

Contribution of chemistry to portable water industry



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CONTRIBUTION OF CHEMISTRY TO PORTABLE WATER INDUSTRY POSITIVE CONTRIBUTIONS

Of all the inputs of industry, the most critical is the RAW-MATERIAL because it plays a significant role in the nature, quality and quantity of the other four factors namely: technology, capital, labour and management. It is on this most crucial factor that chemistry plays its role. The truth of this assertion is clearly evident by merely taking a careful look at Chart 1. The role of chemistry is the conversion of matter from one form into another. Since this also is the aim of industry, chemistry has come to be regarded as the KING of Industry because of its utilitarian value to industry in which it plays a *primus inter pares* role and in some cases its role is *sine qua non* for industries. A few examples will drive home these assertions.

Portable Water Industry: Food, which is the most basic of all the needs of man, can be subdivided into air, water and food (*per se*). Although air and water are divine provision, the impact of life (plants, animals and human) has produced some adverse effects on the quality of these needs, especially water. The quality of water can be examined within four sub-sections; physical, chemical, bacteriological and biological. The main physical characteristics for which water is examined are: appearance, colour turbidity, odour and taste (and at times temperature).

In fact these are the only important characteristics to a villager. The neglect of the other parameters led to (and still accounts for) the deaths of thousands of human beings. Today, science has led us into the appreciation of these other factors. Thus, chemistry has revealed the deleterious effects of toxic chemicals in water and how to remove them. A few examples are:

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(i) Nitrates (If present in concentrations greater than 45mg/L) present a health hazard to infants, because, after reduction to nitrites, they may give rise to methaemoglobinaemia. Also nitrosamines may arise as the products of the reaction between ingested nitrites (some of which may also be formed by the action of gut bacteria on ingested nitrates from various sources including water, and on secondary or tertiary amines present in food). As a result of their carcinogenic potential, nitrosamines are a possible hazard to human health.

(ii) Some polynuclear aromatic hydrocarbons (PAH) are known to be carcinogenic and so, their presence in water is undesirable. The concentration of six representative PAH compounds (fluoranthene: 3, 4-benzfluoranthene; 11, 12-benzfluoranthene; 3, 4-benzpyrene; 1, 12-benzperylene and indeno (1, 2, 3,-cd) pyrene, should not exceed 0.2 µg/L iii) Water regulations limit the concentrations of some METALS (Notably Lead, chromium and iron) because of their undesirable effects on human health. The most critical parameters of water which must be monitored are the bacteriological and biological profiles. There is no such thing as pure natural water.

Natural water contains organic matter and dissolved oxygen and is, therefore, a natural breeding medium for bacteria. Typhoid fever, cholera and jaundice are caused by the infection of water supplies. In order that the bacteria causing these and other diseases may be eliminated, chemistry has supplied the means of sterilizing water for human consumption.

Thus, water is normally sterilized by adding 0.5 ppm of chlorine or 1-2 ppm ozone. Before sterilization, water is pretreated with a mixture of chemicals so

as to form a flocculent precipitate, which, in settling, carries with it, much of suspended and colloidal matter including bacteria. The chemicals commonly used are soluble aluminum or iron salts such as alum or ferrous sulphate plus lime. These are some of the contributions of chemistry to portable water industry.