WASTE INCINERATION - STATE OF THE ART EMISSION CONTROL

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1. Introduction

In the late 80s legal requirements for increased emission control of incineration facilities in most central European countries have challenged flue gas cleaning technology. Generation of products which can be either utilized in conventional industrial processes, or materials warranting long-term inert properties for save landfilling have become the ultimate objective. The active carbon filter, developed in the 70s for a different purpose, has turned out a winner accomplishing these unobtainable emission standards for a variety of incineration processes.

2. Requirements

The legal requirements for the emission limit values for incinerators are summarized in Table 1, showing the now mandatory limits for all new installations as well as existing ones (by the end of 94) in Austria, the Netherlands and Germany (partially in 1996).

Table 1: Emission limits for incinerators

	AUSTRIA LGR-K Half hour mean values mg/m3 SC	NETHERLANDS RV'89 One hour mean values mg/m3 SC	GERMANY 17.BImSchV One day mean values mg/m3 SC
Total Dust	15	5	10
CO	50	50	50
HCl	10	10	10
HF	0.7	1.0	1.0
SO2	50	40	50
NOx	100	70	200
Hg	0.05	0.05	0.05
Dioxins, Furans	0.1 ng TE/m3 SC	0.1 ng TE/m3 SC	01 ng TE/m3 SC

Besides drastically lowered limits for particulates, HCl, SO2 and mercury, to name the most important ones for the first time, an emission limit for dioxins and furans of O.1 ng TE/m3 (SC), has been imposed.

3. Process Design

A gas treatment train that has proven to be efficient and reliable over the past few years is shown in Figure 1. From the boiler outlet (1) the combustion gas is sequentially passed through a

- dust collector (2)
- acid scrubber (3)
- alkaline scrubber (4)
- activated carbon filter (9)
- SCR-DeNOx reactor (13)

Modularity of the system permits flexible accomodation of requirements and boundary conditions which may vary significantly in different applications.

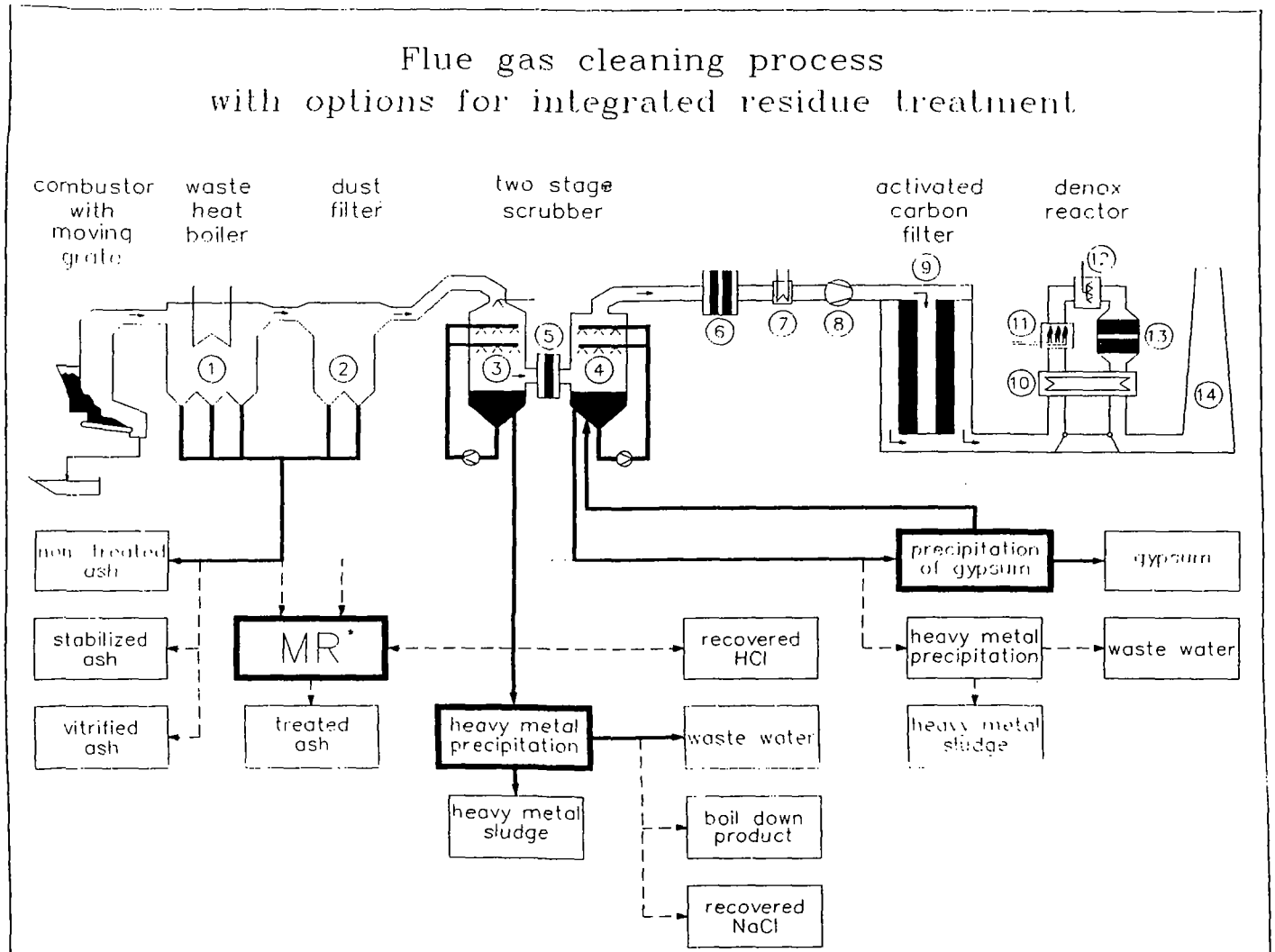
Separate removal/collection of particulates, gaseous, organic and heavy metal contaminants permits post treatment of reagents which could ultimately generate valuable commodities, e. g. NaCl, HCl or gypsum further for use in other production processes.

4. Activated Carbon Dioxin Filter

In most of our installations the activated carbon fixed bed technology was given preference over alternatives, e. g. fabric filter or catalytic techniques.

The main reasons are:

- highest known removal efficiency for particulates, heavy metals, gaseous and organic constituents.
- active carbon can be disposed of in the incinerator.
- offering true cost savings for tail-end low temperature SCR.
- bears highest potential in case of possible tightening of emission requirements regarding:
  PCBs, bromated dioxins/furans, etc.


Flue gas cleaning process
with options for integrated residue treatment
combustor with moving grate
waste heat boiler
dust filter
two stage scrubber
activated carbon filter
denox reactor
1
2
3
4
5
6
7
8
9
10
11
12
13
14
non treated ash
stabilized ash
vitrified ash
MR*
treated ash
heavy metal precipitation
heavy metal sludge
recovered HCl
waste water
boil down product
recovered NaCl
precipitation of gypsum
gypsum
heavy metal precipitation
waste water
heavy metal sludge
* multi-recycle-process

5. Operating experience

The first installation, went into generation in 1989 which was in full compliance with the 17. BImSchV of Germany was the hospital waste incinerator at the University of Heidelberg, shortly followed by another hospital waste incinerator in the Netherlands, the ZAVIN installation near Dordrecht. These first, rather small facilities were followed by the hazardous waste incinerator DTO 9 at AVR-Chemie in Rotterdam and the world´s largest MSW plant - the AVR - at the same location in Rotterdam.

At this facility 6 incinerators are presently in operation, treating more than one Mio tons of waste per year. A seventh unit is currently under construction and scheduled for initial start up by the end of 1995.

Table 2: Observed Stack Emissions

	Hosp. Inc. Univ. Heidelberg GER	Hosp. Inc. ZAVIN NL	Haz. Waste Inc. DTO 9/ AVR-Chemie NL
	mg/Nm3 SC	mg/Nm3 SC	mg/Nm3 SC
Total Dust	< 2	1	< 0.5
HCl	< 1	< 2.2	0.19
HF	< 0.05	< 0.05	0.05
SO2	< 2	0.6	6
Nox	65	343 *	177 *
Hg	< 0.01	0.00031	0.002
Dioxins, Furans	0.003 ng TE/m3 SC	0.03 ng TE/m3 SC	0.03 ng TE/m3 SC

* not equipped with SCR

6. Conclusion

The success of the above outlined technology can best be demonstrated through emission measurements presented in Table 2.
These results show that today´s legal requirements can be met by save margin with the applied process technology.