3-day International Conference on:

Power Plant Operation & Flexibility

**Venue:** Institute of Materials (IOM3), London  [www.iom3.org](http://www.iom3.org)

**Dates:** 4 – 6 July 2018

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**Programme & Registration Form**

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Preceded by two optional 1-day COURSES on:
1) Power Plant Operation, Maintenance & Materials Issues - 2 July 2018
2) Power Plant Short and Long-Term Preservation – 3 July 2018

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**CONFERENCE OBJECTIVES**

Because of changes in demand and competition within the power generation market, fossil fuel fired plants in many countries are now subject to unscheduled cyclic operation, two shifting or load following. Even state-of-the art natural gas fired combined cycle plants are now in a scenario where two shifting is a threat to profitability. The aim of the conference is to identify the basic causes of equipment and component problems in both the base load and cyclic operation plant and to begin to identify procedures which will minimise operating and maintenance costs. This 3-day International Conference is divided into two parts where the first 1.5 days will be spent on discussing the plant flexibility issues, including new developments in creep-fatigue interaction in high temperature plant materials, while the remaining 1.5 days will be dedicated to discussing new developments in general fossil power plant preservation, maintenance, inspection, monitoring, repair, RBI/RBM, RCM and life assessment issues.

The overall aim is to provide an international forum for the exchange of knowledge, information, experience and data where possible. Hence plant owners and operators will be the prime audience in this conference. It is also envisaged that researchers, plant manufacturers and inspection bodies will benefit from this experience/information exchange. The underlying aim will be ‘how to reduce costs associated with plant maintenance and cycling’. Key aspects will be engineering design and materials R&D, cost analysis and plant management/maintenance.

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Cosponsored by the Institute of Materials, Minerals and Mining

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ETD Consulting, Fountain House, Cleeve Road, Leatherhead, Surrey, KT22 7LX, UK
Tel: + 44 (0)1372 363 111  Fax: + 44 (0)1372 363 222  enquiries@etd-consulting.com  [www.etd-consulting.com](http://www.etd-consulting.com)  BS EN ISO 9001: 2008 Certified
ETD Consulting is a trading name of European Technology Development Ltd, Registered in England No: 3553836
TECHNOLOGY BACKGROUND

The severe conditions of cyclic operation can, at worst, result in an increase in unscheduled outage rates due to an increase in the frequency of failures of key items of equipment, such as boiler plant, steam and gas turbines, and alternators. Clearly such events could have a dramatic effect on costs. Even normal two shift operation will have an untoward effect on profitability, primarily due to increase in wear and tear of components, this impacting on operating, overhaul and maintenance costs. Plant flexible operation will often imply an increased NDT budget, extra training for plant operating personnel, replacement of critical components and automation of the plant to ensure faster safer start-ups and shutdowns. The nature of the creep-fatigue interaction is such that ageing plant which have seen a good deal of operating life under base load conditions could show dramatic drop in component safe operating life when subjected to cyclic operation and hence may need plant design modifications before they are subjected to regular plant cycling. The increasing intervention of renewables also means that base load plant may be shut down for some time and hence need plant short or long-term preservation to avoid excessive damage during shut down.

Increasing competition in the electricity market also means that risk based inspection and asset management or reliability centred maintenance studies may be carried out to optimise maintenance costs. Other issues such as plant Benchmarking may help to seek out plant that need improvement in terms of availability, reliability, efficiency and other such KPIs (Key Performance Indicators).

Specific objectives of the conference will therefore be to discuss and identify:

- Key equipment design, materials and corrosion aspects
- Operational constraints and optimisation
- Manpower, management and automation issues
- Component replacement, maintenance and operating costs
- Strategies for optimising maintenance and cyclic operation.

Technical Enquiries to:

<table>
<thead>
<tr>
<th>Dr Ahmed Shibli</th>
<th><a href="mailto:ashibli@etd-consulting.com">ashibli@etd-consulting.com</a></th>
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<tr>
<td>Tel: +44 1372 363111</td>
<td><a href="http://www.etd-consulting.com">www.etd-consulting.com</a></td>
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Proceedings: Electronic copies of these will be provided soon after the Conference. This will consist of Conf. presentations & papers where these are provided.

Submission of full Papers or Presentations will be required by the time of the conference.

Oral presentations will be as follows:

- **Keynote Papers** = 35 minutes (incl. 3 minutes for discussion)
- **Other Papers** = 25 minutes (incl. 3 minutes for discussion)
About the Organiser

European Technology Development Ltd. (ETD)

ETD is an independent UK based engineering, consulting and R&D company specialising in high temperature plant inspection, life assessment/extension, maintenance, materials and engineering issues in all type of power generating and petrochemical/refining/process plant. It provides these services to plants all over the world.

ETD has, in the past, organised various international workshops/courses/conferences in the UK, Europe, North America, Japan, Korea, South Africa and Asia. Some of the topics discussed have included: industrial plant life assessment/extension, high temperature plant materials, plant component safety and durability, performance of in-service welds, power plant cycling, risk based maintenance (RBM), Reliability Centered Maintenance (RCM), probabilistic life and crack assessment, weld repairs etc.

ETD has been leading and co-ordinating a number of large cutting edge international industry initiatives (supported by the industry from North America, Japan, Europe and elsewhere or by government organisations such as the European Commission) on issues related to the assessment and improvement of high temperature plant performance, materials and design, maintenance techniques and strategies, and the development of innovative inspection techniques.

The company has carried out/participated in leading edge projects on P91 quality checks for new plants, weld repairs, crack assessment, integrity issues, failure analysis and has carried out studies of P/T91 performance in plants worldwide.

Further information about ETD, its projects, life assessment courses offered and other activities can be seen at its website www.etd-consulting.com

 Organisation of this Conference

In the past ETD has organized a number of conferences and seminars in London and the USA on both the Base-load and Cyclic Power Plant Maintenance, Operation and Cost Issues. ETD has also produced a number of Reviews and Guidelines on the Operation, Preservation, Inspection, Materials, Failures and Cycling Issues of Conventional Power Plants and CCGTs/HRSGs. The cyclic issues included damage due to the cyclic and load following operation and maintenance, staff training, engineering solutions required to reduce such damage, costs due to plant cycling in terms of plant modifications required, additional plant maintenance, and more. The last plant flexibility conference was organised by ETD in November 2012 in Charlotte, North Carolina, USA.
## CONFERENCE COMMITTEE

<table>
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<tr>
<th>Name</th>
<th>Position/Company</th>
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<tr>
<td>Dr Ahmed Shibli</td>
<td>ETD, UK</td>
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<td>Dr David Robertson</td>
<td>ETD, UK</td>
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<td>Mr William (Bill) Moore</td>
<td>ETD Consultant, UK</td>
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<td>Dr David Allen</td>
<td>IMPACT PowerTech, UK</td>
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<td>Mr Damien Charman</td>
<td>ALS, Australia</td>
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<td>Mr Henryk Mazur</td>
<td>Mazur Energy, Poland</td>
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<td>Dr Andreas, Klenk</td>
<td>MPA Stuttgart, Germany</td>
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<td>Mr Stuart Holdsworth</td>
<td>Empa, Switzerland</td>
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<td>Prof F Masuyama</td>
<td>Kyushu Tech. Ins., Japan</td>
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<td>Dr Andreas Thomas</td>
<td>Siempelkamp, Germany</td>
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<td>Mr Staf Huysmans</td>
<td>Consultant (ex-Engie), Belgium</td>
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<td>Dr Y Hasegawa</td>
<td>Nippon Steel &amp; Sumitomo Metals Co, (NSSMC), Japan</td>
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<td>Mr Julian Ford</td>
<td>ETD Consultant, UK</td>
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<td>Prof Scott Lockyer</td>
<td>Uniper Technologies, UK</td>
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<td>Mr Adam Storey</td>
<td>RWE Generation, UK</td>
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<td>Mr Alexandros Antonatos</td>
<td>Public Power Co., Greece</td>
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### CONFERENCE DINNER AND BOAT CRUISE ON RIVER THAMES

**Thursday 5th July --- 1800 to 2200h**
DAY – 1 (Wednesday, 4th July)

REGISTRATION & Welcome  -------------------------------  0900 – 1000h

1000 – 1005:  Welcome & Introduction to the Seminar

Session 1:  Cyclic Plant Operation, Upgradation, Oxidation & Lifing Issues

1005 – 1040h:  Keynote Paper: Uniper’s Flexible Operation Journey
Scott Lockyer*, Gary Hewitt*, S Simpson* and N Bates**
*Uniper Technologies Limited, **Ratcliffe Power Station, Uniper, UK

1040 - 1105:  Outage Planning and Plant Life Extension of Load Cycling Plant
Rob Wang, EASL, Altrincham, Cheshire, UK

1105 – 1130:  HRSG Revamping for Upgrading GT: A Case Study from UK’s King Lynn Project
Pascal Fontaine, CMI Energy, Belgium

1130 – 1155:  HRSG Temperature Behaviour on Cycling Plant
Richard Walton, SSE, UK

1155 – 1230h:  Keynote Paper: Performance of 9-12% Cr Steels Under Cyclic Loading and Cyclic Oxidation Conditions
J Olbricht, M Jürgens, M Mosquera Feijoo, F Roohbakhsh, L Agudo Jácome, B Fedelich, A Kranzmann, B Skrotzki, Department of Materials Engineering, Federal Institute for Materials Research and Testing (BAM), Berlin, Germany

1230 – 1330  LUNCH BREAK

Session 2:  Materials & Weldment Issues

1330 – 1405:  Keynote Paper: Minimising Flexible Operation Costs by Upgrading Materials and Welds
David Allen, IMPACT PowerTech, UK

Zhuyao Zhang, Bhairav Patel, Alex Malioglou, Metrode Products Ltd., UK

1430 – 1455:  Developments in Assessment of Welds Under Creep, Fatigue and Creep-Fatigue Loadings
J Schleyer, T Bender, A Klenk, Materials Testing Institute University of Stuttgart (MPA), Stuttgart, Germany

1455 – 1520:  Dissimilar Metal Welds in Ultra SuperCritical Power Plants
J Vekeman, Belgian Welding Institute, Belgium

Coffee Break  1520 – 1550
Session 3: Cracking, Failure, Maintenance and Materials Issues

1550 – 1615: Fracture Mechanics Assessment for Boiling Water Circulating Pump Bowls to Prove Inspection Intervals in Times of Flexible Operation
Johanna Steinbock, TÜV SÜD Industrie Service GmbH, München / Munich, Germany

1615 – 1640: Cycling HRSG Plant Failures and At-Risk Areas: A Case Study
David Robertson, European Technology Development, Leatherhead, Surrey, UK

1640 – 1705: Chemical Cleaning of Cyclic and Base-Load Power Plants
Bill Moore, ETD Consultant, UK

1705 – 1730: Issues with Welded ‘Aberrant’ P91 Components & Their Long-Term Strength
Ahmed Shibli, David Robertson, European Technology Development, Leatherhead, Surrey, UK

1730 – 1755: How to Control and Conduct Inspections on Mill Production Material and Fabrication of P91 and P92 Steels
Henryk Mazur, Mazur Energy, Poland

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DAY ENDS: 1800h
**DAY – 2 (Thursday, 5th July)**

**Session 4: Creep & Fatigue Damage**

0900 – 0935h: **Keynote Paper:** Effect of UK Grid Demand on HRSG Fatigue Damage: A Case Study  
*James MacArthur, SSE, UK*

0935 - 1000: **Integrated Boiler Tubes Inspection Program for Southeast Asia’s First Ultra-Supercritical Boiler**  
*Mohd Khairulnizam b. Junoh, Mohd Rusydi bin Mohd Ramli, TNB Janamanjung, Perak, Malaysia*

1000 – 1025: **Modelling of Creep Deformation and Damage**  
*Qiang Xu, Huddersfield University, UK*

**Coffee Break  1030 – 1100**

**Session 5: Creep-Fatigue Interaction & Benchmarking**

1100 – 1135: **Keynote Paper:** Life Assessment of Power Plant Components Under Creep Fatigue Loading Conditions for Operation and Maintenance Strategies  
*Andreas Klenk*, J. Quatier*, K. Metzger**  
*) Materials Testing Institute University of Stuttgart (MPA), Stuttgart  
**) Grosskraftwerk Mannheim AG (GKM), Mannheim, Germany*

1135 – 1200: **Benchmarking and Analysis of Cycling Impact for a Large Group of Power Plants - Technical & Cost Issues**  
*Feroza Akther, European Technology Development, Leatherhead, Surrey, UK*

1200 – 1225: **Stress Corrosion Cracking in T24 Material - Conditions and Mechanisms**  
*Christian Ullrich, W Tillmann, H G Rademacher, R Zielke, and P Körner, VGB PowerTech Service GmbH, Essen, Germany*

1230 – 1330  **LUNCH BREAK**

**Session 6: Innovative Technologies**

1330 – 1405: **Keynote Paper:** Possibilities and Limitations in Combining the Best of Both Worlds: *Combined Cycle Gas Turbines Coupled with Upcoming Battery Technology*  
*Pieter-Jan Stockmans, Engie Laborelec, Belgium*

1405 – 1430: ‘Obikou’: A Pipe Strengthening Mechanism for Creep Damaged and/or Seam Welded Pipes  
*Baginda Affendy, Ahmed Shibli, European Technology Development, Leatherhead, Surrey, UK*

1430 – 1455: **The Development and Use of Portable Scanning Force Microscope (P-SFM) for Early Stage Creep and Fatigue Damage Detection & Life Assessment**  
*Ahmed Shibli, European Technology Development, Leatherhead, Surrey, UK*

**Coffee Break  1500 – 1530**
Session 7: Design & RCM

1530 – 1605: Keynote Paper: Cyclic Tolerant HRSGs
Pascal Fontaine, CMI Energy, Belgium

Nadeem Ahmed, ETD Consultant, Qatar

CONFERENCE DINNER AND BOAT CRUISE ON RIVER THAMES
1800 to 2200 hours
**DAY – 3 (Friday, 6th July)**

**Session 8: Materials and Failure Issues in Power Plants**

0900 – 0935: **Keynote Paper:** Power Station Condensers: Their Design and Failure Modes  
Bill Moore, ETD Consultant, UK

0935 - 1000: **Microstructural Evolution of P91 in High Temperature Conditions and Under Combined Effect of Stress and Temperature**  
Andrea Tonti, Daniela Lega, Alessandra Antonini, Antonello Alvino, Luana Campanile, Loriana Ricciardi, INAIL, Italy

1000 – 1025: **Electrical Discharge Sampling Equipment (EDSE) for Removal of Samples From Pressure Vessels and Turbine Rotors for Quality Checks and Life/ Crack Assessment**  
Alex.Tousias\(^1\), Baginda Affendy\(^2\), Iltaf Hussain\(^1\), Ahmed Shibli\(^2\)  
1. SGS, Manchester, UK  
2. European Technology Development, Surrey, UK

**Coffee Break** 1030 – 1100

**Session 9: Developments in Plant Inspection & Monitoring**

1100 – 1125: **Robots & Drones for Power Plant Inspection: A Group Sponsored Project**  
Ahmed Shibli, European Technology Development, Leatherhead, Surrey, UK

1125 – 1150: **Mapping High Temperature Strain Localisation in Steel Weldments Using Digital Image Correlation**  
R Curry, RD Knutsen, K Singh and F Jayet, Centre for Materials Engineering, Department of Mechanical Engineering, University of Cape Town, South Africa

1150 – 1215: **Developments in Portable Magnetic Measurement Equipment for On-Site Creep Damage Detection**  
* University of Manchester, ** IMPACT PowerTech, ***ETD Consulting., UK

1215 – 1240: **Experience with DC and AC Potential Drop Technique for Creep Damage Monitoring in Piping Systems**  
Adam Wojcik, Mathew Waitt, Matelect, UK

1240 – 1330 **LUNCH BREAK**

**Session 10: Cyclic Plant Behaviour & Assessment of Welds**

1330 – 1355: **Shop Welding Interruptions of P91 Components - Some Considerations**  
Alexandros Antonatos, PPC, Greece

1355 – 1420: **Development and Validation of In-House Software for Creep Damage Analysis**  
Qiang Xu, Jiada Tu, Zhongyu Lu, Huddersfield University, UK

1420 – 1430h **General Discussion & Closing Remarks**
**REGISTRATION FORM**  (Please fax / email)

*International Conference: Power Plant Operation & Flexibility, 4 - 6 July 2018*

*Training Course: Power Plant Operation, Maintenance & Materials Issues, 2 July 2018*

*Training Course: Power Plant Short and Long-Term Preservation, 3 July 2018*

**Registration Fee:** Please put ‘X’ in the relevant box and show the total payment. Fee is to be paid in GB pounds (includes 20% VAT - payable by all attendees at events held in the UK).

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<th>Full Fee (From 5 June 18)</th>
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<tr>
<td>Conference Delegates</td>
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<td>Conference Presenters</td>
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<td>Course: Operation &amp; Maintenance</td>
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<td>Course: Preservation</td>
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**Please show here the Total Amount Payable = £**

**Notes:**
1) 10% reduction if attending more than one event.
2) 10% reduction if more than one delegate attending from the same organisation.
3) 20% reduction for students.
4) 10% reduction for IOM3 Members (Conference Only)

**ONLY ONE REDUCTION WILL APPLY**

**Conference Registration Fee** covers the Proceedings, provided soon after the conference, coffee/tea, lunches, and the Conference Dinner.

**Course Fee** covers printed course notes supplied at the start of the Course, electronic (PDF) copies of the slides (provided after the course), coffee/tea and lunches.

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**How to Pay:** When paying please quote reference ‘ETD Conf. + Course 2018’ and the ETD invoice number (if this was issued):

1) **By bankers draft or bank to bank transfer** to: European Technology Development Ltd.
   *(For payment by bank to bank transfer, account details will be supplied on request).*

2) **By UK bank cheque** made payable to: ‘ETD Ltd.’

3) **Credit Card payment:** Please write to enquiries@etd-consulting.com for details on how to pay by CC.

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**Accommodation:** On request attendees will be provided information on hotels.

**Your title and name:**

**Position (optional):**

**Company:**

**Address:**

**Phone:**

**E-mail:**

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**Address for Registration:** Please post/ fax/ e-mail this form to: kmahoney@etd-consulting.com

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