Engineering Failure Analysis 18 (2011) 499–504

Contents lists available at ScienceDirect

Engineering Failure Analysis

journal homepage: www.elsevier.com/locate/engfailanal

Short communication

Fracture failure of connection pipe of truck diesel engine oil-collector

Zhi-wei Yu, Xiao-lei Xu *, Cun-jie Li

Electromechanics and Material Engineering College, Dalian Maritime University, Dalian 116026, PR China

ARTICLE INFO

Article history:
Received 3 March 2010
Received in revised form 16 August 2010
Accepted 17 August 2010
Available online 20 August 2010

Keywords:
Fatigue fracture
Connecting-pipe of oil-collector
Point-welding
Inclusion cluster
Shrinkage cavity

1. Introduction

A connecting-pipe of oil-collector used in truck diesel engine cracked when performing a trial running of engine (Fig. 1). The connecting-pipe is made of ASTM 1020 grade steel, the specified chemical composition being (wt.%) C: 0.18–0.23, Mn: 0.30–0.60, P $\leqslant$ 0.040, S $\leqslant$ 0.050, Si: 0.15–0.35, Fe: balance). The external surface of connecting-pipe was galvanized. The connecting-pipe (slight curved, shown as illustration in Fig. 1) was jointed with the flange by point-welding, then brazing.

2. Experiment methods

The chemical composition of the fractured connecting-pipe material was analysed by spectroscopic chemical analysis method. The longitudinal and radial sectional samples were cut from the region close to the fracture. Metallographic samples were prepared using hot-mounting, wet grinding up to 1000 grit SiC paper and polishing with diamond suspension and were etched in a 4% HNO_3 ethanol solution. Microstructure was observed by scanning electron microscopy (SEM) on a Philips XL-30 scanning electron microscope. Energy-dispersive X-ray analyses were carried out on the fracture surface to identifying the nature of the phases which were present on the fracture surface. The fracture surface was observed by visual and SEM to study the failure mechanism.

3. Results and discussion

3.1. Visual observations

Visual inspection on the failed connecting-pipe (Fig. 1) and the fracture (Fig. 2) reveals that cracking occurred at the junction between the pipe end and the flange. The fracture surface at the concave side is even and parallel to the radial (Fig. 2). At

* Corresponding author. Tel.: +86 0411 84729613; fax: +86 0411 84726900.
E-mail addresses: xiaoleixu.dlmu@yahoo.com.cn, xxiaolei@dlmu.edu.cn (X.-l. Xu).

doi:10.1016/j.engfailanal.2010.08.011