

Technology of Bottled Water

THIRD EDITION

Edited by Nicholas Dege



 **WILEY-BLACKWELL**

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Third Edition

Edited by

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Preface

Following the positive reception in 1998 of the first edition of *Technology of Bottled Water*, the second edition, published in 2004, met with equal success, being sold in the English language version across a broad range of markets, and also translated into Chinese and Russian. It was originally written from a global perspective to shed some light on the complexities of the industry, prompted by the realization that there was much confusion in the minds of consumers and regulators alike regarding quality, safety and identity of bottled waters, and that there was an increasing number of new entrants to the industry who, in many cases, lacked the practical knowledge of the inherent difficulties in such an enterprise. The process of bottling water might, at first sight, seem to the uninitiated to be simple and risk-free, especially, for example, when compared with those more complex ones required for producing soft drinks. In practice however, because water is so sensitive to chemical, physical and microbiological contamination, it is one of the more difficult products to package to a consistently high standard. The book's principal aim therefore was to provide much needed guidance to producers, regulators, beverage and packaging technologists, microbiologists and specialists in hygiene and food safety.

The continuing perceived value of the book in many markets reflects the fact that, more than ever, bottled water is a commodity of increasing significance worldwide. Growth in the large developed European and North American markets has slowed, but growth has, if anything, accelerated in the developing markets. This has partially resulted from the way in which the larger companies have extended their operations into the newer markets, but along with this has been the appearance of countless smaller bottlers, encouraged by the success of others and the relatively low cost of entry.

The second edition covered the bottled water market, legislative requirements and hydrogeology, with specific guidance on water treatments, filling technology, cleaning and disinfection, methods and materials, watercoolers, quality management, auditing and microbiology.

For this edition, most of the original authors have brought their chapters up to date, although in some cases, new and additional material has been provided by new authors. Thus, Chapter 4 on hydrogeology has been updated by Peter Ravenscroft, and Chapter 5 on water treatment has been updated by Sébastien Saby. Chapter 7 on filling equipment has been entirely rewritten by Manfred Faltermeier to include a new section on PET manufacturing, and Chapter 13 on the microbiology of treated bottled water has been updated by Manuel Chaidez.

As an addition, following product developments within the industry, a new chapter has been authored by Fred Jones to cover the formulation and production of flavoured and functional waters.

Furthermore, in recognition of the increasing emphasis on the importance (both within the industry and beyond) of environmental stewardship, a new chapter on the environment has been added by Tod Christenson and John Stier.

Once again, many thanks to the authors, all of whom are busy people. Their contributions make this book a diverse, comprehensive and unique volume, which has proven through the previous two editions to have been of value. It is hoped that this third edition will prove of equal value to those both within and having an interest in the bottled water industry.

Finally, I would like to extend my thanks to Dorothy Senior, who through her editorship was instrumental in making this book a success in the first and second editions. Although, since her departure from the industry, she chose not to edit the third edition, her updated chapters still have value and relevance; more importantly, the work she did in making this book possible remains a valuable legacy for those of us still involved in this fascinating business.

Nicholas Dege

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1 Introduction

Nicholas Dege

1.1 BACKGROUND

Every living thing has a fundamental requirement for water, and as humankind developed, focus was always on access to reliable supplies of clean water from springs, wells and rivers. As populations grew and civilisation and technology evolved, there was inevitably an increase in the demand for water for domestic and industrial purposes; delivery systems were developed, as were the methods for treating water supplies effectively to ensure that they were safe for consumption, and to prevent the spread of diseases that could be carried by water to the general population.

However, although in most of the developed world there is a reliable supply of water, even with the benefits of modern water supply systems, some types of chemical treatment and the deterioration of pipes can cause organoleptic changes to municipal water, giving it an unpleasant taste. There are also concerns in many countries about potential (and in some cases, real) contamination of municipal supplies, and for these reasons amongst others, consumption of bottled water has steadily increased in both the developed and developing worlds. Furthermore, with the arrival of the unbreakable, resealable, lightweight polyethylene terephthalate (PET) bottle, providing the convenience of being able to consume a wholesome and refreshing drink at will, the consumer in many parts of the world has seized the opportunity to migrate from other beverages to bottled water.

In the light of this growing demand, the first and second editions of *Technology of Bottled Water* had as the principal objective to provide guidance on the legal and technical aspects to those requiring it (technical managers, packaging technologists, microbiologists). It was also deemed appropriate to give guidance to anyone wanting to understand the industry, and particularly those who were charged with the responsibility of regulation, whose own understanding of the industry was not always as complete as might be expected.

Finally, and perhaps most importantly, a key reason for the publication of the book was a general lack of practical information on what was then a relatively young industry in many parts of the world; it was seen as essential that new entrants to the industry were provided with at least a basic introduction to the complexities and potential challenges that they were likely to face. This was and remains particularly important at a time when many people with access to springs or groundwater supplies were avid to enter the industry, seeing it as an easy route to wealth. There was real concern that such new entrants might, in the absence of strong guidance, underestimate the real quality and food safety risks inherent in such a step, with consequential damage not only to themselves and their consumers, but also potentially

to the reputation of the industry as a whole. It was therefore seen as essential to present in one volume some practical and technical advice for those involved in (and those considering entry to) the bottled water industry.

This, the third edition, is being published at a time when the industry is at a decisive point in its development. As predicted at the time of the publication of the second edition, the bottled water market continued to grow, and the new markets (particularly in the Indian sub-continent, the Middle East and Far East) are still gaining momentum. However, in the developed markets, this growth has since slowed (to some degree as a direct result of the global recession), and the value of bottled water is also being challenged by activists who question its relevance and environmental acceptability. Nonetheless, bottled water continues to provide a convenient, healthy source of refreshment and hydration to those not wishing to consume other beverages. Indeed, it is also frequently called upon to be the sole source of potable water in times of emergency, whether simply as a substitute for municipal supplies undergoing periodic deviations from legal or safety standards, or as the only water available when a natural disaster strikes. Furthermore, bottled water companies the world over have long been conscious of the need to protect their sources, thus ensuring that they had a sustainable resource of high quality. Such environmental stewardship is in direct contrast to the claims sometimes made by critics, that bottled water companies are irresponsibly wasting natural resources.

Against this background, this book has been updated and continues to be a source of guidance for anyone wanting to bottle water safely. The third edition also contains two new chapters, of which the first covers the basic requirements for anyone considering developing or producing products in the category of flavoured or functional waters, and the second provides an overview of the work being done by the industry to address the environmental concerns, and to put into context the (actually very limited) impact of the industry.

1.2 THE THIRD EDITION

Although there have been some changes since the publication of the second edition, a major objective for the industry continues to be to find, protect and abstract good supplies of water, followed by filling and distribution to the ultimate consumer of a packaged product that meets all quality, safety and legal requirements. Increasingly also, some bottlers take waters of inconsistent and even of dubious quality (sometimes from private sources and sometimes from municipal supplies) and subject them to various treatments, often with the aim of producing water with a known and consistent composition.

By way of an introduction to the rest of the book, these developments and those of the product sector are covered in Chapter 2, which examines the development of the maturing bottled water market, taking into account historical and regional influences. Changes in packaging formats, reflecting lifestyle changes, and pressure from consumer groups are also shown to influence trends.

Different regions of the world continue to have a wide range of requirements and specifications for bottled water. This is examined in Chapter 3, primarily from the European and North American perspective, though the requirements for bottled waters in other markets are also covered. A part of this chapter also discusses the work done by the WHO/FAO Codex Alimentarius Commission in establishing worldwide standards for bottled waters.

The activities of man can be responsible for pollution of water, for example through agriculture, industry, road and rail construction, and special awareness and control is needed

to protect vulnerable groundwater from undesirable changes in quality when there is a requirement to bottle it without treatment. Chapter 4 describes the evaluation of groundwater sources, discussing varying geological influences. Development and protection of boreholes, and management of catchment zones and water yields, are also covered.

Water may come from various sources or supplies so, in many instances, treatments are used either for safety or legal reasons or to change the compositional quality of the water. Chapter 5 looks at the many options and possible reasons for choosing one or a combination of several treatment processes, although the choice available is always subject to local regulations.

The susceptibility of water to change, chemically, microbiologically or organoleptically, brings challenge to the bottling process. The inherent properties of water, the raw and packaging materials available and the equipment used all have profound implications for the safety and quality of the finished product that reaches the consumer. Chapter 6 looks at the potential impact of the choice of materials and the design and construction of equipment, and provides practical advice concerning the factors to be considered in order to protect the integrity of water throughout the process.

The ultimate objective for the bottler is to package the water in bottles, and although there are several different materials customarily used for bottled water, increasingly it is the ubiquitous PET bottle that dominates. Chapter 7, which covers product preparation and filling, also has a new section describing PET bottle manufacture and handling.

In view of the need for rigorous standards in good manufacturing practices, and more specifically for hygiene when dealing with bottled water, Chapter 8 deals with cleaning and disinfection, describing why and when this is needed. Cleaning-in-place methods and schedules, employee training and safe use of chemicals are also discussed.

Chapter 9 on quality management covers the principal programmes necessary for consistent high quality; areas of process control, in which operators undertake monitoring of quality parameters, as well as the more technical work performed in the quality assurance laboratory, are described. This section also covers food safety, in terms both of the action to be taken on the factory floor and also in evaluating risks throughout the entire supply chain. Hazard analysis critical control point (HACCP) remains central, but with the steady pressure from customers to establish more formalised systems for food safety, the use of standards such as ISO 22000 is also discussed.

Many offices and public places (and, increasingly in some markets, many homes) in densely populated areas, where the quality of municipal water is more affected chemically and organoleptically, have water dispensers, supplied through the 'Home and Office' channel. These dispensers, commonly called watercoolers, can incorporate facilities for chilled and hot water and in some cases, sparkling water. Although in some respects there are similar considerations to those for the retail sector, there are some additional priorities associated with their distribution, as well as the design of the dispensing equipment, all of which are discussed in Chapter 10.

Although companies producing bottled waters may adopt best practices for the industry, it is often the independent audit of the bottling process and systems used that give it credibility with customers and regulatory authorities. Chapter 11 sets out to detail the philosophy behind (and the steps taken during) the process of third-party auditing.

All bottled waters must be safe to drink and are required to be free from any pathogenic (disease-causing) micro-organisms. Some, such as natural mineral waters and spring waters, are required to be free from pathogens without treatment, and compliance with this requirement is monitored by testing for the absence of indicator organisms, as specified by

applicable legislation. On the other hand, some bottled waters, especially those originating from surface or municipal supplies, may be treated to kill any harmful bacteria and make them safe to drink; indicator organisms are again the means of monitoring this.

In the case of groundwater, there is also a natural population of indigenous harmless bacteria. In some markets, these naturally present bacteria are simply monitored to ensure that the normal condition of the water is not compromised; in others, it is a requirement that they remain within specified limits, both in the source and at the time of bottling. Thereafter, even though in still (non-carbonated) water, the number of these organisms grows logarithmically within days of bottling and can remain high for many months; these benign bacteria are not detrimental to the keeping quality of the water or to the well-being of the healthy consumer.

The difference in microbiological status between municipal or mains water and bottled waters is often used in alarmist articles in the media, where the two products are compared. Such a comparison is perfectly understandable and justifiable, but the assumption that the same qualitative standards apply to both products is not. All waters for consumption must be safe to drink. Municipal water achieves and maintains this status through chemical treatments and the presence of residual chlorine disinfection at the point of use. In the case of bottled water, such chemical residues are not only undesirable, as they impart an unpleasant taste and odour, but are also prohibited by legislation, as they contravene the 'standard of identity' of the product. The fact that bottled waters are usually governed by legislation different from that applied to municipal water demonstrates recognition by governments that these products are different. It is therefore no accident that both Chapters 12 and 13 discuss the subject of microbiology, one dealing with water bottled without treatment and the other for which treatment is used. Chapter 14, the first of the new chapters, entitled 'Formulation and Production of Flavoured and Functional Waters' – addresses the technology behind the growing range of products built upon the more traditional water base, and often used to extend brand recognition.

For very good reasons, there is an increasing awareness of environmental issues, and reputable companies include an environmental programme in their corporate agenda. Although the drivers towards this action can be legislation and consumer groups, it also makes good business sense to have sound environmental practice. As the industry continues to develop, much has been achieved in recent years to minimise the impact on the environment by improved manufacturing methods, rationalised distribution and reduction in packaging materials, for example by the light-weighting of containers. Chapter 15, on the 'Environment', is a considered examination of the factors of increasing concern for any modern producer, including raw material and energy use, waste and recycling, and provides some insight into the way these concerns are being addressed.

In publishing the third edition of *Technology of Bottled Water*, it is certain that the industry (which has matured significantly since the publication of the first edition) will continue to evolve and to play a major part in ensuring that consumers across the world have access to a convenient and safe supply of water, wherever they live, and regardless of the water type. Whatever the preference of the individual for style of consumption, bottled water will provide much needed nutriment and refreshment, and add to the pleasure and enjoyment of life.

2 Market Development of Bottled Waters

Duncan Finlayson

2.1 INTRODUCTION

In the second edition of this book, I wrote of how the perspective of bottled water had changed between 1997 and 2003. Now in 2009 perspectives have changed yet again in ways both predictable and surprising. The world economy suffered a major recession in 2008/09. Stronger growth rates in China and other Asian countries have hastened the supremacy of Asia/Australasia, which is now by far the biggest regional market, although the USA remains the largest national market. Here growth is still strong whilst in Western Europe and North America, the next largest markets, it has stalled. Up until 2003, the four major companies Nestlé, Danone, Coca-Cola and PepsiCo rapidly gained a share of the global bottled water market, but have now begun to fall back slightly. Bottled water cooler volume in Europe peaked shortly after the market consolidations of 2002/03, and has since fallen, a victim of plumbed-in watercoolers that are sold on the claim that they purify public municipal water.

During 1997–2008, the world bottled water market grew from 90 to 218 billion litres. The Asian/Australasian market multiplied by more than four. Even geriatric Western Europe managed a 50% increase, whilst dynamic North America added 144%. Healthy growth indeed. However, the same regions show a quite different pattern for 2007/08. The Asian/Australasian market grew by 11%, Western Europe had zero growth, whilst North America fell back by 1%. The world market grew by 5%.

The world recession is affecting current conditions, no doubt, but as an overlay on a number of factors, which contribute to growth differently in different segments of the market. Moreover, parts of the world have diverse traditions of water consumption, which means that they respond to market pressures in distinct ways. Overlaying them all are modern global factors such as the environment and health and well-being. Important questions in a market analysis include: What is the recent history? Where is the market today? Which are the important market drivers? What will the future be? Providing answers requires knowledge of these factors and traditions.

This chapter starts by giving a historical perspective, which touches also on the relationship between bottled waters and other soft drinks. Section 2.3 discusses product and market attributes to make the following sections intelligible. These definitions are dealt with more fully in Chapters 3 and 10. Section 2.4 introduces the big four global bottled water companies. A brief global review that puts bottled water into the context of other beverages is then

followed by three sections looking at different countries by way of example – USA, Europe and China. Section 2.9 considers the effect of environmental pressures, whilst Section 2.10 gives some characteristics of the market for flavoured and functional waters. The final section looks at future trends.

2.2 THE HISTORICAL BACKGROUND

You could say that bottled water once had an Old World and a New World. The Old World is Europe, West and East, extending into Russia. The New World has its older markets – in the USA – and the very youngest such as China. The New World does not have the same traditions, and is driven by modern concerns. Today the Old World, although still exerting a strong influence on the industry and home to Nestlé and Danone (the two largest global bottled water companies), is giving way to the New.

Let us first consider the Old World. Every pupil knows that water is essential for life. Throughout history we have taken in water to survive, but have added to this use, at every opportunity, its role as the base of something more convivial such as wine and beer. Nevertheless, it is possible to discern an early trend for drinking water on its own, of two kinds. The first is a highly mineralised water, prized for its health-giving attributes and possibly for its medicinal properties. This water would often be naturally carbonated from an effervescent spring, and might well be hot on emergence. The second is a cool, fresh water, drunk for its purity and cleansing properties. Here these are named *Mineral Waters* and *Spring Waters*, respectively – terms that should not be confused with modern legal definitions such as Natural Mineral Water and Spring Water, which are referred to later.

The doyenne of the Old World would be a place such as Vichy in France. The history of Vichy reads as a history of Europe: first exploited by the Gallo-Romans during the first two centuries AD, the town and spa became part of the Bourbon estates of Louis II. The cures became famous during the Renaissance, but were really first developed for leisure during the Second Republic when the Parc des Sources was created by order of Napoleon. A second great period of construction followed during the Belle Époque (1890–1930). The two bottled waters of Vichy are Vichy St-Yorre and Vichy Celestins, both highly mineralised. Commercialisation on a major scale started in the 1860s. Both are now in the stable of Groupe Alma, the number one bottled water company in France.

We now turn to the UK, where, as in many markets, the development of bottled water consumption has been closely linked with that of soft drinks. The following brief review is adapted from a publication in the Shire series by Colin Emmins (1991).

The Romans developed various spas including Bath (Aquae Sulis) and Buxton (Aquae Arnemetiae), but more for bathing than drinking. By the eighteenth century, spa resorts were once again flourishing. The properties of various mineral waters became well known including those of the Epsom Spa (from which Epsom salts were extracted). Even the Bath water was drunk in the elegant Pump Room. Spring waters had been bottled from Tudor times, and by the year 1700, flasks of spring water were being taken from Hampstead Wells for sale in Fleet Street.

The technique of carbonation (adding carbon dioxide gas to water) was discovered by Dr Joseph Priestly in the late 1760s, a technique which turned out to be the spur to the creation of commercially manufactured soft drinks. Interestingly, much of the development was in artificial or manufactured mineral waters. Soda waters as well as artificial Seltzer, Spa and Pymont waters were on sale by 1800. Schweppes was set up in 1792. By the early 1800s,

Table 2.1 European patterns of consumption for 1980.

Country	Annual bottled water sales (million litres)	Annual bottled water sales (litres/person)	Annual soft drinks sales (million litres)	Bottled water as percentage of soft drinks
UK	30	0.5	4840	0.6
Spain	800	21	3050	26
Germany	2550	41	8450	30
Italy	2350	42	4100	57
France	3125	68	5715	55

Source: Zenith International © Zenith International 2009.

carbonated spring waters were being offered for sale. However, the tone was still overwhelmingly medicinal and the market still small.

During the nineteenth century, the market changed to one of much wider consumption, developing as much if not more in lemonade, ginger beer and other flavour-based soft drinks than in soda and Seltzer waters. This trend towards an increasing share for non-bottled water soft drink consumption accelerated in the UK because of the giant leaps made in the safety and palatability of the public water supply: progress not reflected on the Continent. Mineral waters, such as Apollinaris from Germany, were still fashionable mixers in the 1890s, but did not have a mass market. By 1902, arguments about naturalness had arisen. Apollinaris was taken to court for claiming that it was a ‘natural mineral water’ (*Davenport v. Apollinaris Co Ltd*), when the composition in the bottle did not exactly match that in the spring (a case rejected, see Chapter 3 for more details on modern natural mineral waters).

Nevertheless, the trends in the twentieth century, especially in the UK as opposed to Continental Europe, remained inexorably of rising consumption of non-water soft drinks. Fruit squashes as dilutables were introduced just before World War I. Coca-Cola was introduced in the 1930s, remaining a modest item until the arrival of American troops for World War II, when consumption became firmly established.

Thus the UK did not go the way of the Old World, because of the good quality of tap water. By 1980, a distinctive European pattern of consumption had been established, with the UK as an atypical Anglo-Saxon outlier, strongly influenced by the USA (Table 2.1).

And what of the New World? Here bottled water has developed as a safe, reliable, consistent, refreshing and convenient alternative, both to traditional soft drinks and to tap water. As consumers have become more health conscious, bottled water provides a calorie-free alternative to sweetened soft drinks. In large parts of the world, where tap water is not universally available, or may be unsafe, bottled water is not a luxury.

2.3 MARKET SEGMENTATION

An analysis of trends in the bottled water market requires market segmentation. In addition, bottled water is itself a segment of the overall soft drinks market. Segmentation is needed because different product/market combinations react in different ways in different countries. Various approaches have been used. Here the main segments, with some element of hierarchy, have been taken as follows:

For bottled water	
packaged	vs. watercoolers
high mineralisation	vs. low mineralisation
still	vs. carbonated
Natural Mineral Water	vs. Spring Water
purified/remineralised	vs. Natural Mineral Water and Spring Water
brands	vs. own label
international brands	vs. others
global brands	vs. international brands
mainstream	vs. flavoured and lightly sparkling
glass	vs. plastic
PET	vs. other plastics
nonreturnable (NR)	vs. returnable (R)
supermarkets	vs. other outlets
multi-sources	vs. unique source
national brands	vs. regional brands

Some of the complexity behind this selection is indicated in Table 2.2. Each of these attributes is worth considering more fully. However, as many are interrelated, the following segmentation is necessarily simplified.

- *Product type*: Packaged water is sold in containers of not usually more than 5–10 litres capacity, directly for consumption. Watercoolers are refrigerating units which dispense water from a large bottle into a cup. The watercooler market worldwide has developed from the US market, where polycarbonate returnable bottles, originally of 3, 5 or 6 US gallon capacity (11.4, 18.9 or 22.7 litres), are supplied to rented cooler units. Nowadays, the larger container hardly exists. The US market is established both in offices and the home. Transfer to the European and other markets is mainly post-1985, and in Europe is so far confined to offices. Bulk water, such as in tankers, is progressively being taken over by the 19-litre container, in some cases through specialist water shops known as water stores or water stations. Mexico, for example, is the third largest bottled water market in the world, with relatively few coolers but widespread sales in 19-litre bottles. Water is drawn from the bottle through valves or ceramic pots. In poorer markets, PET is often used for the large bottles, although shrinkage and a lower washing temperature make it a more challenging material to use.
- *Water type*: The still/carbonated split dates back to the original mineral water/spring water differentiation. However, artificial carbonation, widely available from the nineteenth century, ‘muddied the waters’ as it removed the correspondence between naturally carbonated waters which were mostly highly mineralised and still waters which were generally low in mineral content. The water that bridged the two, and proved to be the outstanding success of the twentieth century, was Perrier. Nevertheless, post-1990, the trend has been towards still waters for home consumption.
- *Mineralisation*: It is a truism in the European context that, as you travel eastward, the traditional palate for water becomes stronger. Generally speaking, US consumers are interested in the absence of microbes, minerals and certainly contaminants, and a typical water would have a dry residue of 200 mg/litre. (Dry residue is the solids left after heating to 180°. It is a measure of dissolved minerals, which is usually less than total dissolved solids. It is used because it is directly measurable in a single test.) In France, on the other hand, highly mineralised waters such as Contrex and Vichy Celestins have

Table 2.2 Elements contributing to market segmentation.

Attribute	Categories	Subcategories
Product type	Packaged water Watercooler Bulk water	
Water type	Still Carbonated (sparkling)	Naturally carbonated Lightly/highly carbonated
Mineralisation	Range high to low	
Flavourings	Natural low calorie Sweet/artificial	Becomes a soft drink 'clear flavoured drink'
Functionality	Many, also known as near waters	Becomes a soft drink
Legal status	Natural Mineral Water Spring Water Other waters	Purified municipal water Treated well water Remineralised water
Container	Glass Plastic	R NR PET (R & NR) PET multilayer PVC (now rarely seen) Polycarbonate (R) Polyethylene
Positioning	Premium Lifestyle Mainstream Ethical Budget Staple	
Branding	Global International National Regional Retailer own label	
Distribution	Supermarkets HORECA ^o Convenience stores Offices Independents Door-to-door Vending machines Others	

^o Hotels, restaurants and catering.

Source: Zenith International © Zenith International 2009.

long had a special role. These are in the range 1700–3000 mg/litre. Even mainstream Vittel (Grande Source) has a dry residue of 850 mg/litre. However, Evian and Volvic are the big international brands from France, and these are both lower mineralisation. The German market has long been based on relatively highly mineralised waters. In the

former Soviet Union, waters were categorised into medicinal/mineral, mineral and fresh. The major brand was Borjomi, from Georgia, a sodium bicarbonate water with dry residue in the range 5000–6500 mg/litre. However, tradition is being eroded and more lightly mineralised water is now the future in Russia and elsewhere. In parts of the world without a bottled water tradition the product is very often water stripped of its minerals through Reverse Osmosis (RO) then remineralised to about the 200 mg/l level. Even in the US, although Nestlé is mostly on a natural water platform, the leading brands of Coca-Cola and PepsiCo, and actually Nestlé Pure Life are waters treated by RO.

- *Flavourings*: Perrier with a twist (of orange, lemon, lime or berry) was introduced to Europe in the 1980s, following its successful launch in America. These are natural flavourings with negligible calorie content, and though legally classified as soft drinks, can be legitimately presented as modified waters. However, the majority of the market is for waters which contain added sweetness, whether natural or artificial. Volvic Touch of Fruit is the most successful example.
- *Functionality*: Functional offerings are relatively new but increasingly numerous. They are one of the fastest developing categories of soft drink at the time of writing, and attaining a significant volume around the world. Some of these are on a water platform, otherwise known as near waters. Examples include calcium fortified water, sports waters and calming waters. See Section 2.10 and Chapter 14 for more details.
- *Legal status*: Obviously legal status depends on which part of the world a water originates from and (less and less) is marketed in. Full details are given in Chapter 3. The categories in Table 2.2 correspond to the European regulations.
- *Container*: Glass has always been the choice for premium products. In some countries, such as Germany and Austria, a tradition exists for returnable glass of a standard format. This has been promoted as environmentally friendly, and even used as an excuse for excluding non-returnable products. However, it is not clear cut that the life-cycle cost of returnable glass really is lower, because of the weight of the glass container, the energy required for washing and the chemicals used. Returnable PET is well established. In the non-returnable field, PVC has disappeared in favour of PET. Difficult applications, such as the new Perrier bottle, require multilayer technologies. Polyethylenes are used for larger containers of budget products, and polycarbonates have captured the watercooler bottle market. PET is used in large numbers for the lower-priced bulk market in essentially the same format as that used for watercoolers (and does also appear on coolers). Bottled waters are also marketed in cans for the airline trade and vending machines, and cups, again for airlines and in fast food outlets. In the United States in particular, there is also still a thriving business for water bottled in one-gallon HDPE containers of the type typically used for milk.
- *Positioning*: Generally speaking, there is a relationship between price and total market size. Premium products in high-quality, individually designed glass bottles aim at profitable, small-volume niche markets. The mainstream is aimed at the wider market. Lifestyle/convenience positioning has been adopted by Nestlé, Coca-Cola and PepsiCo with great success in the USA. Budget brands are a feature of supermarkets in western countries and also of 19-litre distribution elsewhere. Staple products are a direct tap water replacement. A new development for the new millennium has been ethical brands, which devote a proportion or all of profits to charitable causes, typically providing water in Africa.
- *Branding*: Branded products cost more for consumers, a differential they are willing to pay provided they perceive added value, either in product quality or product values or both. Even own-label products have become bound up with the branding of the supermarkets

themselves. In the third millennium, branding has a new dimension, which we categorise as international vs. global. It used to be said that water is a local business because it is tied to a source. Then the big international brands were created – Perrier, Vittel, Evian, San Pellegrino, Volvic. These are tied to a source but sold all round the world. Then Nestlé created the first global brand Pure Life, a staple water produced mostly by RO and remineralisation at locations all round the world. This provides arguably the best platform, being globally recognised but locally produced.

- *Distribution:* Distribution patterns have been quite different across countries, although the trend is towards supermarkets, mass merchandisers and club stores being the dominant outlets for volume consumption of a variety of package sizes. Nevertheless, in Western markets, HORECA is disproportionately important to market value because of the loading on premium brands and smaller sizes. In Asia, for example, direct delivery of the 19-litre package can be very important, whether delivered by truck or two-by-two on the back of a bicycle.

2.4 GLOBAL GIANTS AND LOCAL LEADERS

In the late 1990s, it became clear that the historical position of the two giant soft drinks companies and their ambition meant the world had four global bottled water companies: Nestlé Waters, Danone, Coca-Cola and PepsiCo. In 2004, the bottled water volumes of these four peaked at just over 30% of the global market and has since fallen back slightly (Fig. 2.1). In the case of Coca-Cola and PepsiCo, their share includes water brands owned by bottler partners or franchisees.

However, underlying this is a more startling picture of the ambitions of The Coca-Cola Company. The traditional foundation to both Coca-Cola and PepsiCo has been a relationship between brand owner (the Company) and bottler, which allowed the company to concentrate on marketing and the bottler on production and distribution. The Company

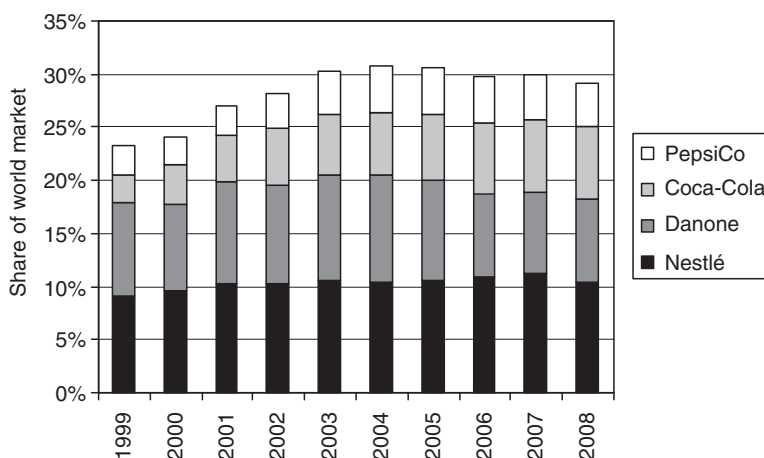


Fig. 2.1 The global companies' share of the bottled water market.
Source: Zenith International © Zenith International 2009.

maintained control and income by providing the proprietary syrup formulation on which the product is based. Bottled waters were an incidental activity of the bottler, with the brand not owned by the Company at all. Two trends have overtaken this. The first is the consolidation of bottling into regional anchor bottlers in which the Company has a substantial or majority stake – deals that in places have included the transfer of water brands to the Company. The second is the launch and expansion of the Company’s own brands: for example, in the case of Coca-Cola, Dasani and Ciel and for PepsiCo, Aquafina and Aqua Minerale. The result is a marked switch into own water brands as opposed to bottler-owned products (Fig. 2.2). Note how different Coca-Cola is to PepsiCo in this respect. In 1999, both companies had around 40% of volume in owned brands, a position that PepsiCo has stuck with, whilst Coca-Cola has grown the proportion to more than 70%.

There is no doubt that Coca-Cola has a strategy of expanding its mainstream business into still drinks in general and bottled water in particular. In May 2007, the company stunned the beverage world by announcing a \$4.1 billion acquisition of Glaceau, producer of Vitaminwater and other water plus products. However, how successful it will be in plain bottled water against the bottled water specialists is an open question. In the USA, Nestlé Waters North America is more than holding its ground (see Section 2.6).

A small cadre of international brands sells round the world on a large scale: Perrier, Vittel, San Pellegrino, Evian, Volvic. Other than these, bottled water is a local business, because it is not economic to transport product over long distances. In the Old World (see Section 2.2), this meant also local brands, because the brand is tied to the source. In the New World, such restraint is missing. A link still exists for natural waters, although it is tenuous. For example, the two giant natural spring water brands in America – Arrowhead and Poland Spring – both come from multiple sources. Poland Spring sources are all in Maine, but Arrowhead now has sources in Canada and California. No such link exists for manufactured water products. Coca-Cola and PepsiCo major waters are typically treated and then remineralised, and can therefore be produced, in principle, at any soft drinks plant (although quality problems can arise if water is not bottled on a dedicated line).

So the Europeans can only develop regional brands, whilst Coca-Cola and PepsiCo are free to create global brands – but is that the picture? Not really – for several reasons. First, it is the Europeans who hold all the international brands mentioned above, which can be

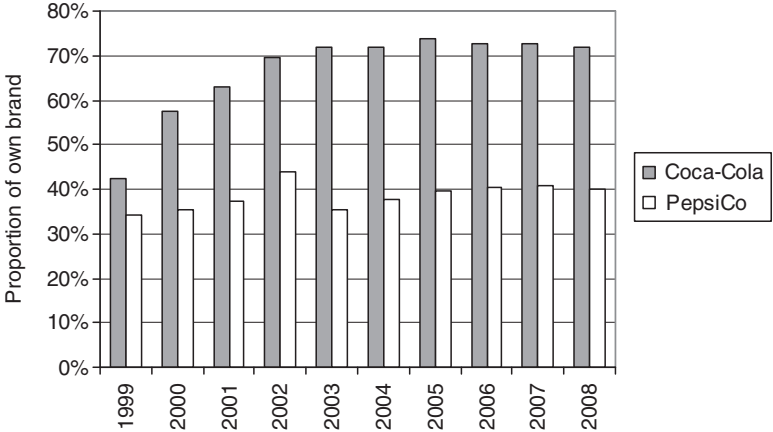


Fig. 2.2 Share of Coca-Cola and PepsiCo water as Company brand. Source: Zenith International © Zenith International 2009.