ACC Tube Sampling & Steamside Corrosion

ACCUG 2026

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Why remove an ACC HX tube for evaluation?

Operational concerns

- Air in-leakage associated with ACC HX tubes
- Problematic iron transport that cannot be managed
- More thorough evaluation of the status of tube corrosion

Direct observation of details

- Quantify remaining wall thickness
- Identify the type and extent of FAC along the tube length
- Microscopic examination of surface structure

Considerations for ACC tube sampling / removal

- Gap after removal
- Tube-to-tubesheet area, common corrosion concern
- Fins and sectioning
- Tube selection
- Accomplishing quality, adequate analysis

Sample removal case: process and results

- Tube selection & removal
- Gap repairs
- Analysis – findings

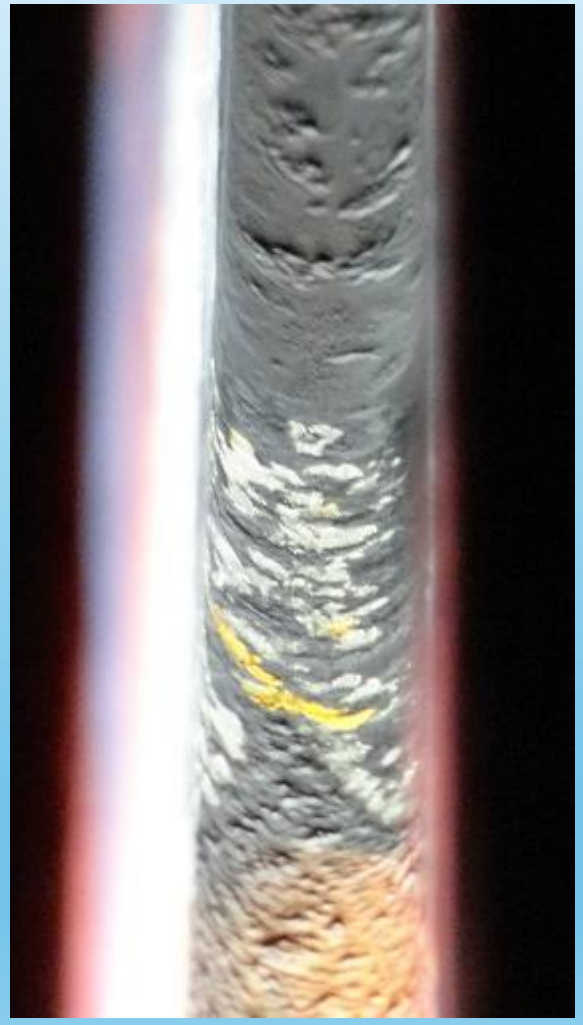
Large forced-draft ACC on coal-fired supercritical unit

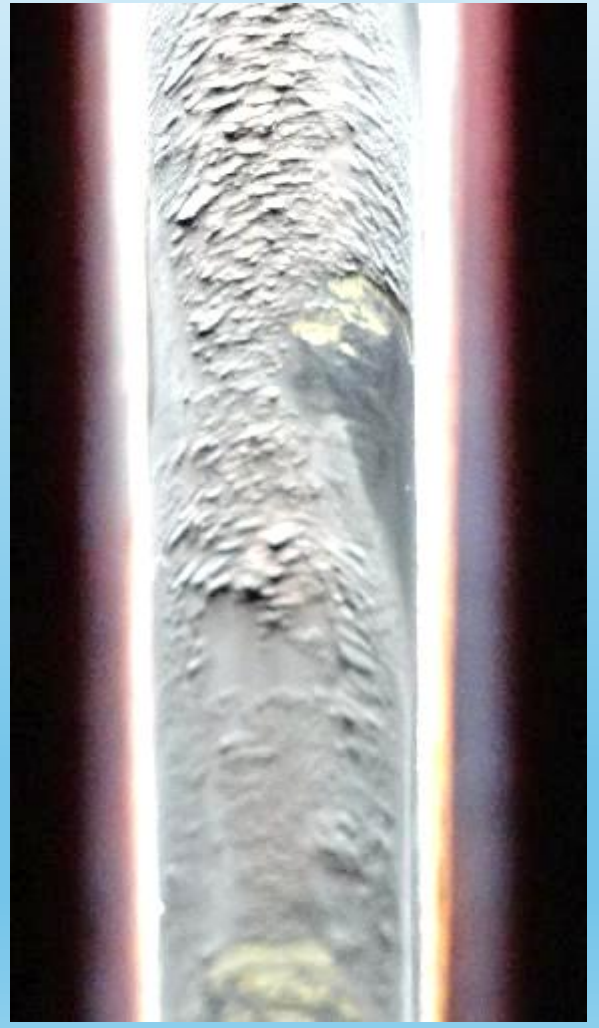
The owner was concerned about significant corrosion observed during inspections and its implication for remaining useful life of the ACC. A better understanding of the situation was needed for planning optimal ongoing plant operation.

ACC tube sampling was undertaken to support this evaluation.

Widespread FAC

FAC 2 to 3 meters downstream of tube entries



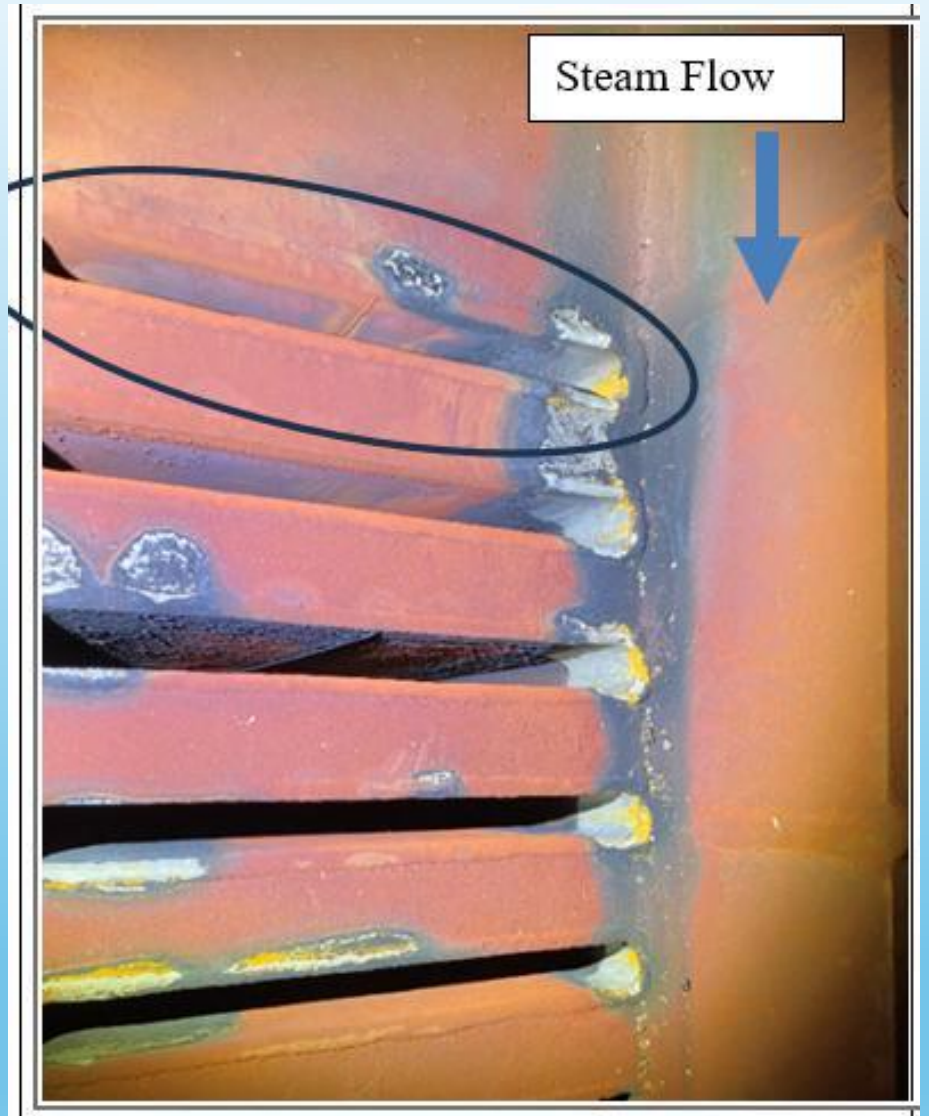


Sample Selection

First tube in steam distribution duct. Bare metal was evident at the tube entry and in adjacent tubes.

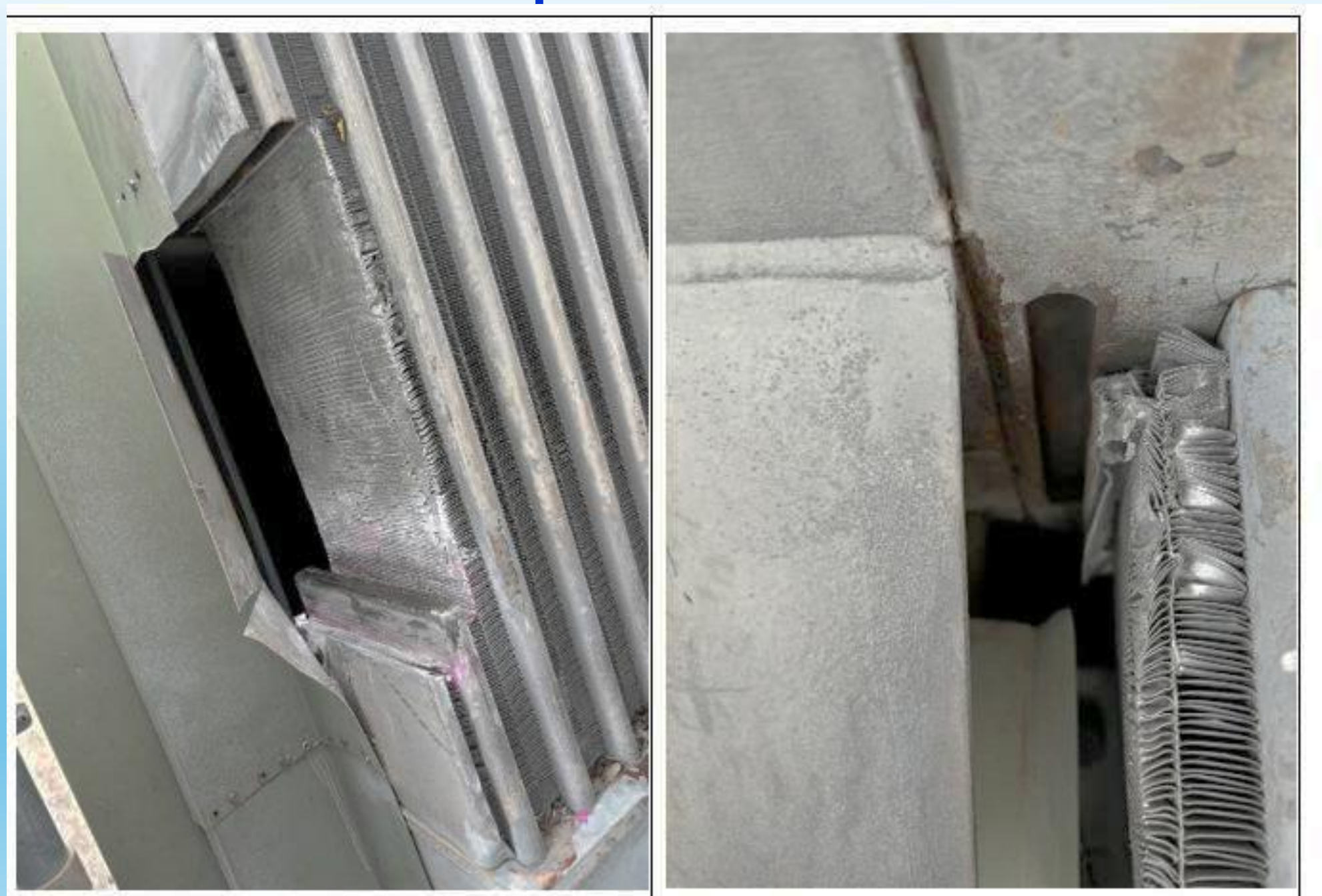
- Easier to repair gap with end-of-duct tube

Tube sampled: Inside steam distribution duct



1. Steam flow from top to bottom as pictured

Tube sampled: Airside of ACC



Sections of tube removed (lab photo)

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~5 ½ feet from inlet

14.4” from inlet	14.4 to 28.7”	28.7 to 43.3”	43.3 to 55.3”	55.3 to 67.3”	~11” section at tube outlet

Results

1. ACC tube samples successfully removed.

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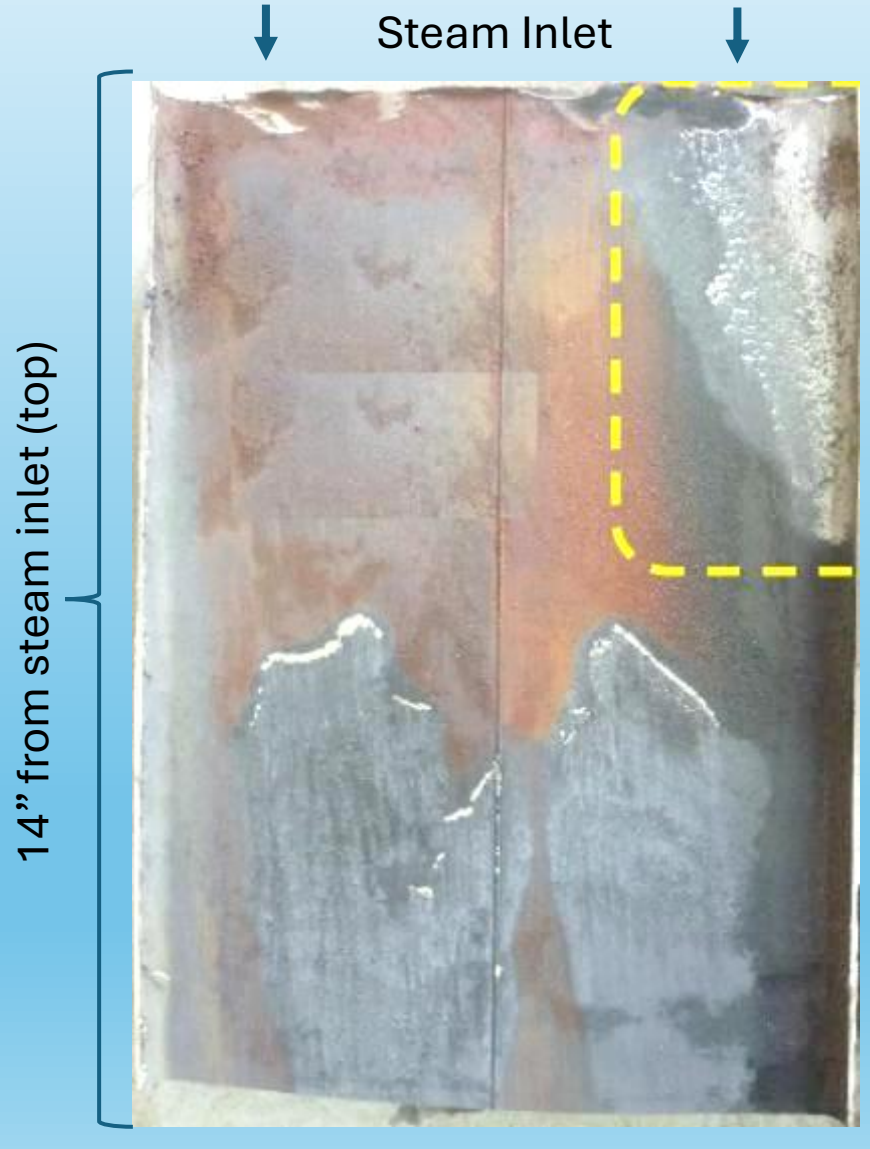
2. **Direct visual examination of tube interior.**

Results: Interior surfaces



Results: Interior surfaces

Flow

14-29”

Flow

29-43”

Results: Interior surfaces

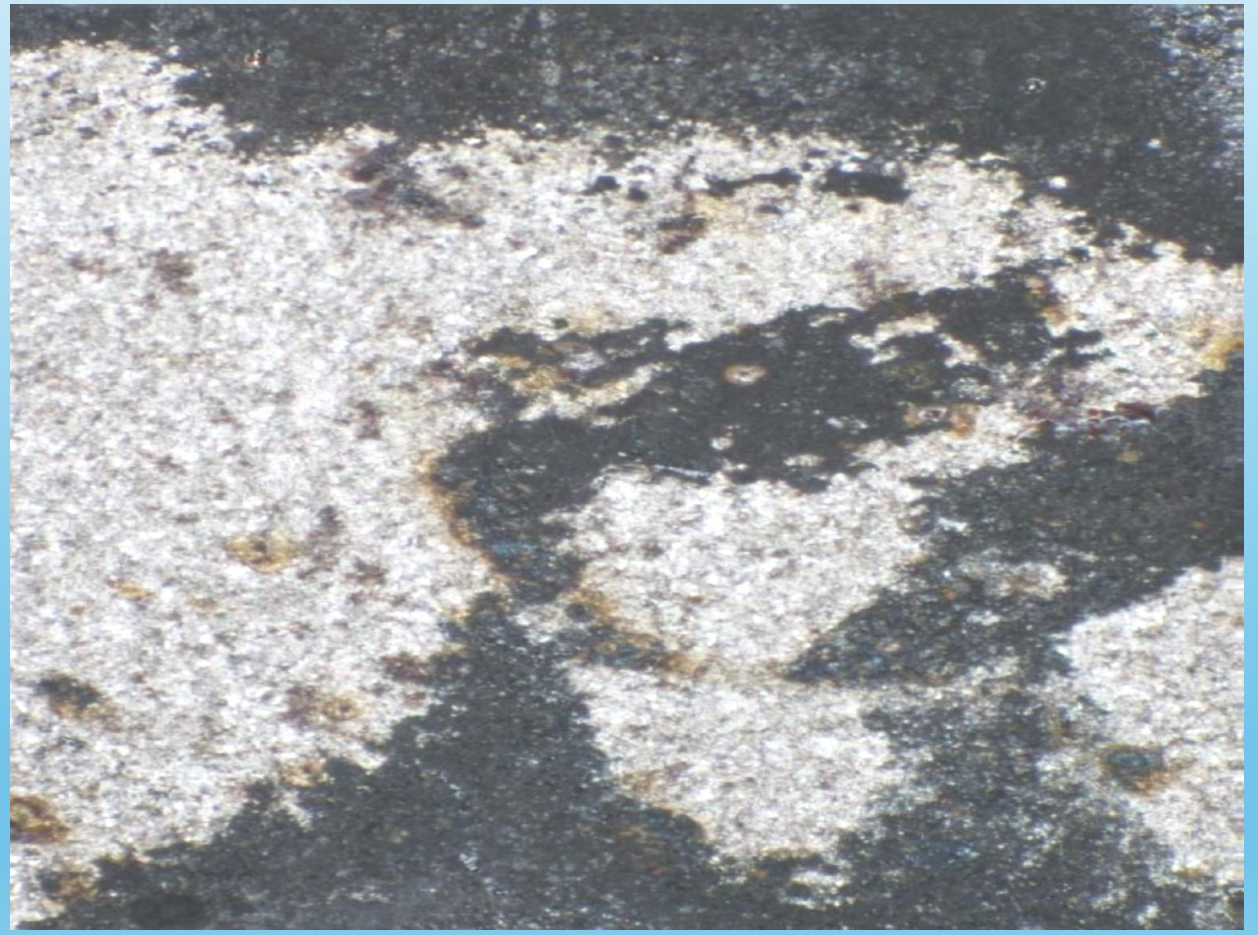
Flow

55-67”

Flow

~11” at tube outlet (bottom)

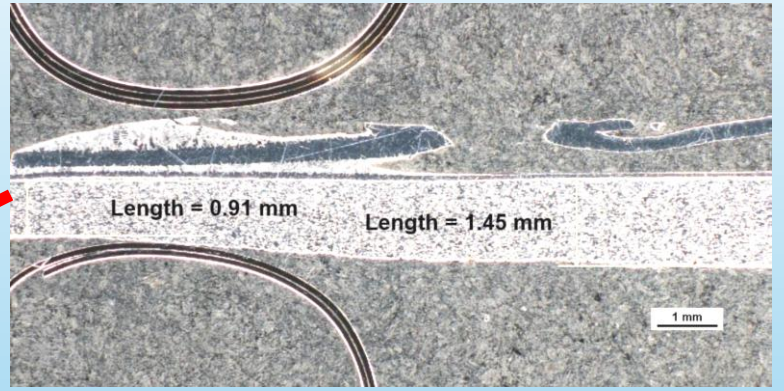
Results: Interior surface, bare metal locations

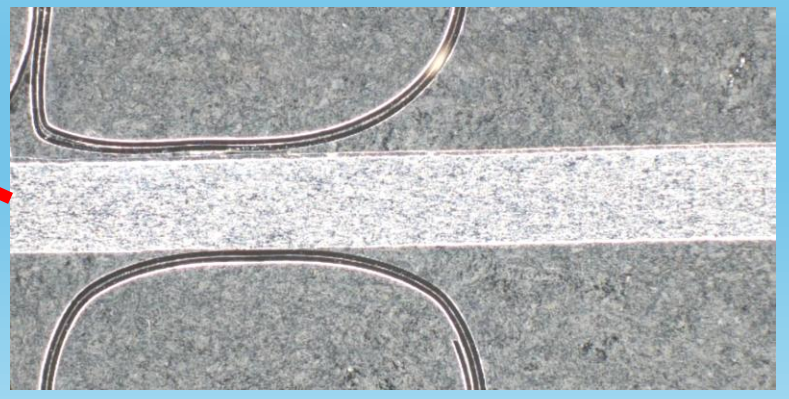


Results

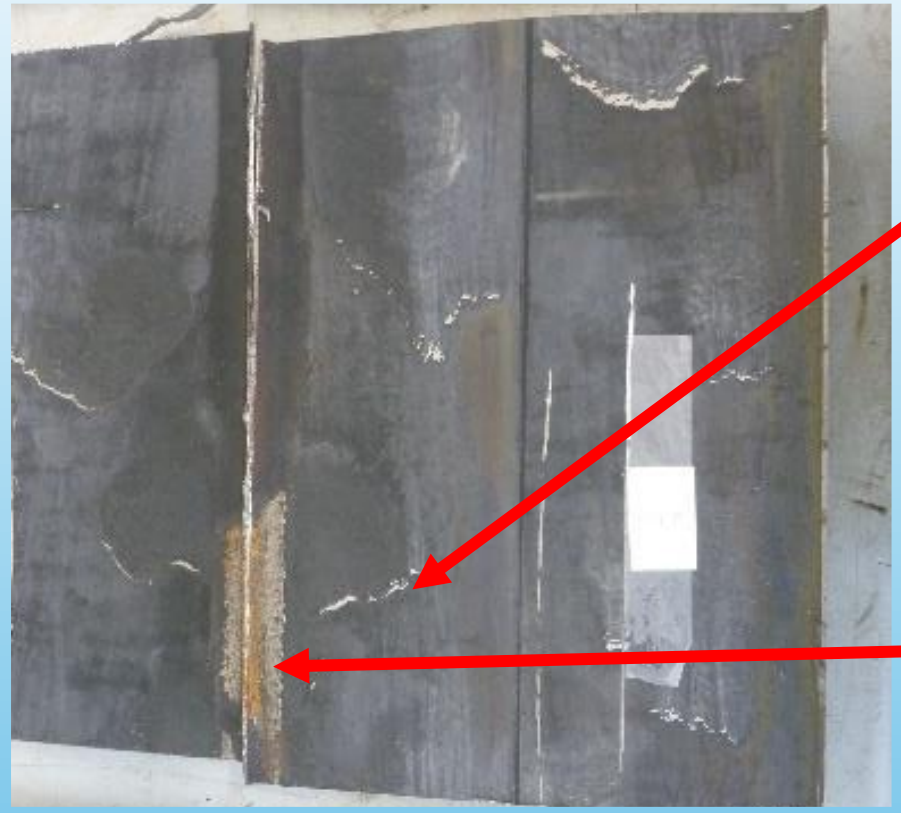
1. ACC tube samples successfully removed.
2. Direct visual examination of tube interior.
3. **Cross-section of corrosion at tube inlet measured.**

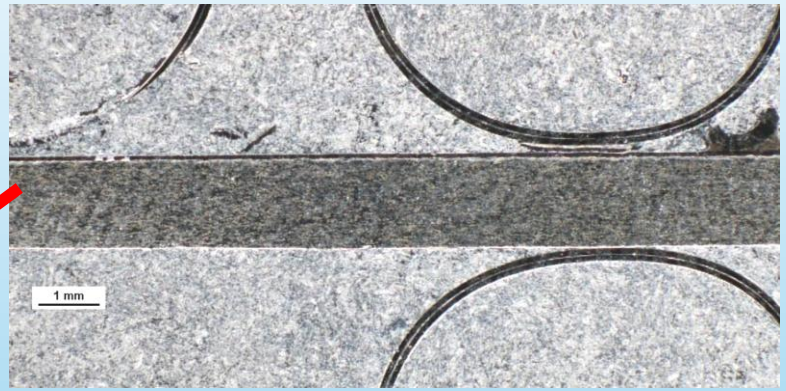
Results: Cross-section examination – near steam inlet

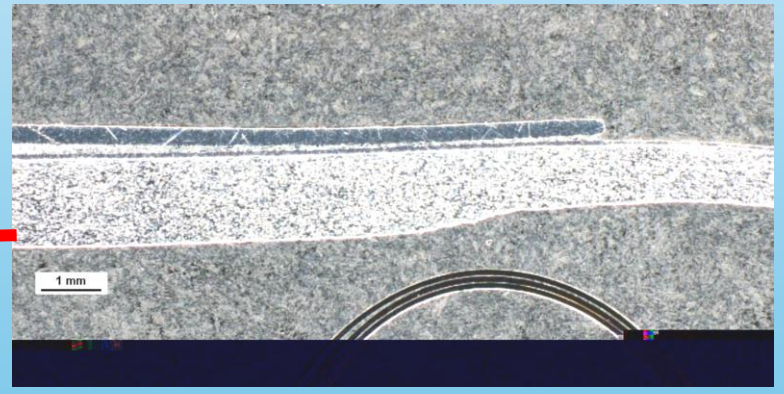




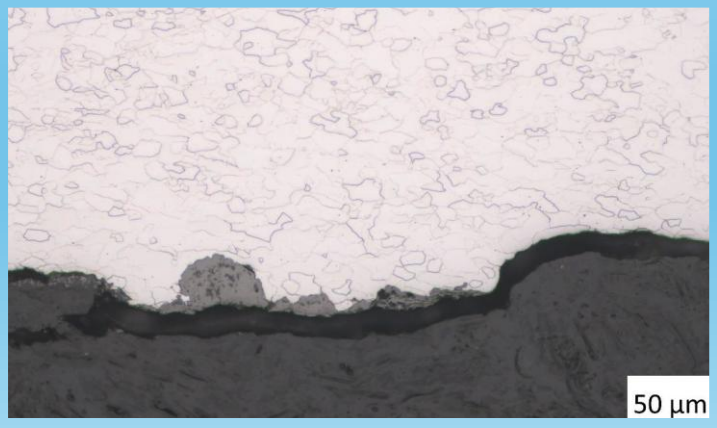
Results: Cross-section examination – 50 & 52” from steam inlet







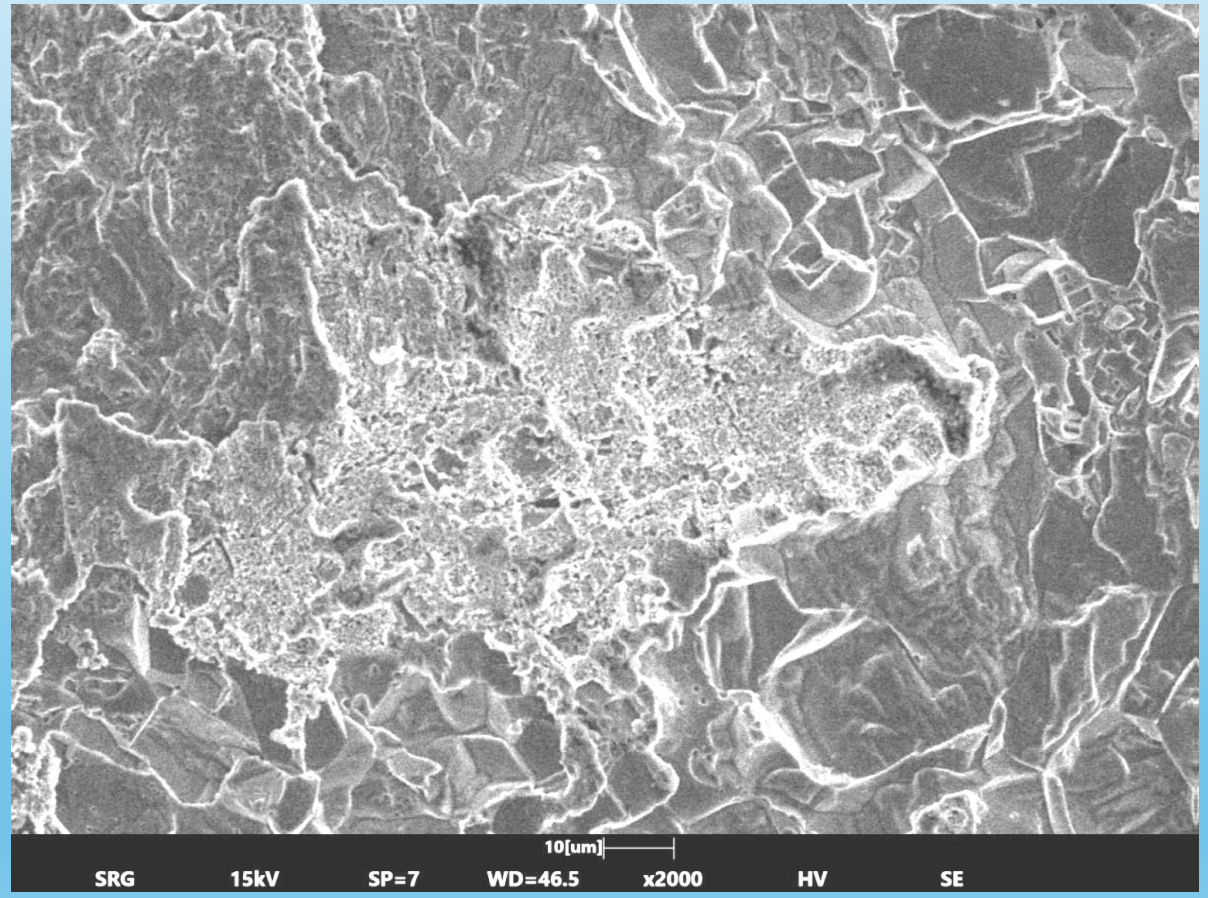
General black surface oxide c/s

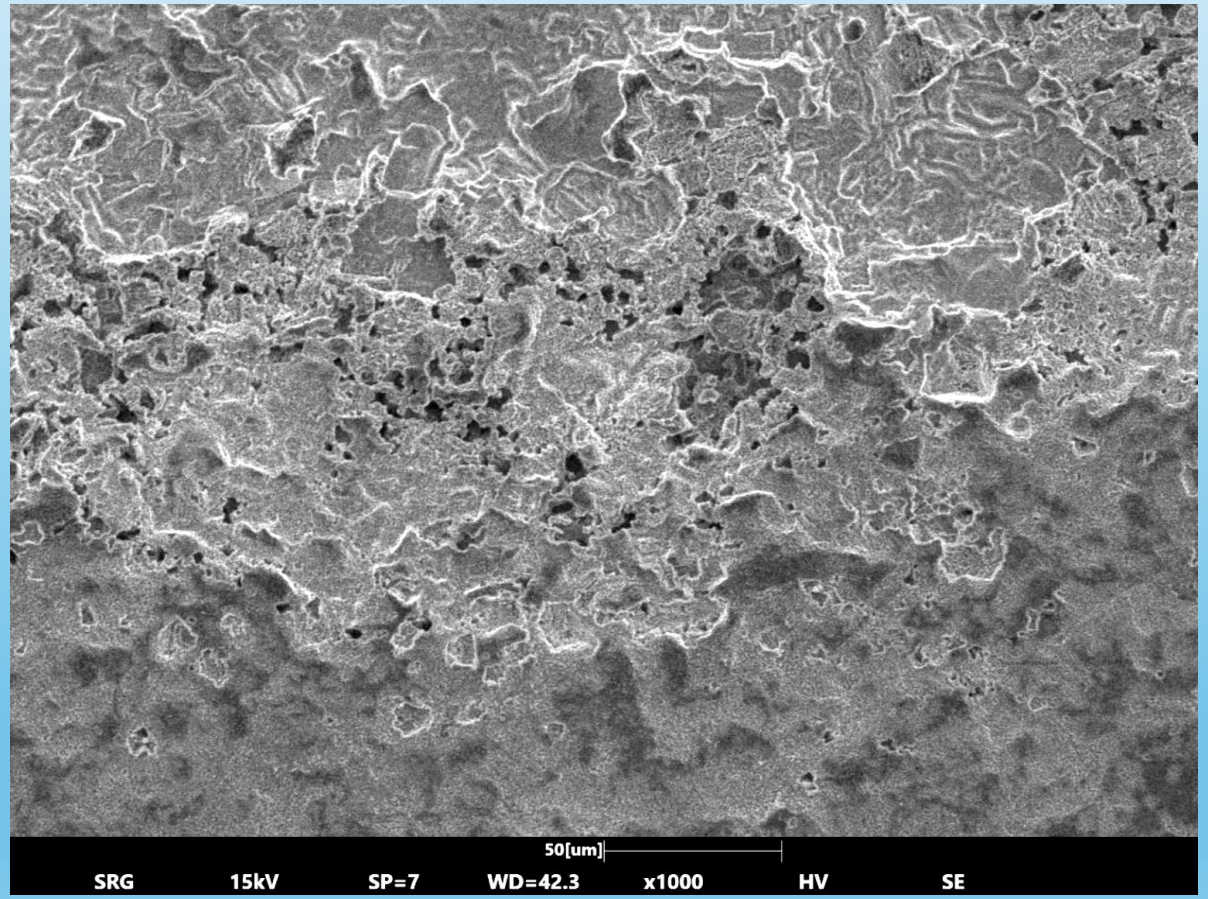


Results

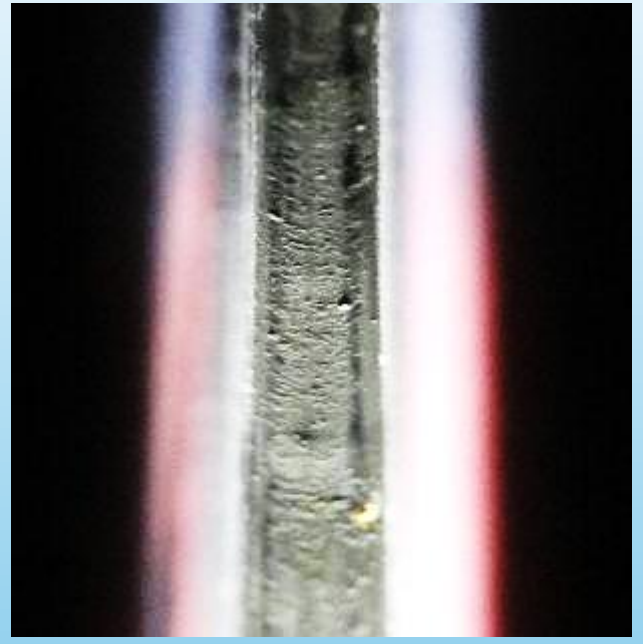
1. ACC tube samples successfully removed.
2. Direct visual examination of tube interior.
3. Cross-section of corrosion at tube inlet measured.
4. **Microscopic imaging of bare metal downstream from the steam inlet confirmed intergranular corrosion mode.**

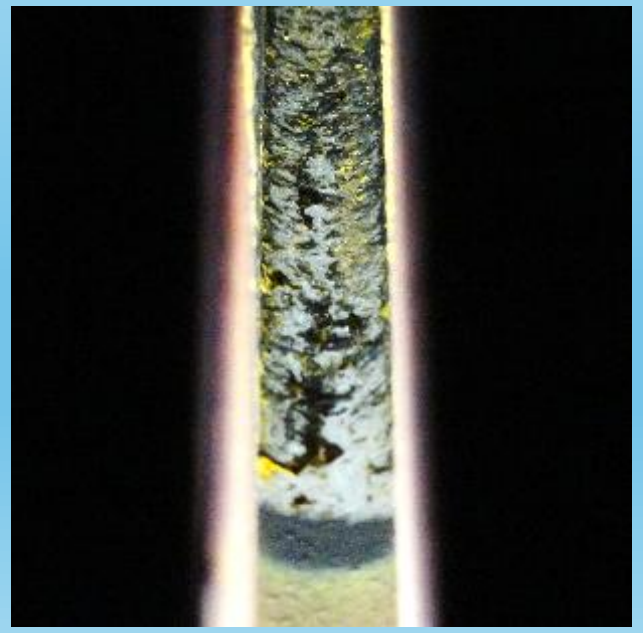
Results: Interior surface, bare metal microstructure *characteristic of intergranular corrosion*

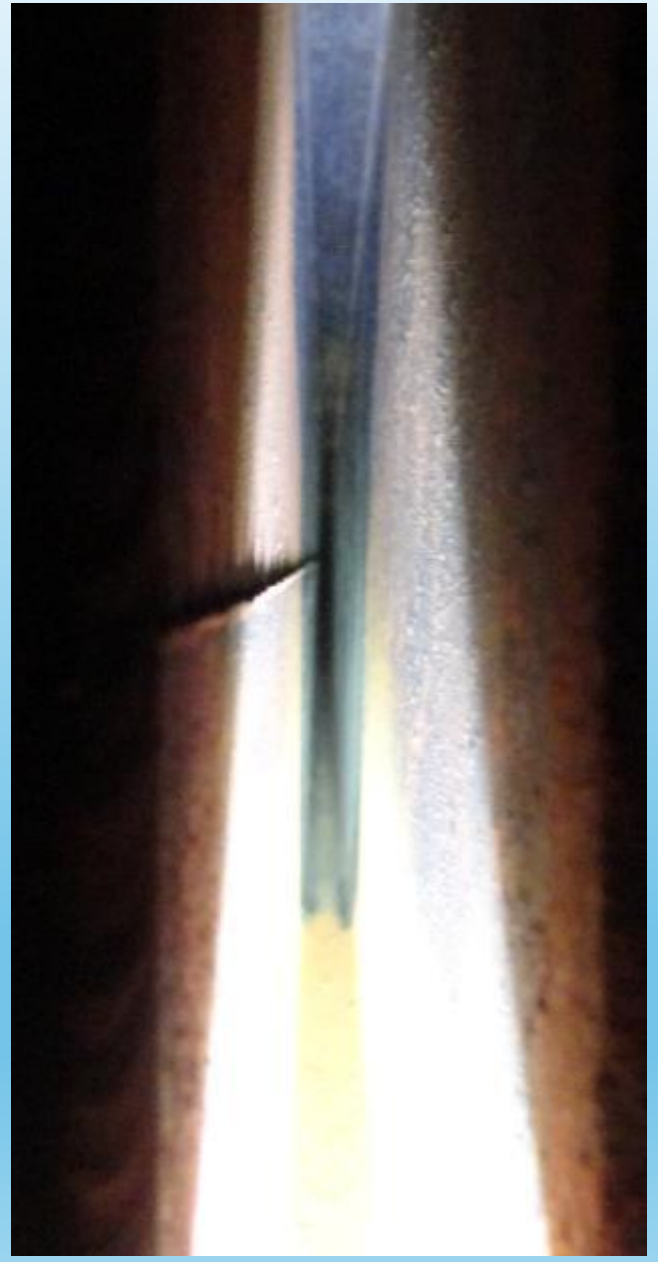




Other ACCs: FAC down the tube from steam entry point







Conclusions

- Removing an ACC tube, or sections of an ACC tube, for detailed analysis is feasible if it is deemed sufficiently important.

- Information obtained from ACC tube sampling both provides confirmation and quantification of wall loss due to FAC that cannot be easily obtained by other methods.

- Detailed analysis of an ACC tube sample provides details about corrosion / deposition that are not otherwise obtainable.

- Corrosion beyond the steam entry point of ACC HX tubes is likely a key to both to understanding the corrosion mechanism and identifying preventive approaches, and tube sampling provides an opportunity to correlate borescope imaging with direct observations of the tube interior.

Discussion / Questions