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## Summary of Symposium on Halogenated Solvents Technology—A Look at the Future

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This brief summary includes key points of the papers, some information not discussed due to time limitations, and an examination of future trends.

All solvents are and will continue to be regulated. They include petroleum solvents, ketones, alcohols, chlorinated solvents, and chlorofluorocarbon 113 (CFC 113). However, none of these solvents are banned nor are they expected to be. Most of the technology contributing to reduced emissions, waste handling, and pollution remediation have been developed by private industry. Thus far, the cooperation of industry and government has resulted in regulations which have been attainable, although disruption and major costs have resulted in some cases. The combination of improved technologies and regulations has reduced halogenated solvent emissions, and this progress can be expected to continue.

Much controversy has existed in the estimation of chemical risk. Industry has been contributing to the advances here as well by defining the mechanisms of cancer and developing a better understanding of the biochemical processes in man and animals. Further, this information is being interpreted by new modeling techniques to yield much lower and more realistic estimates of hypothetical risk. New data and modeling are likely to reduce the perceived risks of halogenated solvents.

Water pollution presents complex and costly but not insurmountable problems. On the other hand, preventing water pollution is very economical and the technology well known. Containment, extra care in material handling and tank monitoring, and early replacement illustrate preventative techniques. In addition, the chemical industry has organized an emergency response system to cope with spills. Call Chemtrec Emergency Response at 1-800-424-9300.

Conservation procedures, improved metal cleaning equipment design, refrigeration, and carbon adsorption have reduced halogenated solvent emissions. More recently, advanced automation is helping to reduce air pollution. Once again, this trend can be expected to continue as more techniques are developed.

Concern for the appropriate disposal of waste has created a new industry which is rapidly becoming more sophisticated. Solvent distillation recovery and reuse both in user plants and by contract

recyclers is the most economical way to reduce waste volume, while incineration of nonrecoverable solvent wastes for heat recovery in cement kilns, for example, is recognized as the foremost final disposal practice.

CFC 113 has been proposed for regulation along with other durable chlorofluoro compounds. This regulation would reduce the use of these compounds accumulatively to the 1986 level in 1989, by another 20% in 1993, and to 50% of the 1986 level in 1998. However, although CFC 113 is proposed for regulation, it is not banned nor likely to be. Its physical and chemical properties are unique and, at this time, it cannot be replaced in its essential applications.

A number of subjects could not be fully explored at the symposium. Perchloroethylene and CFC 113 have displaced Stoddard solvent in drycleaning with improved equipment design over the last 35 years. This has resulted in a reduction of emissions from drycleaning operations in excess of 85%. 1,1,1-Trichloroethane has been used as a replacement for smog-producing solvents, enabling users to comply with regulations where other compliance techniques are impracticable. The ease of distillation recovery and reuse has resulted in greatly reduced volumes of waste. Epidemiology studies of halogenated solvents have not suggested a cancer risk in human populations or other significant adverse health effects; these solvents are among the most comprehensively studied compounds with respect to their toxicology. Use of untested materials must be regarded to have potential serious risks. In many halogenated solvent applications, substitute materials or processes will not provide the needed performance, reliability, and durability in the final product. Finally, there is little doubt that the use of halogenated solvents has prevented thousands of injuries, deaths, and property damage from fire.

Toxicologists are increasing their understanding of high versus low dose exposures, the relevance of animal toxic effects to man, and the extrapolation of risk to human populations. A California law is another illustration of a trend which surprisingly is having a positive effect. Proposition 65, now the Safe Drinking Water and Toxic Enforcement Act of 1986, is conveying a message to the public through the labeling of hospitals, gas stations, grocery stores, etc. The message is, essentially, that everything is toxic or carcinogenic in sufficiently high dosages. This understanding is essential to public acceptance of more realistic risk estimates.

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