



Analysis of Dioxins in Air

Dioxins are a group of highly toxic, similarly structured chlorinated organic compounds that can be generated as by-products of certain industrial processes. The two major industrial sources of atmospheric dioxin in Australia are ferrous/non-ferrous metal production and power & heat generation, which account for 33% and 10% respectively. Other sources include incineration of commercial and municipal waste; burning of fuels such as oil, coal and wood; forest fires and vehicle exhaust emissions.

Formation of Atmospheric Dioxins

Atmospheric Dioxins are formed during combustion processes where chlorine or chlorine containing compounds are present. The three major production pathways are;

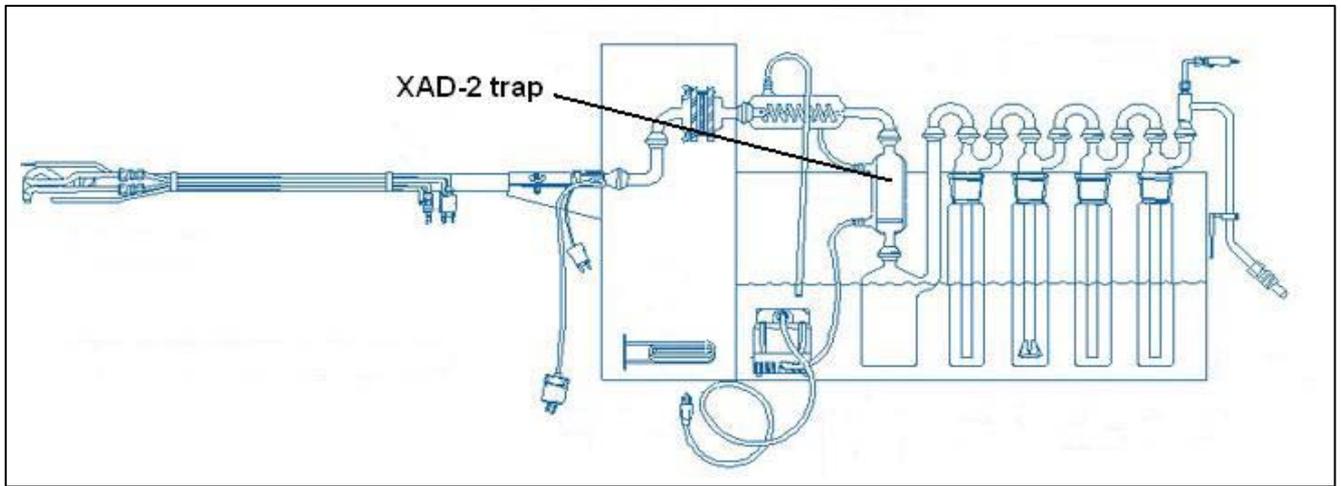
1. Incomplete destruction of dioxins already present in a combustible feed material
2. Catalytic formation of dioxins during combustion of feed material.
3. Recombination of chemicals in combustion gases as they cool down (250°C to 450°C temperature range) particularly in the presence of copper which acts as a catalyst.



Sampling of Stack Emissions for Dioxins

The generally accepted method for the determination of dioxins and furans in combustion gas is USEPA Method 23. This method specifies the use of an XAD-2 resin for “trapping” of dioxins in combustion emissions. A glass sampling trap is charged with approximately 20 – 40g of XAD-2 resin, pre-spiked with a number of $^{13}\text{C}_{12}$ dioxin “sampling” standards. The trap is then deployed in the stack sampling apparatus (illustrated following) for the required sampling period.

The “sampling” standards are used to ensure that the sampling of emissions is carried out correctly and that the XAD-2 resin is not overloaded during the sampling period. After sampling, the trap is returned to the analytical laboratory where the XAD-2 resin is removed from the trap, extracted with an appropriate solvent and analysed for dioxins by HR/GC/MS.



Schematic of Method 23 stack sampler, showing XAD-2 trap.

Dioxin in Air Analysis at ALS

In addition to the analysis of soil, sediment and water the High Resolution Mass Spectrometry Laboratory at ALS Brisbane holds full **NATA accreditation** for the analysis of Dioxins and Furans in **XAD-2 traps** for stack samples as well as **Polyurethane Foam (PUF) canisters** for the analysis of ambient air.

ALS can supply pre-packed XAD-2 resin traps spiked with sampling standard ready for sampling (subject to sampler configuration). Alternatively ALS can clean, re-pack and spike customer's own traps if required. Advance notice of one week is usually required although, if urgent, this timeframe can be reduced for small numbers of traps.

With a typical LOR of 0.05 ng/trap TEQ ALS can achieve the 0.1 ng/m³ TEQ limit that is required for legislative and conformance purposes in Australia as described in the table below.

Country/Region	Limit
Australia	< 0.1 ng/m ³
European Union	< 0.1 ng/m ³
Japan	feed stream of < 2 tonnes per hour: < 5 ng/m ³
	feed stream of > 2 tonnes per hour: < 1 ng/m ³
	feed stream of > 4 tonnes per hour: < 0.1 ng/m ³
USA	liquid/solids combustion: < 0.4 ng/m ³
	gaseous/vapour combustion: no dioxin regulation

For further information please contact ALS Brisbane services.brisbane@alsenviro.com, or your local ALS team.



For further information on specialist Services please visit the ALS website: www.alsglobal.com

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