

A Paradigm Shift in Water Treatment

Aaron Morrison

Sir Arthur C. Clarke's third law of prediction: "Any sufficiently advanced technology is indistinguishable from magic."

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WORKING TOWARD SOLVING THE WORLD WATER CRISIS

I hope that by the end of this article, I will have been able to shed some light on how we can bring new meaning to the phrase "clean coal" and truly create a desire to develop a plan to make it clean coal, or at least cleaner than it is now.

"Clean" is a relative word. It certainly had two separate meanings when I was growing up. One was *my* kind of clean and the other was *my mother's* kind of clean, which clearly wasn't mine. Today *clean* with regard to water has several meanings as well. There is the "safe-to-drink" clean water, which, by the way, can be a dirty brown color, and the clean-looking water, which can kill you.

Focusing on clean energy, we believe we can be helpful in three or more areas, some of which we will look at in this article. The processing of water used in the fracking process, coal ash management, and CO₂ management are three areas we are positive we can make

cleaner. Unfortunately, we will not be able to detail fracking in this article, but the information provided should shed some light on our possibilities to economically treat fracking fluids as well.

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For some time now, I have listened to and watched President Donald Trump talk about his desire for clean energy, "beautiful *clean coal*," and I agree with him 100 percent that it is a very good thing to want. Does he know what it means to have "beautiful clean coal"?

The image of coal-fired electrical generation (generally speaking) is quite bad in that it is viewed as the cause of harm to the planet Earth and the number-one (depending on who you talk to) contributor to greenhouse gas, which some would say (depending on who you talk to) is the cause of global warming, but enough about that. I am thinking that the president is referring to the end-use of coal, and that due to the tremendous and constant improvements made to the industry over the years, there should be a reduction to the harm mentioned earlier. I hope to ask him someday.

Removing or replacing the opinion that coal is bad for the environment with an opinion that coal is good for the environment can, in my opinion, be accomplished by actually delivering clean coal. It certainly will not be changed by doing the same old thing and expecting a differ-

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ent result. It also will not be changed by lowering a standard or changing some regulation. It will only be accomplished by a paradigm shift, which means change, by actually doing something different.

For the last 10 years, Chaoticwaters Inc. has been working on a new way to treat contaminations of all types in water. We started out with simple tests on pond water, for example, to see what our “latest greatest invention” (or, to be more accurate, the result of a *what if* question) would do when we ran the pond water through our technology.

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Based on our goal to kill all the bacteria or disease-causing contaminants found in the pond water, we hit a home run. Not only were we able to kill living matter with adenosine triphosphate, a high-energy molecule that provides every cell with energy, and kill them instantly, but also we were able to create change in elements of the periodic table. Follow-up tests on the hardest bacteria to kill, Brewer’s Yeast, confirmed the ability of Chaoticwaters to instantly kill and render harmless these forms of life.

We went on to do several other tests on other wastewater streams, and with each test, the results revealed to us even greater capabilities. To that end, based solely on our test results to date, Chaoticwaters believes we can create a cleaner environment in the energy industry, by initially assisting with the cleaning up of the production coal ash, and the treatment of captured CO₂ from the exhaust stack scrubbers, during electrical generation.

The cost of our processing was much, much lower than the cost savings to the company. In other words, we are a cash-flow positive right from the start.

When discussing our results with an executive, I asked him, “What do you think of the lab results?” His reply was: “They are pretty darn good. It all depends on how much it cost you to get them.” The short answer is it cost us everything, but the even-shorter answer is that the cost of our processing was much, much lower than the cost savings to the company. In other words, we are a cash-flow positive right from the start, and that is without the marketing benefit of using a sustainable, nonchemical, low-energy-consuming solution to the pollution.

Figure 1. Our Unconventional Water Treatment System Looks Like This

<u>CHAOTICWATERS</u>	<u>CAN DO</u>	
> IT IS PORTABLE ~ 4'L X 5'D X 7'H	<input checked="" type="checkbox"/> YES	THE GOOD NEWS IS THAT WE HAVE ONLY UNCOVERED 20% OF OUR ABIITIES. ☺
> USES NO UV MERCURY BULBS	<input checked="" type="checkbox"/> YES	
> USES 95% LESS ENERGY THAN CONVENTIONAL	<input checked="" type="checkbox"/> YES	
> IS SCALABLE 180K AND UP GALLONS A DAY	<input checked="" type="checkbox"/> YES	
> RUN IN SERIES OR STAND ALONE	<input checked="" type="checkbox"/> YES	
> 100% ENVIRONMENTAL FRIENDLY ~ RUN OFF GRID	<input checked="" type="checkbox"/> YES	
> NO FILTERS ~ NO CHEMICALS USED IN TREATMENT	<input checked="" type="checkbox"/> YES	
> INSTANTLY KILLS AT THE MOLECULAR LEVEL	<input checked="" type="checkbox"/> YES	
> INSTANTLY TREATS TKN TP ~ SUSPENDED SOLIDS	<input checked="" type="checkbox"/> YES	

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For many of you, this is your first exposure to our technology, **Figure 1** offers a description, and a list of some of our abilities.

COAL-ASH TREATMENT PROPOSAL

What we are proposing is to do several trials.

- The first trial will be on an existing ash pond to see what the results of a straight run of existing conditions in a pond will reveal. This would be accomplished by mixing the solution up so we wouldn't just have surface water, but a mixture of ash and water. Before-and-after lab results would need to be third-party independently assessed and the results documented as a benchmark for further trials of the same ash pond.
- The second test we would conduct would be straight coal ash from production mixed with wastewater and then processed through our technology. We would run different consistencies or levels of turbidity, and as with the first trial, a completion of the laboratory testing.
- The third trial we would run would be to process water rich in sequestered CO₂ from contents of water used in scrubbers or possibly other areas of production with high CO₂ levels, and process that mixture through our technology. A complete set of laboratory results would need to be done as well, as with all our trials.

The anticipated result will be our technologies' ability to produce a product free from contaminants that can then be directly released to the environment or further processed if needed and safely used in a nontoxic form. If the latter, it is hoped that there will be additional business opportunities for any by-product, should there be any, that can benefit the utility and the communities in which they operate. The goal through this treatment is to be able to render an ash waste that will be totally harmless and that could be used anywhere without reservation. It should be noted that it is not uncommon for our technology to eliminate suspended solids, which was most noticeable in our sewage-treatment-test results, as well as most other test results.

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It is the results from our paper-recycling effluent and pulp-and-paper liquor testing that give us optimism in treating coal ash. During our testing for pulp-and-paper liquor, we were faced with an exceptional challenge. The raw liquor provided to us was the color of molasses. It was very nasty to work with, and when we were finished, it was the color of honey. We look

Figure 2. Testing Highlights That Unlock Potential Solutions



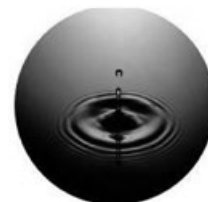
PAPER RECYCLING EFFLUENT

Interesting result with this test. We initially thought we had not created a positive change in the black ink liquid, but after about one hour when we returned from lunch, the 200 gallon sample was perfectly clear and there was a thin white layer on the bottom.



WATER SOLUBLE CUTTING OIL

We took used water soluble cutting oil which needs to be clean at all times and ran it through our process. By killing all the bacteria that was in the oil, they were able to recycle their product and realize a cost saving.



PULP & PAPER LIQUOR TEST

A first attempt found we could improve the conditions of the Liquor in three measured areas BOD (Biological Oxygen Demand) Conductivity which is used to measure the concentration of dissolved solids in the water and TSS (total suspended solids). We were able to improve on these three that were tested.

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forward to treating pulp-and-paper liquor, again as this was tested using our third-generation technology.

If run today, the results would be much better. During the process of treating it, we improved several areas total suspended solids, conductivity, odor, color, and others. With these testing results (**Figure 2**), we are confident that if we were to process coal ash through our technology, we would be able to change it for the better by, we hope, treating all the elements found in it.

TREATMENT OF GREENHOUSE GAS

We are very excited about what we are experiencing and the lessons we are learning. During one of our trials, we have been able to split oxygen molecules off of fines in suspended form, causing them to sink to the bottom. It is our opinion, again from the results of that trial, that we can separate the CO₂.

We are moving up CO₂ trials in our schedule. It is just too important for the world (more important to some than others) not to raise its position on the trial schedule.

As a problem solver by nature, I wanted to look at industries and target areas that we could assist to make them more profitable and more sustainable. The United Nations' Sustainable Development Goals are many and varied, and we are committed to doing our part to assist in the establishment of protocols that, when installed in the energy industry or any other, will improve the air we breathe, the water we drink, and the planet we inhabit.

In our upcoming CO₂ trials, we will create a stream that has a large volume of CO₂ sequestered within it. We will then begin the analysis of the existing stream in detail listing all its components. The focus will be to be able to compare a before-and-after treatment without losing any of the stream contents. The end result should be the changing of the molecular structure to break the contents down to their individual parts. Through the analysis of the finished product (**Figure 3**), we will be able to establish the percentage of overall change for each element.

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For the past four years, we have been engaged in making our technology smaller, which makes it more portable so we could take it to destinations that have problems with their water and effectively demonstrate how we could solve their problems under real-life conditions. It is one thing to show you can treat contaminated water in a lab environment; it is another thing to be able to show on location the abilities to treat a waste stream and then let the company representatives take their own samples in real time. This

Figure 3. Sewage Treatment Test Results From Certified Government Lab

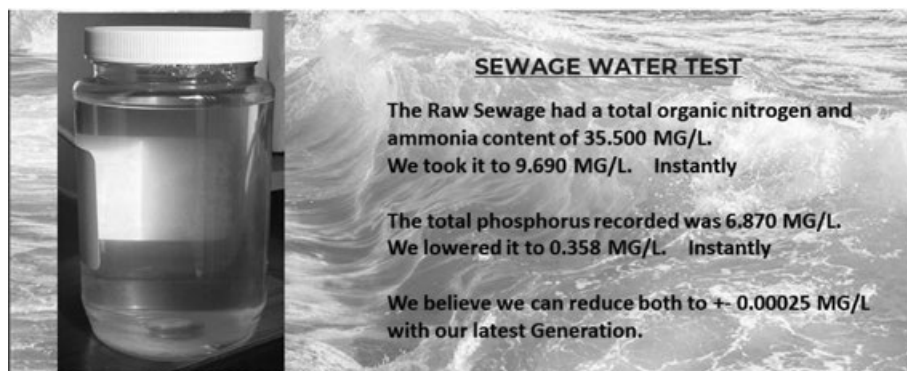


Figure 4. Our Solution Can Be Used in These Following Industries



meant total redesign of our operation at the time, and analyzing which areas could be reduced in size and still keep the integrity of the process.

The current design at the time had a footprint 26 feet tall and 15 feet long by 10 feet wide. We are pleased to report that over the last four years and several attempts, we have been able to reduce it into a footprint of 4 feet by 5 feet by 7 feet without sacrificing any of the production quantity or quality output. We were able to accomplish this earlier this year and are now focusing on our next challenge, which is the treating of a waiting list of contaminated water from various sources on our treatment schedule. After we finish up the next round of tests, we will know for certain our effectiveness at treating CO₂ and hard-to-treat elements such as mercury, arsenic, cadmium, chromium, and others. From these test results, we will be in a position to know what effect we will have on those elements.

At the beginning of the article, I stated I hoped to shed some light on how we can achieve clean coal. As with anything new, there is a tendency not to be a trailblazer. On the other hand, I have always believed that being an early adapter has its advantages so you could be in the lead, or you will be anywhere else that is not in the lead. I believe we have shed some light on the real-life possibilities of Chaoticwaters Inc. technology and the new paradigm shift of the future of wastewater treatment.

Figure 4 is a short list of business silos our technology can be used in. Some reading this article might be able to cross-reference an area I have not written about here that is adaptable to a need in the world of natural gas and electricity or whatever industry you identify with. If that happens, that would be a fantastic thing. You would be looking at things differently and seeing solutions that might have a huge upside potential in your world.

DON'T SIT THIS ONE OUT

From the early days of our discovery, Chaoticwaters Inc. has been challenged by this quote by Carl Sagan:

Anything else you're interested in is not going to happen if you can't breathe the air and drink the water. Don't sit this one out. Do something. You are by accident of fate alive at an absolutely critical moment in the history of our planet.

There is no other choice for us but to "Do something."

Many times over the years, we have experienced the wrong way of doing something, so during those times of difficulty we have sat back and read this quote. It has a way of putting things into perspective. There is no other choice for us but to "Do something." 