Formation of a new powerful International Group **"JUS"** now offering

Innovative Quantitative Life Assessment Services for High-Temperature Power and Process Plants

1. Introduction

In response to the critical need for life extension of high-temperature industrial power and process plants, **KMTL and CRIEPI of Japan, ETD of the UK, and CETIM-MATCOR of Singapore** have joined forces to create the **JUS Consortium** (Japan, UK, and Singapore). This global alliance offers cutting-edge, quantitative life assessment services for owners and operators of high-temperature plants across a range of industries, including power generation, refining, petrochemical, and nuclear sectors.

As aging fossil fuel and nuclear plants face extended service demands due to environmental restrictions on building new facilities, their role in supporting variable renewable energy sources has become essential. However, this increased demand for flexible operation can accelerate both creep and fatigue damage.

Traditional life assessment methodologies, often conservative, rely on minimum material properties as specified by ASME, European, or Japanese standards. Such approaches may underestimate the true remaining life of components, potentially leading to premature and costly repairs or early replacements.

2. The Problem

A key challenge in life assessment is accurately determining the remaining strength of critical components without causing damage to the materials in use.

The **EDSE (Electrical Discharge Sampling Equipment)**, a revolutionary portable spark erosion sampling machine developed by KMTL in Japan, effectively addresses this issue. This tool enables precise, non-damaging sample collection from components of various thicknesses, cutting boat samples ranging from 1 to 20 mm in thickness and of different widths and lengths, even in some of the areas not easily accessible by mechanical boat samplers. By preserving the integrity of the component, EDSE offers a safer alternative to traditional boat samplers.

For example, cutting a miniature 5 mm thick sample for three miniature tensile specimens (used for creep or fatigue testing) from a 25 mm thick wall component has been shown to have little to no impact on the component's remaining life. However, some plant owners remain hesitant to remove samples of this thickness. In response to this concern, the JUS Consortium has developed ultra-miniature specimen testing techniques for specimens that can be machined from 1mm thick boat samples. This minimises any disruption to the component and provides greater confidence in the component safety.

3. The Solution

To deliver quantitative and reliable life assessment, the JUS Consortium has pioneered an innovative testing approach using ultra-miniature specimens. This method involves cutting specimens just 1 mm thick and performing tensile creep tests designed to focus stress on the specimen's gauge length, thus ensuring precise and reliable results. This refined testing technique allows for highly accurate, quantitative data on the remaining life of critical components. It has proven superior to the Small Punch Creep test, a method that often produces variable results due to multiple influencing factors.

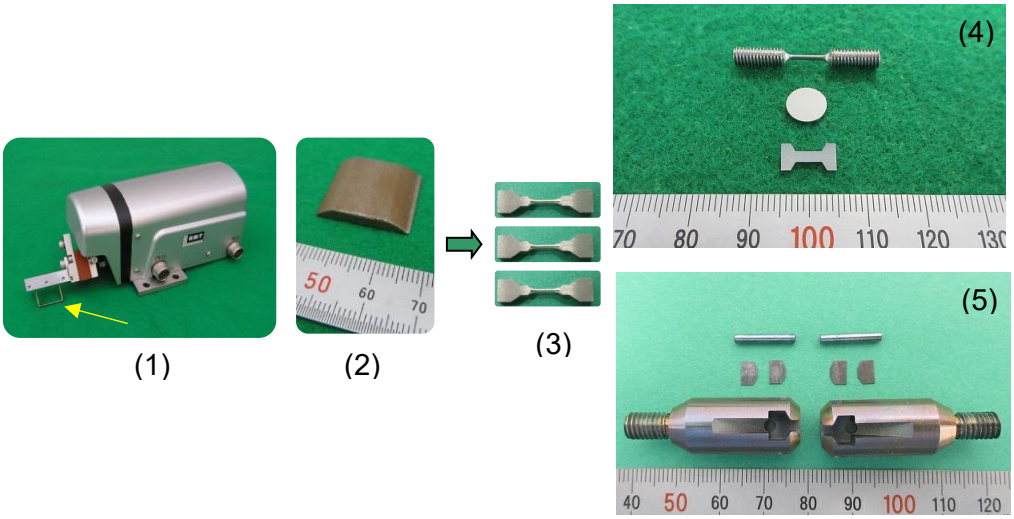

Figure 1: *From left to right:*

1. *EDSE boat sampler*
2. *Slice cut from a component*
3. *Miniature creep specimens (3 specimens machined from 1mm or 5mm thick slice)*
4. *Comparison of Small Punch Creep (SPC) and Ultra-Miniature Creep (UMC) specimen machined from a 1mm thick slice (0.5mm thickness, 10mm long)*
5. *UMC holder for specialized creep testing*

4. Comprehensive Plant Inspection and Life Assessment Services

The Consortium provides a range of services designed to maximize the operational life of high-temperature plants while ensuring safety and reliability. With decades of experience, our experts offer a complete suite of inspection and assessment services, including a ***Three-Tiered Life Assessment Approach:***

Level 1:

- ***Data Collection:*** Initial data gathering, RLA calculations based on inverse design codes, and the next inspection plan development.

Level 2:

- ***Site Assessment:*** Visual inspections, metallurgical replication, laser scanning, NDT, hot and cold walk-downs, and detailed RLA based on site-specific data.
- **Advanced Analysis:** Fitness-for-Service (FFS), Risk-Based Inspection (RBI), and FEA for complex components (such as headers, rotors etc.).

Level 3 (UMC Testing):

- ***Quantitative Life Assessment:*** Detailed analysis through mechanical testing for quantitative life assessment, providing essential run, repair, or replace recommendations.

Note: *The miniature and ultra-miniature creep specimen testing facilitated by EDSE falls under* ***Level 3*** *and is critical for thick-section components, enabling operators to avoid premature repairs or replacements, ultimately yielding substantial cost savings.*

5. Consortium Expertise

The JUS Consortium unites over a century of combined experience in high-temperature plant condition and life assessment. Together, we provide:

- ***Innovative Sampling Techniques***: Precision, non-destructive sampling using the EDSE.

- ***Quantitative Life Assessment****:* Ultra-miniature creep testing for accurate life assessment and extension data.
- ***Comprehensive Solutions****:* End-to-end inspection, assessment, and monitoring services tailored to your specific needs.

With JUS Consortium's proven expertise and advanced methodologies, plant operators can confidently extend the life of their critical assets while optimizing operational costs and maintaining safety standards.

6. Contact Us

For further information or to discuss how the JUS Consortium can support your plant's operational needs, please reach out to:

- **KMTL: web001@kmtl.co.jp**

  https://en.kmtl.co.jp/

- **CETIM-MATCOR:** www.cetim-matcor.com
- **ETD:** www.etd-consulting.com
- **CRIEPI:** https://criepi.denken.or.jp/en/

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