# Failure Analysis of Breech Lock Heat Exchanger Bolts

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## Abstract

This industrial research project is to analyze the torque over loading failure found in bolts used in heat exchanger E1701. The bolts failed while loosening for cleaning and maintaining as a planned interval. The bolts are made of low alloy steel A193 B16 with 1-1/2 inch outside diameter and 5 inch long. The bolts are used for compressing the internal parts of heat exchanger. The failure occurred on the transverse cross section of bolt at the area between the thread end and head bolt. Based on fracture surface analysis and verification tests, the crack was related to torque overload and shown the ductile fracture. Many metallurgical studies were performed in order to find the source of the problem. An attempt was made to prevent this problem by modifying the thread dimension to meet the thread class fit 2 as per ASME B1.1. After testing under the service condition of the heat exchanger, the bolt successfully passed the test.