperatures and times. However, on the other hand, the annealing process at a temperature of 250°C for about 25 min shows beneficial effects on the fatigue lifetimes because of a strain aging concept. Thus, higher fatigue lifetime can be expected as compared to the deep rolled condition.

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Thesis Advisor's signature