

A25

A15

## CASE STUDY OF WATER CONSERVATION EFFORTS

ANTHONY M. DeFONZO

B.S.M.E., Licensed Professional Engineer  
Executive Director, Engineering & Plant Services  
Pharmaceuticals Division  
CIBA-GEIGY Corporation  
Summit, New Jersey U.S.A.

### SYNOPSIS

The 1980-81 drought in the northern portion of the State of New Jersey severely impacted on the operations of CIBA-GEIGY's U.S. Pharmaceuticals Division. Action by the Governor of the State mandated a 25% reduction of water usage on the part of industry. This presentation briefly describes the activities at this plant highlighting those operations which are very water dependent. Conservation activities are discussed in detail including the involvement and reliance upon operating personnel. Future plans for water conservation projects are mentioned and, finally, results of the overall program are discussed, indicating actual volume of water conserved.

## Résumé

La sécheresse de 1980-81 dans la partie Nord de l'Etat du New-Jersey a produit un impact sévère dans les opérations de la division pharmaceutique de CIBA-GEIGY, Etats Unis. Les mesures prescrites par le gouverneur de l'Etat mandant une réduction de 25% de l'usage de l'eau par l'industrie. Cette présentation décrit brièvement les activités de notre usine rehaussant ces opérations qui dependent beaucoup de l'eau. Ces mesures de conservation sont discutées en détail, y compris les implications et la collaboration demandée du personnel opératoire. Des plans futurs pour la conservation d'eau sont mentionnés, et finalement les résultats d'un programme général sont discutés, indiquant le volume actuel de la conservation d'eau.

## Synopsis

La sequia de 1980-81 en la parte norte del Estado de Nueva Jersey impacto severamente las operaciones de CIBA-GEIGY U.S. Division Farmaceutica. El Gobernador del Estado de Nueva Jersey ordeno una reduccion en el consumo del aqua en la industria de un 25%. Esta presentacion describe brevemente las actividades de esta planta mencionando las operaciones las cuales dependen mucho del aqua. Actividades de conservacion son discutidas en detalle encluyendo la participacion y confianza depositada en el personal de operacion. Planes futuros de proyectos para conservacion de aqua son mencionados y finalmente los resultados del programa general son discutidos, indicando el volumen actual de aqua ahorrado.

CIBA-GEIGY Corporation is the wholly-owned U.S. subsidiary of CIBA-GEIGY Limited of Basle, Switzerland. The Summit, New Jersey site is the headquarters and primary production facility for the Pharmaceuticals Division of CIBA-GEIGY Corporation.

To give you just a brief overview of our operations there, let me relate some statistics: The Pharmaceuticals Division employs about 3,000 people of whom, roughly, 1,600 are at the Summit facility. At this site we will find representation of all disciplines; that is, Administration, Medical, Marketing, Research and Production. The 1980 sales for this division amounted to approximately \$325 million.

The Summit site is organized somewhat in a campus arrangement consisting of 34 buildings on about 100 acres (40.47 hectares) of land. These buildings are grouped generally in a functional arrangement; that is, the Administrative buildings are located at the front of the facility, followed directly by a group of research buildings, a Pilot Plant, Chemical Production buildings, Pharmaceutical Production, Pharmacy Research and Drug Metabolism. We are presently engaged in the construction of a 12,000 sq. meter Toxicology facility.

Enough for the geographical configuration and physical background. The summer of 1980 was an extremely dry one and in that September, the Governor of the State declared the existence of a drought emergency situation. Basically, this banned the outdoor usage of potable water.

The fall and winter weather of 1980-81 continued to be rainless. In fact, December, 1980 and January, 1981 were the driest two months ever recorded in the area. In February of 1981, the Governor imposed certain other restrictions: that each person at home restrict water consumption to 50 gallons (189.25 liters) per day and that industrial operations reduce consumption by 25% as compared with established records.

In order to meet this mandate, many actions had to be taken within the operation of our facility. In order to fully explain these actions and to later totally understand the results of our efforts, we must see a little more of the facility's physical make-up.

There are six wells on the plant property capable of producing about 680 gallons (2573.8 liters) of water per minute. This water is pumped to a 150,000 gallon (567,750 liters) storage tank, then chlorinated and distributed to most of the site. As the tank approaches a low level, it is made up via purchased water from a local purveyor; in this case, the Commonwealth Water Company.

There are three separate feeders to the plant from this water company. By means of a network of valves and piping, it is possible to distribute water from either or both sources.

Because of the nature of the different activities of the groups here at CIBA-GEIGY, our use of water varies considerably. For example:

1. Very refined water is used in our Research Laboratories, Pharmaceutical Production and Sterile Products.
2. Treated water is used in our heating and cooling systems.
3. Domestic water is used in our cafeteria, drinking fountains, men's and ladies' rooms, locker rooms, and showers.

4. Recovered water is used in some of our Chemical Manufacturing processes.

In 1979, we used 318 million gallons (1203 million liters) of water. 139 million gallons (526 million liters) were from city water sources and 179 million gallons (678 million liters) from our on-site well system.

During the past five to six years we have been actively engaged in an energy conservation program in an effort to counter the ever rising cost of energies. Some of the actions taken to reduce energy consumption carry with them the inherent conservation of water. Let me give an example:

In 1976 we installed a building utilities automation system for the purpose of managing the operation of our major building environmental systems. Between 1976 and 1980, we have managed to reduce our fuel oil consumption by 640,000 gallons (2,422,400 liters). Accordingly, our boiler make-up water and blow-down were reduced in proportion to that amount of steam we avoided using. Water consumption during this same time period very closely follows the same pattern demonstrating a reduction of some 65 million gallons (246 million liters).

In another energy saving project, we installed a condensate return from our Pharmacy Research building. At the time of construction of this facility it was deemed cost effective to eliminate the return piping and simply waste the condensate. Recently, installation of the return system was justified simply by the heat energy recovered. The water saved was just an added benefit.

During the same time period, our production volume increased somewhat.

Just prior to Governor Byrne's Executive Order in 1980, we implemented what was being asked of the home owner and other industries.

We stopped watering the lawn. Since the Summit site is like a college campus and we take pride in its appearance, this was somewhat distressing.

We stopped the washing of our fleet cars and trucks.

We stopped the use of water in our on-going training of our in-house fire department.

We then started to make our employees aware of the water emergency by means of our weekly and desk top publications.

We posted reminders in each men's and ladies' rooms to conserve water.

Since our cafeteria serves approximately 800 people per day, we knew there was a large volume of water used to wash the dishes and utensils.

We advised our cafeteria manager to use plastic utensils and paper plates. This was done at a slightly additional operating cost.

As a result of this and other measures taken in the administration buildings and the cafeteria, we estimate the reduction of 30,000 gallons (113,550 liters) of water per week.

We then contacted the operating heads of Chemical Manufacturing, Pharmaceutical Production and Research and asked for their cooperation in making their people conscious of water waste.

We asked them to review and modify equipment washing techniques.

They shut down steam jet vacuum systems and water ring vacuum pumps when not in use.

They optimized various heat exchangers for minimum water consumption.

We shut down automatic flushing of dog cages in our vivarium building.

We optimized cage and glass washing cycles.

Two water cooled air conditioning chillers were shut off to conserve water.

Our Maintenance Department took a very active part in reducing water consumption:

1. They adjusted all urinal and toilet flush-o-meters to minimum operating point.
2. We inspected and repaired all leaking fixtures, hoses, sprays, etc.
3. We set and verified hot water temperature for non-process use at 105° F.
4. We minimized boiler and water cooling tower blowdowns.
5. We installed self closing foot pedal water dispensers in laboratories wherever possible.
6. We deactivated electric eye actuated water faucets in Pharmaceutical Production. This was originally installed as a reminder to employees to wash their hands before returning to the production line.
7. We maximized the use of Building "S" cooling water tower for process cooling. This reduced the amount of well water consumption.
8. We modified certain heat exchangers to provide for water recycling.
9. This recycled water goes to an 80,000 gallon (302,800 liters) cooling water recovery tank. The recycled water is used in this solvent recovery still.
10. Resins were changed in two D.I. units which helps to optimize operation and reduce rinse time. A total of 1,400 gallons (5,299 liters) of water per regeneration was saved.
11. We reduced pre-rinse and final rinse times on all water softeners; saving an average of 600 to 800 gallons (2,271 to 3,028 liters) per regeneration.
12. All stills were adjusted for optimum operation.
13. Piping modifications were made on the fire tank pump engine by returning normally discharged cooling water back to the storage tank. This saved 25,000 gallons (94,625 liters) per year.
14. New shower valves and flow restrictors were installed.

15. Waste water from ice house was piped to the recovered water tank.
16. Finally, weekly water meter readings are taken to maintain accurate records of both city and well water consumption.

We presently have an Employee Energy Awareness Program at Summit. This program is designed to make employees aware of energy saving techniques at home and at work.

Using the same forum, we are also apprising employees of the emergency water conditions.

1. Articles for both energy and water conservation are published in our weekly "Update". These articles come from publications such as these or from newspapers and magazines.
2. We gave out water saving flow restrictors to each employee. This flow restrictor can easily be installed in a shower head to reduce water flow.
3. Water and energy saving shower heads and aerators will be sold in the company store at reduced rates. (40% below retail).
4. We are encouraging both water and energy saving ideas by supplementing the Employee Suggestion Program with T-Shirts and hats in addition to cash awards.
5. Government and private publications are obtained and passed on to employees by means of several displays located throughout the site.
6. Finally, we are in the process of developing a mail order store whereby employees can purchase both water and energy saving devices.

There are four projects presently being engineered to save water in the future.

1. We are activating a seventh well which has not been in operation for ten years.

This project calls for the purchase and installation of a new deep well pump and some piping modifications.

2. We are presently expanding our building management computer system.

This project will allow us to easily expand the system without manufacturer input.

Our plans are to connect water consuming process equipment (vacuum pumps, air compressors) to the computer system and shut this equipment down during non-operating hours.

If the area supervisor needs this equipment, he must contact the computer operator.

3. I mentioned before the shutting down of two water consuming air conditioners. Since that time we have eliminated that equipment by repiping chilled water from adjacent closed loop systems.

4. We are actively studying the future installation of a process cooling tower for our Chemical Manufacturing area.

This will provide cooling water for some 43 reactors and 52 condensers, and will significantly reduce water consumption in Chemical Manufacturing.

I would like now to review our results.

Our main objective is to reduce the total consumption of water.

Our second objective is to reduce consumption of city water.

We are doing this by maximizing well water consumption. This is accomplished by setting the water tower level control low enough as not to use city make-up water.

The water used during the day is replenished by well water at night so we start off with a full tank the next working day.

As you can see by the graph, we have met our objectives, that is for both total and city water consumption.

We attribute the success we have realized to the positive environment we have been able to generate.

We have convinced our management that it makes good sense and saves dollars to conserve. We have instilled awareness in our employees by involving them, recognizing their contributions and otherwise rewarding them.

We have converted the problem of a shortage of water to an opportunity to be innovative.