

Resume

Personal information

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Formal education

1- *Ph.D. Metallurgy and Materials Engineering*, The University of Birmingham, England, United Kingdom, July 2002.

Thesis Research: *Fatigue Failure Analysis of Electron Beam Welded Turbine Wheels*

This project was done on behalf of Rolls Royce plc (aerospace division), Derby, England. During the course of this project, I have studied the effects of full penetration and partial penetration electron beam welding (slope out region) on microstructural modifications in jet engine compressor disc materials. Two materials were investigated, i.e., Waspaloy and IN-718. Full microstructural characterisation and quantification were carried out for base metal, full penetration weld metal and slope out region including grain sizing, determination of volume fractions, compositions and size distributions of main phases, precipitates, segregation and minor phases as well as other welding defects such as porosity. Microstructural examinations required extensive use of optical microscopy, Scanning Electron Microscopy (SEM) -on fracture surfaces (fractography) and polished specimens-, Transmission Electron Microscopy (TEM) and image analysis. XRD was also used on base metal and weld metal specimens for the determination of different phases volume fractions. These microstructures were related to the thermo-mechanical and/or thermal history of the materials (including the forging, welding and heat treatment cycles), and also utilised to explain the degradation in mechanical properties, particularly, high-temperature fatigue crack initiation resistance in the slope out region. Full Fracture analysis including SEM fractography was carried out on fracture surfaces and where related to the development of microstructure and thermo-mechanical history. Failure mechanisms were established and a new production scheme was suggested whereby fatigue-resistant microstructure was obtainable.

During the course of my Ph.D., I developed strong experimental and analytical research skills as well as thorough understanding of practical welding and joining metallurgy. I also gained considerable practical research experience, particularly in the areas of Process-Structure-Property relationships, materials characterisation, failure analysis, mechanical and chemical testing of materials.

2- *M.Sc., Industrial Engineering (Design and Manufacturing)*, University of Jordan, Amman-Jordan, August 1995.

Subjects studied:

- Advanced stress analysis
- Advanced manufacturing processes
- Measurements and instrumentations
- Advanced materials
- Production planning and control
- Total quality management
- Advanced engineering statistics
- Computer integrated manufacturing
- M.Sc. Project

M.Sc. project: *Stress Corrosion Cracking of Welded Nickel-Based Superalloys in Hot Brine Environments.*

My M.Sc. project was a part of a larger research project carried out by a research team within the University of Jordan for the Arab Potash Company ([see work experience](#)).

3- *B.Sc., Industrial Engineering (Manufacturing)*, University of Jordan, Amman-Jordan, June 1992.

Work experience

1- From September 2008 to Present, **Assistant Professor** with the Industrial Engineering Department, The University of Jordan, Amman-Jordan.

In addition to teaching for the undergraduate (Bachelor level) and graduate (MSc. Level) students and supervision of laboratories main duties include carrying out scientific and industrial research, technical consultations and industrial training.

Industrial Research Projects

- i- Microstructural Characterization and Performance Evaluation of (Ti,Al)N Hard Coatings for Cutting Tool Applications.
- ii- Studying The Effect of Process and Shape Parameters On The Resulting Structure and Mechanical Properties of Industrially Extruded 6xxx Aluminium Alloys. (in co-operation with Modern Aluminium Company)
- iii- Modelling of the Thermal Spray Process Using Statistical design of Experiments. (in co-operation with Jordan Petroleum Refinery Co.)
- iv- Studying The Friction Welding Process Applied to 1050 Aluminium Alloy and 304 Stainless Steel. (in co-operation with Aluminium Manufacturing and Plating Co.)
- v- Failure Mode and Effects Analysis of Pharmaceutical Tableting Tools. (in co-operation with DAD Pharmaceutical Manufacturing Co.)

a- Ongoing consultations / training

- 1- Technical expert / consultant: United States Agency for International Development (USAD). I have been chosen by the USAID program to perform evaluation of the nature and approximate time span of corrosion on machines imported by this program to the benefit of Aqaba Community and Economic Development (ACED) program in the south of Jordan.

Contact person / reference:

AECOM, ACED Chief of party: Dr. Gregory Massen

ACED Program

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- 2- Technical Expert / Assessor: Jordan Accreditation System (JAC), Jordan Standards & Metrology Organization. I am involved in the assessment of nationwide testing laboratories that involve mechanical

and/or metallurgical testing to the respective standards. This is normally carried out according to the ISO 27025 (General requirements for the competence of testing and calibration laboratories). In addition, I am a member of the board that will carry out the drafting of directives pertinent to two main classes of products (gas burning appliances and toys).

Contact person / reference:

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Accreditation program coordinator

JAC, JSMO

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- 3- Metallurgy and Failure Analysis Training specialist: SOS HR SOLUTIONS, P.O Box 46445, Abu Dhabi. I have been delivering specialized training in the area of Metallurgy and Metallurgical Failure Analysis for regional companies, especially in the oil and gas industry, for the last seven years. This has enriched my experience in the field of failure analysis particularly as actual case studies would normally be brought up by the participants and discussed during these courses.

Contact person / Reference:

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In addition to teaching, I have delivered short training courses both nationally and regionally to companies, mainly from the oil and gas sector, under the following topics:

Course title	Clients
Metallurgy for Non-Metallurgists	Saudi Basic Industries Co. (SABIC), Qatar Petroleum, Dubai Electricity and Water Agency (DEWA), Abu Dhabi Gas (ADGAS), GASCO, Kuwait National Petroleum Co.(KNPC), Dubai Steel
Metallurgical Failure Analysis and Prevention	Dubai Aluminium (DUBAL), Qatar Petroleum, GASCO (Abu Dhabi)
Applied Welding Metallurgy	Qatar Petroleum, SABIC
Welding of Stainless Steels	Qatar Construction Authority and (DEWA)
Industrial Refractories Technology	Qatar Steel, Dubai Steel and Dubai Gas.
Metallurgy and heat treatment of steel	Jordan Modern Cables Co.

The subjects I teach include:

- ***Introduction to Physical Metallurgy for engineering students.***

The course is normally offered to mechanical and industrial engineering students and covers topics such as the iron-carbon system, carbon and alloy steels, heat treatment of steels (hardening, annealing, normalising and hardenability), stainless steels, cast irons, copper and aluminium alloys (briefly) and some aspects of metallographic examinations.

- ***Engineering Materials and Their Properties***

This course is designed to introduce engineering students to the structure and properties of engineering materials with emphasis on the mechanical properties. Topics covered include; atomic structure and inter atomic bonding, structure of crystalline solids, defects in crystalline solids, diffusion, mechanical properties, phase diagrams, introduction to thermal and electrical properties of materials.

- ***Manufacturing Processes I (Metal Forming Processes)***

This course discusses aspects related to plastic deformation processes such as bulk and sheet metal forming processes. Topics covered include; mechanical behaviour of materials and the yield criteria, bulk deformation processes

(forging, rolling, rod and wire drawing, extrusion, etc.) and sheet metal forming processes (blanking, deep drawing, bending, etc.), materials for manufacturing.

- ***Manufacturing Processes III (Welding and Casting Processes)***

This course discusses some casting and welding operations from a process (rather than materials) point of view. Topics covered include melting practice, ingot and continuous casting, expendable- and permanent-mould casting processes, arc-welding processes (consumable and non-consumable electrode processes), laser and electron beam, welding, cold welding, friction welding and resistance welding.

- ***Non-destructive testing techniques***

This course is a graduate (Masters level) course designed to give graduate students the necessary theoretical support of their NDT/NDE practical course the course covers topics such as dye penetrant testing, magnetic particle testing, eddy current testing, ultrasonic testing and thermal imaging.

- ***Non-destructive testing laboratory***

This course continues from the non-destructive testing course and covers practical issues related to the course above.

- ***Materials and Manufacturing laboratories***

c- Previous positions

- 2- From September 2002 to January 2008, **Assistant professor** with the Industrial Engineering Department, The Hashemite University, Zarqa 13115, Jordan.
- 3- 1/3/2001 to 31/12/2001: **Postdoctoral research fellow**, School of Metallurgy and Materials, The University of Birmingham, Birmingham, England, U. K.

I held this position during the writing up of my thesis for nine months.

Research project: ***Stress Corrosion Cracking and Corrosion Fatigue of Spot Welds in Aluminium Alloys for Automotive Applications.***

This research project was done on behalf of Alcan International-UK to look into the replacement of steels by aluminium alloys in car bodies. Some of the envisaged advantages are weight reduction leading to lower fuel consumption (hence, lower greenhouse gas emissions) and better corrosion resistance. Steels in general, however, have better weldability than aluminium alloys and this project started to look at the effect of spot welding (a common welding process used in joining car bodies) on the resulting microstructure(s) and their impact on mechanical properties as well as corrosion resistance.

In addition to the research activities, my duties included teaching (6-9 hours/week) to undergraduate students including coverage of laboratory work related to microstructural characterisation and mechanical properties of metallic materials.

4- July 1994 to Sept.1996, **Research engineer**, University of Jordan Centre for Consultations, Technical Studies and Services, University of Jordan, Amman-Jordan.

During this period, I worked as a member of a research team, which was nominated at the above mentioned centre, to find practical solutions for corrosion problems in hot brine pipelines at the Arab Potash Co. in Jordan. These pipelines were fabricated from two nickel based-alloys; In-625 and Monel 400, normally by folding and arc welding. In addition to the above mentioned materials, two substitute candidate materials were also assessed; Inconel 686 and C-276. My duties included the assessment of different microstructures, resulting from different welding conditions, before and after exposure to corrosion tests. These were carried out, mainly, in SEM and optical microscopy. In addition, I was responsible for carrying out intergranular corrosion (IGC) and stress corrosion cracking (SCC) tests, using NACE and ASTM standard methods, and propose (together with the rest of the team) a modified welding procedure for a better resistance to stress corrosion cracking (SCC). This involved liaising with technicians from both the university and the company. Part of this research contributed towards my M.Sc. degree which I finished in August-1995.

5- Aug.-1992 - Sept.-1993, **Dies' manufacturing engineer**, Universal Metal Extrusion Co., Amman Industrial Estate, Sahab-Jordan.

During this period, my duties included preparation of part drawings, using AutoCAD software and machining operations on aluminium extrusion dies which required CNC machining, such as CNC milling, turning, spark machining and wire cutting operations.

Personal Skills

- Excellent communication and interpersonal skills;
- Team work and team supervision;
- Time management and organization;
- Very good brainstorming and problem-solving skills;
- High ability to work with other people from divergent backgrounds and origins;
- Bi-lingual (Arabic and English).

Technical Skills

- Optical microscopy and quantitative image analysis;
- High-magnification electron microscopy and diffraction pattern analysis (Scanning electron microscopy (**SEM**) and transmission electron microscopy (**TEM**));
- X-Ray diffraction (**XRD**) and structure factor analysis;
- Failure analysis (including **fractography**); especially weld failure analysis
- Mechanical testing (Tensile, Hardness, Fatigue, Wear, Impact; etc.)
- Chemical analysis;
- Heat treatment;
- Corrosion testing;
- Sampling and specimen preparation for all of the above.

Publications

- 1- **A. K. Abdul Jawwad** and M. A. Barghash, Evaluating the Effects of Process Parameters on Maximum Extrusion Pressure Using a New Artificial Neural Network-Based (ANN-Based) Partial-Modeling Technique, **International Journal of Advanced Manufacturing Technology**, Accepted February 2013 (in press).
- 2- M. Al-Tahat, **A. K. Abdul Jawwad** and Y. Abu Nahleh, *Ordinal Logistic Regression Model of Failure Mode and Effects Analysis (FMEA) in Pharmaceutical Tableting Tools*, **Engineering Failure Analysis**, Volume 27, 2013, Pages 322-332.
- 3- **A.K. Abdul Jawwad** and A. Al-Bashir. *A Comprehensive Model for Predicting Profile Exit Temperature of Industrially Extruded 6063 Aluminum Alloy*, **Journal of Materials and Manufacturing Processes**, 2, (2011), 193-201.
- 4- K. Abu Shgair **A. K. Abdul Jawwad** and A. Bashir, Characterizing (Ti,Al)N Film Coating Produced by Inverted Cylindrical Magnetron Sputtering For Metal

Machining Applications, *Journal of Reviews on Advanced Materials*, 24(2010) 48-5.

- 5- A. Bashir, **A. K. Abdul Jawwad** and K. Abu Shgair, Evaluating the Effects of High Velocity Oxy-Fuel (HVOF) Process Parameters on Wear Resistance of Steel-Shaft Materials , **Jordan Journal of Mechanical and Industrial Engineering**, 3, 2009, 157 - 160
- 6- **A.K. Abdul Jawwad** and A. Al-Bashir, *Statistical Modeling of Thermal Spray welding of Steel-Shaft Materials for Wear Resistance*, Proc. of The **International Thermal Spray Conference-2005** (ITSC-2005), Basel, Switzerland, 2-4, May, 2005.
- 7- **A.K. Abdul Jawwad**, M. Strangwood and C. L. Davis, *Microstructural Modification in Full Penetration and Partial Penetration Electron Beam (EB) Welds in INCONEL-718 (IN-718) and its Effect on Fatigue Crack Initiation*, **Metallurgical and Materials Transactions**, Volume 36A, May, 2005, pp **1237-1247**.
- 8- **A.K. Abdul Jawwad**, M. Strangwood and C. L. Davis, *The Role of Slope out Region in Fatigue Crack Initiation in Electron Beam Welded Waspaloy*, **Metallurgical and Materials Transactions**, Volume 34A, August, 2003, pp 1637-1645.
- 9- **A.K. Abdul Jawwad**, J. Clark, M. Strangwood and C.L. Davis, *Microstructural variations for full penetration and partial penetration electron beam welds (EBWs) in Waspaloy*, **Microstructural Science** Vol. 27: Understanding Processing / Structure / Property / Behaviour Correlations. Proc. of 32nd Annual IMS Convention, Cincinnati, USA, 31st Oct - 4th Nov 1999, Pub ASM Intl ISBN 0-87170-687-3 (Published 2000), pp 115-123.
- 10- H. B. Rahmatallah and **A. K. Abdul Jawwad**, *Corrosion Resistance of Welded Inconel-625 Handling Hot Brine Solutions*, Proceedings of The **International Conference on The Joining of Materials-JOM-9**, Institute for the Joining of Materials, May 16-19 1999, Denmark, pp 90-99.

Other interests

Besides my main field as materials and manufacturing engineering, I have a special interest in the application of statistics in engineering such as statistical analysis, Design of Experiments, quality control and Process capability applications.

Achievements

- Highest secondary grade in my school
- BSc grant
- MSc grants, research and teaching assistantships
- PhD grants, research and teaching assistantships and research bursaries
- Distinguished paper in “The No. 1 Journal in Physical Metallurgy and Materials Science (see publication number 7).