

File PVC
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SUMMARY OF WHAT IS KNOWN ABOUT THE RELATIONSHIP BETWEEN PVC INPUT TO MSW'S AND PCDD/F OUTPUT

Conclusions

It has been shown in laboratory experiments that pyrolysis of PVC under certain conditions of incomplete combustion can lead to formation of PCDD/F's. The question, however, is what correlation, if any, exists between PVC loading and output of dioxins and furans (PCDD/F's), during the operation of municipal waste incinerators (MSW's).

The data would appear to indicate that under good operating conditions, or with good particulate control, that increasing the Cl_2 load, or PVC load in an MSW will not lead to an increase in PCDD/F emissions.

The data would also appear to indicate that under poor operating conditions, i.e. in "upset" conditions, or conditions of poor combustion, that there likely is a positive correlation between Cl_2 levels and PCDD/F post formation concentrations.

Studies

In addition to anecdotal information, there are a number of well conducted studies designed to address the PVC question. One such study is the NYSERDA study (New York State Energy Research and Development Authority, 1987). This study, using a full scale operating municipal incinerator was designed to investigate the effect of operating conditions, PVC loading and waste moisture content on PCDD/F emissions. The study also examined the relationship between combustion gas variables.

The major conclusions from this study are

- "There is no evidence that the amount of PVC in the waste stream affects the levels of PCDD/F's at any of the measurement locations. "
- "Incinerator operating temperatures significantly affected the levels of PCDD/F's ...".
- "The levels of PCDD/F's and carbon monoxide are related; ..." but there may be a threshold level above which CO must be above.

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Wastes used in the portion of the study examining the PVC questions were

- typical MSW
- MSW + PVC
- PVC-free (generally cardboard plus wood that had been sorted out of incoming MSW)
- PVC free + PVC

Chlorine load for the experimental runs was about 0.2% for MSW, 0.05% for PVC-free and 1.1% for MSW + PVC.

Another series of experiments in Otto Hutzinger's lab produced similar conclusions. Lenoir et al (1991) studied PCDD/F emissions in a fluidized bed incinerator. As fuels they used typical municipal waste (RDF) with a Cl_2 level of 0.9%, RDF + lime, RDF + 2% plastic, RDF + polyethylene (PE), PE alone, PE + 2% NaCl, PE + 3% PVC, wood chips, cellulose, and cellulose + PVC.

Their general conclusions are as follows:

"Under normal [good] operating conditions, high fluidized bed temperatures ... PCDD/F emissions did not depend on the HCl concentration in the flue gas."

and specifically

"The lack of relationship between PCDD/F and HCl levels described above indicates that the chlorine of the fuel, from which HCl is formed, had no influence on PCDD/F emissions. Indeed, burning RDF with 0.9% Cl_2 , wood chips with 0.2% Cl_2 , and PE with 0.01% Cl_2 led to about the same PCDD/F emissions. ... Adding NaCl to PE and to cellulose fiber, and adding 0.5% PVC to cellulose fiber did not increase PCDD/F concentrations. However, adding 3% PVC to [pure] PE increased PCDD/F levels by a factor of 3 compared to the mean value for PE combustion. This statement lacks statistical significance, since the treatment was not repeated, but it is one of the few experiments where an influence of larger amounts of PVC on PCDD/F emissions were observed in waste incinerators. Conversely it has been frequently published that the addition of PVC to municipal waste and waste paper did not increase PCDD/F emissions (ref. 1 - 5)"

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Consistent with the NYSERDA study, they found that PCDD/F emissions changed with operating conditions and correlated with CO concentrations, with a likely threshold in the correlation.

Thus, they found only one fuel condition showed increased PCDD/F emissions, and that condition (pure polyethylene plus 3% PVC) has no relevance to actual conditions in an operating MSW.

Other authors (ref) have concluded that there may be a correlation between chlorine or PVC load and PCDD/F emissions, but these studies are based upon correlating results across different incinerators, and are therefore measuring the effectiveness of the air pollution control equipment, rather than the correlation between input streams and emissions.

Conclusions

Control of PCDD/F emissions in municipal incinerators is attained through proper combustion and operating discipline, and the use of appropriate pollution control equipment. Under those conditions PCDD/F emissions are independent of Cl₂ load into the MSW incinerator.

Waste streams

As of 1990, EPA reports that 16.2 million tons of plastic are in the nations MSW. This represents about 8.3% of the total or about 9.8% after recycling. (Still looking for % PVC)

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