Managing HP Evaporator Deposits, Avoiding Tube Failures and Chemical Cleaning of HRSGs

Previously Presented as a Workshop at Australasian Boiler and HRSG Users Group (ABHUG)

> Barry Dooley and Doug Hubbard

Virtual HRSG Forum 21st July 2022



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Footer - SLIDE 6



Optimum Cycle Chemistry for Combined Cycle / HRSG Plants (To prevent these HTF)

- Chemistry should be "designed" to address all possible HRSG Tube Failure (HTF) damage / failure mechanisms
 Flow-accelerated Corrosion (FAC)
 - Under-deposit Corrosion (UDC) mainly HD
- Operate under oxidizing chemistry (no reducing agents) to prevent single-phase FAC
- Operate with pH levels which minimize two-phase FAC, and,
- Use corrosion product monitoring to reach satisfactory levels which will not result in heavy HP evaporator deposits

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Achievable Total Fe & Cu Levels – ₩ ₩ **Different Plant Types/Optimized Chemistry** Feedwater Total Fe = OT: $< 1 \mu g/kg$ AVT: Total Fe = < 2 µg/kg AVT (Mixed): Total Fe & Cu = < 2 µg/kg **HP/LP Heater Drains:** Total Fe & Cu = < 10 µg/kg Combined Cycle/HRSG Evaporators/Drums AVT/PT/CT: Total Fe = < 5 µg/kg Air-Cooled Condenser (ACC) Total Fe = ACC Outlet: < 10 µg/kg Post Condensate Filter: Total Fe = < 5 µg/kg **Cogeneration Plants Condensate Return:** Total Fe = < 10 µg/kg Structural Integrity Associates, Inc. Presented Previously: HF Virtual Conference 21st August 2021





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	RCCS Categories	In 151 Fossil Plants %	In 110 Combined
Repeat Situations in Cycle Chemistry Control (261 Plants Worldwide)	outegones	i lanto //	Plants %
	Corrosion Products	93 =	87 🔪
	Fossil Waterwall / HRSG Evaporator Deposition	54 =	57 🔪
	Chemical Cleaning	16 =	5
	Contaminant Ingress	15 =	5 🔪
	Drum Carryover	70 🔪	77 🔪
	Air In-leakage	36 =	10
	Shutdown Protection	69 = (& 92*)	50 = (& 92*)
	On-line Alarmed Instrumentation	77 🔪	81 🔪
	Not Challenging the Status Quo	70	50 🍾
Based on 261 Comprehensive Pl	ant Assessments 200	8 – May 2022	Associates, Inc.











HRSG HP Evaporator Tube Selection Suggestions For horizontal gas path (HGP) units.

The lead HP evaporator tube towards the top of the circuit near to the outlet header should be selected. Preference should be given to tubes on the extremities of the bundle where gases bypass along the duct, or near the center of the HP evaporator if there is a gap due to multiple bundles. (Sometimes heavy deposits are seen at the bottom of the lead row in situations with high levels of corrosion products.)

• For vertical gas path (VGP) units (choice not always as clear) The first and last tube in the bundle will cover the differences in quality, with preference again for the extremities adjacent to ducting. Also, when hydrogen damage or another UDC mechanism occurs, it is often located in the middle of the bundle as well as on leading tubes.

































International HRSG Meetings / Conferences

3rd IAPWS ABHUG

(Australasian Boiler/HRSG Users Group, ABHUG2022) Brisbane, Australia. 15th – 17th November 2022 Premier Boiler / HRSG / Chemistry event in antipodes <u>https://na.eventscloud.com/ehome/672250</u>

9th IAPWS EHF (European HRSG Forum, EHF2023) 16th – 18th May 2023. Prato, Florence, Italy Premier HRSG / Cycle Chemistry event in Europe - Call for presentations to Barry Dooley and Bob Anderson

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