ABWA

(Asia and Middle East Bottled Water Association)

A member of

ICBWA

(The International Council of Bottled Water Associations)

ICBWA*'s Members:*
ABWA: Asia and Middle East Bottled Water Association;
ABWI: Australasian Bottled Water Institute;
CBWA: Canadian Bottled Water Association;
EFBW: European Federation of Bottled Water;
EBWA: European Bottled Watercooler Association;
LABWA: Latin America Bottled Water Association;
IBWA: International Bottled Water Association of the USA;
Suppliers: Suppliers Representation

A Bottled Water Plant Operation
A Key Issue on Quality

The Importance of Water to Human Body

- Water is essential for the functioning of almost all the body's living cells
  - 95% of human blood is water
  - 75% of human brain is water
  - 70% of human skin is water
  - 22% of human bones are water
- Water is the principal constituent of cells and tissues;
- Water is the means of transport of:
  - essential nutrients around the body;
  - waste and excess out from the body;
- Water moist the lungs making it possible to intake oxygen and expulse of carbon dioxide.
- Water plays a vital role in controlling body temperature.
- Human brain and skin are the first two organs that suffer from the effects of dehydration. The early symptoms are headaches, fatigue and the aesthetic quality of the skin.
- A human body eliminates around 2.5 liters of water per day, through urine, perspiration and respiration.
- The body gets its water from three sources:
  - Water in solid foods, which contains wide ranging amounts, from 5 % in biscuits, 60% in steak, to 90% in the juiciest fruits. This will bring in about 1 liter per day;
  - Water produced in the body as a byproduct of chemical changes that convert food into cell material;
  - 1.5 liters need to be ingested in the form of beverage or water itself to recover normal water loss.
- Babies and children need more water, as do pregnant women to maintain hydration for themselves and the baby, and later for breast feeding.
- The elderly should be careful to consume enough water because the sensation of thirst diminishes with age.

Functions and Impact of Mineral Contents in Water to Human Body

Calcium (Ca): Needed for healthy teeth and bones formation, blood circulation, nerve and muscle systems

Magnesium (Mg): Essential for normalizing metabolism, muscle contraction, bone development, maximizing benefit of Vitamin D and calcium intakes.

Sodium (Na): Help maintain proper nerve function, and fixing ionic balance of water in the body.

Potassium (K): In general, contributes to:

-acid base and body water balance;

-blood pressure regulation;

-nerve function; and

-muscle contraction.

In particular, contributes to the good functioning of the cardiac muscles.

Iron (Fe): A component of hemoglobin.

Needed by bone marrow to create new blood cells.

Manganese (Mn):Useful for :

Growth of bones and tendons

Synthesis of carbohydrates and proteins

Complex influence on mental activities

Copper (Cu): Involves in iron absorption, metabolism, and formation of elastic and connection tissues.

Zinc (Zn): Extremely important in the immune system. Plays major role in the enzyme activities.

Chloride (Cl-): Importance for formation of gastric juice.

Fluoride (F-): Part of the bone element.

Help prevent dental caries.

Iodine (I-): Necessary for the function of thyroid grand and hence the metabolic rate.

Global Drinking Water

Demand and Supply

Demand

- Human Body requirement: 1.5 liters/day;
- Total World Population as of January 2010 was estimated by US Census Bureau at 6.797 billion;
- Total Demand for Drinking Water: (6.797 billion X 1.5) 10.196 billion liters/day or equivalent to 540 million 5 gallon bottles/day.

Supply

- Mother Nature:
  - The Water Cycle
  - Ground Water Geology
    - Confined Aquifer
    - Unconfined Aquifer
- Water Properties
  - Natural effect
  - Caused by Human activities
- Water Quality-Contaminations
  - Man Made (Most if not all)
- Bottled Water Industry

Water Property

Metal and Nonmetal contents in Water

Metals	**Nonmetals**
Calcium (Ca)	Oxygen (O)
Magnesium (Mg)	Hydrogen (H)
Sodium (Na)	Carbon (C)
Potassium (K)	Chlorine (Cl)
Iron (Fe)	Sulfur (S)
Manganese (Mn)	Nitrogen (N)
Copper (Cu)	Silica (Si)
Zinc (Zn)	Bromine (Br)

pH

- 12.0
- 11.0
- Pink 10.0
- Indicator 9.4
- Range Colorless 9.0
- **8.5**
- Typical Range for 8.0
- Drinking Water 7.0
- **6.0**
- 5.0
- Orange 4.3
- Indicator 4.0
- Range Red 3.0

Water Properties (Continued)

Hardness VS Softness

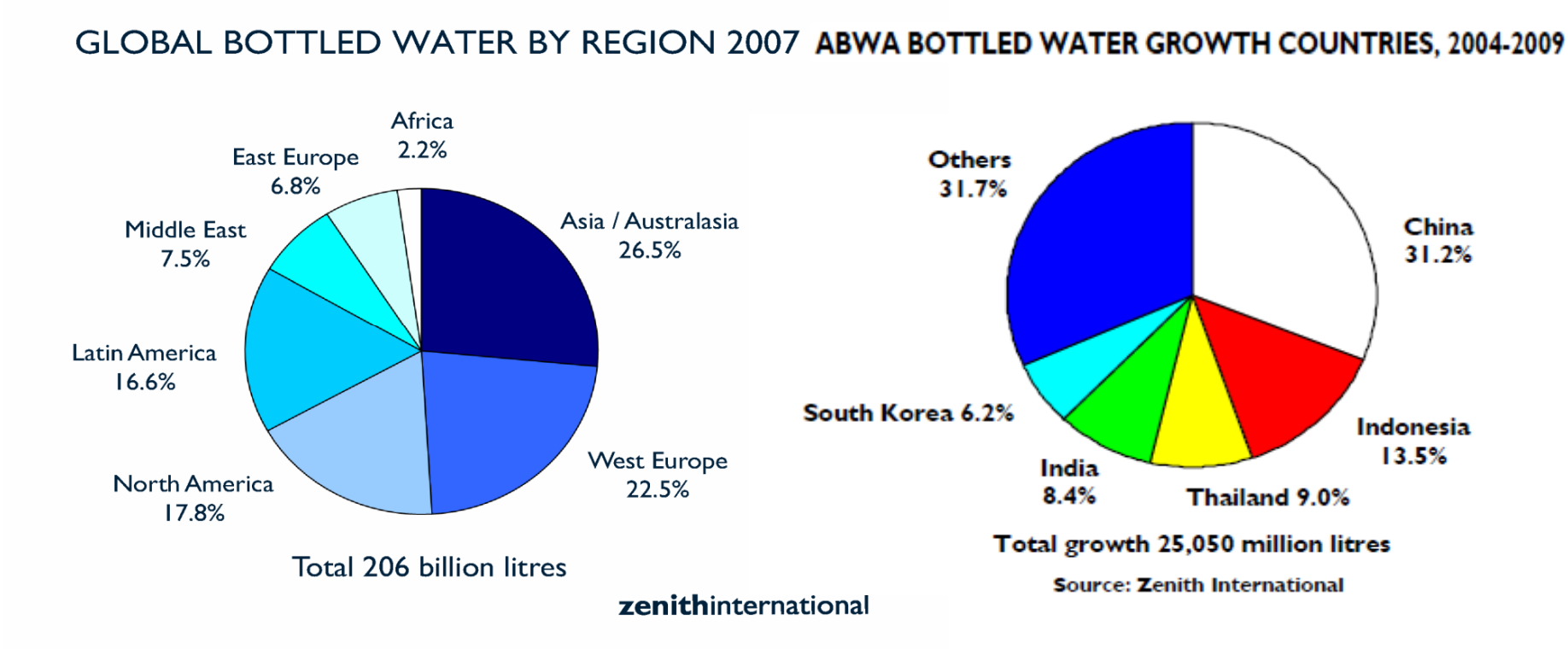
The ions which cause hardness are calcium (Ca) and magnesium (Mg), although some metals which are usually present in comparably small amounts can do the same.

Thus, to produce soft water, replace ions which cause hardness with ions with cause softness which is sodium (Na).

Negative and Positive Ions

Anions	Negative Ions	Cat ions	Positive Ions
Bicarbonate	$HCO-_3$	Calcium	Ca^{++}
Chloride	Cl^-	Magnesium	Mg^{++}
Fluoride	F^-	Sodium	Na^+
Iodide	I^-	Potassium	K^+

Global and Asia Bottled Water Markets



Global Bottled Water Market

Product Differentiation:

- Packaging: Glass, PC, PET, PC, PP
- Serving: Returnable, One way (single serve)
- Size
  - 5 gallons
  - 3 gallons
  - 1.5 liters
  - 1 liter
  - 500cc, 600cc, 750cc
  - 330cc, 350cc
  - 220cc, 250cc

Trend in Developing Countries:

- Countries like Philippines, Indonesia, Thailand, India and China face serious problems of insufficient infrastructure on the municipality water supply services. As a result, creative entrepreneurs have created the refill-station concept. It started in the Philippines in the early ’80-s, then took Indonesia by storm. Being an island country (over 17,000 islands) installing a proper drinking water-distribution system with a limited budget is not an easy feat for the Government. Hence, the refill-station concept grew wild, it has now grown to over 8,000 units since 1998

Global Bottled Water Market

Question: Will Bottled Water Market still grow?

Bottled water will grow, as long as:

- Poor quality city water system
- Poor or no basic infrastructure
- Urbanization: rural people moving to cities to find jobs
- seawater intrusion caused by industrialization and abrasion
- Growing income per capita (middle class)
- Growth in population
- Health consciousness and taste preference
- New trend brought in by foreigners
- Growth of tourists and travelers

Potential Developments:

- Cheaper packaging
- More environmentally friendly packaging
- More attractive design
- Diversification of products (such as flavored water, oxygenated water, vitamin-enriched water, sports water, baby water), as long as buying power is there

Bottled Water Industry A highly regulated industry

Regulators: Local, Country, Regional, ICBWA/ABWA, Codex/WHO

Standard of Identity (SOI)

Natural Mineral Water

Drinking Water

Standard of Hygiene (SOH)

Source

Facilities, Design, Construction, and Operation

Personnel, treatment, equipments, and facilities

Hygienic practice

Standard of Quality (SOQ)

- Physical Parameters
- Parameters Concerning Substances Undesirable in Excessive Amounts (e.g. F, Fe, Ca, Zn, Pb, Cd, and Ba)
- Parameters Concerning Toxic Substances (e.g. As, Cd, and PCB's)
- Parameters Concerning Radio-active Residues (i.e. alpha and beta emitters)
- Pesticides Residues (e.g. DDT and Lindane)
- Microbiological (HPC, Coli form and e. Coli)

Labeling

- Product Name
- Supplemental Designation
- Name and Address of Processor
- Brand Name
- Batch or Code Number
- Date of Processing
- Treatment of Disinfection
- Expiration Date
- Net Volume
- Source Location
- Direction for Storage
- Other Required Marking
- BIS Mark

ABWA Model Code

SOI, SOH, SOQ, Labeling, Mandatory annual Audit, CPO

ABWA Unified Inspection Checklist:

(146 checking requirements)

- Source water extraction, transmission, and storage
- Product water treatment and processing
- Product water production
- Facility requirements
- Bacteriological / Testing Requirements
- Laboratory
- Personnel
- Documentation
- Compliance Requirements
- Labeling
- Production Recall Requirements

ABWA HACCP Checklist

(13 Checking Requirements)

- Management commitment and HACCP team;
- Product description and intended uses;
- Production flow diagram;
- Conduct Hazard analysis;
- Identify Critical Control Points (CCP);
- Establish:
  - critical control limits for each CCP;
  - monitoring system for each CCP;
  - corrective actions;
  - verification procedures;
  - documentation and record keeping,

To Pass an Annual Mandatory Inspection, a Bottler Member must achieve a minimum Passing Score of 75%.

ABWA CPO

- Each bottled water plant must be manned by at least one Certified Plant Operator.
- Certified Plant Operator:
  - Enroll in a 2 days intensive training program;
  - Pass a 120 questions examination with score over 75%
  - CPO Certificate valid for 3 years;
  - To renew the CPO Certificate:
    - Pass a re-examination with score over 75%; or
    - Enroll in related and accredited educational seminar or training with accumulated credit exceeding 15 credit hours.
    - These training programs, however, must be submitted either before or after, to be evaluated by ABWA's Secretariat for the assignment of their scores

Bottled Water Plant Operation
A Key Issue on Quality

A Bird's Eye view-Bottled Water GMP

- Facility and Ground Maintenance
- Plant Construction and Design
- Sanitary Facilities, e.g. Approved Sources, Operation Water
  - Monitoring Requirements (Annual Analysis, Weekly Microbiological Sources Analysis)
  - Use of Appropriate Sampling Techniques
- Sanitary Operation
- Equipment Design and Construction
- Production and Process Controls
- Record-Keeping
  - Source Approval
  - Analysis
  - GMP Records

Note : ABWA issued a Product Recall Procedures System to help its members

Bottled Water Production Process:

- **Source Water**
- **Pre-treatment:**
  - **pH adjustment**
  - **Aeration**
  - **Flocculation**
  - **Chlorine or Ozone Injection**
  - **Preliminary Filtration**
- **Treatment:**
  - **Sand Filter**
  - **Activated Carbon Filter**
  - **Softener**
  - **Microfiltration**
- **Final Treatment:**
  - **Reverse Osmosis**
  - **Mineral Injections**
  - **Disinfection**
    - **Ozone, UV**
- **Empty Bottles Washing**
- **Bottling;**
- **Quality Control.**

Source Water in the Middle East

Desalinated Water:

- Desalination: Process to remove excess salt and other minerals from water. Three main technique:
  - Multi-stage flash distillation (MSF);
  - Multiple-effects evaporator (ME);
  - Vapor Compression (VC)
- In the Middle East, desalination account for close to 75% of world's capacity.
- The world's largest desalination plant is Jebel Ali in UAE.
- Other methods: Ion Exchange, Membrane processes including RO, Seawater Greenhouse, etc.

Bromate Issue

- Bromate in Drinking Water is undesirable. It is a suspected human carcinogen, substance that causes cancer.
- The most common bromate is the reaction of ozone and bromide in water: $Br^- + O_3 = BrO_3^-$
- Bromide is present in typical seawater with concentration of around 65 mg/l which is around 0.2% of all dissolved salts.
- To reduce bromate:
  - Lowering pH to between 5.9 – 6.3; and
  - Limiting the dosage of ozone.
- Using Reverse Osmosis in drinking water product plant minimizes (if not eliminates) bromide in source water. Utmost care should be taken to prevent introducing bromide into the system through other operations especially at the mineral injections stage

Quality Issues

Quality Control/Quality Assurance Concepts

- To ensure best quality product, quality checking must be incorporated into every crucial part of the production system starting from source water.
- The Principle of QC/QA is to control and make sure that each processing unit perform the designed/designated functions properly. Common practice is to compare the designated property of input and output of each processing unit
- For Source Water: At designing or pre-operating stage:
  - Raw water properties must be comprehensively checked to be able to specify the necessary and required pre-treatment, treatment, and disinfection systems.
- For Source Water: At operation stage:
  - Frequency: Hourly at a minimum;
  - Check record, and compare core properties of raw water (i.e. pH, TDS, Conductivity, Chloride, Hardness)
    - Direct from source
    - After being pre-treated
  - Watch for abnormal variances from CCP which may indicate:
    - Abrupt change of raw water properties;
    - Any potential malfunction of the pre-treatment units
  - If necessary, take necessary corrective measures

For each treatment unit:

- Frequency (hourly at a minimum)
- Check and compare appropriate properties which include:
  - pH
  - Tubidity
  - Taste and odor
  - Chloride
  - Hardmess
  - Temperature
  - Chlorine (when feeding)
  - Conductivity / TDS
  - HPC
- Check performance of each treatment unit to supplement the Quality Control Check:
  - Pump pressure
  - Phosphate feed
  - Brine flow
  - Product flow
- Microbiological test to identify potential contamination
  - Coli form test
  - E-coli test

Bottles Washing and Quality Control

- This is the only area in the entire product cycle where we are handling an article that has been returned to the premises.
- Thoroughly cleaning by washing with an effective cleansing agent.
- Final rinsing of the inside, using operations water or product water, shall be used to remove traces of the sanitizing agent.
- 2.5% caustic solution and a minimum temperature of 50◦C for not less than 1 minute where high velocity jets are used, for not less than 3 minutes where soaker-type bottle washers are used.
- The use of any other sanitizers must provide effective germicidal treatment.
- Pre Washing Inspection: The primary inspection point for foreign objects, cracks, or foreign substances which cannot be removed by the washer. These bottles should be removed and destroyed.
- Washing Solution: At start-up and at every 2.5 hours, check concentration of bottle washing solution.
- Clean Bottle Inspection: Using visual, optic scan, and swabbing test technique, check and test for carry-over, left-over foreign substances, cracks or chip neck. If using chlorine in the washer, conduct a chlorine carry-over test.
- Test records must be maintained for at least 2 years.

Bottling Room & Environment Qualities

Bottling Room

- Location requires enclosed space for bottle washing and filling operations equipped with automatic door closure.
- Conveyor line covers should be within a few inches of the bottle necks and sufficient to protect the shoulders of the bottle.
- Filler room floors should be constructed with hard, non porous surface; walls should be smooth and washable.
- The following require daily sanitation and inspection:

Filler nozzle exteriors	Filler gaskets
Splash shields	Bottle positioning clamps
Counter wheel spokes	Cap bin
Cap bowl	Cap chute
Bottle neck guide rails	Capper

Bottled water plastic containers are 100 percent recyclable.

Bottled Water: The Original Recyclers
Larger bottles used in home and office delivery coolers can be sanitized and re-used an average of 50 times before they are shredded and then recycled.

The bottled water industry supports comprehensive curbside recycling programs and partners with other beverage and food companies, municipalities, and the recycling industry to educate consumers.

Conclusion and Reference

Conclusion

A Bottled Water Plant Operation
A Key Issue on Quality
A Bottled Water Company Operation
Key Issues on Qualities:
PRODUCT
SERVICES
ENVIRONMENT

Reference

ABWA Technical Manual

ABWA Model Code

Drinking Water Research Foundation's the fact about water

IBWA'S the real fact about bottled water

Country Regulations

Food Control Section, Public Health Department, Dubai Municipality's HACCP Guidelines for Food Manufacturing Premises 2005

Address :

Jl. Garuda No. 1 (RC Veteran)
Tanah Kusir, Bintaro
Jakarta Selatan 12330
Indonesia
Phone. +62 217365662 / 7354103 / 7388564
Fax. +62 21 7365683
Email: ithaher@cbn.net.id
abwa@indosat.net.id
ithaher8@yahoo.com
Web : www.asiabwa.org