

2007 In Review

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The year 2007 was filled with challenges, opportunities and major milestones. The Ojozona water treatment plant came on line and demonstrated that the AguaClara technology is able to produce safe drinking water without an external power source. Our close connection with Agua Para el Pueblo, [APP](#), in Honduras grew stronger and APP hired a Honduran technician, Antonio Elvir, and two Cornell graduates, Carol Serna and John Erickson to work full time on the AguaClara project. The design team at Cornell continued work toward our long term goal of producing the first automated design tools for municipal water treatment plants, and the research team continued their work to better characterize the conditions necessary to produce effective flocculation.

Ojozona

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Ojozona water treatment plant in January 2008 (photo by Lindsay France).

The AguaClara water treatment plant at [Ojozona](#) is the first implementation of a suite of technologies designed by the AguaClara team. These technological firsts include:

- [Flow control modules](#) for constant and easily adjusted delivery of both aluminum sulfate and calcium hypochlorite
- Modular assemblies of plastic corrugated roofing material for both hydraulic flocculator baffles and plate settlers
- Piped delivery of water into the sedimentation tank to reduce horizontal fluid velocities
- Sedimentation tanks designed to take advantage of a floc blanket to get enhanced turbidity removal
- Vertical flow hydraulic flocculator for small flowrates (The previous minimum flow for these flocculators was 7000 liters per minute. We proved the technology can be adapted for flowrates as low as 200 liters per minute.)
- Novel plant design that uses only one valve per tank and yet can be easily controlled for normal plant maintenance
- Plant operating tables that eliminate the need for calculating plant flow rates and chemical dosages.

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Inauguration ceremony of AguaClara water treatment plant at Ojozona in January 2007.

The Ojozona plant was inaugurated in January of 2007 with a ceremony that included representatives from water sector organizations, local mayors, AguaClara team members, [Sanjuan](#) Foundation, NRW, and [APP](#). The ceremony marked a significant milestone of the end of the construction phase, but it wasn't until later in the year that we were able to bring the plant fully online and operating according to design. The first year of plant operation was a learning experience for everyone involved as we developed operating guidelines, made improvements to various components, and learned the art of adjusting the alum dose to obtain clean water.

At the inauguration ceremony we committed to providing upgrades, technical support, and whatever else was required to produce clear, safe water at the Ojojona plant. Due to the number of technical innovations required to build and operate a small scale gravity powered water treatment plant it took an additional 9 months after construction was completed to reach that goal. During those months we developed new fabrication techniques for modular baffles and plate settlers, learned the importance of controlling the plant flow rate to eliminate flow spikes after rain storms, developed a much simplified plant operating procedure, devised maintenance procedures that optimize plant performance, and designed and fabricated the next generation of flow control modules. The result is a water treatment plant that is easy to operate, easy to maintain, and that already performs better than many of the "high" tech plants in Honduras.

Tamara

As Honduran communities learn of the AguaClara technology an ever increasing number are requesting that they be considered as potential sites for future water treatment plant projects. Site selection proved to be a challenge during the fall of 2007. The community of Moroceli was a top candidate because of its proximity to Tegucigalpa, size, and the recent construction of a new water storage tank at an ideal site overlooking the town. Unfortunately, poor engineering by the agency responsible for building the new tank left the tank high, dry, and unusable. Without water in the new storage tank Moroceli was no longer a viable candidate and APP helped identify additional communities that were close to Tegucigalpa in the Amarateca valley. A series of community meetings and engineering studies ensued and before long [Tamara](#) was identified as an ideal community. Tamara has a population of 3500, a well organized water board, and a single water supply serving the community. APP was already working with Tamara to extend their distribution system and so the addition of a water treatment plant was a logical next step.

Capacity building and training

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Plant operator training workshop using the demonstration plant in Ojojona in August, 2007.

In August Monroe presented a 2 day workshop in Ojojona on the theory and operation of the AguaClara water treatment plant. The workshop was attended by 3 plant operators and 2 members of the water board from Ojojona, the plant operator and head of the water board from La 34, Antonio Elvir (the AguaClara APP technician), and 7 employees of AHJASA (a Honduran water sector NGO). The transparent [demonstration plant](#) that was built by the AguaClara team during the spring of 2007 proved to be a valuable teaching tool. The demonstration plant is able to illustrate the concepts of reactor residence time, flow measurement, chemical dosing, the development of floc size in the flocculator, and sedimentation on the plate settlers.

The operator training continued from August to December as John, Carol, and Antonio worked with the 3 plant operators from Ojojona. We anticipate that the training period will be shorter in future plants, but a significant training period of at least several months will always be necessary to ensure that the plant operators have the experience and confidence to continue operating the plant. It is essential that the plant operators become completely familiar with all of the operation and maintenance procedures and have the confidence to make changes and repairs to the plant as needed. One of the reasons that the high tech plants fail is because the plant operators don't feel ownership. It is our goal that by including a thorough training period of successful plant operation that the community will begin to expect safe water and that the plant operators will develop pride in providing a high level of service to the community.

AguaClara Engineers working for Agua Para el Pueblo

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Carol Serna and John Erickson, AguaClara Engineers in Tamara, Honduras.

Beginning in August of 2007 [APP](#) hired two Cornell graduates, Carol Serna and John Erickson, for a year assignment working on AguaClara projects in Honduras as [AguaClara Engineers](#). Funded by the [Sanjuan Fund](#) Carol and John have worked with Antonio Elvir to make improvements at the Ojojona plant, to train plant operators, to evaluate potential sites for future plants, and to document the performance of the Ojojona plant. They have also been an invaluable link between the research and design teams at Cornell and APP. We plan to continue the AguaClara Engineers program at the same level in 2008-2009.

Research and Design

The AguaClara team at Cornell made advances on many fronts. Much of the design work had direct application to the Ojojona plant. The team designed new fabrication techniques for plate settlers and for the flocculator baffles using materials that are available in Honduras. They designed a modular flow control device that is easier to install and use. And they designed and built a transparent demonstration plant that replicates all of the systems found in the full scale AguaClara water treatment plants.

In the fall of 2007 the design team created an improved plant layout for Tamara. Now that the process design has been proven the team focused on making the plant as easy as possible to operate and maintain.

Another branch of the design team made great strides toward our goal of creating an online fully automated design tool for AguaClara water treatment plants. Our goal is to be able to provide fully detailed designs including 3-D AutoCAD drawings and parts lists to municipalities, NGOs, and consulting firms who want to build the AguaClara water treatment plants. Our goal is to get version 1 of this capability running by the end of the spring semester in 2008.

Project Funding

Now that we have demonstrated that the AguaClara technology can reliably produce safe drinking water we are expecting a rapid increase in the rate of water treatment plant construction. We are currently building water treatment plants with a capital cost of \$20 per person served. We anticipate that we will be able to lower that cost as we move from the prototyping phase to steady construction. Assessing and developing appropriate funding sources for the capital costs became a priority during the latter half of 2007. Our circle of [partners](#) has continued to grow with the addition of the [First Congregational Church of Ithaca](#) and Somers Rotary Club. The Somers Rotary club is taking the lead in funding the Tamara project. We hope to build 5 water treatment plants in 2008 and thus we will continue to explore additional funding sources.