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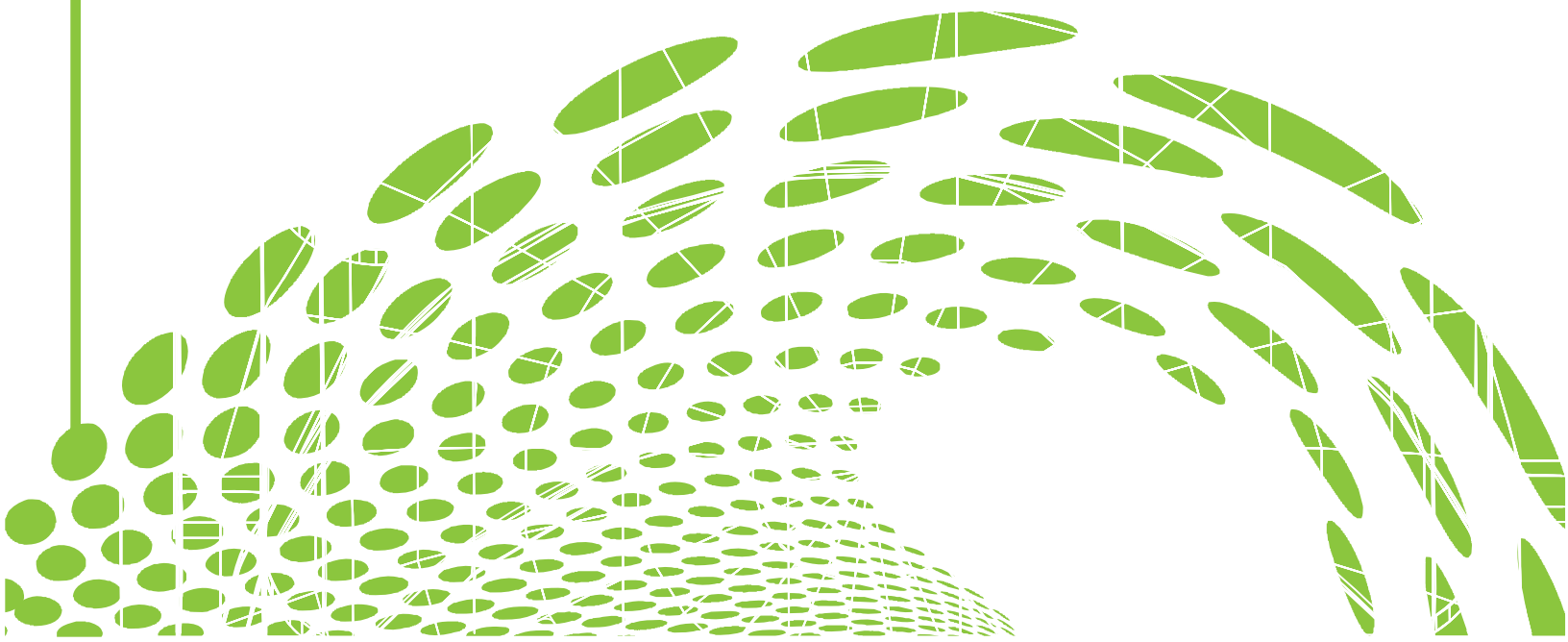
STP-PT-089

CREEP-FATIGUE FLAW GROWTH ANALYSIS TO SUPPORT ELEVATED TEMPERATURE FLAW SIZE ACCEPTANCE CRITERIA



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Creep-Fatigue Flaw Growth Analysis to Support Elevated Temperature Flaw Size Acceptance Criteria

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Date of Issuance: January 31, 2020

This publication was prepared by ASME Standards Technology, LLC (“ASME ST-LLC”) and sponsored by The American Society of Mechanical Engineers (“ASME”).

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Two Park Avenue, New York, NY 10016-5990

ISBN No. 978-0-7918-7346-5

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FOREWORD

The goal of this publication is to analyze a matrix of typical elevated temperature components using recognized creep-fatigue flaw growth analysis methods and data. The authors acknowledge, with deep appreciation, the activities of ASME staff and volunteers who have provided valuable technical input, advice and assistance with review of, commenting on, and editing of, this document.

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ABSTRACT

Creep fatigue crack growth analyses using the EDF R5 V4/5, API 579-1/ASME FFS-1, and EPRI BLESS methodologies are carried out in an iterative fashion on four components: superheater tube and pipe, and reheater tube and pipe. Three materials are considered and twelve flaw configurations, which varied in orientation, location and geometry. The scope of the work is to calculate the largest initial flaw size for each case that satisfies the specified transient operating conditions: temperature, pressure, time, and cycles. The stresses are calculated via transient finite element analyses and software is developed to apply the three fracture mechanics methodologies. Extensive unit-testing is implemented to verify the codes and several hand calculations are done and included in the report. The results are compared in tabulated format and conclusions are drawn.