

## ABOUT ACOUSTIC EMISSION INSPECTION

Acoustic Emission (AE) has been widely applied in the petrochemical, aerospace, and electric utility industry over the past 20 years. It is a passive monitoring technique that "listens" for the high frequency sounds of flaws growing in materials. Sometimes referred to as "structural seismology", it shares the capability with that science of source locating emission sites by means of time-difference-of-arrival techniques.

On high energy fossil piping applications, AE "waveguides" are welded to the piping every 15-18 ft to form a continuous linear source location array. A complete volumetric inspection of the piping is performed under online operational conditions. High frequency (400 KHz) AE sensors are mounted in the waveguides, and provide detection/location of actively growing flaw sites. Plant data, such as temperature and pressure in the piping, is also recorded to provide correlation of activity with stimulus. Proprietary filtering and analysis techniques are applied by AEC to distinguish flaw growth emissions from other background noise (flow). Applications include inspection of seamed hot reheat piping, superheat link piping, and headers.

**Acoustic Emission Consulting, Inc.** was founded in 1991 to develop the application of online AE inspection of high energy piping for the power industry. AEC has been integral in developing the EPRI Guidelines (Nov. 1995) for inspection of both seam-welded high energy piping and headers.

As of 2002 we have performed over 75 full-scale tests of seamed HRH and SH piping to the EPRI Guidelines.

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**HIGH ENERGY PIPING INSPECTION  
AND LIFE MANAGEMENT**

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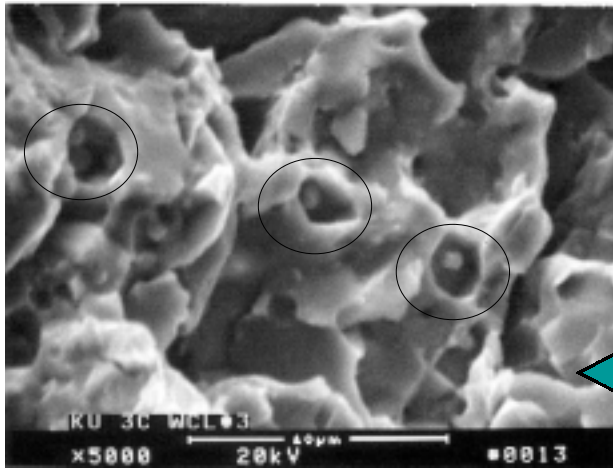
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## PREVENT HIGH ENERGY PIPING FAILURES



*Dedicated Service to the  
Power Industry*

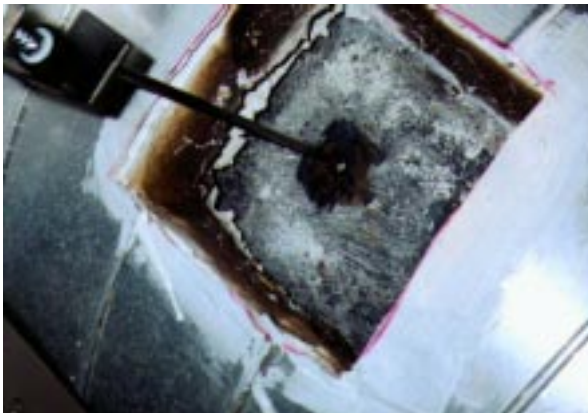
**Tel: 916-965-4827**



Creep cavitation around inclusions in SH link piping weld identified with AE during online testing. SEM view of cryo-cracked surface at 5000X.

### ***UT will find this..***

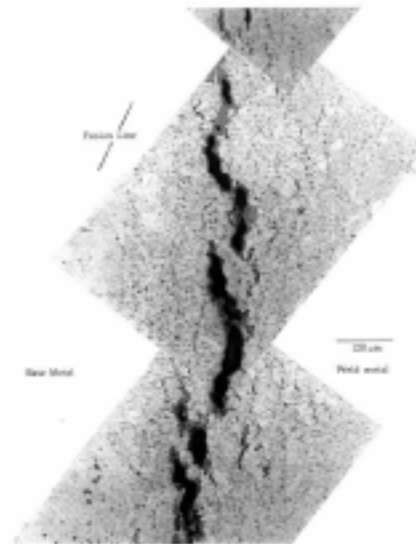
Conventional shear wave ultrasonics will find creep fissuring and cracks, but is highly dependent on the technical proficiency of the inspector. At least two piping failures have occurred within 1-3 years of inspections that should have found them.



Acoustic emission waveguides are welded to the pipe wall every 15-18 ft to provide complete volumetric coverage of the piping system.

### ***AE will find this..***

Acoustic emission has shown to be the most sensitive technique for detecting and locating creep damage at the earliest stages of damage, exemplified by this micrograph showing cavitation around inclusions at the grain boundaries.



### ***Or this may find you..***

Failures of seamed piping continue to occur in spite of the industry's knowledge of the problem. Seamed piping failures are becoming more common—eight failures since 1992, two of them catastrophic (SH link piping).

### ***Key Features of AE Inspection***

- ◆ *Realtime, online monitoring*
- ◆ *High sensitivity to early creep damage*
- ◆ *Global inspection*
- ◆ *Linear location of sources*
- ◆ *Severity ranking*
- ◆ *50-80% more economical than conventional ultrasonic inspection*
- ◆ *No plant outage required*
- ◆ *Minimal insulation removal*
- ◆ *Permanent data record*



August '98 failure of Hawthorne 5 SH link piping. This was the 2nd catastrophic failure of SH link piping in two years (Mt. Storm Unit 1 in June 1996). The piping was not known to be seam welded from supplied documentation.



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