After consuming nearly 1,400 tons of CFCs a year, one company declared its commitment to ODS elimination.

Environmentally Clean Activity: The Seiko Epson Story

In August 1988, Seiko Epson Corporation, a manufacturer consuming nearly 1,400 tons of chlorofluorocarbons (CFCs) a year, became the first company in Japan to declare its commitment to eliminating ozone-depleting substances. In October 1992, it achieved this goal, 17 months ahead of schedule.

Seiko Epson's overseas affiliates began preparing their CFC-elimination campaigns in March 1991. Their goal was to totally eliminate CFCs by March 1994. Thanks to technology transfers and close cooperation between these companies and the related divisions in Japan, steady progress was made. By March 1993, one year ahead of schedule, Singapore Epson Industrial Pte., Epson Portland Inc., and seven other overseas affiliates had already phased out CFCs. The rest of the affiliated companies finished right on schedule.

The key to elimination was to go back to square one and ask ourselves why we used CFCs in the first place. Could we design processes that did not require a cleaning step or the use of alternative agents? We looked at the processes and worked with chemical and equipment manufacturers to find answers to these questions. As a result, the Seiko Epson group has reaped rewards that go far beyond-the elimination of CFCs.

To promote the CFC-elimination program, an internal CFC Phase-Out Center carried out a variety of activities to build a consensus and a common sense of purpose within the company. Original posters, stickers and T-shirts created by Seiko Epson designers made an especially important contribution. In particular, the annual posters showed clearly the objectives and significance of the CFC-elimination activities and the progress toward the goal: with their Innovative designs, they attracted an international response.

Another prominent factor in Seiko Epson's CFC-free campaign has been its emphasis on solving this global issue through cooperation first rather than competition. The company has taken a positive attitude toward publicizing its newly developed technologies and experiences. As well as responding to coverage by the media, it has welcomed missions from such international bodies as the United Nations Environment Programme, the Industry Cooperative for Ozone Layer Protection, and Hong Kong Government Environmental Protection Department. Seiko Epson has also provided information to Japanese organizations and manufacturers. In recognition of this company-wide effort to eliminate CFCs, Seiko Epson received the Stratospheric Ozone Protection Award from the U.S. Environmental Protection Agency in September 1992.

Epson Electronics Trading Ltd., Taiwan Branch (ETT), an Epson sales affiliate, was instrumental in organizing a March 1993 seminar on CFC-reducing technology for the Chinese National Federation of Industries. As part of its overall effort to contribute to Taiwanese society, ETT sent instructors to the seminar and supplied individual corporate guidance in order to introduce the Seiko Epson group's CFC-free technology to Taiwanese companies.

Exploiting Traditional Cleaning and Water Treatment Technologies to Eliminate CFCs

Seiko Epson has carried out long-term, original research into the treatment of wastewater from plating processes - processes essential to watchmaking, the roots of the enterprise. This research contributed immensely to our switch from CFCs to water-based cleaning processes.

Seiko Epson carried out its CFC-free campaign in several stages. First it reviewed its cleaning processes and eliminated unnecessary steps. Then it considered whether noncleaning was an option. Finally, when cleaning operations could not be eliminated, the company switched to water-based cleaning processes, on the premise that the new process would not create another source of pollution.

The company reviewed and tweaked its cleaning operations. It reduced cleaning frequencies, it began using vacuum packs to transport parts between processes, and it found ways to prevent CFCs from evaporating from containers. The cumulative effect of these adjustments was amazingly high, accounting for 27% of the total reduction of CFCs in fiscal 1989. During its search for ways to eliminate cleaning processes altogether, Seiko Epson experimented with using an extremely inactive type of flux for printed circuit boards,

using a volatile anticorrosive agent and implementing design changes.

The main technological developments are described below.

Spin-drying: involves washing parts with pure water and then removing the drops of water by spin-drying. This method of drying, which is used especially for parts with complex shapes, has been sped up by adding hot-air blowing.

Pure-water extraction drying: utilizing the surface tension of water. this technique serves as an alternative to the drying method that previously ranked on top of the company's use of CFCs. Items are cleaned in pure water at 50^0-60^0 C and then lifted out slowly. Drawn away by the surface tension, no drops of water remain on the surface of the item, which emerges in an almost dry state. This method is very suitable for board-like items and is used for liquid-crystal panels and glass molds for plastic eyeglass lenses.

In-line shower cleaning: The aqua-cleaning equipment, developed jointly with an equipment manufacturer, uses such substances as an alkaline detergent and high-grade alcohol and removes fluxes by using a water-shower method. The technique is used for cleaning printed circuit boards after they have been soldered.

Lot-processing jet-cleaning: employing the same cleaning agents as the above method, this technique, a Seiko Epson original, enables the simultaneous cleaning of a large number of printed circuit boards by means of a jet

Germany, where environmental awareness runs high, has responded to the tremendous increase in the volume of refuse in recent years by enacting regulations to prevent packaging waste. The regulations, which stipulate that companies must take responsibility for the retrieval and recycling of all packaging used in their corporate activities, have been implemented in stages: transportation packaging from December 1991, outer packaging from April 1992 and sales packaging from January 1993.

The Seiko Epson group, led by the European headquarters of Epson Europe B. V. in the Netherlands and Epson Deutschland GmbH in Germany, has set about responding to these regulations and otherwise developing packaging that does not burden the environment.

The group is already using the "Europallet," a standard European pallet that can be used repeatedly for its transportation packaging. With regard to sales packaging, the Seiko Epson group belongs to Dual System Deutschiand GmbHm (DSD), a retrieval and recycling business established by 400 firms in Germany. The group has carried the DSD's "Green Point" mark, a sign of participation, on its finished-product packaging for printers, computers, liquid-crystal televisions and other goods since July 1992. The group has also switched from using Styrofoam to using "pulp molds" made from recycled pulp for the inner packaging for its liquidcrystal televisions.

Case 2:
Response to battery regulations in the United States

battery-run products are ubiquitous, but not only are the mercury, cadmium and other heavy metals contained in these batteries harmful to the human body, they are also precious resources. These concerns have given rise to a rapidly growing movement to recycle used batteries rather than dispose of them in landfills.

The United States has enacted regulations that define used batteries as harmful substances and stipulate that states have an obligation to (1) retrieve used mercury batteries, (2) retrieve other harmful used batteries, (3) make batteries easily removable, and (4) label batteries or equipment containing batteries with information on disposal methods and a recycling mark.

The Seiko Epson group abandoned the use of restricted mercury batteries. As for the retrieval of used batteries, Epson America Inc. has joined the nonprofit Portable Rechargeable Battery Association (PRBA), founded by battery manufacturers in Europe, Japan and the United States to establish a system for retrieving and recycling nickelcadmium and other small rechargeable batteries. The Seiko Epson group also includes instructions on how to dispose of batteries in manuals and has adopted designs that facilitate battery removal.

spray from a nozzle installed in the tank,

While considerable difficulties were encountered, the company was able to establish the same level of product quality as before. Seiko Epson's existing cleaning and water-recycling technologies contributed a great deal to a smooth switch from CFCs to water-based cleaning.

In March 1992, with CFC elimination within sight, Seiko Epson commenced activities aimed at completely eliminating two more newly-restricted ozone-depleting substances, 1.1.1-trichloroethane and carbon tetrachloride. The company set a goal of totally eliminating these substances by the end of March 1994.

Preserving the Irreplaceable Environment

Eliminating CFCs was only Seiko Epson's first step in handling environmental problems: a manufacturer must pay attention to environmental concerns at every stage of the product cycle, from production to disposal.

Seiko Epson uses the Earth's finite resources and energy to create products that contribute to a better, more affluent life. At the same time, the company has long sought to develop activities that prevent and control the exhaustion of resources and the pollution of air, water and soil. Epson feels that this is part of its responsibility to

the local and global community.

Seiko Epson seeks to minimize the burden placed on the environment in the various stages of manufacture, distribution, consumption and disposal. The company's practical programs include activities to (1) reduce. reuse and recycle resources, (2) design parts for long life and ease of disassembly and recycling and (3) develop manufacturing processes that do not use, create or discharge toxic or harmful substances.

In October 1992, Seiko Epson established the "Environmentally-Sound Manufacturing Special Expert Committee". This committee, which focuses on product development and design, aims to develop and design products that realize outstanding resource conservation and recyclability. The committee is currently working on assessing the environmental impact of products.

Seiko Epson is also pressing ahead with activities to reduce the volume of waste in the manufacturing process, to review methods of distribution and to establish systems for the retrieval and recycling of distribution materials and used products.

Resources and energy are finite, as is the natural capacity of the ecological system to clean and renew itself. Human economic activity is putting pressure on the environment and it is widely recognized that a preservation effort is needed. While one company can't solve this problem alone, Seiko Epson is attempting to do its part. The experience and confidence gained by meeting the challenge of becoming a CFC-free enterprise have given Seiko Epson the courage to strive farther towards becoming an environmentally clean manufacturer. By fulfilling its responsibility to the community, Seiko Epson intends to be a good company, trusted in every part of the world. PC