

Boiler Materials Failures; Mechanisms, Inspection & Prevention

15th October 2025, 10am – 4pm
Novotel Southampton, 1 West Quay Road,
Southampton, SO15 1RA



When boiler components fail in service the consequence can have the potential to be catastrophic for human safety & well-being and the environment and / or continuity of operations. On a lower level, the effect of such occurrences can include the requirement to reschedule production, execution of emergency repairs and unplanned outages. The impact of plant failures is undoubtedly negative for plant operators, however, understanding the types of failures that can occur and ways to prevent them is critical to the continual improvement of plant safety, performance, availability, and reliability, whilst reducing maintenance costs.

applications. Attendees will gain the necessary understanding of what can go wrong in boilers, ways to inspect them and ways to ensure that correct actions are put in place to avoid failures. Attendees will also develop the knowledge of identifying failure mechanisms.



With over 1,000 failure investigations conducted, R-TECH Materials have an extensive library of case studies across a wide range of materials, failure mechanisms and

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The course structure will include the following:

1. Introduction
2. Boiler materials waterside damage mechanisms (Part A) which would cover the following mechanisms:
 - A. Water formed & Steam formed deposits
 - B. Caustic embrittlement
 - C. Chloride stress corrosion cracking
 - D. Caustic gouging & hydrogen embrittlement
 - E. Acid phosphate corrosion
 - F. Oxygen corrosion
 - G. CO₂ Corrosion
 - H. Erosion Corrosion
3. Boiler materials fireside damage mechanisms (Part B) which would cover the following mechanisms:
 - A. Graphitisation
 - B. Spheroidisation
 - C. Sigma Phase Embrittlement
 - D. Sensitisation
 - E. Creep and stress rupture
 - F. Short term overheating-stress rupture
 - G. Decarburisation
 - H. Stress relaxation cracking (Reheat Cracking)
 - I. Acid dewpoint corrosion
 - J. Polythionic Acid Stress Corrosion Cracking
 - K. Fuel-ash corrosion
 - L. Fire-side erosion
 - M. High temperature alkali salts corrosion
4. Boiler materials damage mechanisms (Part C) which would cover the following mechanisms:
 - A. Thermal Fatigue
 - B. Corrosion Fatigue
 - C. Cavitation
 - D. Welding Defects
 - E. Liquid Metal Embrittlement
 - F. Temper Embrittlement
 - G. Incorrect material & defects
 - H. Repair
5. The course will provide the following:
 - A. A description of each failure mechanism and critical factors
 - B. How to identify a particular mechanism
 - C. Locations affected by the mechanism
 - D. Affected material types
 - E. Recommendations on how to prevent the damage mechanism including inspection and monitoring
 - F. 1 or 2 case studies related to the mechanism