



INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI  
PhD-17 SHORT ABSTRACT OF THESIS

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**SHORT ABSTRACT**

HP40Nb Steel is used in petrochemical industries as reformer tubes for hydrogen generation. These steels exhibit very high hardness. Though, during the operation, each tube is subjected to a maximum temperature of around 1000 °C for long duration of 11 ½ years, it is subjected to a constant temperature gradient from this high temperature to around 100 °C during its life span. However, the microstructure and mechanical properties of these steels are not degraded when used at temperatures up to 650°C for such long periods and retain their high hardness and strength. These portions of the reformer tubes can be repurposed for applications requiring superior wear resistance, maintained even after prolonged high temperature service life. Hence this work was taken up with the objective of investigating the abrasive and adhesive wear performance of HP40Nb reformer steel tube after being exposed to 650°C for 11½ years. Abrasive wear and adhesive wear testing of the HP40Nb steel in the as received as well as after surface hardening were performed by different design of experiments (DOE) techniques and analyzed by ANOVA. The results obtained were also compared with those of high speed steel and SS304. The wear mechanisms were also investigated using various characterization instruments. The results indicate that SS304 exhibits the lowest adhesive wear resistance and increases in the order: as-received HP40Nb steel < carburized HP40Nb steel < HSS.