



National Seminar on
PACKAGED WATER INDUSTRY IN INDIA

30 June 2009 ITC Windsor, Bangalore

Concept Note

Background

Among the broad spectrum of issues related to water management - drinking water is particularly significant as optimum availability of clean drinking water is the basic requirement for healthy living. Water constitutes 60% of an adult body and 75% of a child body and hence, the quality of water that we consume is of prime concern. In Indian scenario, providing access to clean and safe drinking water, irrespective of the socio-economic strata, has remained an elusive dream. As of now, the drinking water scenario is not particularly encouraging. The main reason for poor access to safe water is the inability to finance and adequately maintain the necessary infrastructure. Overpopulation and scarcity of water resources are also some of the contributing factors. This lack of access and availability to a sizeable chunk of population is directly hampering health of people.

In order to gauge the magnitude of the severity related to drinking water and its impact on health, let us look at some statistics:

- ✦ As per United Nations Human Development Report 2006, over 2 billion across the world do not have a reasonable access to fresh water.
- ✦ Every year more than five million human beings die from illness linked to unsafe drinking water and sanitation.
- ✦ An alarming 1.6 million diarrheal deaths occur among children < 5 yrs occur in developing countries.



Factors affecting Quality of Drinking Water

Although humans utilize many sources of water, some contain biological or chemical contaminants that may cause long-term health problems. While the occurrence of waterborne diseases in developed countries is generally low due to a good system of water treatment, distribution and monitoring, waterborne diseases are among the leading causes of morbidity and mortality in low and middle-income countries.

Parameters for drinking water quality typically fall under two categories: chemical/physical and microbiological. Chemical/physical parameters include heavy metals, trace organic compounds, Iron, salts, total suspended solids (TSS), and turbidity. Microbiological parameters include Coliform bacteria, *E. coli*, and specific pathogenic species of bacteria (such as cholera-causing *Vibrio cholerae*), viruses, and protozoan parasites. Chemical parameters tend to pose more of a chronic health risk through buildup of heavy metals although some components like nitrates/nitrites and arsenic may have an immediate impact. Physical parameters affect the appearance, taste of the drinking water, and may complicate the removal of microbial pathogens.

The World Health Organization (WHO) publishes Guidelines for Drinking-water Quality, which many countries use as the basis to establish their own national standards. The Guidelines represent a scientific assessment of the risks to health from biological and chemical constituents of drinking water and of the effectiveness of associated control measures.

Packaged Water (PW) – An Introduction

Because of dwindling safe fresh water supplies, people in urban areas are increasingly looking towards packaged water as a means of meeting some or all of their daily requirements. Although this cannot be substitute for drinking water provided through piped distribution systems, yet holds significance, as it provides a safe option that is readily available, has much better quality perception and is easy to carry anywhere, anytime. Packaged water can come in variety of forms – bottles, cups, jars, even pouches. The size may range from 200 ml, 500 ml, 1 litre and the large 2 litre bottles. Bulk water usually comes in two sizes -- 25 litre can / 20 litre bubble top PET.



Due to lack of trust in the quality of supplied water, people are resorting to packaged water, as one of the options for meeting their daily drinking water requirement. Hence, providing packaged water solutions is fast emerging as a business opportunity. As per an estimate, the bottled water industry in India is worth Rs 1,000 crore. It is growing at 40 per cent a year and by 2010 it is expected to reach Rs 5,000 crore. However, much remains desired vis-à-vis adherence to quality standards, distribution, pricing, infrastructure, environmental concerns etc.

Packaged Water falls under two categories:

- **PNMW or Packaged Natural Mineral Water** (governed under IS:13428:1998, Amendment 1-5 upto 15th October 2004): Water is drawn from natural source, conforms to composition listed under the standard and is bottled without altering the composition. Some brands available are Danone's Evian and Ferrarelle and Nestlé's Perrier and San Pellagrino etc. They are being retailed in the range of approx Rs 80-100.
- **PDW or Packaged Drinking Water** (governed under IS:14543:2004): In this case, any of the processes of filtration / disinfection listed under the Standard can be utilized, altering the composition of subject water & finally bottling. Simply speaking, it is ordinary water treated to meet certain quality standards. Some popular brands are Kinley, Aquafina, Hello, Prime etc. 1 Ltr variants are being sold at approx Rs 10. *This segment is where the action is.* Due to inefficiencies in the present distribution system, PDW is fast emerging as an alternative drinking water supply, especially in urban areas. The main consumers of packaged water are no longer restricted to the upper class but include middle class and lower-middle class families as well.

All Indian PW manufacturers have to obtain ISI mark from Bureau of India Standards. In fact, it is only when inspection is completed that a manufacturer can commence production. Apart from emphasis on packaging, hygiene, lighting, civil works, labeling - restrictions on the permissible limits for physical / chemical / biological / pesticide levels have been set. The manufacturers must adhere to them, failing which their license can be revoked or suspended temporarily.



Water testing determines the standard and quality of water. The standards of water pollution have become increasingly binding since the adoption of two major federal environmental statutes: the Clean Water Act of 1972 that implemented a national system of regulation on the discharge of pollutants; and the Safe Drinking Water Act of 1974, that set up standards for drinking water. The PW manufacturers should be equipped with laboratory testing facilities to carry out all physical, chemical and micro biological tests prescribed as per IS : 3025, 1070, 4905, 5401, 5402, 5403, 5887, 10146 & 10500 and it has to be conducted by expert chemist / micro biologist.

Maintaining Quality – The Biggest Challenge

Superior quality (as per the standards prescribed), is the basic premise driving consumers to buy packaged drinking water. Because of reasons ranging from manufacturing process, storage, shelf life etc, quality – in many instances – becomes a casualty. Some substances may prove more difficult to manage in bottled than tap water. This is generally because bottled water is stored for longer periods and at higher temperatures than water distributed in piped distribution systems. Control of materials used in containers and closures for bottled waters is, therefore, of special concern. In addition, some microorganisms, which are normally of little or no public health significance, may grow to higher levels in bottled waters. Malpractices like not treating water properly before storage, filling tap water in used bottles and re-selling them, ambush selling etc are also prevalent and end up eroding people's trust.

Water obtained from different sources does not have same physical & chemical characteristics; hence, the treatment method and plant operations depend on the result of raw water analysis report. There are various processes employed to purify the water and various combinations of the processes mentioned below are incorporated to ensure that final composition of the product confirms to latest BIS norms.

- **Desalination** is defined as the removal of dissolved salts from various waters – brackish, sea, etc. It can be performed by several techniques including membrane process like reverse osmosis and electrodialysis. The other membrane processes, which can be employed for partial desalination, include ultrafiltration and nanofiltration.



- **Reverse Osmosis** is the best filtration process so far as it is capable of refusing bacteria, salts, proteins, particles, dyes as well as other harmful constituents. It is a natural bio chemical process that enables the abstraction of particles as tiny as ions. RO uses a semi permeable membrane that affects the movement or diffusion of water molecules toward the solution that has high TDS, and it is induced by osmotic pressure. These membranes are effective in removing constituents and are efficient in removing TDS in any feedwater up to 40,000-ppm (i.e. sea).
- **Nanofiltration** (NF) is effective in removing divalent ions (i.e. calcium and magnesium), larger monovalent ions (i.e. sulphate), high molecular weight organic molecules, and colour. NF membranes are efficient in softening feedwater below 1,000 mg/l TDS. These membranes provide significant rejection of hardness caused by dissolved calcium and magnesium.
- **Ultrafiltration** is effective in removing high molecular weight proteins, bacteria and viruses. Rejection of monovalent and divalent ions is considerably less than RO and NF. UF membrane pores are smaller than MF but greater than NF. The primary mechanism of constituent removal is filtration; however, some salts are transported across the semi-permeable membranes by diffusion.
- **Microfiltration** MF is effective in removing suspended solids of all types and larger colloids. These generally filter out suspended constituents in feedwater.
- **Ultra Violet** or UV is a band of invisible light in the electromagnetic spectrum, in the range of 200-400 nm wavelengths, having germicidal effectiveness, which penetrates the microbial cell membrane to destroy the DNA molecule thus preventing cell replication. It is to provide bacterial disinfection in water. As UV does not change the Physical or Chemical characteristics in water & does not have any residual properties left in treated water, it is widely used to disinfect the water for microbiological contamination.
- **Ozonation:** Ozone, triatomic Oxygen is colourless, unstable & reactive gas with a acrid odour. It is strongest available sanitizer and decomposes back to



oxygen without leaving any traces. Hence, makes preferred choice for disinfection. It is a very reactive Disinfecting agent, & 3000 times more effective than any other known disinfectants. It destroys any Bacteria, Viruses, Cysts, and Pathogens in a shortest possible time when it is exposed to water.

Once the filtration process is over, conditions under which the treated water is packaged and what material has been used for packaging determines the final available quality of drinking water. Though BIS has not put any restriction on manual filling, humid Indian conditions make the product susceptible to external contamination due to unhygienic conditions. Therefore, automation in post processing stage is strongly recommended for minimizing the chances of contamination through air. Once the product is ready for distribution, storage conditions should be as prescribed and the final product must mention details like batch number, date of manufacturing and best before.

Key Concern Areas

- **Standards & Certifications**
- **Water efficient manufacturing processes**
- **R&D on improving quality**
- **R&D on determining potential health hazards and mitigating them**
- **Packaging**
- **Pricing**
- **Recycling of PET bottles**
- **Mechanisms to address malpractices**

With this background, CII is organising Seminar on “Packaged Drinking Water”. The objective of this Seminar is to understand these issues and work on developing a consorted strategy to provide win-win solutions to consumers, maufacturers, society and environment.