

Parameter	Frequency	Malfunction Detection		Corrective Action	
Scrubber inlet flow rate					
- Flow Rate Monitoring	Continuous	The wet scrubber is equipped with a sight glass and a float which provides an indication of liquid flow rate through the wet scrubber. Because the diaphragm pump causes a pulsing effect on liquid flow rate, the float is constantly moving up and down the sight glass column. Using this system it is not possible to demonstrate that a minimum numeric flow rate is continuously being met. Therefore, flow rate monitoring is used in a qualitative, not quantitative, way - to show that the system is functioning properly. Proper operation is indicated by the movement of the float within the sight glass. System leaks or blockages would cause this normal functioning of the float to change as follows:		NA	
- System Leak	NA	If a system leak occurs, the back pressure on the diaphragm pump is expected to decrease this would cause an audible difference in the sound of the pump and/or an increase in the frequency of its cycling. Alternatively, a small leak that doesn't change the back pressure on the pump would not be detectable audibly. However, the presence of visible liquid on the ground would be an indicator of a leak. The sight glass float would also be an indicator of a system leak. The float rises and falls within a normal range. If a leak occurs, it is anticipated the range of the float would rise in the sight glass as the pumping rate would increase. A large leak would see the float rise to near the top of the sight glass. A small leak may be harder to detect if the range of the float only changes slightly.		Corrective measures include shutting the system down and fixing the leak then re-starting the process. Normal shutdown and startup procedures will be followed.	
- System Blockage	NA	If the system becomes plugged or blocked the back pressure on the diaphragm pump is expected to increase, this would cause an audible difference in the sound of the pump and/or an decrease in the frequency of its cycling. Alternatively, a small blockage that doesn't change the back pressure on the pump would not be detectable audibly – but also would not affect system performance significantly. The sight glass float would also be an indicator of a system blockage. The float rises and falls within a normal range. If a blockage occurs, it is anticipated the range of the float would lower in the sight glass as the liquid flow rate decreases. A large leak would see the float fall to near the bottom of the sight glass. A small leak may be harder to detect if the range of the float only changes slightly.		Corrective measures include shutting the system down and fixing the blockage then re-starting the process. Normal shutdown and startup procedures will be followed.	
Parameter	Frequency	Normal operating range	Alarm range	Response	Corrective action
Carbon breakthrough at Carbon Canister outlet	Once each calendar day during operation when cleaning occurs	<0.1 %CH ₄ (i.e., 1,000 ppm) as measured by MSA Altair 5X Multigas Detector (in 100% Volume IR Mode)	MSA Altair 5X Multigas Detector has no alarm in the 100% Volume IR Mode	Schedule carbon changeout. Change out carbon and record date.	Stop waste tank washing if Carbon Canister outlet concentration exceeds 0.4 %CH ₄ (i.e., >4,000 ppm)

Do Not Operate Process Unless Wet Scrubber/Carbon System is properly operating. If replacement parts are needed, cleaning operations will not resume until parts are obtained and installed.