Professional CV **MICHAEL ORTON**

Key qualifications: BEng in Mechanical Engineering (1st class Honours), Manchester Metropolitan University, 2014

Awarded the IMechE Frederic Barnes Waldron "Best Student" Award, 2014.

Key experience: Extensive experience in high temperature assessments of structural steels, design code/fitness for purpose analyses, safe life assessments, probabilistic assessments of boiler tubes, FAC assessments and hanger survey audits. Experienced in the use of Microsoft Office, Visual Basic, SolidWorks, ABAQUS CAE, R-CODE, PSA5, task management and quality assurance.

Suitably Qualified Experienced Personnel (SQEP) Qualifications are:

Role code 0: Classic Strength of materials
Role code 1: Design code & piping assessments.
Role code 7: Creep-fatigue initiation assessment, R5 Volume 2/3
Role code 13: Flow Accelerated Corrosion Assessment (On-Site Support)
Role code 14: Pipework Support Survey
Role code 15: Creep rupture and R5 Volume 6 assessments

Senior Engineer June 2012 – Present

Engineering Analysis Services Limited (EASL), Altrincham

Single point of contact (SPoC) and deputy team lead for EDF Energy DHT team, from September 2019. The roles include managing EASL resources across all DHT tasks and attending fortnightly meetings with EDF equivalent to discuss overall work plan and any contractual matters.

Training manager at EASL. Responsible for the overall SQEP training plan at EASL, ensuring engineers are looking to maintain their current technical accreditations and drive towards achieving new accreditations. Management of the different technical leads for each SQEP role to ensure there is good coverage for a wide range of technical disciplines.

Details of Tasks Undertaken:

Design Code Assessments (SQEP):

- Experienced in design code assessments to calculate minimum acceptable thicknesses or elastic stresses/stress ranges for multiple features, such as straights, bends, branches, expanders, vessels, valves or trunnions. Experience with the use of design codes BS EN 13480, BS806, BS1113, PD 5500, ASME or fitness for purpose routes for all relevant failure mechanisms, coding up own assessment tools when needed.
- Provided outage support for multiple Heysham 2, Torness and Dungeness outages to SAG by originating and verifying referral responses for varying issues, from minimum thicknesses recorded below relevant minimum acceptable thicknesses to the presence of defect indications. Components are assessed against all failure mechanisms, including plastic collapse, ratchetting, fatigue, creep rupture and fracture.
- Experience of more complicated assessments for different failure mechanisms when margins are not acceptable when using either a design code or fitness for purpose assessment. This generally involved the use of finite element modelling, for example carrying out a Riks analysis to determine a reference stress, or a cyclic FE analysis using either elastic-perfectly plastic or a hardening law to demonstrate shakedown.

Component Life Assessment (CLA), R5 Volume 2/3 (SQEP):

- Carried out multiple regular reporting tasks as part of the CLA safety case for EDF-NG, acting as task engineer, originator, mentor or verifier. This includes steady state temperature/pressure review to identify long and short term trends, transient reviews to analyse plant transients and allocate a plant operating condition (POC) code, Tier 3 updates to collate the data presented in the transient review and calculate the current and future damages to all LARCs and Tier 2 updates. Primarily involvement has been on Heysham 2 and Torness, though also had experience of Heysham 1/Hartlepool and Dungeness.
- Experienced in high temperature creep-fatigue crack initiation assessments to procedure R5 Volume 2/3 to determine if cyclic loading will affect the creep strain accumulation of a component throughout its service life. This has enabled a good understanding of complicated hysteresis cycle constructions for calculation of creep dwell stresses and strain ranges, ultimately looking to determine a creep-fatigue

damage of the components.

- Design code assessments are also carried out under this procedure to ensure failure by plastic collapse, creep rupture, ratcheting and fatigue are also not of concern.
- Primarily assessed different austenitic material types, such as Type 316/316H, Type 347 and Esshete 1250.
- Involvement in more complicated and refined calculation of creep and fatigue damages through means outside of the R5 Vol 2/3 assessment procedure, e.g. determination of creep strain and strain range through the use of finite element analysis (FEA).

Creep Rupture and Transition Joint Assessments, (SQEP):

- Very experienced in creep rupture assessments and currently the technical lead for this SQEP discipline. Have carried out multiple creep rupture assessments for austenitic and ferritic parent and weldment materials. This includes an understanding of relevant reference stress / rupture reference stress solutions and creep re-distribution factors as part of the assessment. Currently the technical lead for this SQEP discipline.
- Also experienced in the assessment of transition joints for creep rupture and fatigue damage, which are also included in this SQEP discipline.

Fracture and Creep-Fatigue Crack Growth Safe Life Assessments, (working towards SQEP):

- Experienced in carrying out safe life assessments for high temperature pipework systems. This involves calculating limiting defect sizes using procedure R6 to evaluate L_r and K_r. Experience in using classical theory to determine the stress distribution required, or inputting the results directly from FEA. The limiting defect size is compared against the crack growth for a specified time period, which is calculated using the R5 Vol 4/5 procedure for combined creep-fatigue crack growth. Experience in doing this for a constant reference stress throughout the growth period (standard loading methodology), or a relaxing secondary reference stress / re-distributing primary reference stress (combined loading methodology 1 and 2).
- Experience of reviewing different pre-defined fault events and understanding which need to be assessed for various components, depending on the failure tolerability of the component and frequency of the event.
- Experience in using EASL spreadsheet limiting defect size and crack growth tools, or using the EDF-NG tool R-CODE.

Hartlepool and Heysham 1 Boiler Analyses

- Experienced in the HRA and HYA boiler closure unit (BCU) assessments, including reviewing stud hold down loads during an outage and recommending remedial actions if required, or reviewing the CO_2 leakage rates.
- Carried out multiple probabilistic assessments for the HYA / HRA boiler tubes and upper transition joints (UTJs) using the assessment codes UTJLIFE and TUBELIFE / TUFARI, acting as task engineer, originator, mentor or verifier. This involves the processing of large quantities of input data into the relevant databases and submitting these to the pre-processors for generation of input files. Output files are then processed to determine the predicted annual failure rates for both creep-fatigue and plastic collapse failure mechanisms. Originated or mentored multiple reports for both HYA / HRA to present the results and discuss implications for Boilers Group at Barnwood.
- Carried out an update to the TUBELIFE / TUFARI pre-processing route following a significant update to the assessment code methodology (resulting in the redundancy of the UTJLIFE code). This involved updating multiple areas of VBA coding, implementing new VBA coding and implementing new databases. Multiple additional updates were carried out to make the pre-processor more efficient and reliable. The final output was creation of a user guide for the new TUBELIFE / TUFARI pre-processor.

On-Site Flow Accelerated Corrosion (FAC) Inspection Programme and Pipework Survey Audits (SQEP):

- Provided on-site support for the inspection and assessment of components susceptible to FAC for Heysham 1, Hartlepool and Torness outages. Reviewed the results of ultrasonic thickness inspections and visual inspections and made judgements on whether the FAC is present within the component and if the measured thicknesses are within the allowable MATs. Determined remnant life and made judgements on whether the component is acceptable for return to service, assigning a re-inspection period where necessary. Recommendations on repair of replacement of components made if not acceptable for return to service.
- Carried out multiple pipework support audits during outage or hot conditions for multiple stations but primarily HYA / HRA, acting as originator, verifier or task engineer. Originated multiple reports which compared recent results against historic data to ensure the system structurally safe. Made recommendations for modifications to pipework and hangers where required.