Reduction of dioxin emissions by long time monitoring support

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Introduction

In the middle 80's the knowledge about dioxins and their toxicity increased. Different investigations came to the result that restriction of the emission of this compounds shall be limited. That time the technology for analysing this compound was – compared to today – in the very beginning. The same is valid for the available technology for flue gas treatment to filter or destroy dioxins.
First technologies for dioxin destruction had been already tested. An Austrian construction company guaranteed the first time an emission value of below 0,1 ng/m³. The respective plant was a waste incinerator in Vienna.
This limit was set up to the legislation of several countries. The limited available measurement technology caused, that this limits were proved just a few times a year.

In 1993 it was again in Vienna where that the first continuous dioxin monitoring system was introduced, installed and in use. With this prototype installation already many details of the plant characteristics could be recognised.

Especially a construction using at least two sampling positions is needed to gain representative results when the plants runs at full capacity as far as it runs at partial capacity.

With the first standardised device, first installed in 1994, and constructed in detail according to the today's EN 1948-1 an additional tool for the plant operator to optimise the plant for lowering the dioxin emission was provided.

Today the technique is well known and discussed to be included in the legislation of some countries.

Applications

The main application of the dioxin monitoring, where (today) we talk about the long time sampling and laboratory analysis using this term, is the emission measurement. Several data have been presented[1].

Advanced application of the continuous monitoring, especially using the measurement results for additional calculations and plant optimisation procedures, indicate how powerful this advanced technique can be used.

Example 1: calculation of mass flow and dioxin emission index

The results of the continuous monitoring of a whole year was used together with the volume flow data of the plant to calculate the dioxin mass flow (TEQ). The example shows data from a hazardous waste incinerator with an average emission value of
1,3 pg/m³, which is known to by a very low value especially when continuous monitoring is done. The calculated mass flow was 0,70 mg per year.

The dioxin emission index shall be defined being the emitted amount of dioxins (TEQ) in the respective medium per unit of processed material. The unit of processed material shall be e.g. for waste incinerators tons of incinerated waste, for cement kilns both (depending on the viewpoint), tons of produced cement or tons of incinerated waste fraction.

The emission index in the respective example was 18 ng Dioxin(TEQ) in the flue gas per ton waste.

This index gives the opportunity to compare plants objectively and to decide where e.g. supporting investments will be most efficient.

Example 2: plant optimisation

The opportunity of the reduction of the emission levels and to keep them low following becomes easy by using continuous monitoring. One plant operator started to changed the design of the activated carbon injection while the monitoring was done. After just a few sampling cycles a very efficient design was found and the emission level was decreased to about 15 pg/m³. This design was used for permanent installation. Following, by using statistical methods, changes of the efficiency of the flue gas cleaning are recognised early. The dioxin mass flow as far as the emission level can be kept at a low level.

[1] P. Ruggenthaler et al, Dioxin conference `94, Kyoto, Japan