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POU/POE FORECAST

IS THERE AN EXPANDED FUTURE FOR SMALL, DISTRIBUTED WATER TREATMENT SYSTEMS?

The question is: Are distributed systems the future of water? Four years ago, at the Water Quality Association Annual Conference in Albuquerque, I first learned about Kinetico's plans to team up with water utilities to provide a broader range of services to residential water users. A service that offered combining the "one size fits all" brand of utility potable water, with the options that a POE/POU provider, in this case Kinetico, can provide for the end-user. The concept was aimed at providing a communications-like (e.g., cable TV, telephone/Internet, etc.) level of options of water service to the end-user. Appropriately enough, the high tech, Silicon Valley-based San Jose Water and Kinetico (through their local distributor, Crystal Choice) are engaged in a leading edge example of such a relationship. The question remains: Is this a trend … or a dead end?

My belief is that distributed water treatment is a trend, that is, only if a few other factors converge.[1]

- Energy (i.e., pumping, water pressure) costs continue to increase.
- Technology continues to improve in cost and performance (especially membranes, disinfection, remote multiparameter monitoring and control).
- Water technology and service companys take a leadership role (especially focusing on life cycle costs, marketing and communicating various grades and brands of water for particular uses).

To determine the current progress of the development of small systems, WaterInfoCenter.com is performing an online survey of water/wastewater utilities to develop a baseline for current activities and thinking with respect to these distributed systems. Highlights of the results, and of a separate report on the data, will be published in *WQP* in the coming months.[2] In addition, based on both formation of the survey and our experience in the water industry, "distributed small systems" does not have a distinct definition. The U.S. Environmental Protection Agency (EPA) defines a small system as one treating 10,000 gallons per day or smaller. Many municipalities consider "small systems" as anything less than 100,000 gallons per day, and medium systems are in the 0.1 to 1.0 million gallons per day. For purposes of the survey, we looked at systems in the medium to small range (less than 1.0 million gallons per day). A key point that is emerging in all this discussion of small and distributed systems is that water can be used and reused at basically three broad levels of the water utility system: the home, neighborhood and city. Depending on the topography, local water availability and the existing infrastructure systems, a given water system may be more "centralized" or distributed through these broad levels of water use. Water availability, use and reuse can be thought of as having at least these three nested cycles at the broad levels of "distribution" (and collection/reuse). For our purposes, by "small distributed systems" we mean the home and neighborhood level, and not the city infrastructure/water cycle level. Cities will continue to manage centralized along with distributed systems, as technology and economics dictate. It will be up to the industry to provide water/wastewater agencies with the tools, services and financing options to integrate and manage these ever complex nested systems. This is not without precedent; the movement to mainframe, mini and micro computers already is being accomplished. The same will continue to occur in energy.[3]

Until we see and analyze those results, however, there are a few factors that also will drive the trend of distributed water treatment systems.

- Growth of the water recycling market
- Technological innovation
- Utility deregulation and privatization
- Leadership by industry participants

These are each briefly addressed in the balance of this article.

Water Recycling: Water is [Not] Water...

At last year's annual WateReuse Association meeting, in Napa, Calif., a phrase often was repeated: "water is water." The more this rang in my brain, the more I realized that this obfuscates rather than clarifies the future of water. As most of us know, we don't tell our kids to drink from the toilet, gutter, a cesspool or the ocean, and while we live on "the water planet" most if it is not potable. Rather, water comes in many grades and flavors. This every consumer knows from experience. So how can water professionals use this knowledge to advance water quality and water abundance?

Water recycling is the single fastest growing sector of the water market.[4] So it represents an important trend in our industry either to watch and/or participate. However, as is being played out in practically every community that is pursuing water recycling, there are plenty of issues (both real and imagined) with respect to quality and appropriate use of the water. Some of the issues raised by extending our water supply via recycling are

- **System size.** For example, San Diego has recycling systems starting from gray water at the home to a 30 mgd facility in North City whose water is being used by UC San Diego, Torrey Pines Golf Course, Caltrans and some of the growth companies in that region. Are all sizes appropriate, or will one size tend to dominate?
- **Water marketing.** Finding ongoing users of recycled water is a major job requiring education, pricing, funding, contacts, etc. What role is private industry going to play to enhance and rationalize this marketing effort?
- **Public/Private Partnerships.** Because reclaiming water is technically sophisticated and requires the ongoing presence of private companies to both capitalize and service recycling equipment, new public/private relationships (partnerships?) between water equipment (i.e., filters, membranes, control, etc.) and service companies and municipalities will be required.

While it is beyond the scope of this article to answer all these questions here, the point is that part of the distributed water treatment trend will—in fact, it actually must—include recycled water (and desalination where appropriate). Membranes, disinfection and emerging technologies provided by the water quality industry will factor into facilitating this growth in very major ways, leading to both business success and community satisfaction.

Technology: Membranes, Disinfection, Bio and Structured Water

None of this discussion would even be possible if it wasn't for the significant advances in water treatment technology. The two current trends and two important future trends in water treatment are

- **Membranes.** At a recent membrane conference,[5] a major theme by a number of the presenters was water sustainability. What was clear from all the presentations is that prices continue to drop, while quality (through-put, control and reduced fouling) is going up.
- **Disinfection.** The expansion of ultraviolet and advanced oxidation in wastewater and continued expansion in water is testimony to the expanding influence of these important technologies over just chlorine.
- **Biotreatment.** New biotechnologies (fixed film, unique high performance bed designs, enzymes, etc.) will continue to improve and gain market share. The role, interaction and control of these techniques along with oxygen, nutrients and surfactants still is evolving but will become a major force in the immediate future.
- **Structured water.** An emerging, and much maligned and misunderstood market is the development of technologies for "structured water."[6] The future of water will entail a much deeper and richer understanding of water "chemistry" than what we have even begun to realize to date. Companies that can secure a position in this market early on will be future winners in the water industry.

As water professionals know, water (except bottled water) is not a high margin, high product turnover business. So unlike electronics, communications and pharmaceuticals, water does not have these drivers of technology innovation. Not only that, water has a barrier the other industries don't: technology "lock

in" due to "best available technology" legislation as part of the states and EPA's method of implementing and regulating SDWA and CWA. Nevertheless, its own snail's pace, technology is evolving in this industry. As the above technology innovation streams converge by the next generation (2025 and beyond), the water industry will start to look a lot different than it does today … just look back over the last 25 years.

Energy's Relations: Disruption and Sustainability

Deregulation, especially privatization, has long been an issue in the U.S. water industry. Unlike France, England and now Germany, Spain, Brazil, etc., the role of the private sector in the United States has been viewed with suspicion bordering on hostility. Many water industry observers have been looking at energy as a model for deregulation that may proceed or portend a direction for our water industry.

Sitting here in California as I write this under the threat of daily rolling blackouts, the future doesn't look so "bright." However, we have other examples in the United States. For example, Pennsylvania's Nora Mead Brownell, president of the National Association of Regulatory Utility Commissioners, attributes the association's success to five fundamental principles.

- Everyone must benefit.
- Markets are fragile and must be nurtured over time.
- Demand and capacity must be kept in balance.
- The independent service operator (ISO) must truly be independent.
- Market transparency is essential.

Her conclusion is "not to abandon deregulation but to make it work for everyone." This free market environmentalist and public trust approach can and likely will be applied to water with good effect, assuming our leadership (both public and private) steps up to the collective plate.

Leadership: Inventing a New Future for Water

Water leadership, however, will require something more compared to effective energy leadership. It must be based on at least the following elements.

- Vision and focus on meeting all the fundamental needs of water end-users (commercial, residential, industrial and agricultural).
- A deep understanding of how water is the ultimate recyclable resource and that through recycling we can achieve resource abundance.
- A view of water sustainability principles to provide a secure and abundant water future for all of the world's citizens as well as nature.[7]

We have both the technology and the social and business models to lead to a new future of high-quality water abundance for all. "In order to lead any organization you only need to do two things well," says John Ruetten, president/CEO of Resource Trends, Inc. "First, have clear vision, and second, hold people accountable to realizing the vision."

A vision for the water industry and for your company in the industry must be based on fundamentals of what people want from water. We have boiled that down to four basic things.

- Abundance
- Quality
- Affordability
- Excellent customer service

If a water equipment or service company isn't providing one or more of these basics to end-users, then it's future is in jeopardy. However, a clear and unflinching commitment to these principles, combined with sound fundamental business practices, likely will ensure your company's future in water. In addition, an understanding and practice of the interrelationships of the nested cycles of distributed water systems, water reuse, water treatment technology evolution, deregulation and free markets of water, combined with a focus on vision and accountability of both your company and the industry, will create a future of expanded decentralized small systems. It just makes too much sense not to.

Water is one of those commodities such as air and food that people can't ever do without. Because it truly is very abundant on the planet, though often not at the right quality and price, means that providing it in the right quality, price, amounts and methods will insure its important place as the foundation to both our physical and economic life. This has become a life's calling for most water professionals reading this article. Your choice as both business and community leaders is to lead, follow or get out of the way. Choose to lead, and you ensure not only your own bright economic future, but quite possibly the future of children and grandchildren as well. The future of decentralized water, therefore, is in your hands. WQP

About the Author
Dan Noble, director/co-founder of Resource Trends, Inc., a company devoted to expanding resource productivity investment returns of process resources of water, energy and chemicals, is also co-founder of Environmental Business International, Inc., publisher of *Environmental Business Journal* and author of leading market reports on the United States and global water industry.

For more information on this subject, write in 1018 on the reader service card.

[1] *A more detailed discussion of water industry discontinuties that are leading water trends can be found in WaterView 2000 Report Series, authored by Resource Trends, Inc. and EBI, published by EBI, Inc., San Diego, Calif.; www.ebiusa.com.*

[2] *A survey form (if you are a member of a water or wastewater agency) can be found at www.waterinfocenter.com/*

[3] *See Rocky Mountain Institute,* Small is Profitable*, at www.rmi.org.*

[4] *See "Water Recycling," by Dan Noble in* Why Invest in Water?*, a series of articles published online at www.waterinvestments.com.*

[5] *Membranes 2000, Dec. 5–7, 2000, BCC Membrane Conference, Boston.*

[6] *"Structured water," also called "functional water," is a rather crude attempt to label a very intriguing set of observations of interdependent phenomenon that only now are being discovered and researched globally. It relates to the interaction of the various hydrogen bond configurations that water can have related to dissolved gasses (oxygen, argon, CO_2, etc.); the oxidation reduction potential of the water (i.e., how oxidized or reduced the water is); temperature; various dissolved substances (metals, surfactants, other nutrients, etc.); overall ability to measure these factors; and the actual availability of those nutrients to organisms or other chemical activities and reactions. A lot of the "variable results" of biotreatment and other magnetic and energetic effects on water and wastewater stem from a poor understanding of the basics and complexity of water chemistry.*

[7] *For a detailed analysis and principles of a sustainable water future see* The Worlds Water 1999-2000*, Peter H. Gleick, Pacific Institute, Oakland, Calif.*