

Title: An Investigation Of Carburization Resistance Performance Of Ethylene Furnace Tube Alloys

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Abstract: Carburization tests and analysis were performed on some samples of radiant tube alloys of ethylene furnaces at three petrochemical plants. These tubes had undergone carburization in service with some losing their structural integrity. This study evaluates and compares the carburization resistance performances of some of these tubes in service and identifies the cause of their degradation. The polished surfaces of the test samples were visually observed. The depth of carburization zones for each test sample was measured. Scanning electron microscopy and energy dispersive x-ray spectroscopy were used to examine the carburization zones and the rest part of the specimens and to characterize the microstructure and elemental composition of the tubes' material. Optical microscope (Image analyzer) was used to examine the etched surface of each of the test samples. Micro-hardness testing was performed to determine their mechanical strength. Visual inspection revealed the sagging in some of the tubes. Metallurgical assessment indicated that the selected furnace tubes showed relative greater depths of carburized zones when compared with other tube materials tested. Microstructure of the tubes showed coarse Cr-carbide precipitation and continuous carbide networks at austenite grain boundaries.