

Water Opportunities in Chemical Processing

By Shilpa Tiku

• Higher regulatory scrutiny since 9/11 due to national security, recession and public perception with growing environmentalism – each creates challenges and prospects for improved water management in the U.S. chemical industry.

The chemical industry is a keystone of the U.S. economy, converting raw materials (oil, natural gas, air, water, metals, and minerals) into more than 70,000 different products. Few goods are manufactured without some input from the chemical industry. Chemicals are used to make a wide variety of consumer goods, as well as thousands of products that are essential inputs to agriculture, manufacturing, construction and service industries. The chemical industry itself consumes 26% of its output. Major industrial customers include rubber and plastic products, textiles, apparel, petroleum refining, pulp and paper, and primary metals. Chemicals are nearly a \$1.5 trillion global enterprise, and the U.S. chemical industry is the world's largest producer. There are 170 chemical companies with over 2,800 facilities abroad and 1,700 foreign subsidiaries or affiliates operating in the United States, according to "The Business of Chemistry 2000" survey of the American Chemistry Council.

Onsite water and wastewater treatment has become increasingly important to industrial end-users, following quality concerns and rising environmental legislation. More and more, regulators are stipulating effluent discharge levels to industries and imposing high penalties in the case of violation as water supply charges increase. Major pollutants in wastewater from chemical industries include BOD, COD, suspended solids and numerous impurities from washing stages. Traces of ammonia, acids, salts and various chemicals and solvents also occur, along with heavy metals such as copper, zinc and cadmium. Wastewater from chemical industries often requires a combination of treatment methods to remove contaminants before discharge. For heavy metals, oxidation, precipitation and filtration is used. For organics, a combination of air or steam stripping, granular activated carbon, wet air oxidation, ion exchange, reverse osmosis, and electrodialysis is used. A typical system may include neutralization, coagulation/flocculation, flotation/sedimentation/filtration, clarification and biodegradation (for example, trickling filters, anaerobic treatment, aerated lagoons, rotating biological contactors and activated sludge processing). A final polishing step using filtration, ozonation, activated carbon or chemical treatment may also be required. Other industry-specific technology trends include filtration and precipitation through lime and stripping processes to remove foreign chemicals.

The chemical industry is highly regulated. Chemical facilities have been burdened with a number of additional emission control requirements, in the form of Maximum Achievable Control Technology (MACT) standards. Official monographs exist, providing purity guidelines related to the type of water used for manufacturing purposes. There are permit programs instituted to monitor wastewater effluent discharges as a direct result of manufacturing. Inclusive of both levels of regulation are guidelines known as good manufacturing practices (GMPs). They govern

any type of equipment or process that's directly or indirectly used for chemical manufacturing practices. Embedded into these regulations are levels of validation requirements, documentation standards, and equipment and process design specifications. In addition to this commitment, violations of any regulations mentioned will result in incident investigations, possible loss of operating licenses, legal contingencies, and financial fines or reprimands. These outcomes also can have a negative impact on the overall reputation of the parties involved, if exposed to the media or within corporate financial records.

Table 1. SWOT analysis of chemical processing market

Strengths	Weaknesses
Technological Expertise	Passive and Reactive Sales
Quality and Reliability	Price Concerns
Customized Solutions	
High Customer Loyalty	
Improved Serviceability	
Opportunities	Threats
Sizeable Industry	Industry Consolidation
Diversity of Demand	Market Maturity
Strong Legislative Market Drivers	Competitive Pressures
Upgrades and Improvements	New Demand Saturation

Market maturity, coupled with the competition and complexity within the chemicals industry, impede the water and wastewater treatment suppliers in this sector. Also, the diversity of demands among chemical plants dictates a need for specialization and customized services. Process water and effluent treatment requirements vary depending on the production of specific chemicals, extending from negligible water use to complex quality concerns and high effluent impurities. Successful suppliers must be closely tuned into the industry specifics in order to attract future demand.

Saturation of new demand is by far the most critical constraint of future market revenues. Installed capacity is now reasonably high in most chemical plants and in most cases, at the very least, achieves the minimum regulatory requirements. Maturity of the market also brings about disincentives for further large-scale development, particularly in the field of water and wastewater treatment, which represents a sunk cost for chemicals manufacturers.

Demand for water and wastewater treatment equipment in the chemicals industry is inextricably linked to the growth pattern of the chemical industry itself. A decline in market growth for the chemicals industry has meant that investment in environmental concerns and wastewater treatment in particular has been low. Large chemical companies such as DuPont, Celanese and Nova Chemicals have reported steep year-end losses in 2008. The American Chemistry Council has projected that U.S. chemical output will drop 8.7% in 2009 from 2008 levels.

Within this market segment, there are two major Tier-I competitors (Siemens Water Technologies and GE Water & Process Technologies) that have been able to capture over half

the market share. These companies are able to maintain this share by providing a large variety of water treatment technologies, as well as total solutions required for the chemical water treatment industry. Inclusive in this capability is the fact that both Tier-I competitors have strong reputations and brand recognition,, which enhances their ability to retain their current market share over time. With proven technologies, large corporations provide process water treatment, wastewater treatment, byproduct recovery, as well as residuals management.

An increased understanding of the requirements of the chemical end user is gaining importance as industry needs change in accordance with strict regulations and environmental laws. It is essential for treatment equipment manufacturers to keep abreast of these requirements to capitalize on future opportunities.

New entrants will need to position themselves as providers of superior service quality to gain a foothold in the market. Incumbents can preempt new entrants by either improving their current service quality or introducing state-of-art technology ahead of new entrants.

Table 1 shows a four-way matrix, or Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis, that identifies key opportunities and threats in the market, as well as primary strengths and weaknesses of the overall supply base.

Due to its water requirements, the chemicals industry has justifiably been staged as a vital industrial customer in the maturing field of water treatment. Regulatory demands are also driving the wastewater sector; however, the approaching maturity of the water and wastewater treatment market suggests demand saturation.

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