

**STATIONARY SOURCE EMISSION  
AIR QUALITY MONITORING (Stack Testing)**

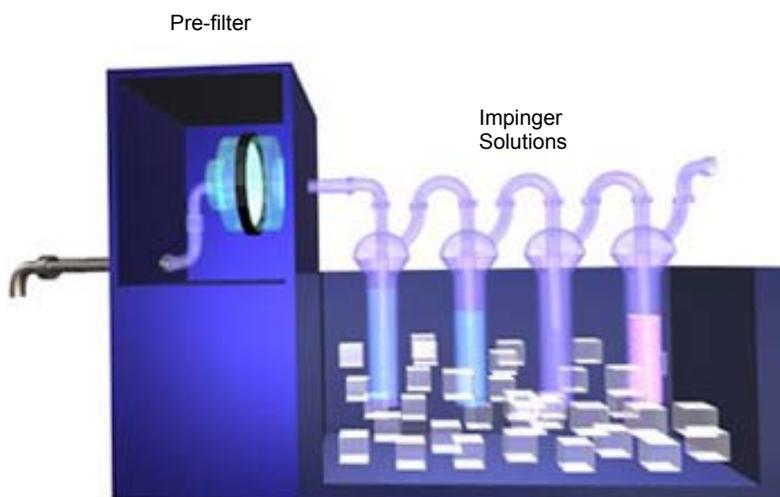
**Introduction**

Over the past century some industries have discharged considerable quantities of gaseous and particulate matter into the environment. The legacy today is a number of ex-industrial sites and surrounds impacted by chemical contaminants. With increasing environmental awareness and legislation, new technologies have been introduced to monitor emissions and potential harmful effects on the environment.

The Protection of the Environment Operations Act- 1997 (POEO), prescribes that stationary source emissions be monitored to ensure compliance with Load Based Licensing (LBL) requirements for a facility with emissions to air. The POEO General Regulation 1998 – Section 20 provides pollutant weightings for a number of specific air pollutants.

**Sampling Methodologies**

The sampling of stationary source emissions is a complex procedure due to the variable nature of contaminants and the fact that many pass through a solution without being retained. As a result, 'sampling trains' are utilized where specific solutions are used to collect analytes of concern. The adjacent diagram shows a sampling train with four impinger receptors for gaseous analytes, and a pre-filter for particulate analytes.



**Analysis**

Analysis of resulting stack solutions requires specific methodologies. Following extensive validation, ALS Environmental (Newcastle) is able to offer a NATA-accredited range of analytical procedures for stationary source emissions based on USEPA methodologies. These are summarised as follows:

<u>Analyte(s)</u>	<u>USEPA reference</u>	<u>ALS method code</u>	<u>LOR in Impinger Solutions</u>
Metals	<u>USEPA (1997) Method 29</u>	<u>EN/EA146</u>	(1-10 µg/L) See table 1
Sulphuric Acid mist and SO <sub>2</sub>	<u>USEPA (1997) Method 8</u>	<u>EN/EA143C</u>	0.01mg SO <sub>3</sub> /ml 0.05 mg SO <sub>3</sub> /ml
Hydrogen Halides and Halogens	<u>USEPA (1997) Method 26A</u>	<u>EN/EA147</u>	0.1 mg/L 0.5 mg/L
Hydrogen Sulphide	<u>USEPA (1997) Method 11</u>	<u>EN/EK089</u>	5 mg/L
Fluoride	<u>USEPA (1997) Method 13B and AS3580.13.2</u>	<u>EN/EA144C</u>	0.01mg/filter

## 1. Metals Emissions from Stationary Sources

Metals emissions are sampled using an impinger train that collects air drawn isokinetically from a stack sampling point. Particulates are collected on the sampling probe and heated filter. The gaseous load is collected in an acidified hydrogen peroxide solution for all metals except mercury, which is collected in an acidified potassium permanganate solution. Analysis is performed by ICPMS and CV-FIMS (mercury).

The LORs for typical metals determined by this methodology follow:-

<u>Table 1</u>		
<u>Element (LOR in µg/L in Impinger Solutions)</u>		
Antimony (10)	Cobalt (10)	Phosphorus (10)
Arsenic (10)	Copper (10)	Selenium (10)
Barium (10)	Lead (10)	Silver (10)
Beryllium (10)	Manganese (10)	Thallium (10)
Cadmium (10)	Mercury (1)	Zinc (10)
Chromium (10)	Nickel (10)	

## 2. Sulphuric Acid Mist & Sulphur Dioxide Emissions from Stationary Sources:

Gas samples are collected by bubbling air through isopropanol and hydrogen peroxide solutions. Samples are analysed for H<sub>2</sub>SO<sub>4</sub> and SO<sub>2</sub> using a Barium-thorin titration method and are reported as mg of SO<sub>3</sub>.

## 3. Hydrogen Halides and Halogen Emissions from Stationary Sources

Samples are collected using an impinger train of absorbing solutions, with the use of a pre-filter for determining the particulate load. Samples are analysed by Ion Chromatography, using UV detection for hydrogen halides (e.g. HCl, HBr and HF) and halogens (e.g. Cl<sub>2</sub>, Br<sub>2</sub>).

## 4. Hydrogen Sulphide Emissions from Stationary Sources

Samples are collected in a Hydrogen Peroxide/Cadmium Sulphate solution impinger train and subsequently analysed by titration. This method is used for a variety of industries including sulphur recovery plants, fuel gas combustion plants etc.

## 5. Gaseous and Acid-Soluble Particulate Fluoride

Air samples are collected on alkali and acid treated filters, which sorb gaseous and acid soluble fluorides. Samples are analysed using an Ion Selective Electrode (ISE) or titration. This method of sampling is often for air quality monitoring in the vicinity of aluminium smelters, power stations, steel works and fertilizer plants.

*Note –Impinger solution volumes are recorded pre-analysis and are included on the ALSE report to enable concentrations to be calculated as mg of analyte per m<sup>3</sup>.*

*For further information on stationary source emission analysis please contact your nearest ALSE laboratory (see [www.alsenviro.com](http://www.alsenviro.com)), the ALSE centre of excellence for Air Analysis in Newcastle (phone: + 61 2 4968 9433) or email [alsnewcastle@alsenviro.com](mailto:alsnewcastle@alsenviro.com)).*

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