



Water Treatment in *China*

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Water treatment describes those processes which make water more acceptable for a specific end use. Depending on the requirements of this end use, water treatment thus means removal of specific contaminants:

- For drinking water, those contaminants that are harmful to human health or that have a negative impact on the taste, smell and color of the water need to be removed
- For industrial water, contaminants that interfere with the subsequent industrial processes are removed
- For waste water, the goal is to remove or reduce those contaminants which harm the environment.

Water treatment may include physical, biological and chemical processes. This paper focuses on chemical treatment. These chemicals can be grouped by their effect during the water treatment process:

- Algacides kill algae. Examples include copper sulphate and benzalkonium chloride
- Antifoams break down foams and thus ensure efficient processes. Antifoams typically contain oils and silicones, or are based on organic siloxane powders.
- Coagulants induce clumping together of solids (e.g., organic matter, inorganics, pathogens), facilitating their subsequent removal by filtration. Positive metal ions with multiple charges (e.g., Al^{3+} , Fe^{3+}) are typical examples.
- Corrosion inhibitors protect metals from dissolving. There are many different types, many of which work by forming a protective layer on metal surfaces

- Disinfectants kill present unwanted microorganisms in water. Chlorine, chlorine dioxide, ozone and hypochlorite are commonly used.

- Flocculants promote bonds between suspended particles and thus reduce turbidity. Both cationic and anionic polymers are used

- Neutralizing agents and pH conditioners are used to neutralize acids and basics. Examples are sodium hydroxide, calcium carbonate, or lime to increase pH levels, and sulphuric acid or hydrochloric acid to decline pH levels

- Oxidants are used to remove both organic and oxidizable inorganic components. Examples are hydrogen peroxide, ozone, and oxygen

- Oxygen scavengers prevent oxygen from introducing oxidation reactions (which can lead to damages). Examples include hydrazine and other organic products but also salts

- Scale inhibitors prevent the formation of precipitate that forms on surfaces as temperature increases. Scale inhibitors are surface-active negatively charged polymers such as phosphate esters, phosphoric acid and solutions of low molecular weight polyacrylic acid.

However, value creation of water treatment companies does not only involve the production of water treatment chemicals. In fact, there are three distinct steps of the value chain.

Chemical producers focus on the production of one or several of the chemicals listed above. They are thus production-oriented, with production cost being a major success factor. Many Chinese chemical companies active in water treatment follow this business model as it is relatively simple and does not require establishment of strong services, nor strong water treatment knowledge. Many water treatment chemicals

also have other uses; therefore chemical producers are not necessarily highly specialized on water treatment.

Chemical formulators take different water treatment chemicals and use them to formulate water treatment products for specific applications. They may also provide toll manufacturing. Many of these companies are quite small and have only local reach. Flexibility and formulation knowledge specific to water treatment are their key success factors.

Water management service companies provide more or less comprehensive services based on their technical expertise. This may include not only the application of chemicals for water treatment, but also the provision of equipment, testing equipment and consulting services. Veolia, a global leader in water treatment, has a strong presence in China with this model. Sino-French provides the water services for the Shanghai Caojing Industrial Park.

China is the region with the fastest growth for water treatment, driven by the huge population, the fast-growing industrial production and the gradual increase in environmental standards. An annual water treatment growth of 7-8% is forecast for the next few years. A particular growth area is municipal water treatment (drinking water) as so far the market is far more dominated by industrial water (particularly cooling water) than in the more developed Western markets.

Consequently, many global players in water treatment have put substantial resources in the domestic market:

- Ashland is strong in municipal water treatment and solutions for the pulp & paper industry. Ashland Water Technologies operates a technical center in Shanghai. In the



past, Ashland strengthened its water treatment business in China via the acquisition of some domestic and multinational competitors

• BASF (including the former Ciba businesses) is one of the world's largest suppliers of water treatment chemicals and will in 2012 start manufacturing water treatment and paper chemicals by building two world-scale plants for organic flocculants in Nanjing

• Dow (including the former Rohm&Haas businesses) will build a new world-class reverse osmosis membrane plant in Huzhou, adding to the formulated products in the portfolio (particularly formulations for cooling water treatment)

• GE Water & Process Technologies focuses on complete solutions for water and wastewater treatment, covering both municipal water and a variety of industrial applications. Though GE produces individual water treatment chemicals in China, the business focus is on integrated solutions including consulting, equipment and process optimization

• Nalco (now part of Ecolab) has a large presence in China with more than 800 employees and a technology and training center. Focus is on industrial applications, with the large number of more than 500 sales and service staff indicating the high importance of services rather than individual chemicals.

• Veolia entirely focuses on services and does not produce chemicals in China. Their operations include full water services contracts in Shenzhen, Kunming, Changzhou, Liuzhou, Lanzhou, Haikou and Tianjin as well as industrial water services from abstraction or desalination to producing process water through to treating and recycling wastewater and sludge.

In China, these large Western companies account for about half of the market for water treatment chemicals. As shown above, Western companies have moved towards offering solutions rather than just producing individual water treatment chemicals (in fact, the production of some water treatment chemicals has already been outsourced). Multinational water treatment companies frequently use chemicals that are quite similar to those used by domestic companies, but they are much more experienced in

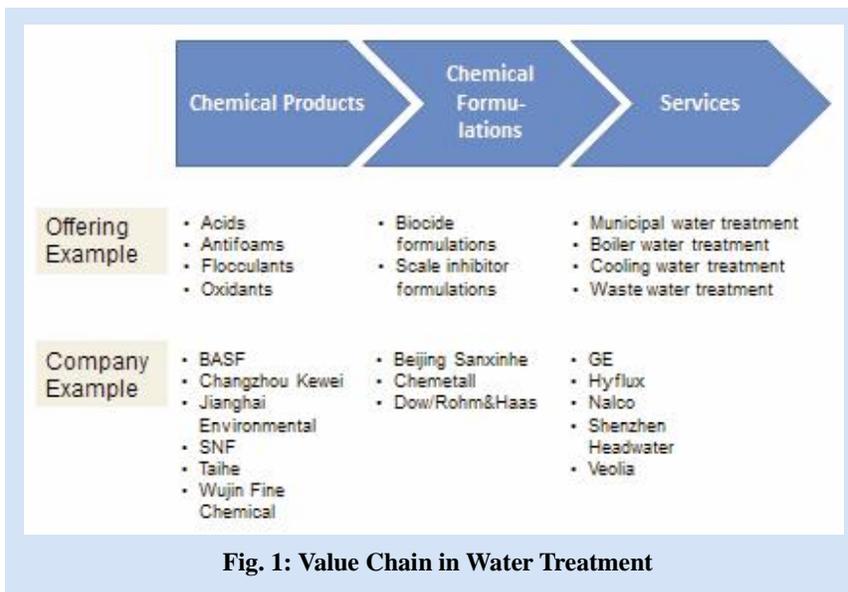


Fig. 1: Value Chain in Water Treatment

creating formulations and adding automation solutions. Furthermore, they have a global presence, which is an advantage for multinational clients. Among the solution providers, engineering companies such as Kurita also have advantages in water treatment as they can easily provide equipment for water treatment, though they do not produce chemical agents.

In contrast, the situation of the Chinese chemical companies highlights their key issues and the resulting challenges:

• The industry is highly fragmented, with almost all domestic water treatment companies achieving sales well below US\$50 million. Consolidation therefore is required to create stronger players with broader capabilities and larger geographical reach

• The biggest domestic companies such as Jianghai and Wujin Fine Chemical focus more on production of water treatment chemicals rather than on provision of water treatment services, and thus are stuck in a segment with lower profitability and lower growth rates. As a consequence, potential domestic industry leaders need to focus more on services and may even outsource the production of water treatment chemicals. This will require investment in

people, technologies and service networks rather than in production assets.

• Lack of critical size and of suitable technology prevents domestic companies from offering comprehensive service offerings to industry clients and municipalities. Again, this points to the need for consolidation among domestic players.

• However, in some areas that are do not require advanced technologies (e.g., desiccation), the many small domestic companies have a large combined market share. The advantages of domestic companies are both lower prices and good relationships to local governments.

Finally, it needs to be emphasized that the future growth of the water treatment chemicals market in China will largely depend on government action. This refers less to the existing regulation but rather the strictness of implementation. Currently only large multinational companies regularly observe the rules regulating, e.g., waste water treatment while particularly small, privately owned Chinese companies often lack the resources to do so. In a way, this hinders the development of a domestic water treatment industry as global players will initially prefer to work with their familiar global counterparts in water treatment rather than with some less known domestic players. ■