



European Technology Development

**T91 BOILER TUBE OXIDATION / INTEGRITY ISSUES
&
LIFE EXTENSION / REPLACEMENT STRATEGIES**

Project Acronym: 'T91 Tube Lifting'

ETD Project No: 1103-gsp-prop08

Proposal Brief

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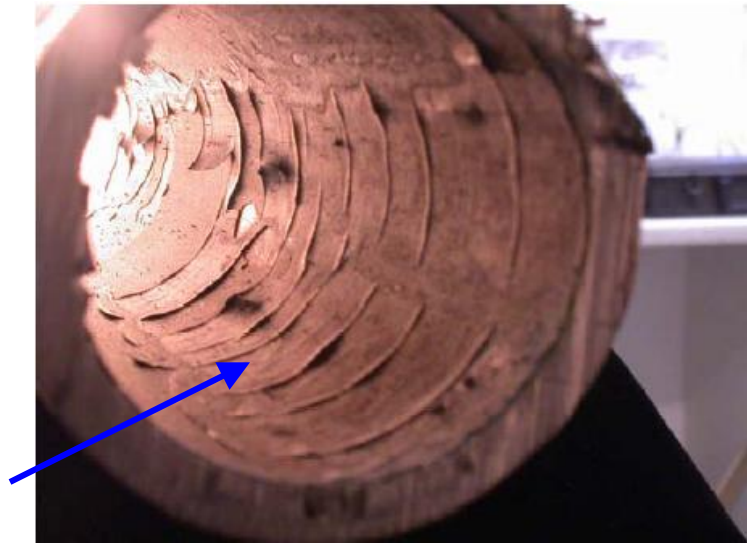
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EXECUTIVE SUMMARY

This is a ten-month study proposed to conduct seven Tasks shown in Section 2. At the end of this investigation a detailed review of the factors affecting T91 tube oxidation and wastage when used in high temperature plant containing steam and/or flue gases will be produced.

This report will also provide guidelines on how to monitor tube damage and assess their integrity and remaining life with a view to making informed and knowledge-based decisions on their continued operation or replacement, the decisions which are technically sound and economically beneficial. The guidelines will also help to identify factors that may enhance the tube life (such as acid cleaning, aluminising etc.) and thus defer or even eliminate the need for their replacement and associated costs.

This study will be based on the worldwide plant and research experience and its critical analysis, an aspect that ETD is well placed to investigate due to its international contacts both in industry and research organisations. ETD's earlier studies have shown that T91 tube steam and flue gas oxidation has had a significantly detrimental effect on the use of this material by some utilities. This study may help us, amongst other things, to find the factors (such as any particular chemical compositions – e.g. lower Cr levels albeit within the code specified limits, plant operating or monitoring practices or other aspects) that may be responsible for the adverse effect on tubing in some plant. This project should therefore lead to a significant improvement in the knowledge and skill base of the plant operators to deal with this issue and thus improve their plant performance. The steel makers, tube producers and plant manufacturers should equally benefit from the findings of this project to help improve their material or product and thus win more customers and business.



A view of an ex-service T91 tube bore containing thick and broken steam side oxide

2. PROPOSED STUDY PROGRAMME

A programme of study and investigation is proposed here to look into the issues described above. *(these task are described in detail in the proposal)*

Task 1: Review of Worldwide Plant Experience

Task 2: Review of Research Experience

Task 3: Tube Life Estimation from Oxide Thickness and Cavitation

Task 4: Acid Cleaning

Task 5: T91 Tube Aluminising *(aluminized T91 tubing is at present being studied by ETD)*

Task 6: T91 Tube Replacement Strategies

Task 7: Recommendations

This task will involve the bringing together of the findings of the preceding six tasks and putting together advice and recommendations as to the use of T91 tubing in future plant, how to assess its performance and life expectancy in the existing plant and what options may be available for replacement, if and when required.

3. PROJECT BENEFITS & COSTS

The *cost* to a sponsor for joining the project will be provided on request but it needs to be stated at this stage that one of the main benefits of joining a Group Sponsored Project (GSP) is that the project cost is shared between a number of sponsors. As a result each sponsor contributes only a fraction of the total cost although he/she will get the full benefit of the outcome, thus making it an excellent value for money.

4. TIMESCALE AND DELIVERABLES

The work will be carried out over an estimated period of *10 months*.

The detailed *Report structure* will depend on the findings of the study. It is nevertheless envisaged that it will have the following 10 broad sections:

(listed in the proposal)

5. PRINCIPAL INVESTIGATORS

Because of the multi-disciplinary nature of the project a number of ETD staff and its international experts with complimentary skills and knowledgebase, will contribute to this study. The ETD staff and consultants regularly working on this project are described in the proposal.

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