

E²G INDUSTRY

INSIGHTS

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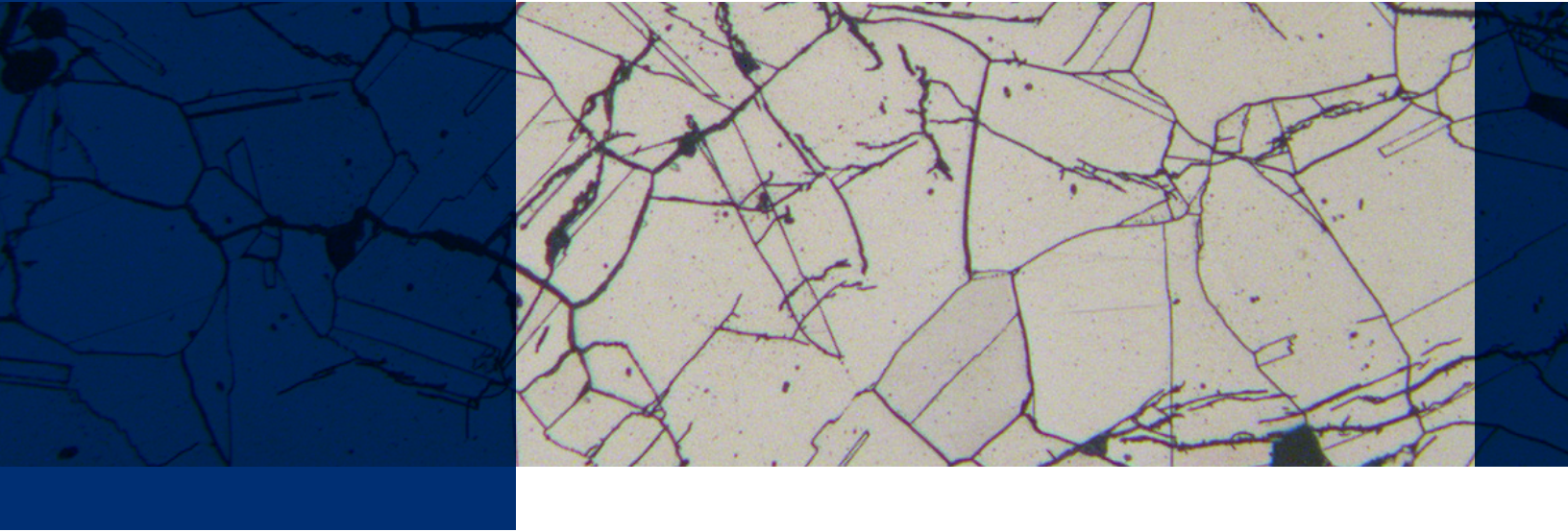
**DETERMINING DAMAGE MECHANISM
IMPACT THROUGH METALLURGICAL
ANALYSIS & MECHANICAL TESTING**

SMART TECHNOLOGY. ANSWERS FOR TODAY.
INSIGHTS FOR TOMORROW.

E²G | The
Equity
Engineering
Group, Inc.



DETERMINING DAMAGE MECHANISM IMPACT THROUGH METALLURGICAL ANALYSIS & MECHANICAL TESTING



Metallurgical analysis is a service E²G offers to many clients to help provide clarity on complex failure situations of which it proves difficult to pinpoint the root cause. Learning from failures is a key part of continuous improvement at your plant. E²G can quickly determine the root cause of a failure, and, more importantly provide practical recommendations to avoid its reoccurrence. This is possible due to the unique combination of our access to detailed analytic laboratory equipment and a number of experts with decades of plant experience to help determine realistic recommendations and corrective actions.

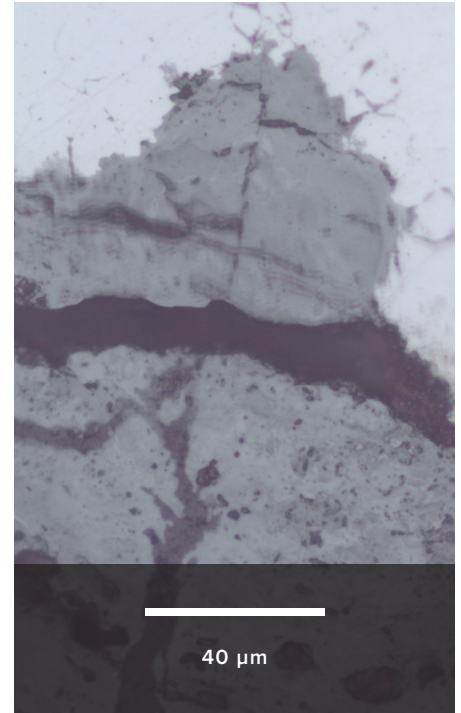
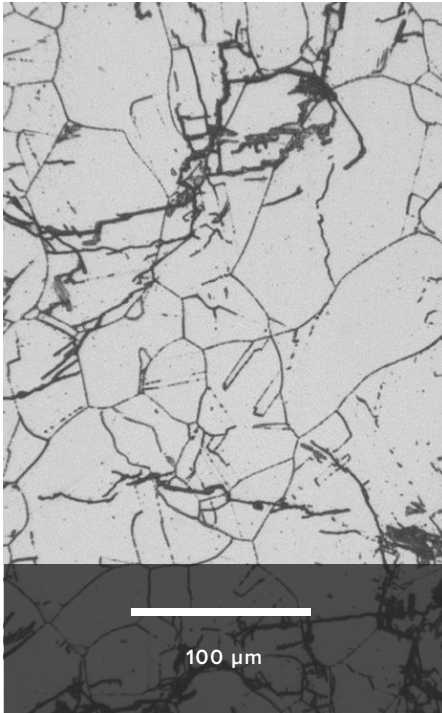
E²G also provides a turn-key solution for determining actual vessel properties measured on removed plate material (i.e., a boat or window sample) and incorporating these into FFS evaluations. This eliminates the need to assume material properties (such as toughness, hardness, tensile strength, and remaining creep life) – an assumption that can sometimes be too conservative in critical FFS evaluations – and allows for more accuracy. For some clients, this approach has proven very helpful in determining flaw sizing for propane/butane bullets made from vintage carbon steel. Additionally, this has been utilized to provide confirmation of field NDE calls for damage mechanisms such as High Temperature Hydrogen Attack (HTHA). Oftentimes after a major failure, answers are needed quickly to determine repair/replace strategies. E²G can provide rush

metallurgical service and turn around samples with preliminary results in a matter of days (not weeks)! This allows for decisions to be made during the turnaround, not after, in some instances. In addition to providing remote failure analysis, E²G experts are available to arrive on site to help facilitate incident investigations as part of a formal Root Cause Failure Analysis (RCFA) or API 585 type protocol as well as Fire Damage Assessments. E²G can provide a turn-key solution in leading incident investigations, metallurgical lab analysis, and in repair/replace decisions, which can expedite getting your plant back online safely.



E²G has the metallurgical experience and expertise to answer all of these questions and others that you may have.

Contact us: 216.283.9519



Let E²G assist you with guidance on life cycle management of in-service equipment through metallurgical analysis and mechanical testing. Some examples of how we have helped our clients are:

- Identifying HTHA from field NDT calls
- Charpy impact testing to develop “Custom” MPTs and critical flaw sizing
- Creep damage characterization and Omega creep testing
- Conducting testing on removed hot tap coupon to determine material properties after high-temperature exposure
- Quantifying the impact of thermal runaway/upset events
- Distinguishing fabrication defects from fatigue damage and offering mitigation solutions for remaining in-service components
- Evaluating for sensitization of 300-series stainless steels and offering preventative practices to stop PTASCC from occurring



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