Sepehr Gerami
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WALDRON
AVIATION FORENSICS • FAILURE ANALYSIS

Profile

Experienced materials engineer with a strong background in materials processing, manufacturing and, failure analysis. In depth knowledge of material degradation and damage including corrosion and fatigue related mechanisms in aerospace components, industrial equipment, construction materials, and consumer products. Intimately familiar with both destructive and non-destructive materials evaluation and testing methods. Extensive experience in welding, brazing and allied processes.

Education

Master of Applied Science, Materials Engineering, University of British Columbia, 2010.

Bachelor of Applied Science, Materials Engineering, University of British Columbia, 2007.

Certifications

Professional Engineer, Licence No. 42790 – Association of Professional Engineers and Geoscientists of British Columbia (APEG-BC)

Certified CSA W178.2 Welding Inspector, Registration No. 12959 – Canadian Welding Bureau

Welding Engineer – Canadian Welding Bureau

Experience

Metallurgical Engineer and Investigator – RJ Waldron & Company, Richmond BC, August 2017 – Present

Failure analysis and forensic investigations of incidents in a wide variety of fields, including but not limited to aerospace, machinery, structures, and piping/plumbing/pressure vessels. Laboratory competencies include scanning electron microscopy, optical microscopy, metallagraphy/materialography and Fourier transform infrared (FTIR) spectroscopy.

Consulting Engineer, Materials and Welding – SKC Engineering/ApplusRTD, Surrey BC, November 2011 – June 2017

Materials engineering consulting including: failure analysis of metal structures and industrial equipment including lifting equipment, piping and pressure vessels and machinery parts; preparation of welding and quality control specifications; quality assurance for public and industrial infrastructure projects; and commissioning and management of a materials testing laboratory.

Weld engineering consulting including: Defect root cause analysis and solution development; preparation of welded fabrication plans/sequences; preparation of welded repair procedures for components including pressure equipment in oil and gas production and refining applications, structures, ships, lifting equipment, heavy equipment, rotating machinery, etc.; weld sequence optimization for control of welding distortion and residual stress; specification and qualification of welding procedures for pressure vessels, piping, structural, corrosive and elevated temperature environments, aerospace and military applications for steel, aluminum, copper, nickel and other alloys, in accordance with pertinent codes and standards including ASME boiler and pressure vessel code, ASME pressure piping codes (B31.x), CSA Z662, NACE MR0175/ISO 15156, NACE MR0103, oil and gas company specifications, CSA W59/W47.1, AWS D1.1, D1.2, D1.5, D1.6, D3.6, D17.1, marine classification society (LR, ABS, DNV-GL) rules and regulations, and Canadian Department of Defense specifications; preparation of welding quality manuals and standard operating procedures, to comply with above codes and specifications.

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Research Engineer – University of British Columbia Department of Materials Engineering, Vancouver BC, September 2010 – October 2011

Design, construction and commissioning of experiments and pilot scale laboratory equipment; instrumentation and data acquisition; data processing and engineering calculations; streamlining of data processes.

Intern – IPSCO Steel (now Evraz NA), Regina SK. January 2006 – September 2006, April 2007 – September 2007.

Investigation and analysis of field failures associated with company products (steel plate, pipe). Thermomechanical simulation experiments investigating phase transformation behaviour in support of product development.

Professional Associations

Current member of Association of Professional Engineers and Geoscientists of British Columbia (APEG-BC), the American Welding Society (AWS), and the Canadian Welding Association (CWA).

Sample Investigations

Brittle fracture of concrete reinforcement bars

During construction of a commercial building, concrete reinforcement bar cages partially embedded in the foundation footings and slab were found to fracture in a brittle manner under minimal deformation. Examination of the steel bars revealed that the reinforcement bars in the cages were joined by arc-welding. Tests carried out on the reinforcement bars revealed that their carbon content was too high for the arc-welding procedure used, resulting in excessive hardening and embrittlement of the steel bars at the welds. Any one of the following would have prevented the failure, and the costly mitigation efforts: Use of a more appropriate welding procedure, steel bars with a lower carbon content, or fabricating the reinforcement bar cages using tie wires instead of welding.

Fracture of mobile crane/digger derrick sub-frame attachment bolts

During routine inspection, many of the structural bolts on a mobile crane/digger derrick were found to be cracked or fractured. The bolts were used to attach the lifting device to the truck – in-service failure of the bolted joint would have resulted in detachment of the device from the truck and a very high probability of serious injury to tradespeople working near the machine. Examination of the bolts found that the cracks initiated and grew through metal fatigue. In the absence of objectionable flaws in the bolts, and available records demonstrating correct installation of the bolts, excessive cyclical stresses in the bolts were identified as the likely cause for fatigue. Subsequent inspection of the device controls found that the electronic overload safety device had been over-ridden by an operator, presumably to allow lifting of loads that were above the device's rated capacity.

Toilet Water Supply Connector Nut Failure

Braided hoses supplied with a certain brand and model of toilet were found to have high rate of service failure, resulting in costly residential water escape incidents. The failures occurred at plastic (polyoxymethylene) collar nuts attaching the hoses to the toilets. Examination of failure nuts from separate incidents revealed that the nuts fractured in the same location, at a particularly severe stress riser designed into the nuts. Calculations showed that hand tightening of the nuts would result in very high levels of stress at the stress riser, within the range expected for creep rupture for the time periods in service.