Pollution Prevention is not a new concept. I can recall some of Polaroid's early Toxic Use and Waste Reduction (T.U.W.R.) efforts as far back as the mid-70's. My old division, the Chemical Operations group, began working with people in the process development laboratories to prioritize and work on key candidate waste streams for recycling and waste reduction efforts. The problem was that this was an adjunct to the primary job of developing chemical synthesis processes which made better and cheaper film products rather than better waste streams.

Waste minimization didn't become an important concept until the mid '80's nationally with efforts such as a study by the Office of Technology Assessment in Washington, a project Polaroid participated in. Using the O.T.A. work as a model, we began developing our program in early 1987. I was fortunate to participate as a member of the team which developed the framework for the TUWR Program, working with our C.E.O. Mac Booth towards the planned announcement of the program at the 1987 Annual Meeting.

We developed an early version of the reporting format based upon the following concepts:

1. The reporting system should serve as an overall chemical material balance around the reporting unit.
2. It should include all chemicals, regardless of toxicity or their inclusion on any Federal or State lists (remember this predated S.A.R.A. Title III).
3. It should track all waste streams in extreme detail (drum vs. bulk, physical state, TSDF destination and ultimate treatment technique).

The team then began the task of setting appropriate goals and began addressing such questions as:

1. Should we aim for reductions of 10% per yr. or 50% over 5 years? More? Less?
2. Do we reduce usage or wastes?

These and other questions resulted in compromise whereby chemicals would be slotted into four categories by a team of experts and
Recycle/reuse counted as waste reduction depending upon category. It was easy to agree that the reduction index be calculated on a per unit basis to account for changes in production schedule.

Finally, it was decided that the reduction goal would be corporate-wide and the accounting system developed to afford tracking of progress at all levels of the corporation.

The accounting system dubbed E.A.R.S. (Environmental Accounting and Reporting System), was developed for reporting quarterly via the corporate-wide VAX system already in place to allow data entry at the divisions and data base administration at the corporate level.

Chemical categories were assigned initially to ~1300 chemicals and ~200 more have been assigned since. Those chemicals having the highest environmental risk were placed into Category 1 and include substances such as acrylonitrile and Freon 11. Category 2 contains dichloromethane, ammonia and silver nitrate among others while Category 3 contains such materials as toluene, ethylene glycol and hydrochloric acid. Category 4 includes most alcohols, ketones and zinc dust and is the largest chemical category. A Category 5 was later added to track solid, non-chemical wastes such as paper, plastics and molded metal products.

The final product, announced in 1987, set a 5 year goal of 10% reduction per year in usage of Category 1 and 2 Chemicals and 10% per year reduction of waste by-products of Category 3, 4 and 5 materials. The Category 3 reduction allows credit for on-site recycle (off-site for Categories 4 and 5) providing the generating division actually reuses the recycled materials. The program also established a waste management hierarchy with preference shown to recycle over disposal and internal disposition over external handling. At the bottom of the hierarchy are emissions and land disposal.

The final goal established was a "virtual" elimination of emissions of Category 1 chemicals at the end of 5 years.

The program was initiated with 1988 as the baseline year and was to be voluntary in nature with corporate-wide (international) scope and local autonomy over accountability. I was among the early skeptics and there did not seem to be much going on well into 1989 in many areas until a Polaroid "Earth Day" was established in the Fall of 1989. It was hosted by Polaroid's Vice President of Worldwide Manufacturing and attended by the C.E.O. and ~200 officers and other operations, research, engineering and environmental types. Plant Managers had to present their TURW progress reports to this corporate-wide forum. In my opinion, this was the first time many of them thought much about their waste minimization efforts. I think we turned the corner that day.

Now, Polaroid has made an annual event of this "Earth Day" process and has instituted several other waste reduction forums such as Waste Reduction University (an all day exchange of ideas held at Bentley College), a waste reduction newsletter issued periodically to all
employees, a grassroots Waste Reduction Now program and an annual awards program where ~ 20 employees are awarded plaques by the C.E.O. at a luncheon he hosts.

In order to achieve successful waste reduction, a cooperative effort was needed involving operations, R&D and engineering representatives. The company is now committing significant capital spending to the program, encouraging toxic use reduction via process changes and funding installation of solvent recovery systems. It has been recognized that different T.U.R. techniques are required in the varied divisions with such diverse products as chemicals (dyes and polymers), photographic negative, cameras, film (assembly), coated sheet and the film pack battery. Thus, each division is encouraged to manage its own program while drawing on the resources of the corporation as needed.

Today, I'm going to summarize five case studies which illustrate the diversity of the projects encountered.

The Camera Division replaced degreasing equipment which resulted in increased condensing/recycling capability and an 80% reduction in Freon. Meanwhile, the Battery Division completely eliminated the small quantity of mercury in our battery, giving up a small amount of energy for a major environmental benefit. The Chemical Operations Division has, among its many successes, managed to replace the chemical sodium chromate which was used as an oxidizing agent in a synthesis with air as the oxidant. One can be sure air is lower on Polaroid's list of toxics than sodium chromate!

The Industrial Coatings group has already converted one solvent based coating mix to an aqueous system and has committed to the same for its primary product, a coating fluid containing a four-solvent system which is virtually impossible to recycle.

Finally, two groups have instituted an interdivisional waste reduction program where a methanol-caustic waste from one division is sent to another who separates the two components and reuses the caustic as a neutralizing agent in the plant. By the end of 1991, the methanol was also being reused, in this case by the generator.

At this point, we are trying to fit the T.U.W.R. Program into other on-going initiatives such as S.A.R.A. Title III (TRI), EPA's Industrial Toxics Program, Clean Air Act Amendment reductions and Massachusetts' Toxics Use Reduction Act (T.U.R.A.).

Polaroid is now targeting S.A.R.A. TRI reductions in our EARS reports and will attempt to modify the data base to allow us to cull the S.A.R.A. Form R reports directly out of EARS. In addition, we have recently "signed up" for EPA's voluntary Industrial Toxics Program (ITP), recommending to the EPA that we use our existing program to generate the data. Of course, the EPA's program is emissions reduction oriented while ours measures reductions in total "toxics" used or generated as wastes, depending upon the category.
With regards to C.A.A. Amendment compliance, we are currently looking at the potential for utilizing our T.U.W.R. Program to achieve Air Toxics reductions of at least 90% in order to achieve M.A.C.T. early reduction credits.

Finally, we are now in the midst of preparing our second annual T.U.R.A. reports (Form S's which complement Form Rs), using EARS data as much as possible to generate the data. It will require considerable modifications and reprogramming of EARS to allow data reporting as required by the Form Ss and for appropriate Production Units. This may be accomplished in time for the reports due July 1, 1993.

The main thing our program will do for T.U.R.A. will be to help us achieve its goals since we are aiming for 50% reduction by 1993 using 1988 as the baseline year. Conversely, T.U.R.A. will help us achieve the T.U.W.R. Program goals by forcing us to report (and evaluate) each production unit annually. In addition, it will probably spur a second generation T.U.W.R. Program when T.U.R. Plans are required biennially beginning in 1994.

At this point we have achieved an ~ 25% reduction corporate-wide after the first three years but are experiencing some difficulty in the third and fourth years. The "low hanging fruit" has now been picked and some of the substantial process changes (use reduction) and new solvent recovery systems will take a year or more to implement, putting the company back on-line to achieve its goals by the end of 1993.