

CEN22LA312

POWERPLANTS

Group Chair's Factual Report - Attachment # 2

PWC Service Investigation Accident/Incident Report No.: 22-118, Materials
Laboratory Analysis

October 24, 2023



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4.0 MATERIALS INVESTIGATION

General suction side (top image) and pressure side (bottom image) views of the submitted CT blades. The blades were numbered from #1 to #58 (Ref. Photo No. 31).

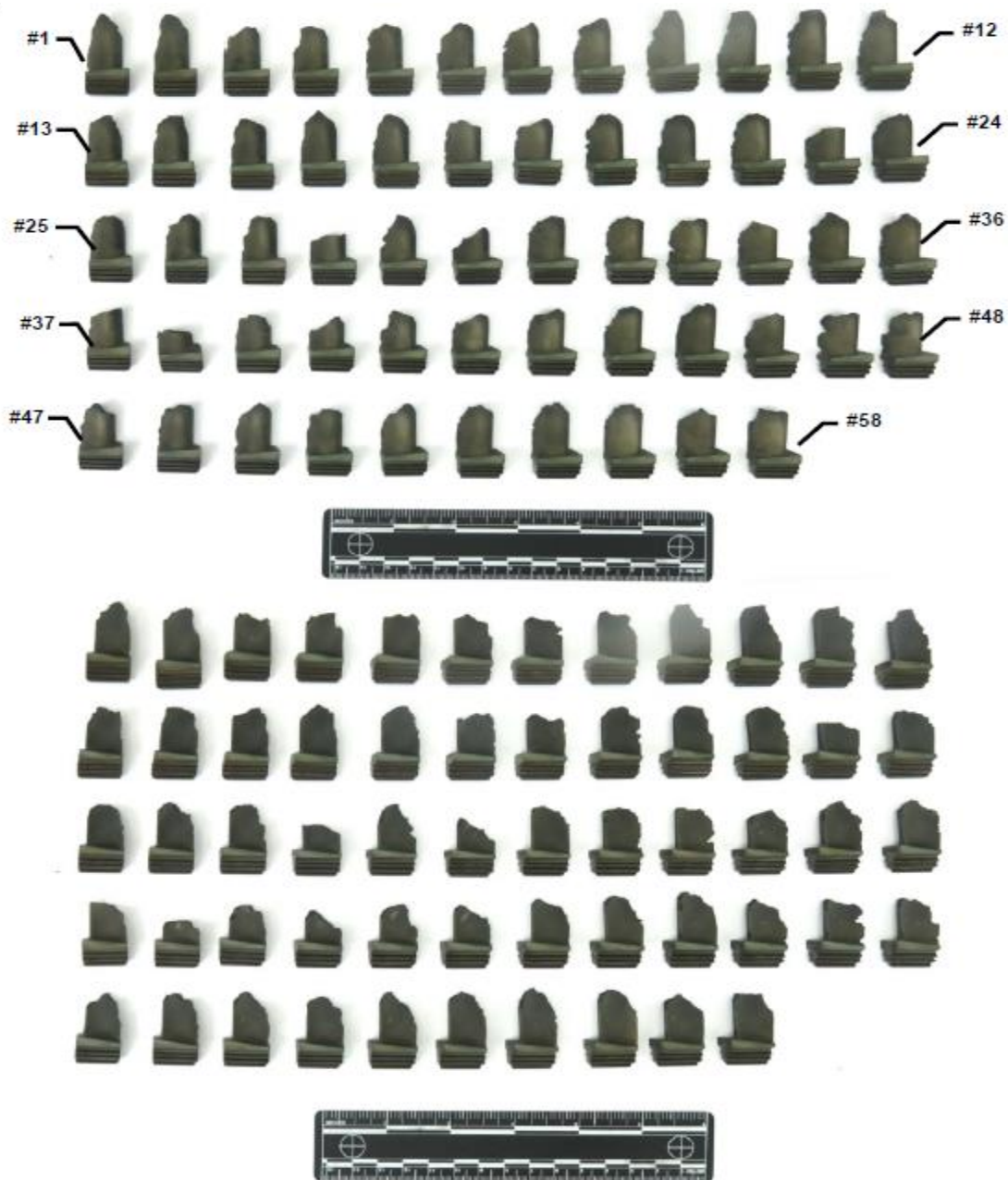


Photo No. 31



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Blades No.1 and No. 20 were sectioned to evaluate the blade microstructure. Both blades exhibited solutioning which confirms the blades have been exposed to elevated temperature (Ref. Photo No 32 and No. 33).

Location	Observations	Microstructure
24 mm 0,94" (Blade tip)	Solutioning	
21 mm 0,83"	Solutioning	
18 mm 0,71"	Solutioning	
15 mm 0,59"	Solutioning	
12 mm 0,47"	Solutioning	
9 mm 0,35"	Rafting	
6 mm 0,24"	Rafting	
3 mm 0,12"	Coarsening	
Platform	Unaffected	
Root	Unaffected	

Photo No.32

Microstructure evaluation of blade No. 1 at 0.125 inches from the trailing edge.



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Location	Observations	Microstructure
21 mm 0.83" (Blade tip)	Solutioning	
18 mm 0.71"	Solutioning	
15 mm 0.59"	Solutioning	
12 mm 0.47"	Solutioning	
9 mm 0.35"	Rafting	
6 mm 0.24"	Rafting	
3 mm 0.12"	Coarsening	
Platform	Unaffected	
Root	Unaffected	

Photo No. 33

Microstructure evaluation of blade No. 20 at 0.25 inches from the trailing edge. Etchant reagent No. 17.



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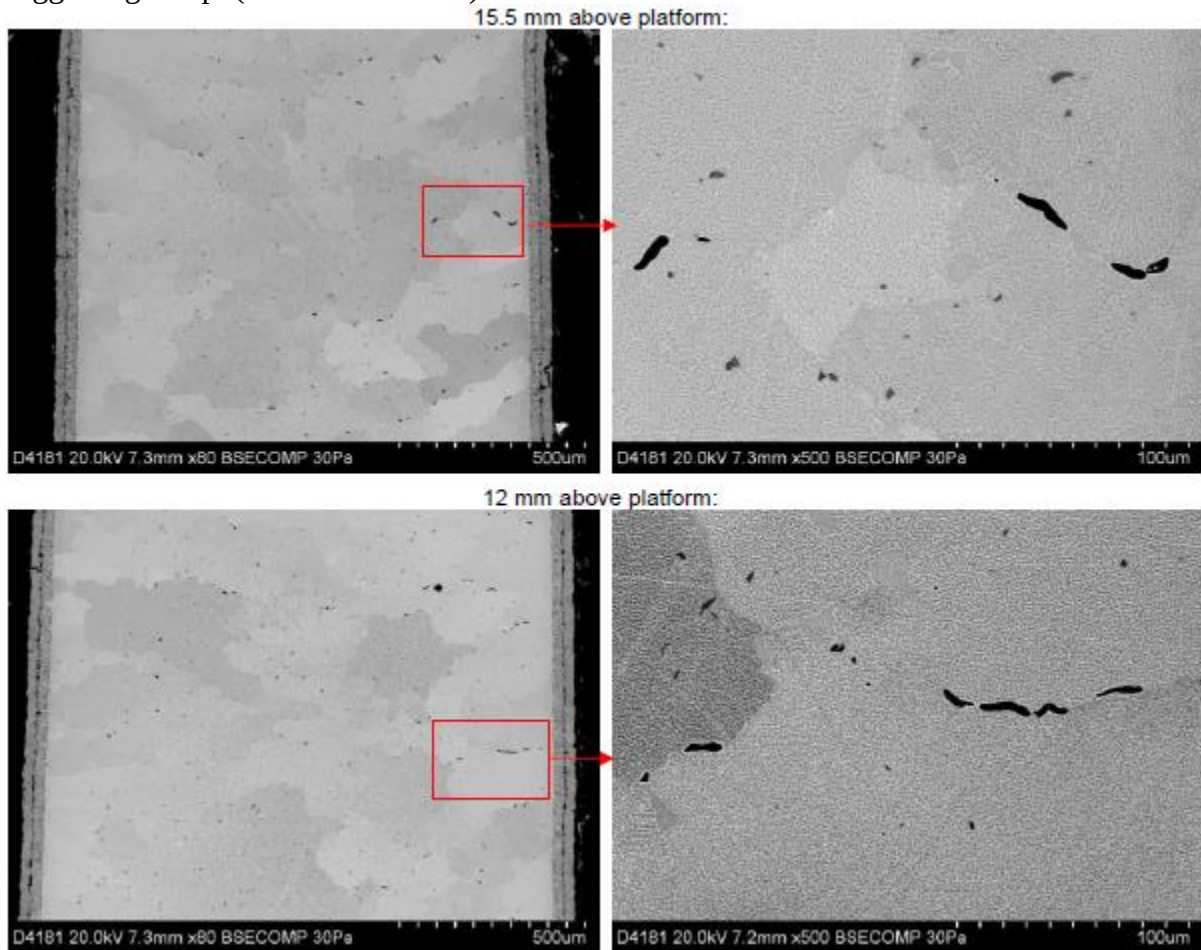
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Blade No. 20 was submitted for metallographic cross section examination at 0.25 inches from the trailing utilizing a scanning electron microscope (SEM). Micro voids perpendicular to the airfoil axis and located at grain boundaries are observed at various heights with respect to the platform suggesting creep. (Ref. Photo No 34).





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Blade No. 39 was submitted for metallographic cross section examination at 0.125 inches from the trailing utilizing SEM. Micro voids perpendicular to the airfoil axis and located at grain boundaries are observed at various heights with respect to the platform suggesting creep. (Ref. Photo No 35).

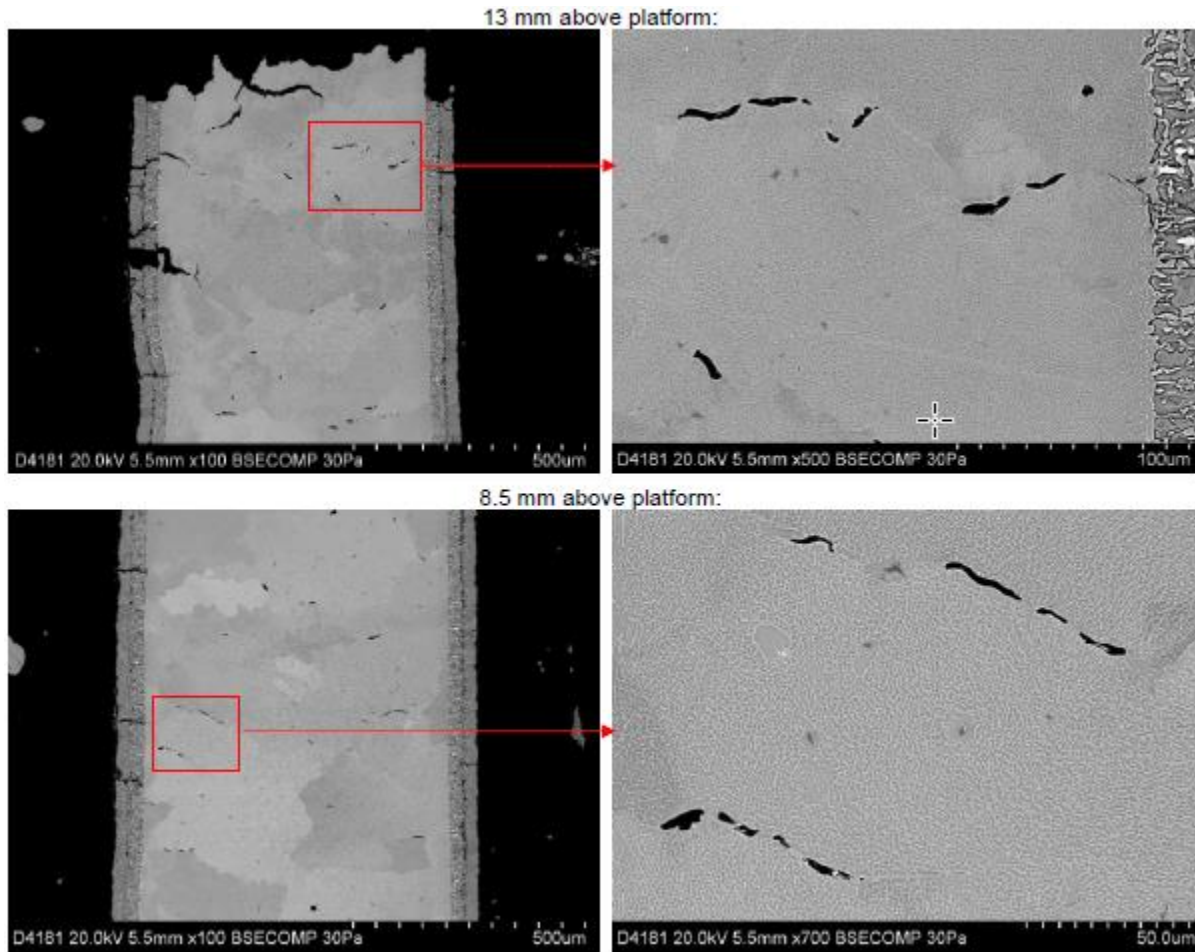


Photo No. 35

The fracture surface of blade No. 23 was examined under an SEM. The top right image (Ref. Photo No. 36) shows the typical overload fracture features. The trailing edge region which showed a different fractographic aspect, is heavily oxidized which inhibited the observation of fractographic features, still, the roughness of the fracture surface and absence of progression marks suggest that this fracture is most likely not a result of fatigue.



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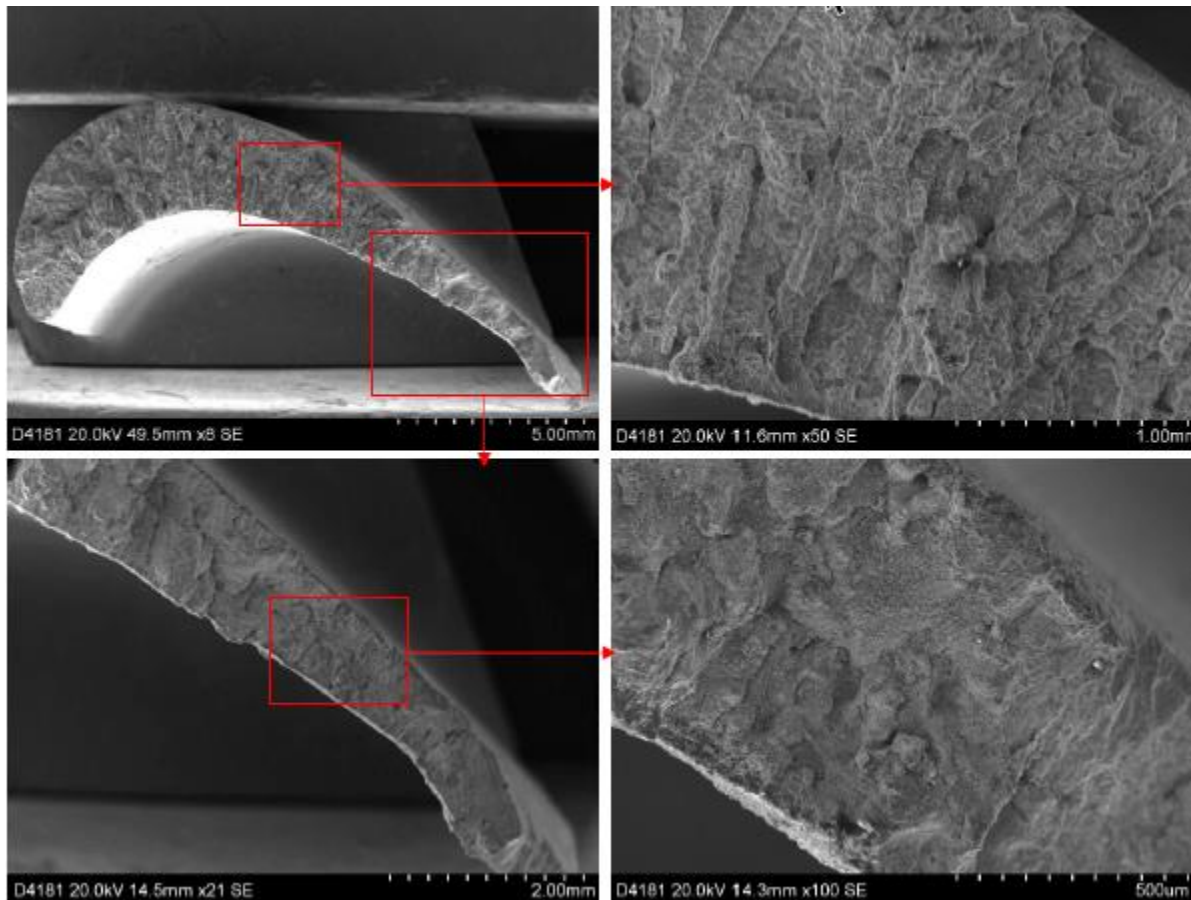


Photo No. 36

The CT blade material was found to meet the drawing requirements.