CHAPTER 4

BOTTLED WATER: AN ALTERNATIVE SOURCE OF SAFE DRINKING WATER

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Americans, in growing numbers, are turning to bottled water to quench their thirst. Last year, the bottled water industry served about 15 billion glassfuls of water to more than 12 million consumers in every state of the Union. According to trade statistics, the number of people drinking bottled water is increasing at more than 10 percent per year. At current growth rates, industry sales could top $1 billion by 1985.

The most frequently asked question about the industry is, why do people buy bottled water? Until recently the answer has been threefold: to satisfy a special dietary need, as a source of safe drinking water in times of emergency, and for aesthetic reasons. Bottled water is recommended and often medically-prescribed for pregnant women and infants in areas where nitrate levels in a local water supply are excessive, for individuals on sodium restricted diets, and to protect children from mottled teeth in regions where fluoride levels are too high.

Use of bottled water in emergency situations caused by floods, earthquakes, and hurricanes is a matter of record. Bottled water also is used as an alternative source of drinking water when the safety of a community water supply is compromised by contaminants of natural or industrial origin. Asbestos in Duluth, radioactivity at Three Mile Island, nitrates and selenium in Wyoming, and pesticides in Hawaii are illustrative of just some of the reasons why and locations where bottled water has proven invaluable in times of emergency -- a use now officially recognized by the Department of Interior and in EPA's National Contingency Plan under the Superfund Act.

Aesthetic factors are the driving force behind most purchases of bottled water. Consumer demand for water that

looks clean and tastes good readily explains why bottled water sales are concentrated in geographic areas where the aesthetic quality of water is poor. Per capita consumption of bottled water is greatest in the Southwest, where growing populations and limited water supplies combine to push total dissolved solids (TDS) levels up and consumer acceptance down. For example, bottled water use in Southern California exceeds the national average by sixfold. Nationwide, one consumer in 18 uses bottled water. California, where one of every six consumers drinks bottled water, tops the national average by three-fold. In Southern California, the pace-setter, one of every three consumers uses bottled water both at home and when away from home.

Today, health considerations, in addition to dietary, emergency, and aesthetic factors, are beginning to affect buying habits. Even though the bottled water industry makes no health claims, customer inquiries and consumer interviews reflect a growing public concern about the safety of public and private water supplies.

Although a wide range of package sizes is available, most bottled water users are served by direct delivery of large 5-gallon bottles to homes, offices, factories, hospitals, and public facilities. This means that bottled water tends to be purchased for all members of the family or work-staff, rather than only for those individuals having special dietary needs. This trend is clearly evident in an analysis of the U.S. bottled water sales, which shows that direct delivery of 5-gallon bottles accounts for about 80% of the industy's total estimated 1982 sales of $700 million. Grocery distribution, typically in 1-gallon bottles, accounts for about 20% of total sales.

	U.S. BOTTLED WATER SALES	
	Dollar Sales (Million)	Percent (Approx.)
DIRECT DELIVERY		
Home	420	60
Institutional*	140	20
GROCERY	140	20
Total Sales	700	100

* Offices, Factories, Hospitals, Public Facilities.
Source: 1982 Industry Survey Data.

To support the quality and safety of its products, the industry is organized to ensure that each of its members (a) meets all regulatory requirements, (b) is familiar with new water treatment technology, and (c) employs accepted manufacturing practices.

The bottled water industry is represented by a trade association headquartered in Alexandria, Virginia. Formed

in 1958 as the American Bottled Water Association and renamed the International Bottled Water Association in 1981, IBWA represents over 200 bottler members who distribute more than 85% of all bottled water sold in the United States.

The chartered purpose and objectives of the Association are to:

- o Work with all legislative bodies and government agencies involved with the supply and regulation of drinking water;
- o Conduct continuing education programs to assist industry members with quality control and production procedures;
- o Facilitate exchange of technical, scientific, and governmental relations information among members.
- o Promote the production and sale of packaged drinking water.

PRODUCTS

The industry distributes four generic types of bottled water, all of which must be derived from a protected source:

- o Natural water is water obtained from a protected spring or well.
- o Mineral-free water may be produced by distillation or by demineralization.
- o Fluoridated water may originate from a natural source or may contain added fluorides in an amount ranging from 0.8 to 1.7 milligrams per liter, depending on the annual average daily air temperature at the location where the bottled water is sold.

PROCESSES

All bottled water is processed in some manner. IBWA membership standards require that any non-chlorinated public water supply be treated by mechanical filtration and ozonation prior to bottling. If a chlorinated water supply is used as the source water, activated carbon filtration and ozonation are required. If the source water is a protected private water supply, such as a spring or well, the minimum treatment required is ozonation or other acceptable means of protecting the product against bacterial contamination.

Beyond these minimum requirements, most bottled water companies employ a more sophisticated range of technologies depending on the composition of the source water and the types of end products produced. Advanced water treatment

techniques such as distillation, deionization, and reverse osmosis may be used singly or in combination to produce demineralized water. One measure of the degree of water treatment is found in the fact that the industry removed more than 1.25 million pounds of dissolved chemical substances from its incoming source waters last year. A remineralization process is used to add back low-levels of selected minerals when "good taste" is the sought-for consumer attribute. Ozonation, approved by FDA as GRAS, is used by most bottled water suppliers as a biological control agent.

Packaging is a final safeguard. To assure that its products are fully protected during distribution, the bottled water industry has been and continues to be a pioneer in the design and use of large 5-gallon food containers. At the present time, the industry is actively engaged in converting from glass to a lighter weight, energy conserving and equally protective polycarbonate bottle.

Figure I shows how a bottled water operator might combine several processes in the manufacture of fluoridated water, purified water, and drinking water. If, for example, the source water was chlorinated (e.g., a municipal supply, both mechanical and activated carbon filtration would be used -- the carbon to remove residual chlorine and organics. Thereafter, a softener or other conditioning treatment might be used ahead of reverse osmosis to substantially reduce levels of total dissolved solids. Treatment with a mixed-bed resin is a typical step in the production of purified water from which both fluoridated water and drinking water are manufactured through the addition of appropriate mineral mixes. It is sometimes economically advantageous, depending on the composition of the source water, to use cation and anion exchange resin pretreatment ahead of the mixed-bed resin. In keeping with common industry practice, note that each product is treated with ozone prior to bottling.

REGULATION

Regarded as a food by the Food and Drug Administration, bottled water is the nation's most highly regulated and monitored drinking water supply. To comply with FDA's Quality Standard (21 CFR Section 103.35), and Good Manufacturing Practices (21 CRF Sections 129.1, 129.20, 129.3, 129.35, 129.37, 129.40, 129.80) for bottled water, all industry products must come from protected sources, be bottled in facilities regulated as food plants, processed using manufacturing practices approved by the Federal Government, delivered to consumers in sanitized bottles whose safety is assured by federal regulation, and so labeled as to provide public notification whenever the microbiological, physical, chemical, or radiological quality of any bottled water product is sub-standard.

In addition to FDA, most states now regulate bottled water.

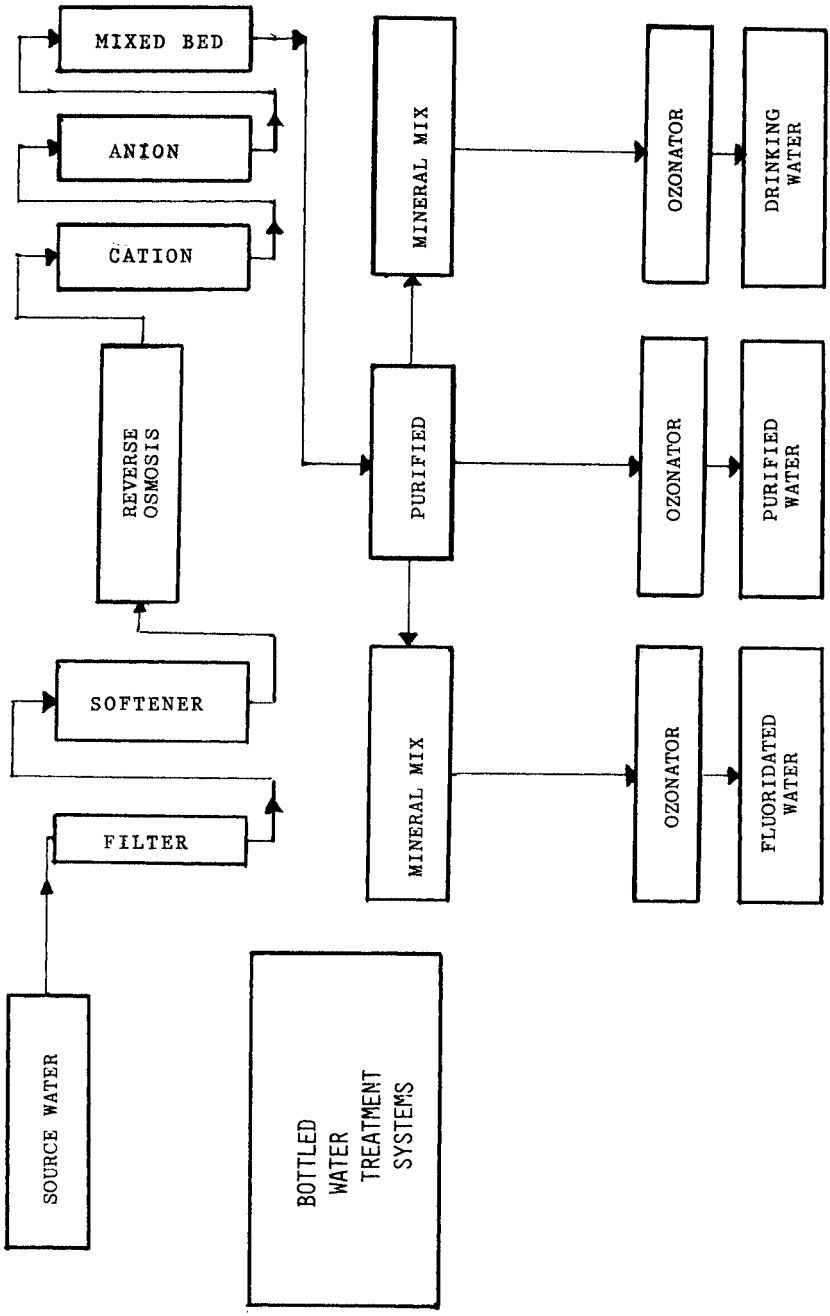

Figure 1. Processes used in producing bottled water.

Under provisions of the Safe Drinking Water Act of 1974, and in keeping with a 1978 Memorandum of Understanding between FDA and EPA, the Environmental Protection Agency also has a definite impact on the regulation of bottled water. The 1974 Act requires FDA to adopt revisions in EPA's National Drinking Water Standards for bottled water, or publish in the Federal Register reasons for not doing so. Taken together with the requirement of FDA's Quality Standard, this FDA-EPA arrangement means that bottled water must meet all currently effective provisions of EPA's Interim Primary and all Secondary Drinking Water Standards (Table I). No other drinking water is so highly regulated. And, needless to say, similar controls and safeguards are neither possible nor economically feasible for all municipal, community, and private water supplies.

Frequency of inspection is a final measure of regulatory oversight. A just completed IBWA survey of member companies shows that bottled water plants throughout the U.S. are inspected at least annually by a federal, state, or local agency. In fact, most plants are inspected several times a year.

SELF-REGULATION

In addition to government regulation, the industry has a comprehensive program of self-regulation. The foundation for this program is the IBWA Plant Technical Manual which provides all members with detailed "how to" information on processing and quality control techniques to be used in the production and bottling of each industry product. To ensure that these procedures are adhered to, the industry employs an independent laboratory -- the American Sanitation Institute -- to audit the performance of each member company. The ASI audit, conducted annually, evaluates compliance with both the Association's performance requirements and FDA's Quality Standard and Good Manufacturing Practices. To stimulate high performance on the part of each member company, the audit results are used as the motivational thrust in IBWA's Product Excellence Award Program. To keep the industry informed on the latest quality control techniques in water processing and bottling, IBWA sponsors an ongoing series of technical seminars and workshops along with an operator certification program. Each of these programs is available to members and non-members alike.

Summarizing to this point, we note that bottled water is a publicly accepted source of drinking water. Each year growing numbers of Americans use bottled water at home and away-from-home locations. While aesthetic factors -- appearance and taste -- are the traditional motivations, health concerns are beginning to influence buying habits.

Because all industry products meet EPA's Interim Primary and Secondary Drinking Water Standards, bottled water is an ideal alternative whenever a public or a private

TABLE I. FEDERAL DRINKING WATER STANDARDS (mg/L)

Substance	FDA Bottled Water Standards	EPA Primary Standards	EPA Secondary Standards
Arsenic	0.05	0.05	
Barium	1.0	1.0	
Cadmium	0.01	0.01	
Chloride	250.0		250.0
Chromium	0.05	0.05	
Copper	1.0		1.0
Iron	0.3		0.3
Lead	0.05	0.05	
Manganese	0.05		0.05
Mercury	0.002*	0.002	
Nitrate (N)	10.0	10.0	
Phenols	0.001		
Selenium	0.01	0.01	
Silver	0.05	0.05	
Sulfate	250.0		250.0
Total Dissolved Solids	500.0		500.0
Zinc	5.0		5.0
Turbidity	5.0	<5.0	
Color	15.0		15.0
Odor	3.0		3.0
Corrosivity	---		Non-corrosive
Foaming Agents	---		0.5
pH	---		6.5 - 8.5
Endrin	0.0002*	0.0002	
Lindane	0.004*	0.004	
Methoxychlor	0.1*	0.1	
Toxaphene	0.005*	0.005	
2,4-D	0.1*	0.1	
2,4,5-TP Silvex	0.01*	0.01	
Radioactivity	Concentration in Picocuries per liter		
Gross Alpha Plus Gross Beta	<5 *	<5	
Trihalomethanes	100 ppb**		

*Effective July 1, 1979
**Federal Register 48(40):68624(November 29, 1979)

water supply fails to meet consumer expectations for health or for aesthetic reasons.

FUTURE ISSUES

Before closing we should ask, what can bottled water contribute to the nation's future safe drinking water programs? As I see them, the major national drinking water issues to be dealt with in the years ahead are safety, availablility, and cost.

Even though progress is being made in the area of safety, much remains to be done. Many questions as to the public health significance of short-term and life-time exposure to the hundreds of organic chemicals known to be present in drinking water are backlogged -- waiting to be answered. Using ever more sensitive detection methods, analytical chemists are discovering organic chemicals in drinking water at rates faster than toxicologists and epidemiologists can assess their health significances. In some regions of the country, acid rain-induced alterations of the natural leaching process represent an uncharted and potential source of toxic pollutants. Finding workable and economically acceptable answers to the problems of heavy metals and other contamination originating within distribution systems will demand a substantial commitment of scientific and financial resources.

The nation's news services serve up steady reminders that drinking water safety is a serious public concern. Media attention to lead, barium, cadmium, TCE, DBCP, EDB, bacteria, and other contaminants in public and private water supplies has become commonplace in virtually every state of the Union.

Supply shortfalls, dropping water tables, and increased competition among users for available supplies can be expected to add challenging new dimensions to future safe drinking water programs. Like questions of safety, future problems of availability are not restricted to any one geographic region. Perhaps predictive of trends elsewhere, the supply situation is especially critical in the Western states, where conflicts between the use of water for energy production, agriculture, industrial productivity, and domestic consumption already are visible and worsening.

Given the complex range of questions concerning national priorities, state laws, water rights, and parochial interests, it is unlikely that the task of protecting the adequacy and safety of drinking water supplies will be easily or quickly accomplished. The problems to be resolved are most evident in water-short regions where population growth is causing a decline in the per capita supply of fresh water.

California, faced with one of the nation's fastest growing populations, is a case in point. Already the nation's most populous state, California's Colorado River water allotment is scheduled to be cut by more than 50% as

the State of Arizona under a Supreme Court order, preempts a greater share of the Colorado River supply in 1985. Plans to divert fresh water from the north to the southern portion of the state continue to be delayed by a series of legislative, executive, and legal actions, and are further complicated by deficit-conscious public attitudes.

There is a growing realization that in the future water will cost more. Pointing to the rising cost of pumping water from greater depths and the escalating expense of transporting it over increasingly longer distances, some experts have projected that the price of water to California consumers will rise at least 300% within the next ten years. But -- because it fails to allow for any additional water treatment or rejuvenation of aging distribution systems -- others argue that this estimate is too low.

In short, drinking water: where to get it, how to treat it, and how to deliver it seems destined to remain, for the foreseeable future, a priority issue at the national, state, and local levels.

As in the past, we can and must depend on the bottled water industry as an alternate source of safe drinking water whenever (a) natural or man-made emergencies make a water supply unsafe, (b) the cost of bringing a public water supply or distribution system into regulatory compliance is prohibitive, (c) special health needs require low nitrate, low sodium or reduced fluoride diets, (d) a demand exists for drinking water that meets all primary and secondary standards, that is protected in sealed containers against contamination during distribution, and that looks clean and tastes good.