Appendix I

A GENERIC FRAMEWORK FOR LIFE-CYCLE MANAGEMENT OF HAZARDOUS SUBSTANCES

Presentation at

CHLORINE LIFE-CYCLE ACCIDENT PREVENTION WORKSHOP

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CHEMICAL LIFE-CYCLE MANAGEMENT

In October 1989, representatives of ESSO Petroleum Canada met with senior officials of several federal government departments to brief them on the company's hazardous chemicals management program. Those chemicals being managed under the program included chlorine, ammonia and hydrogen sulphide but the main focus of discussion was hydrofluoric acid (HF). Subsequently, Environment Canada convened a meeting with ESSO and Transport Canada to discuss the life-cycle management of hazardous chemicals and decided on an industry-government project to investigate the issue further.

A decision was made that such a project should proceed with the following objective in mind:

> To develop a framework for the application of a generic set of recommendations (ie. recommended practices) that will result in the safe manufacture, transport and use of hazardous chemicals, including effective mitigation and emergency response to releases.

Initially, this project was run under the Major Industrial Accidents Council of Canada (MIACC) Working Group #12 - Accident Prevention Activities. In order to develop the management framework, it was felt that chemical-specific workshops were the best means to provide a forum for information sharing and learning about hazardous chemicals management. In January 1991, a one-day HF workshop was held with representatives from the manufacturing, transportation, distribution and end-use sectors. A number of conclusions and recommendations were reached concerning the proper management of HF including the fact that companies have developed comprehensive systems to manage the substance. These have application for other hazardous chemicals as well. These conclusions and recommendations helped to better define the hazardous chemicals management framework. Environment Canada has since provided input to an ongoing study of HF by the United States Environmental Protection Agency (EPA). EPA has been especially interested in the Canadian consensus approach to hazardous chemicals management.

A recommendation to create a separate working group (#8) Life-Cycle Management of Hazardous Substances, dedicated to chemical life-cycle management, was approved at the MIACC Annual Meeting in 1991. The objective of this working group is to achieve a high level of safety consciousness in the handling of hazardous substances, particularly by downstream small and medium-sized enterprises through life-cycle management of these substances. Through the application of a generic framework for life-cycle management of hazardous substances, MIACC will be able to assist facilities handling hazardous substances to improve safety and develop effective prevention programs.

The Life-Cycle Concept

In September 1986, a multi-stakeholder group chaired by Environment Canada released a report entitled From Cradle to Grave: A Management Approach to Chemicals. This group comprised representatives from large chemical manufacturers, industry associations, non-government organizations, Federal and Provincial governments, labour and others.

The report suggested that society's concerns centred on four main issues, namely: human health, the environment, the economy and government action. In the work of the task force, chemicals were viewed as chemical substances including wastes associated with industrial production, industrial and consumer use and disposal. The group concluded that preventive measures, if properly implemented, can enhance the overall Canadian economy. There was felt to be a need for a fundamental re-evaluation of government approaches to environmental issues. Also, governments must assume the leadership necessary to implement a management approach to chemicals.

The task force proposed a framework for a new approach to comprehensive chemicals management shaped by considering the following:

i) Setting Objectives - This includes agreed upon priorities, consensus involvement of relevant stakeholders, and agreement on base line information from which to measure success.

ii) Emphasizing Prevention - A preventive rather than a reactive approach is preferable, based on the systematic management of chemicals.

iii) Ensuring Comprehensiveness - Careful attention must be paid to all stages in the life-cycle of chemicals. By identifying and discussing issues, priorities can be set to provide a faster, more focussed resolution of problems.

iv) Establishing Priorities - This ensures the greatest benefit can be obtained for those resources invested.

v) Information - All stakeholders must have equal access to relevant and reliable information.

vi) Scientific Uncertainty - In some cases, efforts must focus on filling the critical data gaps.

vii) Working Together - Stakeholders must design new approaches that consider social and political needs as well as scientific evidence.

viii) Jurisdictional Harmony - The management approach cannot be effective without jurisdictional consistency and coordination. This requires cooperation among all levels of government.

ix) Voluntary and Regulatory Approaches - A management approach requires an appropriate mix of these two options, dictated by what is most effective and credible in particular circumstances.

x) Evaluating the System - Periodic auditing and monitoring are essential to promote compliance and provide objective measures of success.

xi) Demonstrating Costs and Benefits - The costs of implementing this management approach can be significant but preventive approaches provide greater benefits, including cost effectiveness, over the long term.

The Task Force's report identified seven life-cycle stages. An initial "Research and Development" phase covers the development of all new substances and processes. "Introduction to the Marketplace" addresses all preparations for commercialization as well as test marketing. The "Manufacturing" stage represents actual commercial production. "Transportation" is the physical movement of chemicals by truck, rail, ship, pipeline or aircraft. Those businesses which supply, handle or sell chemicals (ie. packagers, processors, reformulators and importers) constitute the "Distribution" phase. The "Use" stage applies to commercial enterprises and institutions with consumer use as a secondary consideration. Finally, "Disposal" is the dispersion of the chemical or by-products into the environment once the substance loses its commercial or chemical value. This management process is designed to focus on those life-cycle elements which prevent, help prepare for and improve the response to accidental releases of hazardous substances. It should not be confused with life-cycle assessment which considers inputs (raw materials, energy), outputs (products) and discharges to the environment. The life-cycle approach to the management of hazardous chemicals is the foundation upon which the Canadian Environmental Protection Act (CEPA) was developed.

Life-cycle management has also served as the basis for the creation of the Responsible Care Codes of Practice developed by the Canadian Chemical Producers' Association (CCPA) for use by its member companies. Six CCPA Codes have been developed for the following areas:

- Community Awareness and Emergency Response (CAER)
- Research and Development
- Manufacturing
- Transportation
- Distribution
- Hazardous Waste Management.

This current project is designed to build upon the work of both CCPA and Environment Canada, by providing assistance in the implementation of the Codes and promoting adoption of this management concept, particularly outside the chemical industry. This work touches on a number of issues which were identified during development of the Green Plan and are now being discussed during its implementation including: management of toxic substances, environmental emergencies and sustainable development.

The Generic Management Framework

This management framework is being developed to assist all those who deal with hazardous chemicals in carrying out their activities in a manner that minimizes risk to human health and the environment while supporting industrial productivity and encouraging competitiveness, consistent with the concept of sustainable development. This approach will be of interest to any organization involved in the development, manufacture, marketing, distribution, use or disposal of hazardous chemicals.

The June 1992 draft Generic Management Framework developed by MIACC Working Group #8 identifies the priority issues for attention by management, for each of the life-cycle phases. Addressing these issues in an organized, comprehensive approach will help to shape an effective framework for hazardous chemicals management. As an example of this identification process, research and development phase issues include health and safety of personnel, potential risks throughput the life-cycle as well as sample effluent disposal. The framework goes on to highlight and explain such priority issues for all subsequent life-cycle phases as well.

The decision-making process phase of the Management Framework highlights possible options for resolving concerns identified above and their likely consequences. Their relative advantages must be weighed along with developing the most appropriate solutions, setting objectives and indicating how these will be achieved. A final point for consideration is how the preferred solution will be evaluated and assessed (quality assurance/quality control) once implemented. Elements of the solutions which can be incorporated into the life-cycle management framework include, among others: consultation, data accessibility and recognition of gaps, industry and community contingency planning and stakeholder roles and responsibilities.

The Framework then covers the required components for an effective management framework along with an accompanying description of the means to accomplish each. For example, the Manufacturing phase constitutes the actual commercial production of chemicals. Manufacturers are encouraged to develop and apply standard operating procedures (SOPs) to cover all routine day to day operations. A Best Management Practices (BMPs) program can serve as an appropriate management tool to address such aspects. Organizations must determine applicable effluent and emissions standards to achieve environmental loading targets and those technologies available which are capable of achieving them. Codes of practice and standards covering siting, design, construction, operation,

decommissioning and abandonment should be followed. The management of every workplace must ensure that worker health and safety procedures are designed to take account of design, operation and continuous improvement, change, demonstration and documentation, training and monitoring. Emergency contingency standards should cover events such as start-ups, shut-downs, process changes, power failure and accidents. Reference should be made to the Emergency Planning Standard (CAN/CSA-Z731-M) from the Canadian Standards Association for guidance. Other documents such as the Community Awareness and Emergency Response (CAER) Code of Practice from CCPA can provide assistance in community planning and awareness involving all relevant stakeholders eg.the fire department, police, emergency measures, hospital, municipal officials and the public. Organizations should consider trial runs and exercises of emergency response procedures, provision of information on potential hazards and a coordinated emergency response capability between the public and private sectors. Companies must strive to continuously improve processes and modify plants in order to reduce, reuse and recycle. Finally, although the focus of the framework concerns new chemicals, companies must also periodically evaluate existing chemicals. Chemical uses, exposures, environmental and human health effects should also be considered while taking account of changing use patterns, information or data requirements.

The recommended components of the other life-cycle stages required to achieve that high level of safety consciousness mentioned above are presented in a similar manner in the Framework.

The Workshop Process

A comprehensive Hazardous Chemicals Life-Cycle Management project should contain the following elements:

- Technology transfer
- Community dialogue
- Public awareness

Initial work in this program is concentrating on this technology transfer aspect, looking at safety and management in hazardous chemicals handling more than proprietary processes and hardware. The preferred method of accomplishing this is through the workshop process, as was demonstrated by the success of the 1991 HF which was co-sponsored by Environment Canada and MIACC.

This current workshop will focus on chlorine and has been designed to emphasize the manufacturing, transportation, distribution and end-use phases of the life-cycle. The program will begin with presentations on the generic management framework, CCPA's Responsible Care Program and the work of the US-based Chlorine Institute. The workshops on the first day will be sector-specific for manufacture, transportation, distribution and use. Discussions will centre on what's being done well within each sector, where there may be deficiencies and possible gaps. People will be asked to highlight any concerns with other phases as well. Workshops on the second day will provide an opportunity for participants from all sectors to discuss common issues and concerns and work to resolve these in a systematic manner in order to establish a continuum of effective chemical management practices.

Findings will be used to validate and further refine the generic framework for chemical life-cycle management. CCPA and its member companies manufacturing chlorine will also be interested to see how the Responsible Care Codes satisfy specific life-cycle management requirements for this chemical.