

MSWI Plant HBW Spittelau Vienna, Austria - Three Years' Experience: Emission Below 0,1 ng TEQ/m³ SC *)

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Introduction

Amongst other countries such as the Netherlands and Germany, Austria has limited the emission of PCDD/F's from municipal solid waste incinerators (MSWI) by national emission laws to below 0,1 ng TEQ/m³ SC. This boiler emission law became effective in Austria for new plants in 1988 as well as old plants in 1989.

The Spittelau plant Vienna/Austria was originally built in the late sixties and equipped with a grate and electrostatic precipitator (ESP) as the only emission control device. It now operates and processes two lines of solid waste incinerators of about 17 t/h (280,000 tpy) with a completely new gas cleaning plant, including an SCR catalyst since 1989. After start-up of the SCR plant it was found that the same catalyst was also very effectively reducing PCDD/F's. This article presents 3-year operating experience with the lowest emission values worldwide in a full scale incineration plant especially with regard to curbing dioxins to below 0,1 ng/m³ SC.

Plant Description

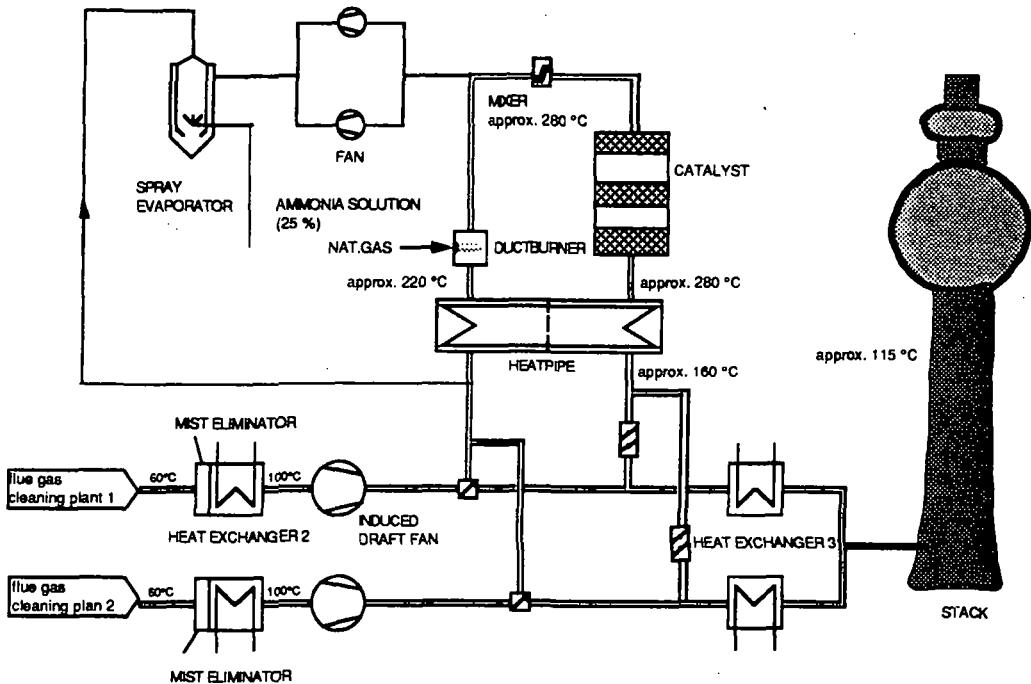
A layout of the plant indicating the locations of the test ports is given elsewhere (1,2,3,4,5). In this article we confine our information to the SCR plant, shown in fig. 1. The incinerators are setup independently until after the second (SO₂) scrubber, thereafter the flue gases are combined and passed through the SCR DeNO_x facility, which as of April 1993 had operated for 24,000 hours. An aqueous NH₄OH-injection device is placed up-stream of the heatpipe which raises flue gas temperature from 110°C to 220°C.

*) under dry conditions at 11% O₂

EMCO

A duct burner raises the temperature of the flue gas upto 280°C. The catalyst is of a honeycomb type with primarily V_2O_5 - WO_3 supported on a 4 mm-pitch TiO_2 -carrier. The operational costs for reheating from 220°C to 280°C plus power and NH_4OH amounts to ATS 46.50 (ca. US \$ 4) per t of waste.

Fig. 1: Process Flow Diagram of SCR Plant Spittelau



Emission Measurements

Table 1 gives the monthly run-down of half-hour mean values (min., max. and monthly average) as required by Austrian law. Table 2 is the summary of PCDD/F measurements carried out from October 1991 until the last values available for this publication deadline. All values proved to be not only in line with the $0,1 \text{ ng/m}^3$ legal limit, but by a safe margin below this limit ever since the installation of the third catalyst layer in mid-'91.

DIOXIN EMISSIONS

October 91 - March 93

| date | fluegas volume x 1000 m ³ /h sc | catalyst temperature | TEQ ng/m ³ sc before catalyst | TEQ ng/m ³ sc after catalyst |
|---------------|---|-------------------------|---|--|
| 15.10.1991 | 200 | 280 | 1,64 | 0,051 |
| 16.10.1991 | 200 | 280 | 1,40 | 0,093 |
| 17.10.1991 | 200 | 280 | 3,28 | 0,065 |
| 18.10.1991 | 200 | 280 | 1,81 | 0,036 |
| 19.10.1991 | 200 | 280 | 0,95 | 0,052 |
| 04.02.1992 | 200 | 280 | 1,60 | 0,038 |
| 07.04.1992 | 200 | 280 | 1,68 | 0,020 |
| 03.06.1992 | 200 | 280 | 3,48 | 0,068 |
| 02.09.1992 | 200 | 280 | 2,14 | 0,022 |
| 17.11.1992 | 200 | 280 | 1,28 | 0,024 |
| 18.12.1992 | 200 | 280 | ***** | 0,049 |
| 19.01.1993 | 200 | 280 | 2,19 | 0,035 |
| 16.02.1993 | 200 | 280 | ***** | 0,020 |
| 16.03.1993 | 200 | 280 | ***** | 0,052 |
| 08.04.1993 | 200 | 280 | ***** | 0,079 |
| 18.05.1993 *) | 200 | 280 | ***** | 0,048 |
| 17.07.1993 *) | 200 | 280 | ***** | 0,015 |

Table 1

*) only 1 boiler in operation

DISTRICT HEATING STATION SPITTELAU

averaged monthly emission values

mg/m³ SC, dry at 11% O₂

| | particles | HCL | SO ₂ | CO | NO _x | HC |
|-----------------|-----------|------|-----------------|-------|-----------------|------|
| emission limits | 15,0 | 15,0 | 40,0 | 100,0 | 100,0 | 20,0 |
| April 1992 | 0,7 | 1,3 | 7,0 | 37,3 | 26,5 | 0,4 |
| May 1992 | 0,7 | 1,4 | 8,7 | 32,2 | 26,8 | 0,3 |
| June 1992 | 0,9 | 2,6 | 8,1 | 25,4 | 35,8 | 0,8 |
| July 1992 | 0,7 | 3,2 | 7,3 | 24,7 | 27,9 | 1,0 |
| August 1992 | 0,5 | 1,7 | 3,3 | 27,8 | 24,0 | 0,8 |
| September 1992 | 0,8 | 2,1 | 3,1 | 30,6 | 25,0 | 0,3 |
| October 1992 | 0,9 | 2,2 | 2,1 | 35,0 | 25,2 | 0,4 |
| November 1992 | 0,8 | 2,1 | 8,5 | 38,2 | 22,7 | 0,5 |
| December 1992 | 0,7 | 2,7 | 3,0 | 40,0 | 23,5 | 0,8 |
| January 1993 | 0,8 | 3,0 | 8,5 | 38,5 | 25,3 | 0,8 |
| February 1993 | 0,7 | 3,1 | 3,2 | 36,1 | 27,4 | 0,9 |
| March 1993 | 0,7 | 3,8 | 6,4 | 36,4 | 27,2 | 0,5 |

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For verification of the systems and measurements an elaborate program was performed during January 1993. The results are presented in Table 3. Here is demonstrated that the results of a long term (2 weeks) sampling procedure and simultaneous samples obtained from various ports in the gas cleaning train are highly consistent.

Table 3: Comparison of Stack emissions (Ref. 5)

| | Date | Measured Value ng TEQ/m ³ |
|---|-----------------------|--------------------------------------|
| Sample 1 (2-weeks' sample) | 18 Jan 93 - 29 Jan 93 | 0,034 |
| Sample 2 | 19 Jan 93 | 0,035 |
| Sample 3-8 (various ports in vicinity, simultaneous measurements) | 29 Jan 93 | 0,040 |
| | 29 Jan 93 | 0,051 |
| | 29 Jan 93 | 0,039 |
| | 29 Jan 93 | 0,034 |
| | 29 Jan 93 | 0,042 |
| | 29 Jan 93 | 0,038 |

Conclusion

We therefore conclude, that with a system configuration like the Spittelau plant with highly efficient particulate removal and two stage wet scrubbing, a SCR DeNO_x facility of this design can safely meet the required 0,1 ng TEQ/m³ SC emission limit.

References:

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- 2 Hartl, H.: VDI, München Sept. 17/18, 1992
- 3 Sparrer, J.: 2nd Workshop Rotterdam NL, 26. Jan., 1993
- 4 Kneissl, P.J., Pacher, W., Unipede March 1993
- 5 Press Release HBW Vienna, April 28, 1993; in detail presented at Dioxin '93, Boos, R., Stock, M.: Simultaneous sampling of PCDD's and PCDF's at the MSWI Spittelau, Vienna