Selenium & Arsenic Sorbent Traps

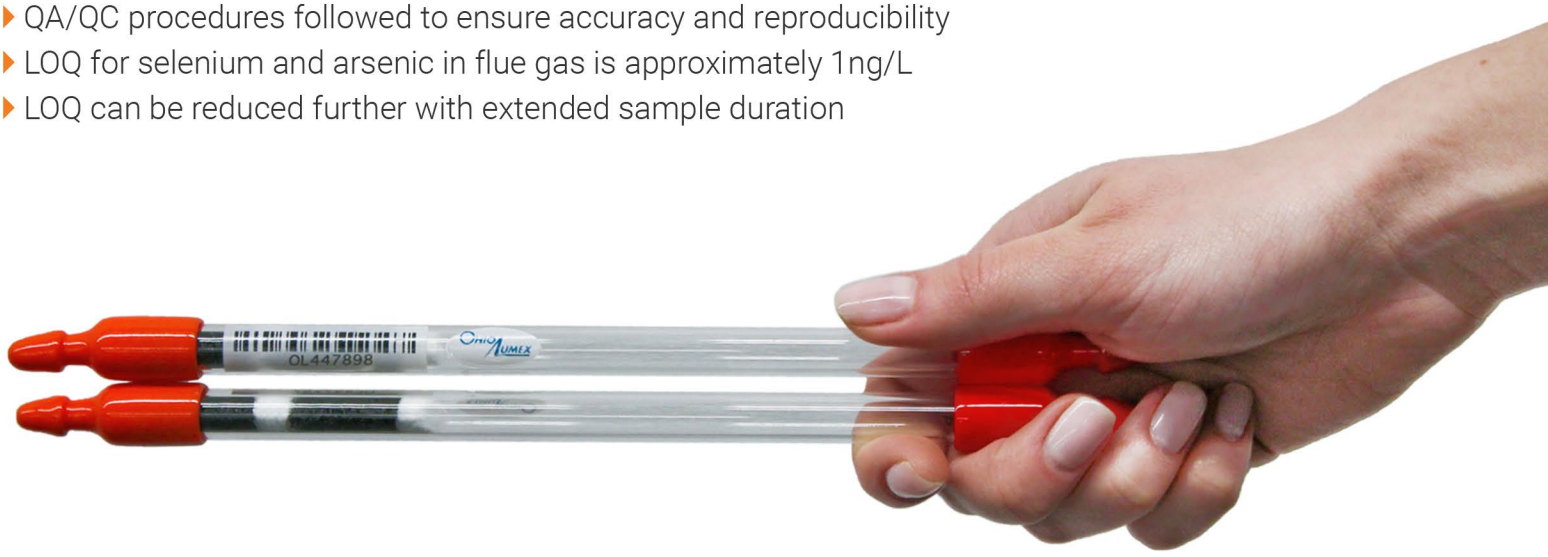
Obtain accurate and cost-effective measurements of both selenium and arsenic in a variety of flue gas matrices. The sampling procedures and equipment are nearly identical to what's used for Method 30B sorbent traps.

Method Characteristics

- Simple sampling procedure
- Same equipment used for other sorbent trap methods
- Can be customized for specific source conditions

Analysis

- Analyzed via hydride generation atomic fluorescence spectrometry (HG-AFS)
- Analyzed at the NELAP Accredited Ohio Lumex Laboratory
- QA/QC procedures followed to ensure accuracy and reproducibility
- LOQ for selenium and arsenic in flue gas is approximately 1ng/L
- LOQ can be reduced further with extended sample duration



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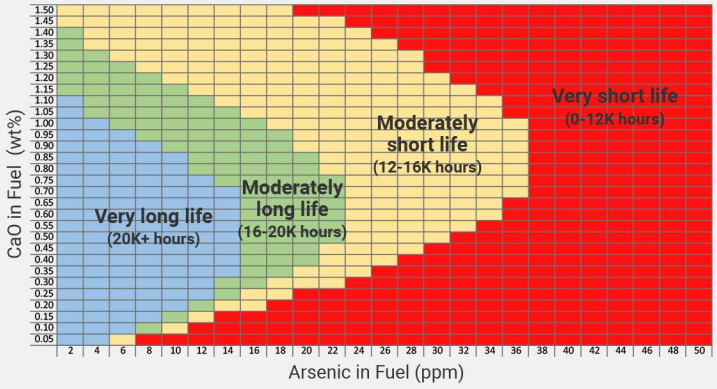
Effluent Limitations Guidelines

Measuring total selenium (Se) on both sides of the ESP may allow one to quantify total Se present in the particulate fraction, and aid in optimizing Se removal upstream of the FGD. Se measurements have typically been in the 10-100ng/L range, only requiring a short sampling period of 30 minutes or less to be well above the analytical limit of quantitation. This dataset is a typical series of Se measurements obtained at two different FGD inlets.

Sampling Data				Analytical Results		Calculations			
Trap ID	Temp (°C)	Flow (Lpm)	Volume (L)	Section 1 (ng)	Section 2 (ng)	Total (ng)	%Breakthrough	Concentration (ng/L)	RD%
Selenium Snapshot 1									
OLC046685	150	0.5	15.0	288.5	2.2	290.7	0.8%	19.4	7.6%
OLC046716			15.0	246.5	2.9	249.4	1.2%	16.6	
OLC046738	150	0.5	15.0	446.5	4.4	450.9	1.0%	30.1	7.5%
OLC046677			15.0	379.1	8.6	387.7	2.3%	25.8	
OLC046680	150	0.5	15.0	442.5	4.3	446.8	1.0%	29.8	3.0%
OLC046711			15.0	415.2	5.4	420.6	1.3%	28.0	
Selenium Snapshot 2									
OLC046688	150	0.5	15.0	1220.3	3.9	1224.2	0.3%	81.6	1.7%
OLC046705			15.0	1177.2	4.9	1182.1	0.4%	78.8	
OLC046720	150	0.5	15.0	1547.3	5.4	1552.7	0.3%	103.5	10.6%
OLC046731			15.0	1243.4	12.0	1255.4	1.0%	83.7	
OLC046703	150	0.5	15.0	1155.6	9.0	1164.6	0.8%	77.6	3.8%
OLC046724			15.0	1066.4	12.2	1078.6	1.1%	71.9	

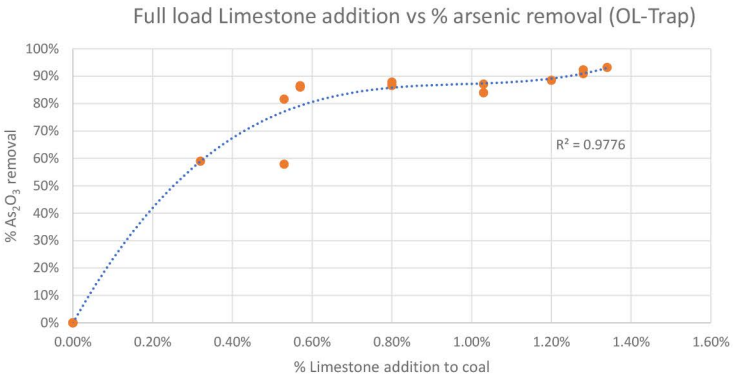
Catalyst Poisoning

Arsenic (As) concentration in flue gas plays a major role in the overall lifespan of a catalyst, as it is known to deactivate the catalyst by occupying active pore sites. As_2O_3 is formed during the combustion of coal and reacts with oxygen to form As_2O_5, which bonds to and deactivates the site. Adding calcium to fuel is an effective means of reducing the amount of As_2O_3 in flue gas (by forming $Ca_3(AsO_4)_2$), thereby slowing the rate of catalyst deactivation. This calcium-arsenic compound does not follow the same reaction pathway as As_2O_3, but rather passes through the SCR, captured downstream at the ESP and FGD.



Limestone Addition vs Arsenic Removal

Arsenic sorbent traps have been used to measure concentrations of total As at varying limestone feed rates to determine the effectiveness of limestone in reducing As_2O_3 concentrations and extending catalyst lifespan. Experiment data is shown here. As a result of these measurements, this plant was able to select a limestone feed rate that was nearly half the maximum tested feed rate of 1.3% by mass, based on the fact that As_2O_3 removal reached a plateau around 0.6% limestone feed rate.



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