



Terrence McCarthy for The New York Times

At the International Business Machines Corporation's disk-drive factory in San Jose, Calif., Mike Carrol, of the manufacturing engineering division,

monitors electronic components in a cleansing process that has replaced chlorofluorocarbons with soapy water.

## Moving Fast to Protect Ozone Layer

BY ANDREW POLLACK

Special to The New York Times

**SAN JOSE, Calif.** — The nation's leading electronics companies are moving more rapidly than they expected to phase out the use of industrial cleansers that damage the earth's protective ozone layer.

Only a few years ago, the companies predicted that no suitable substitute could be found for the chemicals, known as chlorofluorocarbons, used in the vital process of cleaning circuit boards and sensitive electronic components. But to their surprise, they have developed alternatives — including warm, soapy water — that in some cases are better and less expensive than CFC's. Some companies have revamped their manufacturing methods to produce circuit boards that need no cleaning at all.

Environmentalists say the rapid progress demonstrates how unfounded the industry's complaints

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about the burden of environmental regulations can be. They say the CFC experience shows what can happen when companies stop fighting environmental measures and instead seek to carry them out.

"This is just another example of how when push comes to shove, you can get beyond the first line of defense," said Ted Smith, the executive director of the Silicon Valley Toxics Coalition, a group that monitors pollution by electronics companies here. "For all the moaning that went on, it really has not been a significant

technical problem."

David Doniger, the senior lawyer for the Natural Resources Defense Council, an environmental group, said the CFC example had important implications for other concerns, including how much time the industry should have to reduce fossil-fuel use, which contributes to global warming. Environmentalists cite other examples, such as the elimination of CFC from aerosol cans and the formulation of cleaner gasolines.

Industry executives are divided on whether other environmental goals can be met as readily as the phasing out of CFC's. But some say that with sufficient determination industry can indeed solve other problems. "If the Federal Government set a goal that there would be no fossil fuels sold by 1994, I bet you we would see electric cars by then," said George Allen, the chemist in charge of CFC reduction

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## Icahn Sale Of USX Stock Seen

### 13.3% Stakes in Both Energy and Steel Units Are Traded

By The Associated Press

Carl C. Icahn apparently sold his holdings in the USX Corporation yesterday, ending a long and tempestuous relationship with the steel and energy conglomerate.

A week after USX shareholders approved the separation of the company's stock into two classes — one for its steel business, the other for energy — blocks representing 13.3 percent of each class were traded on the New York Stock Exchange.

Mr. Icahn, the company's largest shareholder, held exactly that percentage.

The blocks traded at \$25 a share, with 33,918,600 shares of USX-Mara-thon being sold and 6,783,700 of USX-U.S. Steel. Total proceeds of the two blocks were \$1.02 billion.

Mr. Icahn built up his stake in 1986, and appeared to have a profit of around \$200 million on the sale. But that figure does not include either the costs of proxy fights he waged or the proceeds from dividends over the years.

The takeover strategist and chairman of Trans World Airlines was not in his office when a reporter called for comment. Bloomberg Business News quoted Dan Herring, a spokesman for USX, as saying it appeared that Mr. Icahn had been the seller. He said the block trades had been handled jointly by three leading brokers, Lehman Brothers, Goldman Sachs and Salomon Brothers. It appeared the buyers were institutional investors.

Mr. Icahn had been expected to unload his holdings once USX shareholders approved the creation of two classes of stock.

#### Standstill Agreement Signed

In January, after management agreed to split the stock, the financier signed what is known as a standstill agreement, under which he could not acquire any more USX shares or pursue a takeover.

Mr. Icahn had long argued that USX's laggard steel business drained profits away from the company's energy operations — including the Marathon Oil Company — and depressed USX stock. He put pressure on management to spin off or sell U.S.

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at Apple Computer Inc.

The electronics industry's progress is most evident at the International Business Machines Corporation's sprawling disk drive factory here, which in 1987 was the nation's largest source of CFC-113 emissions. The chemical is the main type of chlorofluorocarbon used by the industry.

I.B.M. said this week that its CFC-113 emissions at the San Jose plant last year were 95 percent below the 1987 level. Officials here also hope they can eliminate the solvent's use by the end of the year, two years ahead of the corporate target date.

## High-Tech Car Wash

I.B.M., which is based in Armonk, N.Y., is replacing chlorofluorocarbons with, of all things, water. In the plant, disk-drive components are dipped in soapy water and are then carried by a moving track through various bays, where they are rinsed and dried with hot air in what resembles a miniature car wash.

"Some of the things we thought would be really big problems in 1987 turned out to not be such big problems," said June J. Andersen, the plant's manager of environmental programs. "It's hard to imagine in 1991, but in 1987 this was a hotly debated issue of whether you could water-clean the parts."

Other large companies, including the American Telephone and Telegraph Company, Northern Telecom, the Digital Equipment Corporation and Apple, have said they will eliminate CFC's by no later than 1994.

## Other Problems Remain

But some experts say problems remain. Many smaller companies have not yet taken action, for lack of money or interest. Military contractors have not moved as fast as commercial computer and telephone companies, saying that regulations gave them less freedom to alter their production processes.

"The speed at which the industry as a whole is converting is not the same as those big-name, high-profile companies," said Mr. Doniger of the Natural Resources Defense Council. He added that the electronics industry was moving faster than expected. Chlorofluorocarbons have been linked to the deterioration of the ozone layer, which in turn is expected to lead to a sharp rise in certain types of cancer. In an accord reached in Montreal in 1987 and since amended, many nations agreed to eliminate the use of CFC's by the year 2000.

## A Big User of CFC's

The electronics industry accounts for about 20 percent of the use of CFC's in the United States. The largest use, accounting for about 40 percent of consumption, is in air-conditioners and refrigerators. Another primary use is in making foam for insulation and food packaging.

The executives say all the industries that use CFC's are reconsidering their statements about how hard it would be to eliminate the chemicals. "Our views have changed on how quickly it could be done," said Kevin Fay, the executive director of the Alliance for Responsible CFC Policy, an industry lobbying group. He said that makers of refrigerators, air-conditioners and foam insulation were shifting toward alternatives, though in some cases these are other fluorocarbon-based chemicals less harmful to the ozone layer than the ones they replace.

## Du Pont's Prediction

But the electronics industry's progress has been particularly fast—especially considering that a few years ago, an expert at Du Pont, the leading manufacturer of CFC's, predicted that CFC-113 would be the most difficult type to replace.

CFC-113 is mainly used to clean printed circuit boards of the residue

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that remains after chips and other components are soldered on. The residue can cause corrosion, leading to a breakdown of the computer.

Such cleaning is becoming more important and more difficult, as the industry develops more complex products. Chlorofluorocarbons not only cleaned all the nooks and crannies well, it was also non-toxic, nonflammable and inexpensive.

While Du Pont and others have developed some alternatives to CFC-113, many electronics companies have not waited. Some use water to clean components, while others have turned to a solvent made from terpenes, chemicals that are extracted from orange rinds.

## Modifying the Process

And other companies, like Northern Telecom and Apple Computer, are modifying their soldering process so that circuit boards do not have to be cleaned at all. This not only eliminates CFC's but also saves a step in manufacturing, and eliminates the need for water and for waste-water disposal, which are drawbacks of the other approaches.

"When you go to an electronics conference today, people complain that there are so many choices, not that they don't know what to do," said Stephen Andersen, an official of the Environmental Protection Agency who works with electronics companies. "That's a real turnaround from when they were saying 'Goodbye computers.'"

The industry executives say that cleaning processes must be tailored for each product or assembly line and that no CFC substitutes have been found for some areas. "There is no one magic drop-in solution," said David R. Chittick, A.T.&T.'s vice president for environment and safety. The telephone company is aiming to end its use of CFC's by 1994.

## Just as Good, Even Better

The executives say that in some cases the alternatives clean as well as CFC's or even better. And in some cases, the alternatives are also less expensive, although there can be high initial costs.

"We've shortened the process, gotten better-quality boards; it's been more helpful to the environment, and we've saved money," said Margaret G. Kerr, the vice president of health and safety for Northern Telecom. The Canadian telecommunications equipment manufacturer has pledged to eliminate CFC's by the end of the year, earlier than most companies.

A I.B.M. spokesman said the company was expected to have spent about \$100 million in capital and personnel costs by 1993, its target for eliminating CFC's from its plants worldwide. He said I.B.M. did not expect to save money over all. But at the San Jose plant, Dr. Andersen said she expected savings to pay for the cost of new cleaning equipment in three years.

## Reasons for Progress

There are several reasons for the electronic industry's progress. It is used to rapid change because of technological advances. A Federal tax that has more than doubled the price of CFC's is scheduled to keep rising. And some environmentalists speculate that the industry, which has generally enjoyed a reputation as nonpolluting, was growing uncomfortable being blamed for contributing to ozone destruction.

But the industry executives say the secret was to consider the goal a challenge, like developing a new product, rather than merely doing the minimum to comply with guidelines.

"I've never seen a project with this level of grass-roots motivation by the engineering team," said Dr. Andersen of I.B.M. "They got convinced that this was the right thing to do."

## U.S. Petroleum Data

In millions of barrels except refinery utilization

	May 10 1991	May 3 1991	May 11 1990
Gasoline production, daily	7.0	6.8	6.7
Distillate production, daily	2.9	2.9	2.9
Gasoline stocks	206.2	204.3	215.0
Distillate stocks	101.7	101.3	96.8
Crude imports, daily	6.2	5.2	6.3
Product imports, daily	2.2	2.0	2.5
Crude stocks	338.7	338.6	376.2
Crude production, daily	7.4	7.4	7.3
Refinery utilization (%)	87.0	86.1	84.2

Source: American Petroleum Institute