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INVESTIGATION OF MECHANICAL, STRUCTURAL AND CORROSION RESISTANCE PROPERTIES OF LOW CARBON STEEL AFTER PLASMA CARBURIZING AND CARBONITRIDING PROCESS

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The use of surface treatments by plasma technology has increased substantially in the recent years for applications where wear and corrosion resistance properties are required. Among the different plasma surface hardening techniques, plasma carburizing has yielded good results for low carbon steels. Plasma carburizing is considered to be of more advantage over the conventional carburizing process mainly due to the reduced time and gas consumption during the treatment and also for its environmentally friendly nature. Morever, with the use of plasma carburizing processes it is possible to achieve better dimensional control even for complex geometry components. Another variant process of plasma carburizing called plasma carbonitriding has also been recently developed where along with carbon, nitrogen is allowed to diffuse simultaneously into the steel.
In this paper an attempt is made to optimize both plasma carburizing and carbonitridng to enhance both surface hardness and corrosion resistance properties of low carbon steel (AISI 1020) treated at different temperatures. Plasma carburizing process was carried out using 98 % hydrogen and 2 % acetylene gas mixture whereas plasma carbonitriding was carried out using 80% hydrogen, 18% nitrogen and 2 % acetylene gas mixture. The surface hardness of these plasma nitrocarburized stainless steel specimens increased by a factor of two compared to the untreated specimens. Moreover, there was only a marginal improvement in the corrosion resistance after these treatments. The advantages of having high surface hardness along with good corrosion resistance after these processes were explored. This paper also discusses the distortion studies of actual gears after plasma carburizing and carbonitriding processes.

Keywords
plasma carburizing
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