

# McLaren/Hart

ENVIRONMENTAL ENGINEERING CORPORATION

TO: Tim Mulholland

COMPANY: WDNR

RE: Logemann Brothers Property - Saukville

DATE: August 7, 1996

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MESSAGE:

Elizabeth Rich requested that this report be forwarded to you in reference to your meeting later today. Please call if you have any questions.

*whdwdnr1.fax*

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*From the desk of:*

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**DECOMPOSITION PRODUCTS OF  
ISOCYANATES  
LOGEMANN BROTHERS COMPANY  
SAUKVILLE, WISCONSIN**

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## INTRODUCTION

While precise operational information for the former Georgia Gulf facility in Saukville, Wisconsin, was not provided to representatives of McLaren/Hart Environmental Engineering Corporation (McLaren/Hart), McLaren/Hart has been advised that this facility was engaged in an operation to formulate the materials to create polyurethanes. McLaren/Hart was also advised that various raw materials, intermediates or finished products may have come into contact with the surface or subsurface soils at this facility. Additionally, McLaren/Hart was advised that selected process reaction wastewaters were incinerated in an air-curtain incinerator on the site with these waters also potentially contacting surface/subsurface soils.

Considering that polyurethanes are formulated by the reaction of an isocyanate and a polyol, McLaren/Hart examined the type and classification of chemicals purportedly utilized at the property. Based on this review, it was ascertained that toluene diisocyanate (TDI) was likely present at the facility. In the event TDI was not present, then other isocyanates or diisocyanates or other compounds which precede isocyanates in the production cycle (isocyanic acid or esters) were likely present at the facility. Irrespective of the exact chemical compound(s) that was present, McLaren/Hart completed a limited review of the literature to determine decomposition products which are associated with isocyanates and isocyanate compounds.

In completing the literature search, McLaren/Hart accessed four databases including Toxline, HCA, HSDB, and Toxnet. In reviewing these databases, in excess of 200 references (English only) were located that responded to the decomposition of isocyanates. Specific database queries were also presented to determine the formation of cyanide and cyanide compounds during this decomposition. The following section of this report defines the results of the review of the literature and the interpretations of these references (articles, papers, texts or other published works).

## LITERATURE REVIEW RESULTS

In excess of 20 citations were located that established cyanide, as hydrogen cyanide, as a thermal (pyrolysis) decomposition product of isocyanates. These references were located in peer-reviewed publications as well as texts. Selected references are included in the bibliography (1-10). Several other peer-reviewed references were also located describing the environmental fate of isocyanides. Specifically, toluenediamine and various polyureas were significant decomposition products of TDI which was released in a swamp (11,12). This indicates that isocyanates and isocyanate compounds are not inert with various associated degradation products that may have been discharged to the environment at the site.

Additional references revealed that TDI and other isocyanates react readily with compounds containing active hydrogen cations, such as water, acids, and alcohols (13). The contact of TDI and other isocyanates with bases (including soil to which the material may have been discharged) may cause uncontrollable polymerization with rapid evolution of heat (13). In concentrated solutions, hydrolysis of one of the isocyanate groups to the amine is followed by rapid reaction of the amine with an isocyanate group on another molecule leading to dimers, oligomers, and polymers (13). In one experiment the hydrolysis product yield of this reaction was 20% diamine and 80% polyurea (14). Again, this indicates that these compounds are not inert and, in fact, react with a wide range of materials and compounds that are found in the environment to which the materials may have been discharged.

### SUMMARY

Four databases were reviewed to determine the decomposition products of isocyanates or isocyanate compounds. From these databases, in excess of 200 English references were located which defined the decomposition products of isocyanates and isocyanate compounds. In general, depending on the fate of the isocyanate and isocyanate compound a variety of compounds and elements may result, including but not limited to hydrogen cyanide and other cyanide compounds, selected amines and polyurea. The comprehensive analysis of volatile organic compounds, semi-volatile organic compounds and cyanide in environmental media that may potentially be impacted with these compounds (soil and groundwater) should be sufficient to evaluate the potential for these compounds to have impacted the Logemann Brothers Company's Saukville, Wisconsin property.

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