case STUDY

INDUSTRIAL

Air Filtration - Total Cost of Ownership

Effective Filtration System Eliminates Acid Gases and Costly Chlorine Evacuations for Global Manufacturer

Company Profile:

Global manufacturer with a New England facility produces semi-conductor devices used in consumer and industrial goods.

The Situation:

Employees were detecting chlorine odor in one of their processing areas from an outside source (probably re-entrained exhaust from their acid scrubbers), at times prompting costly personnel evacuations. The customer installed a competitor's product and was attempting to assess chemical filter performance by monitoring "remaining capacity" in the media. This procedure did not offer specific guidance on chlorine removal from the air.

Camfil Farr was invited to review the competitor's installations and test reports and provide alternative recommendations. The customer was also in the process of replacing two 30,000 cfm AHUs and requested guidance on installing more effective gas-phase filtration.

The Action:

The customer presented performance data on the competitor's filter. Camfil Farr concluded there was no correlation between the test data and the incidence of chlorine evacuations. It was also determined that the type of filter media deployed by the competitor was incorrect for this makeup of air. With new custom AHUs, it was agreed that "zero bypass" Camsorb® plastic disposable canisters would be installed in both 30,000 cfm units. Camfil Farr recommended CFS-202 caustic-impregnated media for its broad-spectrum effectiveness in controlling inorganic acids, including chlorine- and sulfur-containing acid gases.

Since this was an acid gas problem, Camfil Farr's test system of copper and silver reactivity coupons were installed to evaluate levels of the contaminants of concern.

The Result:

Four months after installation of the Camsorb canisters, coupon results upstream revealed that the outside air still contained extremely high levels of hydrogen sulfide, sulfur dioxide and chlorine gases.

Downstream of the Camsorb canister filtration stage, corrosion coupon results were "mild" and no chlorine was detected in the air. This was further supported with zero odor complaints and no evacuations.

"CFS-202 media effectively reduced chlorine gas levels from extremely high to zero."

The Proof:

Camsorb® plastic disposable canisters with "zero bypass" and properly selected carbon-impregnated media still controlled all measurable chloride emissions after four months of operation. The upstream tests indicated a severe state of GX, with chlorides measuring at 148.1. Downstream tests revealed a mild level of G1 with chlorides measuring zero. The tests demonstrated an improvement in air quality by three ISA (Instrument Society of America) levels.

COUPON NO.	LOCATION	Copper Corrosion Strip				Silver Corrosion Strip				
		OXIDE Cu2O	Sulfide Cu2S	Total Å	ISA Class	CHLORIDES AgCl	SULFIDES Ag2S	UNKNOWN	Total Å	NOTES
C. 1173	MAU-2 (upstream)	438.8	2210.5	2649.3	GX	148.1	95.5	54.3	297.9	1,2,4
C. 1221	MAU-2 (downstream	146.2	136.0	282.2	G1	0.0	94.2	29.7	123.9	1,3,4
Improvement in Air Quality				3 ISA LEVELS		NO CHLORINE DETECTED				

NOTES
1. All values are given in Angstroms (Å).
2. Chlorides are present and could give rise to electrical component failure in less than five years.
3. Chlorides are not present.
4. Sulfides are present and could give rise to electrical component failure in less than five years.

ISA STANDARD S71.04 REACTIVITY LEVEL DEFINITIONS & CORROSIVE GAS CONCENTRATIONS

Severity		G1	G2	G3	GX
Corrosion reactivity		Mild	Moderate	Harsh	Severe
Corrosion layer	(Thickness in Angstroms)	<300	< 1000	<2000	>2000
Contaminant					
Group A	Hydrogen sulfide	< 3 ppb	< 10 ppb	< 50 ppb	> 50 ppb
	Sulphur dioxide trioxide	< 10 ppb	< 100 ppb	< 300 ppb	>300 ppb
	Chlorine	< 1 ppb	< 2 ppb	< 10 ppb	> 10 ppb
	Oxides of nitrogen	< 50 ppb	< 125 ppb	< 1250 ppb	> 1250 ppb
Group B	Hydrogen fluoride	< 1 ppb	< 2 ppb	< 10 ppb	> 10 ppb
	Nitric acid	< 500 ppb	< 1000 ppb	< 2500 ppb	> 25000 ppb
	Ozone	< 2 ppb	< 25 ppb	< 100 ppb	>1000 ppb

The gas concentrations (in ppb) given in the second half of the table, are believed to approximate to the copper reactivity levels, assuming the RH < 50%.

For a given concentration, the reactivity class can be raised by one for each 10% increase in RH over 50%.

G1 MILD –An environment sufficiently well controlled such that corrosion is not a factor in determining equipment reliability.
G2 MODERATE – An environment in which the effects of corrosion are measurable and may be a factor in determining equipment reliability.
G3 HARSH – An environment in which there is a high possibility that corrosive attack will occur. These harsh levels should prompt evaluation resulting in environment controls or specifically designed equipment being installed.
GX SEVERE –An environment in which only specifically designed and packaged equipment would be expected to survive. Specification for equipment in this class are a matter of negotiation between the user and the supplier.

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