

High-Tech industry is viewed globally as more than a direct source of jobs and economic activity. It is considered the model for a new type of industry. In many ways, high-tech is different from other manufacturing industries, but it is no better. To protect the environment, high-tech production must be subject to regulation and public scrutiny. The shift of semiconductor production from Silicon Valley has not eliminated the toxic risks of high tech; it has spread it.

Through the early 1980's, most people in Silicon Valley considered electronics production a clean, light industry. The products dripped no oil. The factories boasted no smokestacks. Some production - such as wafer fabrication - took place in "clean rooms," in which workers wore ultra-clean "bunny suits."

In fact, semiconductor production has always used a wide variety of extremely toxic substances, including acids, ethers, solvents, and lethal gases such as arsine. Printed circuit production uses and releases heavy metals into the environment. Disk drive producers used chlorofluorocarbons. And the products' intolerance for physical impurities meant that solvents were used on just about everything.

High-tech production - unlike microcomputer operating systems - is a classically competitive industry. Producers compete by lowering prices and introducing both innovative product and process technologies. Firms tend to be run by engineers - often their founders. Top managers resent interference from government, community groups, organized labor, and even their investors.

In the early 1980's, throughout Silicon Valley, chemicals were discovered to be oozing into the groundwater from leaking underground storage tanks. The county's fire chiefs, the new Silicon Valley Toxics Coalition, and others demanded strict regulation of chemical storage. The oil companies unsuccessfully fought regulation tooth and nail, while the representatives of large high-tech companies merely fought for rules with which they could practically comply.

As U.S. EPA and the Regional Water Board considered remedies for the numerous toxic sites in the Valley, high-tech polluters grudgingly complied. Still, they remained reluctant to work with the people - workers and neighbors - who breathe their fumes and drink their contaminated water. They were slow to consider cleaner production technologies, and they still don't seem to do much to protect production workers. Problems are less visible in the Valley, however, since semiconductor companies have moved the bulk of their manufacturing elsewhere. And most of the Valley's phenomenal growth is in software, which generally does not pollute - at least in the conventional sense.

The emergence of Moffett Naval Air Station as a major Superfund site in the late 1980's illustrates high-tech industry's relative hostility to oversight. At Moffett, the Navy convened a technical review committee and later a restoration advisory. Moffett has served as a national model for public participation in the oversight of cleanup, demonstrating that if you give the troublemakers a "seat at the table," they will play a constructive role. There are now similar bodies at more than 300 military bases throughout the United States. While some lack influence and a few are dominated by apologists for the military, Restoration Advisory Boards are an important vehicle for public involvement.

Moffett shares a large "regional" plume of contaminated groundwater with major high-tech companies, including Intel. EPA provided the Toxics Coalition with technical assistance grants at both sites, and it shared information with the public at both, but the private responsible parties rarely communicated with community representatives - except about Moffett Field.

Today, semiconductor producers have shifted production from the Valley to locations which generally have a weaker record of environmental protection. That's apparently not the primary cause for their new locations, but it's an important consequence. Valley production companies subcontractors still generate hazardous wastes, but strong regulation and community oversight protect the environment. Workers in many plants, however, face continuing exposures.

Semiconductor manufacturers - now conducting wafer fabrication in locations such as New Mexico, Texas, Arizona, and Oregon - have learned some of the lessons of Silicon Valley. They probably aren't losing chemicals and waste through unseen, unmonitored, unlined storage tanks. They have applied end-of-pipe solutions, but they have not fully embraced pollution prevention.

But they are slow to apply their innovative skills to pollution prevention for three reasons:

- 1) to produce more powerful products competitively, they are continuously making process improvements and using new chemicals;
- 2) the companies that design production equipment are not the ones who are held responsible for pollution;
- 3) they still resist any outside influence.

Nevertheless, for a few years there have been efforts, led by U.S. EPA, to encourage pollution prevention in the electronics industry. Those efforts test the political loyalties of the Clinton Administration: Is it more interested in pleasing the environmental movement or the owners and managers of high-tech manufacturing companies?

To be honest, I don't know how much progress is being made on this front. Based upon my work at Moffett Field, I have spent the last five years specializing in military pollution. And that provides an important contrast.

The U.S. military is one of the world's largest polluters. It probably is responsible for more toxic sites than any other organization. Most of its products are designed to be destructive.

But it is also a centrally planned, publicly owned industrial enterprise. At the highest levels, the same people are responsible for using and disposing of weapons systems and designing and procuring them.

And those top managers, through Congress, are accountable to the public.

So now the military is making "green" - that is, lead-free - bullets. More important, it is applying cradle-to-grave analysis to an increasing number of military systems, particularly munitions. The Deputy Secretary of Defense just issued a Directive requiring the sustainable management of munitions ranges. While this notion of sustainability - retaining the ability to indefinitely bomb or shell specific pieces of real estate - seems perverse, the military's new policy can be traced directly to the concerns expressed by activists who live near active military ranges.