



European Technology Development Ltd

“Highly innovative engineering and consulting company engaged in providing services to the power plant, petrochemical, refining and other industrial sectors - backed up with state-of-the-art collaborative R&D and product development”



Page 1: ETD's Consulting Services **Including New On-Site Life Assessment**

Page 2: New Group Sponsored Projects (GSP's) & P91 Users Group

Page 3: Currently Running GSP's

Page 4: 2010 Training Courses & Conferences, Completed GSP's

Page 5: Maintenance Advisory Software, Conference Proceedings, OMMI Journal + more

ETD Newsletter, February 2010

Third Party Consultancy – backed up by world class collaborative R&D

2010 is proving to be an exciting year for ETD, as was 2009, for providing dynamic consultancy services to power and petrochemical plant worldwide. The following are *examples* of our current projects and activities:

- ETD is very pleased to announce our *new on-site life assessment capabilities* including replication, hardness testing & metallography. This service is highly complimentary to our other capabilities & utilises the extensive knowledge and experience of ETD's in-house and international technical experts.
- We have been particularly busy with providing technical advice and consulting related to the use of *P91 and its welding issues* to avoid fine grain HAZ related Type IV cracking. The international clients included manufacturers and plant operators from world over. Welding companies and manufacturers (more recently from North America and the Middle East) included those whose welds were sometimes considered by their clients not to be entirely satisfactory and ETD was called in to advise on assessing the integrity or improving the quality of the welds at a minimum cost. It also included those whose welds showed problems during service.

Examples of other subject areas in which we are providing consultancy during 2010 include the following:

Advice and guidance on *Plant Cycling, 2-Shifting and Load Following Operation* or improvement in the design and maintenance for such an operation and *cost modelling* related to the damage caused by such an operation.

- *Risk-Based Maintenance* is becoming a popular topic with many of our clients. As ETD has developed its own Procedure & Software '*Riskfit*' with templates for all plant components (boilers, turbines, electricals etc.) this means that many clients world over can now benefit from this support which is fast, very effective and affordable.
- Our consultancy also includes services such as *inspection* and *outage planning*.
- *Benchmarking* is another area where ETD expertise is now well established and during 2009 we have carried out this work for a number of European and North American utilities. This was in addition to a multi-client Group Sponsored Project (see later) on this topic that ETD has started recently.

The other specialist areas for ETD consultancy are:

- *Crack Assessment* both at low and high temperature using ETD's own procedure and software '*Crackfit*'
- *Fitness-for-Service* both for petrochemical and plant power
- *Failure analysis* of industrial components, and,
- *HRSG design* and operational issues.
- *Probabilistic Assessment* of Catalytic Reformer Process Lines for a UK refinery was carried out recently. ETD has developed this as one of its specialist areas saving money to both petrochemical and power industry.

International P91 Users Group

Formed in 2006 and expanding since then, the International P91 Users Group (P91UG) is an international forum for discussing problems and exchanging knowledge and experience in the fabrication/ welding and use of P91 in high temperature plant. P91UG members regularly receive information on key issues such as new cases of cracking or failures in plants worldwide, weld cracking or high steam side oxidation etc. P91UG Technical Experts produce quarterly Technical Review Reports each focusing on one or two specific issues of interest to members, such as new developments in P91 life assessment methodologies, new developments in European or ASME codes regarding P91 fabrication etc. etc. Members include utilities, plant and component manufacturers, service providers and research institutes from Japan, Europe, Asia and North America.

ETD's 'Group Sponsored Projects' (GSP's) - *How do they work?*

These are the most popular projects for industry involvement. They are also very economical in that each project sponsor only pays a fraction of the total project cost but benefits from the full results. And yet the responsibility for the deliverables lies with one organisation (ETD) so there is no room for 'passing the blame' and not delivering on time or good quality product. This is why many of our clients are repeat customers. These are usually plant owners/ operators, manufacturers or service providers. The projects can be joined at any stage of their execution although those who join early have more opportunities for making sure that the project deliverables are more relevant to their needs.

New Group Sponsored Projects (GSP's) - *started in Jan. 2010 (New sponsors welcome)*

Weld Repair Review and Guidelines

ETD started this multi-client Group Sponsored Project (GSP) in January 2010 and aims to complete it by July 2010. This will consider all type of weld repairs (such as cold or hot weld repairs) and their behaviour and endurance in high temperature plant. Materials included in the study are: 2.25Cr1Mo, 0.5CrMoV, 316SS, P91, 1CrMo forged for rotors and 1CrMo cast for turbine casings. The study aims to include data and results from ETD earlier large projects in this area such as the industry sponsored project on casing weld repairs, European Commission and European industry supported projects such as 'Integrity of Repaired Welds' and information and data from various other European, Japanese and North American projects that ETD has access to. In addition data and knowledge from various conference and journal publications (some of which were organised by ETD) will be analysed and included in the Report. Both plant experience and R&D findings are being reviewed. These guidelines should be particularly useful to industry and service providers in deciding on best practices, the type of weld repairs to undertake for their particular circumstances and the life expectancy of such repairs.

Development of a State-of-the-Art Procedure & Software for Integrity & Life Assessment of Petrochemical, Process & Refining Plant

This project has just been started and is envisaged to be completed before the end of 2010. It will build up on a similar procedure already developed by ETD for Power Plant which has been much appreciated by its industry sponsors (see below) both as a lifing procedure and as a training tool.

Benchmarking

ETD has just completed *Phase 1* of a project on analysing power plant performance, providing advice on how to improve operation and maintenance efficiency. This project included about 60 plants and produced a large 127 page report. It was considered, by one of the project's European sponsors, to be a milestone in Benchmarking of Power Plants, Cogen Plants and HRSGs. A brief/ contents of the report can be obtained from ETD by those who may be interested in benefiting from this work or wish ETD to undertake similar work on their plant. *Phase 2* of this project started in January 2010 and includes over 100 plants (conventional power plant, OCGTs, CCGTs and Cogen plant) mainly from Europe and North America including some Asian plants.

Group Sponsored Projects (GSP's) Currently Running *(new sponsors welcome)*

LIFE ASSESSMENT PROCEDURE AND SOFTWARE FOR POWER PLANTS *(now nearly complete)*

The development of this international industry sponsored deterministic and probabilistic state-of-the-art 1300 pages long procedure and the associated interactive software (with on-line life calculation facilities etc.) dealing both with the conventional power plants and the HRSG has now been completed.

Feedback from the sponsors:

- *"We would like to congratulate you on your efforts to date. The content developed...is comprehensive and includes most recent information. The compilation of such a large amount of information, on so many specialised topics, and with a user-friendly software and examples was long overdue and will most likely become a critical engineering reference for the Power Industry". Eskom, South Africa*
- *"We can state that the Lifting Procedure and software are very robust and contain a huge amount of very useful and up-to-date information....although originally sold to us as the Lifting Procedure, we now see that it can also work as a great tool for the training of our younger engineers". Electrabel, Belgium*

e-Atlas of In-Service Microstructure Degradation and damage development in high temp. materials used in power and petrochemical industry and their relationship with the material life as a function of time and temperature

This project has collated and organized information in an intelligent software format where microstructures in a variety of combinations (weld, base metal, HAZ, various materials combinations etc.) can be called and compared. Information from about ten thousand replicas of in-service components of up to or more than 40 years old plants is involved.

This is aimed at helping utilities and petrochemical plants which need to compare their very old plant component microstructure with reference microstructures and thus have a degree of confidence in the remaining life of their plant.

Technical and Cost Analysis of Component Replacement in Ageing Plant

This project has been initiated at the request of a number of Canadian utilities but is now available as a GSP to international industry. *Further information on request.*

P91 Welded Components: Inspection, Monitoring, Integrity and Life Assessment

The current sponsors include: A number of Canadian utilities, CRIEPI (Japan), Electricite de France (EDF), Ansaldo and ESB (Ireland).

Damage to Power Plant due to Cyclic Operation and Guidelines for Best Practices - Technical & Cost Issues

Update & expansion of the earlier completed GSP. A number of UK, European and North American utilities were involved in the sponsorship of this project.

Damage to CCGT Due to Cycling- Technical, Cost Issues & Plant Performance

Update & expansion of the earlier completed GSP. A number of UK, European and North American utilities are involved in this project.

Materials & Data Review

This project consists of four independent sub-projects on 'Low Alloy Ferritic Steels', 'High Cr Martensitic Steels', 'Stainless Steels' and 'Ni-Based Alloys'. It critically reviews and compares code based materials data (ASME, EN, Japanese etc.), plant experience & new developments for Design & Lifting of High Temperature Plant. It provides expert advice on which materials are best to use under various plant operating conditions. *Data sheets have been produced for high temperature steels/ alloys used by petrochemical and power industry. The existing sponsors include Electricite de France (EDF), Electrabel, ESB etc.*

Riskfit

Development of an RBM interactive software tool for Power Plant. This project's objective is to optimise process aimed at rationally allocating maintenance/ inspection resources in proportion to an identified risk level using the ETD 'Riskfit' Procedure. *Further information on request.*

On-Site Powerful Metallography

This project is being conducted in collaboration with a UK University and a Russian Institute. The aim of this revolutionary new development surpassing and replacing component replication is to further improve an already developed and lab-tested suite of portable equipment and software for on-site component inspection by means of digital portable microscopy for *nano-level* microstructural deterioration, micro-damage detection (very early stage cavitation due to creep, or, fatigue/corrosion damage etc.).

O/CCGT & CHP Plants – Plant Performance including Cost Analysis Aims at benchmarking of about 100 plants from a number of European and other utilities. The objective is to help project sponsors to aim for better *plant efficiency, reduction in operation/ maintenance costs and component failure, etc.* Existing sponsors include Iberdrola and others.

Training Courses & Conferences

- 4-days Training Course in Gas Turbine Component Failure and Lifting:

Venue: IOM3, central London, 20 - 23 April 2010.

This is a repeat course which has been highly appreciated by the previous attendees. During this course ETD experts from UK, Germany and Japan will cover the principles of Gas Turbine Design, Operation and CCGT Thermodynamics. Other issues to be discussed include: Materials and their selection; Component degradation, failure and root cause analysis (especially rotating parts); Integrity/ lifting of turbine blades and coatings; Hot gas path component life calculations, stress analysis, Finite Element Tools etc. including Worked Examples.

- P91, P23 Courses and Industry Seminars in Houston, Texas (July 2010) and in Sydney, Australia (May 2010). For information and programmes please visit ETD website www.etc1.co.uk

- 3-Days 5th International HIDA Conference HIDA-5 (23-25 June 10)

Preceded by: Optional 2-days Training Course in 'Crack Assessment in High Temp. Plant', (21-22 June 10)

Venue: University of Surrey, Guildford (near London)

The *HIDA series of conferences*, started in April 1998, have now become a regular event aimed at addressing plant integrity both in the defect-containing and defect-free components of high temp. plant. HIDA-5 has been expanded to cover failure analysis, fitness-for-service, preventive/ risk based maintenance and *probabilistic assessment*. Full programme at: www.hida5.com →

Completed GSPs (for Purchase)

Data, results and reports on completed Group Sponsored Projects are available for purchase. These include:

- New Materials Review (P91, P92, T23, T24, P122): R&D & Plant Experience
- Guidelines for Maintenance, Inspection Monitoring and Repair of HRSGs
- Damage to CCGT's due to Cyclic Operation
- On-Line Plant Monitoring
- Advanced Plant Inspection Techniques
- Crackfit: Development of a Procedure and Commercial Software for Assessment of Cracks in High Temperature Components. Developed jointly with a large European utility and tested independently Crackfit includes most common industrial components and crack geometries for surface and embedded cracks. Crackfit involves both deterministic and state-of-the-art probabilistic assessment. *Further information on request.*

Cost of Power Plant Cycling

ETD now provides consultancy in this area on regular basis and as a result of its years of work has perhaps built up the best expertise in this area. With its own *generic cost models*, a *large database* and *software* ETD can provide advise on most efficient plant operation and how to reduce damage/repair costs due to cycling.

The 2-days Training Course in Crack Assessment is a popular repeat course and covers the fundamentals of damage and fracture mechanics and their application in high temperature plant for the assessment of crack initiation and growth. Details at: www.hida5.com

HRSG Cyclic Operation - Design and Lifting Studies

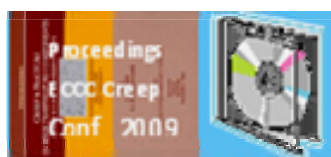
ETD offers a range of services to operators and manufacturers of both conventional boilers and heat recovery steam generators (HRSGs). In recent months, ETD has completed three cyclic operation capability studies of HRSGs and root cause analysis of HRSG superheater component cracking for plant operators in Europe and Middle East. The cyclic operations studies concerned HRSGs that have been designed for base load operation but will in future operate in two-shifting mode and/or be subject to frequent rapid load changes during operation. The work performed by ETD included (i) *design review* to identify component features that could be weaknesses under cyclic operating conditions, and (ii) *fatigue analysis* according to European standard EN 12952 to estimate the cyclic life of key components of the HRSGs.

Maintenance Advisory Software- MAS

A Procedure and a 4-module suite of Software has been prepared by experienced ETD staff and its international plant maintenance consultants to help steam power plant and HRSG maintenance engineers and managers to quickly and easily recognise maintenance problems in their plant and find suitable engineering strategies at the touch of a button. MAS deals with both base load and cyclic plant maintenance. MAS is being used by a number of plants in Europe (particularly in Ireland) and has also been translated in other languages.

MAS has recently been expanded and better and more attractive packages are now available for licensing.

Proceedings of the 2nd International Creep Conference, 21-23 April 2009, Zurich,



Organised by European Creep Collaborative Committee (ECCC), the Proceedings of this conf. are now available in the electronic format for downloading from the ETD website www.etd1.co.uk Just click on the Proceedings logo (shown opposite and also sited on the front page of the ETD website) and make payment by credit card/ Paypal or other methods and then follow instructions for downloading (with colour pictures and graphs). Also included are instructions for the purchase of the book of proceedings.

OMMI – Power Plant: Operation, Maintenance and Materials Issues

OMMI is the ETD's refereed internet journal published three times a year in April, August and December. More information at: www.ommi.co.uk

Volume 6, Issues 1 and 2 (Out in 2009).

Some of the Papers published in these two Issues are:

Comprehensive Approach to Creep Life Assessment of Martensitic Heat Resistant Steels

F Masuyama, T. Tokunaga, N. Shimohota, T. Yamamoto and M. Hirano, Japan

Properties of T/P92 Steel Weld Metals for Ultra Super Critical (USC) Power Plant

Z Zhang, G Holloway and A Marshall, Metrode, UK

Cold Weld Repair of T91

J Vekeman and S Huysmans, Belgium Welding Inst. and Laborelec, Belgium

Remaining Life Assessment of an In-service Exposed High Pressure Valve Casing

A Bagaviev, S van Meegdenburg and T Siwczak, E.ON., Germany

Impact of Oxidation on Creep Life of Superheaters and Reheaters

P Jauhainen, S Yli-Olli, A Nyholm, P Auerkari, J Salonen, O Lehtinen and S Mäkinen, VTT, Finland

Metallurgical Properties and Creep Behaviour of P91 Steel Base Metal and Weldment after Short-term Exposure at 500°C

F Vivier, A-F Gourgues-Lorenzon, J Besson, C Petry, Y De Carlan, Y Lejeail, S Dubiez-Le Goff, EDF, France

Acoustic Emission Testing of Highly Loaded Combustor Liner Tiles For Gas Turbines

C Mende, E Heits, A Schulz, H-J Bauer and A Wanner, Germany



Further information

ETD, 6 Axis Centre, Cleeve Road, Leatherhead, Surrey, KT22 7RD, UK
 Tel: + 44 1372 363 111 or, Tel: + 44 1372 363 112 Fax: + 44 1372 363 222
etd@etd1.co.uk www.etd1.co.uk (new)