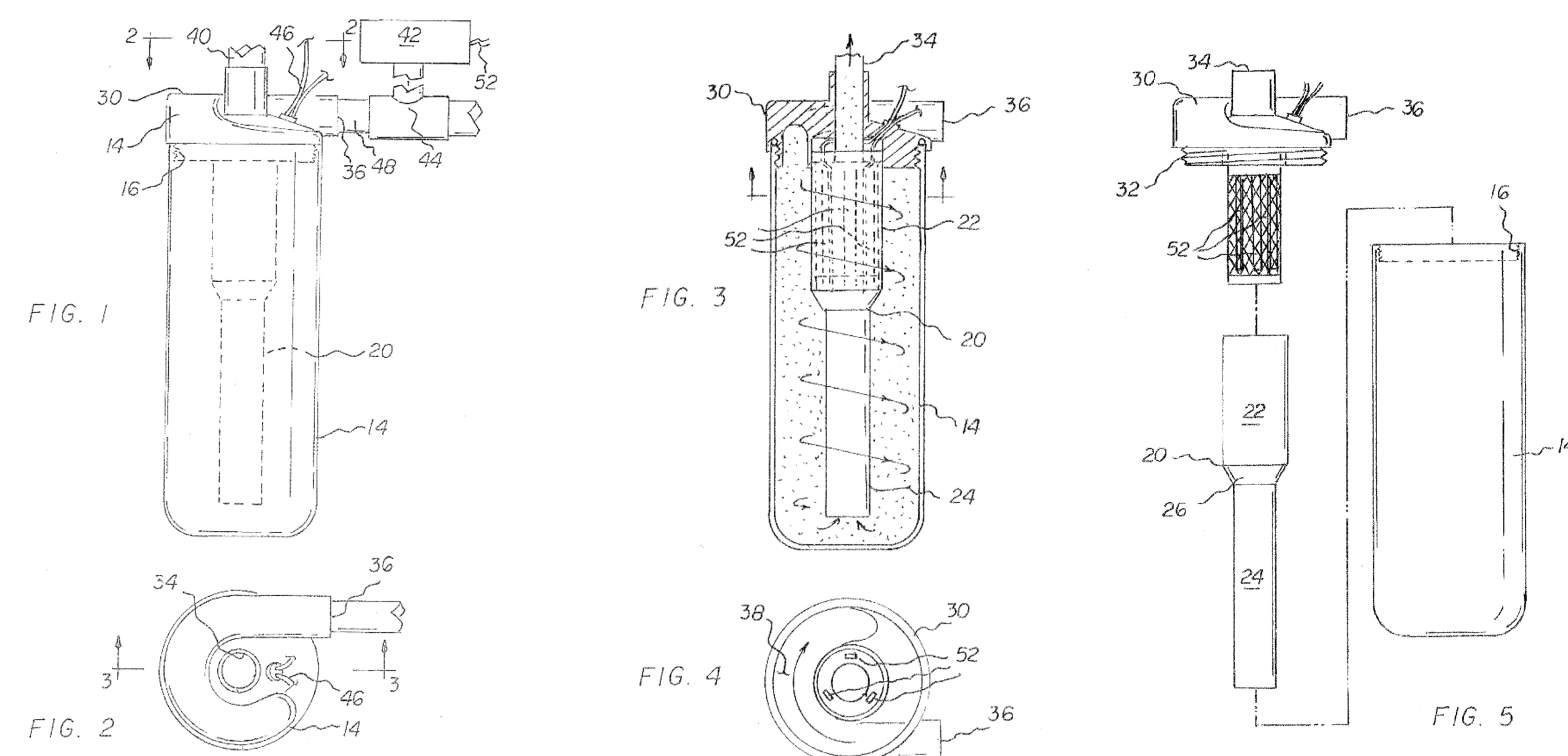


## Introduction

The Clean Ballast Water Team was tasked to design and perform water treatment and testing using ballast water treatment technologies developed by the client, Andy Priess of Integrity Pools, DBA A.P. Water Solutions. The testing was performed in order to present data on the disinfection efficiency of the system. This experiment was a preliminary step in testing the system to quantify if the technology performs as expected. Further experiments performed by the client will be able to compare the system to current on the market methods for ballast water treatment.



## Design Solution

To test for efficacy, the team decided to test for ATP on water collected from Trinity Bay outside of Houston. The team concluded the best option for these preliminary tests was to collect ocean water to obtain comparable salinity and then seed these samples with chosen organisms to ensure quantifiable organic matter is present in the water.

The samples were tested before and after treatment. To measure percent disinfection, the ATP levels were measured prior to and post treatment. By subtracting free ATP from the total ATP after the treatment has occurred, the number of microbial organisms still present in the water will be measured.

## Cost Analysis

	Organisms	ATP Testing
Contents	- Bacteria - Protozoa - Copepod	- Ensure Touch Testing Device - Free and Total ATP Testing Sticks
Price	\$130.00	\$2,500.00
Total	\$2,630.00	

## Conclusion

The results we found after the experiment were encouraging because they showed complete disinfection in both of the seeded samples. The Ozonator + salt cell is the most efficient method of treatment with full disinfection being attained within five minutes. The Ozonator by itself is also showed disinfection, however, due to the ORP not working with the Ozonator only samples, the disinfection time was not able to be determined.

There are a few variables that are wary due to the ORP Pen measurements not reaching the desired threshold of 650. The ORP measurement for the Ozonator had to reach 650 in order to produce chlorite when it reacts with the salt cell. Chlorite is a non-carcinogenic mineral that can be released into the sea with no harmful effects. Since it did not reach this threshold and the ORP shot up once we turned on the salt cell, we believe the system was creating chlorine which is a chemical that is not allowed to be released into the sea due to its harmful effects in the ecosystem.

The goal of this project was to determine the disinfection efficiency of the system. While disinfection did occur, there are several changes to the system that the team believes will enhance the system's operation. It is recommended that a filtering system be added to filter silt out of the system. This modification will allow the ozone in the device to not be encumbered by the oxidative requirement of samples with a large total dissolved solids content. The ozone injector also likely needs to be adjusted to allow for an increase in ozone concentration in the system.

