ALPEMA® IOW for BAHX June 2025

Integrity Operating Windows for Brazed Aluminium Plate-Fin Heat Exchangers

	IOW Description	Typical Location	Parameter	Damage Mechanism Controlled	Industry Guidance Document	IOW Type	Limit	Monitoring Interval	Time Allowed Outside Limit Before Response	Response Required/ Recommended	Who Responds
BAHX related Parameters	Temperature Rate of Change for Infrequent Events (Startup, Shutdown, Trips)	Within 5 pipe diameters of the inlet and the outlet nozzles	Temperature	Fatigue	ALPEMA API 668 GPA TB-001	Standard	<60C /hour <5C /minute	Continuous	1 hour 5 minutes	Either stop opening the flow valve or throttle the flow valve	Operator
	Temperature Rate of Change for Frequent Events (Steady State)	Within 5 pipe diameters of the inlet and the outlet nozzles	Temperature	Fatigue	ALPEMA API 668 GPA TB-001	Standard	<1C /minute	Continuous	30 minutes	Tune controllers, throttle valve on inlet to boiling stream	Operator
	Temperature Difference	Within 5 pipe diameters of the inlet and the outlet nozzles	Temperature	Fatigue	ALPEMA API 668 GPA TB-001	Standard	Max stream-to-stream and stream-to-metal temperature difference <~30C at warm and cold ends and mid stream	Continuous	30 minutes for a single occurrence	Introduce the flow slowly; either stop opening the flow valve or throttle the flow valve.	Operator
	Pressure Differential	Within 5 pipe diameters of the inlet and the outlet nozzles	Pressure	Fatigue	API 668	Standard	Variation below +/- 30% of mean pressure differential	Continuous	30 minutes for a single occurrence	Throttle the flow valve.	Operator
	Pressure Drop	Within 5 pipe diameters of the inlet and the outlet nozzles	Pressure Differential	Fatigue	API 668	Standard	<2 times the allowable pressure drop	Continuous	1 week	Determine the cause of the pressure drop. Either derime or clean.	Engineer
	Fluid Composition	Stream sample	ppm	Corrosion	API 668	Standard	No fluids corrosive to aluminium	Monthly	Month	Correct or install pre-treatment systems	Engineer
Cold Box	Nitrogen Purge System	Nitrogen Panel outside Cold Box	Flow	Pressure		Standard	Flow, Cold Box Overpressure	Continuous	2 Hours	Nitrogen Flow Adjustment	Operator

Notes

1 The scope of an IOW is typically for a process unit and a brazed aluminium plate fin heat exchanger is one component of the process unit. Therefore the information in this document should be viewed as a subset of a process unit IOW
2 The IOW Type of 'Standard' was selected. However, a case can be made the IOW Type is somewhere between 'Standard' and 'Critical'
3 Gas detectors are recommended for leak detection around heat exchangers and cold boxes
4 Fluid composition sampling of process streams can detect internal leaks between streams in heat exchangers
5 Fluid composition sampling of cold box nitrogen purge streams can detect external leakage of the equipment
6 Detection of ice formation through visual inspection of cold box exteriors may indicate leakage or insulation issues
7 Over-pressurization of cold boxes may indicate an equipment rupture
8 Fatigue is a complex phenomenon usually correlated with stress versus the number of cycles. The higher the stress the fewer cycles to fatigue the material. Exceeding temperature IOW limits leads to increased thermal stress. Fatigue can result in leaks
9 Fluids corrosive to aluminium flowing through brazed aluminium plate fin heat exchangers can result in reduced fin thickness. Corrosion can lead to loss of containment