



## Project Summary

# The Survey of Industrial Hazard Anticipation Technology

Susan Coffey, William Yeager, and Shri Kulkarni

**This report reviews currently available technologies for monitoring the operations of chemical manufacturing and handling facilities to detect airborne emissions of hazardous chemicals before they reach levels which pose an acute hazard to public health. The Survey is a first step toward providing industrial planners and plant managers with an overview of the available monitoring techniques which would aid them in designing appropriate warning and safety systems.**

***This Project Summary was developed by EPA's Air and Energy Engineering Research Laboratory, Research Triangle Park, NC, to announce key findings of the research project that is fully documented in a separate report of the same title (see Project Report ordering information at back).***

### Introduction

The Air and Energy Engineering Research Laboratory (AEERL) is concerned with accidental releases of hazardous chemicals as well as with routine emissions of air pollutants. Volatile organic compounds emitted from hazardous waste disposal sites are also of increasing concern. Chemical detection systems which are able to identify and monitor dynamic situations where hazardous materials gradually build up to dangerous levels may avert

major accidents by providing timely warning to plant personnel. For major industrial installations, some product-specific monitoring systems have been developed. Where appropriate monitoring techniques are not available, research and development needs are to be identified.

### Approach

Research Triangle Institute (RTI) has reviewed the literature necessary to identify typical chemicals of concern. Several organizations have constructed lists of hazardous chemicals based on various criteria. Because resources available to this project are finite, a few of the most hazardous chemicals have been selected as the basis for investigating monitoring techniques. Eventually more chemicals may be considered.

### Results and Recommendations

Specific instrument methods for detecting and quantifying airborne chemicals are reviewed. For each method, the results of a literature review and discussions with manufacturers are presented in a uniform format. This format includes the principle of operation, physical description, suggested applications, performance data, advantages and disadvantages. Ten methods for detecting the 35 chemicals specified by AEERL were examined. These methods are identified in Table 1. Research and development needs for new methods to detect these chemicals are also discussed.

**Table 1. Chemicals vs. Detection Methods**

Chemical	Colorimetric Tape	Continuous Colorimetric	Derivative Spec	IR Spec	Fourier Spec	Laser System	GC/PID	MS	Halide	Diffusion/ Electrochem.
Acrolein				X	X	X	X	X		
Acrylonitrile				X			X	X		
Phosgene	X			X	X	X	X			X
Chloropicrin				X						
Bromine		X							X	X
Methyl isocyanate				X						
Toluene-2,4-Di-isocyanate	X				X			X		
Chlorine		X						X	X	X
Ammonia		X		X	X	X	X	X		X
Sulfuric Acid/H <sub>2</sub> S	X	X		X	X		X	X		X
Hydrochloric Acid		X		X	X			X		X
Nitric Acid								X		
Hydrogen Fluoride		X		X	X			X		X
Hydrogen Cyanide		X		X	X		X	X		X
Vinyl Chloride				X	X	X	X	X		
Benzene				X		X	X	X		
Styrene				X		X	X	X		
PCBs (Polychlorinated Biphenyls)								X		
Toluene				X	X		X	X		
Methyl Alcohol				X	X	X	X	X		
Carbon Tetrachloride				X	X		X	X	X	
Ethylene Oxide				X	X	X	X	X		
Formaldehyde		X		X			X			

(continued)

Table 1. (Continued)

Chemical	Colorimetric Tape	Continuous Colorimetric	Derivative Spec	IR Spec	Fluor Spec	Laser System	GC/PID	MS	Halide	Diffusion/ Electrochem.
Sulfide Dioxide				X	X			X		X
Cumene Hydroperoxide <sup>a</sup>										
Carbon Disulfide			X		X		X	X		
Allyl Chloride			X		X		X	X		
Sodium Hydroxide <sup>a</sup>										
Phenol		X		X	X		X	X		
1,2-Dichloroethane						X	X			
Phosphorus Trichloride										X
Phosphorus <sup>a</sup>										
Mercaptans		X					X			
Sulfites <sup>a</sup>										
Ethylene Glycol		X					X	X		

<sup>a</sup>No measurement method found.

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*The complete report, entitled "The Survey of Industrial Hazard Anticipation Technology," (Order No. PB 88-235 536/AS; Cost: \$14.95, subject to change) will be available only from:*

*National Technical Information Service  
5285 Port Royal Road  
Springfield, VA 22161  
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