

## IS THERE A MEANINGFUL DIOXIN:CHLORINE LINK IN COMMERCIAL SCALE SYSTEM FLUE GASES?

**H. Gregor Rigo**

Rigo & Rigo Associates, Inc.  
Berea, Ohio

**A. John Chandler**

A. J. Chandler & Associates Ltd.  
Willowdale, Ontario  
Canada

**W. Steven Lanier**

Energy & Environmental Research Corp.  
Durham, NC

### ABSTRACT

An extensive database including more than 1,900 PCDD/F test runs at different types of waste combustors was assembled and analyzed. A series of increasingly sophisticated statistical techniques found that for the vast majority of the data sets, the effect of feed chlorine content on PCDD/F emissions cannot be differentiated from normal variability. The small number of data sets that showed an effect displayed conflicting results. The quantity of PCDD/F increased in some cases and decreased in others. Whatever effect chlorine feed rate has on PCDD/F in the products of combustion, it is not discernible against the background. Consequently, mandatory chlorine reduction programs are unlikely to produce any measurable reduction in the quality or quantity of PCDD/F emissions from commercial scale waste combustors.

### INTRODUCTION

Since polychlorinated dibenzo-p-dioxins and dibenzo furans [PCDD/F] are organochlorides, they clearly cannot be found in the products of combustion when there is no chlorine. On the other hand, atmospheric measurements demonstrate that air contains enough chlorine to produce about 2,500 ng/dsm<sup>3</sup> of 2,3,7,8 TCDD and laboratory experience indicates that intrinsic PCDD/F might pass through the flame zone under poor combustion conditions or be formed throughout the combustion system via a complex series of interacting gas phase, surface catalyzed and solid phase reactions. Laboratory work also shows that PCDD/F formation is strongly influenced by combustor design and operating conditions. This leads to the question, which effects predominate PCDD/F emissions at commercial scale facilities? Is a change--discernible in some laboratory experiments--a meaningful factor in full scale system operation?

### FOCUS & LIMITATIONS

This paper summarizes some of the key findings of the effort directed by the Subcommittee on The Relationship between Chlorine in Waste Streams and Dioxin Emissions from Combustors of the ASME Research Committee on Industrial and Municipal Waste to examine the impact of waste feed chlorine content on PCDD/F emissions from waste combustion systems. The effort focused primarily on the acquisition, review and analysis of stack emissions data from the municipal, medical, hazardous and agricultural (biomass) commercial waste management segments. Seminal data from laboratory, pilot and small-scale test facilities were used to provide understanding of mechanisms and provide a framework for examining full-scale facility performance.

The full report (Rigo, Chandler & Lanier, 1995) provides an analysis of the data, a discussion of the statistical techniques employed, and a standardized listing of the pertinent data so that others may perform independent analyses. There is a wealth of information in the main body of the report and Appendix D that can be used to address other PCDD/F formation questions and assess air pollution control system [APCS] performance. Others are encouraged to use this reference work as a starting point to verify the following conclusions and observations and to extend the assessment to address other questions.

Neither this paper nor the underlying study, however, address changes in the PCDD/F characteristics of residues and liquid effluents leaving commercial scale waste combustion facilities. This limitation does not seriously reduce the utility of the effort since multipathway health risk assessments find stack emissions predominating the PCDD/F risk contribution; the other effluents have a negligible effect. This is not surprising since testing at Stapelfeld, Germany (1985) and Montgomery County, Ohio (Radian, 1989) found little PCDD/F in scrubber effluents and routine TCLP testing finds that whatever PCDD/F is in combustor residue, it is not leached. This study properly emphasized the area where an environmentally significant relationship is most likely to be found.