

# PROFILE

## FARMEN HELPS LAUNCH CRYSTAL CLEAR TECHNOLOGIES TO OFFER BETTER TREATMENT TECHNOLOGY

**L**isa Farmen traces her interest in water back to 1976 when working for the M&I Consulting Engineers lab in Fort Collins, Colo. At the time, she was a student at Colorado State University, from which she graduated in 1980 with a degree in biology.

She worked at M&I for several years, moving from washing beakers to a full analytical water chemist for inorganic, organic, and biological testing of water, wastewater, and soils. Subsequently, Ms. Farmen held other positions that related to water analysis and treatment before co-founding Crystal Clear Technologies Inc., the firm she now heads in 2005.

The following comments from Ms. Farmen are based on recent communication with *ULTRAPURE WATER journal*.

### Background

**UPW:** Please provide a summary of your education, and work background as it relates to the water treatment business.

**Ms. Farmen:** "My passion for clean water started in 1976 working in a water lab for an environmental consulting firm named M&I Consulting Engineers in Ft. Collins, Colo. The field work took me to Fort Saint Vrain (near Platteville, Colo.) to sample water and the contaminants that could be on a nuclear power plant site and the direct impact to the water steered my career path from veterinary medicine to biology, chemical engineering, and radiation physics. Further analytical work at Rocky Flats (near Denver) also motivated me to look at water contamination and clean up of contaminated water as a career option."

"After graduation from Colorado State University in 1980, I moved to the Silicon Valley and my first job offer was to work in a leased water lab in an environmental

By Mike Henley

### Meet the Executive

**Name:** Lisa M. Farmen  
**Company:** Crystal Clear Technologies, Inc.

**Job title:** President & COO

**Location:** Portland, Ore.

firm, EMCON Associates in San Jose, Calif. I analyzed their water, hazardous waste, and soil samples. My employers encouraged me to find additional water testing clients to keep the water lab going. Being in Silicon Valley at the relative beginning of the semiconductor and electronics manufacturing heyday was very exciting."

**UPW:** Tell us about your experiences in the Silicon Valley.

**Ms. Farmen:** "I established numerous accounts within the electronics manufacturing fabs analyzing their tap water supply to the plant, rinse tanks from the various chemical processing, and the wastewater prior to discharge. When the regulations came out requiring these manufacturers to install both water and wastewater treatment equipment, this opened up a new opportunity to design, build, and install capital equipment, so I teamed with three additional people and formed Ecology Protection Systems (EPS)."

"During my time with EPS, we designed both influent water treatment systems as well as wastewater treatment systems for removing heavy metals, fluorides, and other toxic contaminants from water. We had an established equipment line that serviced the semiconductor, circuit board, lead frame, and metal finishing industries. We designed systems ranging from 25 gpm to 3,500 gpm."

**UPW:** What are your experiences in the capital equipment side?

**Ms. Farmen:** "I started my own capital equipment company, Waterworks Tech-

nologies Inc., and was an early adopter of ion exchange technology for metal removal and water recycle. This company was located in Auburn, Calif., and was later sold to a group of investors."

**UPW:** Tell us about your work with Texas Instruments.

**Ms. Farmen:** "To strengthen my engineering and high-purity water experience, I took a senior engineering position with Texas Instruments and became an integral part of TI's worldwide water team whose goal was to design and build the most advanced water high-purity water systems, coupled with the most aggressive water reclaim and recycling in the semiconductor industry."

"To expand the fab in Santa Cruz at the end of the 1990s, we had to double production or wafer starts, while at the same time cutting the amount of water consumed for the plant by 30% before the expansion. The City of Santa Cruz told us we could expand the fab all we wanted; we just could not have any more water. We were one of the first HERO installations, and designed and built with the fab running, a very state-of-the-art high-purity water system with the RO running at 95% recovery, and the entire site reclaimed or recycled 90% of all



water used. “

“While the fab expansion was being engineered and built, I returned to graduate school to finish my executive MBA in international business from Golden Gate University, completing the international finance portion in London and Dublin.”

**UPW: What led to forming Crystal Clear Technologies?**

**Ms. Farmen:** “After leaving TI in 2001, I worked with Sandia National Laboratories on their design-and-build HERO system to reduce the amount of water the National Lab used. In 2005, we wrote a proposal to the National Science Foundation (NSF), Small Business Innovative Research (SBIR) program to develop nanotechnology effective in the passive removal of both biological and chemical contaminants in water. “

“Crystal Clear Technologies Inc. (CCT) was incorporated in 2005 when the NSF SBIR Phase 1 grant was won. Since then, we have three grants with the NSF. In 2006, we competed in the California Clean Tech Open, a business plan competition in Silicon Valley sponsored by MIT-Northern California Chapter and we won for best clean green emerging technology for Water. Also in 2006, ONAMI (Oregon Nanotechnology and Microscience Institute) awarded CCT with the University of Oregon a “Gap” grant to support moving the developed nanotechnology from proof of concept in the lab to the technology validation stage, which we are in with several potential lead customers.”

**UPW: Were any of your past jobs influential in setting the tone for your present work?**

**Ms. Farmen:** “Without question, my previous work in wastewater treatment had tremendous influence on the nanotechnology CCT has developed for water purification. I have built numerous wastewater treatment systems where the contaminants are removed from an industrial waste stream (point A) and then landfilled in a Class 1 disposal site (point B). The economics to recover the metal as a resource were just not there.”

“CCT has developed the ability to recharge an exhausted media bed with heavy metals by applying our bifunction-

al ligand chemistry that will bond to the metal layer on the adsorptive media and providing a “fresh” site for an additional layer of metal to be bonded. After just 8 layers of metal, we can concentrate the metal contaminants over 15% by weight and exceeding the metal in ore, making it economical to recover the metal as a resource, and not land filling it as a hazardous waste. This is a huge step forward for treating metal bearing water and being able to reclaim the metal and the water, without generating a waste stream.”

“The other significant accomplishment for CCT’s technology is that we have developed our passive nanotechnology so that it is extremely low cost to the point that the majority of the world’s population can afford it. “

**UPW: Any noteworthy mentors?**

**Ms. Farmen:** “Without question, the two individuals who influenced me the most are the late Lacy G. Thomas and David R. Wood, both from Ecology Protection Systems days. David Wood turned me into a better water chemist than I ever would have been on my own, and Lacy Thomas empowered me to learn engineering, manufacturing, and design by doing them. It was a very steep learning curve.”

**Work**

**UPW: Please describe your position at Crystal Clear Technologies.**

**Ms. Farmen:** “At CCT, I play a key role in working with my partner, James Harris, Ph.D., on development of our nanotechnology, writing grants, developing key relationships with lead customers, writing MOUs and commercializing our technology. I am the principle investigator on the NSF and ONAMI grants.

“It is the best job you can have in that we have developed this technology from a blank sheet of paper with the goals being leading edge nanotechnology, passive, and very low cost. In accomplishing all three objectives, we can now commercialize the technology to the majority of the world’s population.”

“There is not a more significant contribution that one can make, short of educating people to read and write than to bring to market water purification technology that even the poor can afford.”

**Philosophy/Approach**

**UPW: Do you tend to deal more with endusers or suppliers?**

**Ms. Farmen:** “To license the nanotechnology, we work direct with the large scale endusers from a customer licensing standpoint and a large manufacturer/supplier of water treatment technology.”

“We can license both of the nanocoatings as well as the final NMX media.”

“For our portable water purifier, we work with contract OEM manufacturers, as well as key local partners for technology and product dissemination. We are in the process of converting the human powered prototype to a water purifier for the underserved in both the U.S. and India had have established local partners for both markets.”

**UPW: Related to your work, what are some of the goals you have in reference to the water treatment business?**

**Ms. Farmen:** “By 2015, it is estimated that two-thirds of the global population will be without a clean reliable source of water and 1/3 will not have year around access to water at all. The sole reason that clean water is not readily available has little to do with technology and more to do with cost. With 2 billion people earning under \$4.00/day, they need to be able to purify water for a few pennies. There are not that many people doing research on developing low cost water purification.”

“For wastewater treatment, removing the contaminants without generating a waste stream or wasting water or using a tremendous amount of energy to treat the water must be developed. I am very proud to say that CCT has achieved all of these goals. “

**Future Trends**

**What changes do you see coming in the water treatment field?**

**Ms. Farmen:** “There are more SBIR grants being issued for development of technology for water that will either reduce the cost or eliminate waste streams. I do not see the R&D budgets for companies increasing to develop technology that achieve these goals, which is why the SBIR program at the NSF plays a crucial role in advancing technology in the United States.” □