

REMARKS

Applicants respectfully request entry of the Amendment and reconsideration of the claims. Claims 1, 24, 26, 36, 40, 41, and 42 are amended. Claim 6 is cancelled. New claim 65 is added. After entry of the Amendment, claims 1-5, 7-42 and 65 will be pending.

No new matter is added. Amendment of the claims is made solely to expedite prosecution of the above-identified application. Applicants reserve the right to prosecute the same or similar claims in the present or future applications. The amendments made are not related to any issues of patentability.

Support for Amendments

Claim 1 is amended to provide antecedent basis for all terms and to include subject matter from claims 6 and 26 and paragraph [0060] of the specification. Claims 24, 36, 41, and 42 are amended to correct dependency.

Support for new claim 65 can be found, for example, in paragraph [0067] of the specification.

Claim Rejections under 35 U.S.C. § 112

Claims 1-42 are rejected under 35 U.S.C. § 112(b), second paragraph, as being indefinite. Specifically, claims 1, 24, and 36 are rejected because some of the terms in the claims lack antecedent basis. Claim 1 has been amended to provide antecedent basis for all terms. Claims 24 and 36 have been amended to correct dependency in order to provide antecedent basis.

Claims 41-42 are rejected because it is allegedly unclear how the construction of the body of water relates to the method steps of the present invention. Claims 41 and 42 have been amended to depend from claim 40, which recites an excavated structure having a bottom and walls to contain the water and a non-permeable flexible membrane covering the bottom of the water body, the bottom having a slope that is about 20% or less and the walls having a slope that is greater than about 45%. The soil compaction recited in claims 41 and 42 relates to the type of bottom that is provided, which in turn relates to the cleaning method and ability to use of the mobile suctioning device to clean the bottom.

Claim Rejections under 35 U.S.C. § 103

1. Claims 1-6, 8, 10-13, 16-24, 28, 30, and 34-40 are rejected under 35 U.S.C. § 103 as obvious over Fischmann (U.S. Publication 2012/0024794) (hereinafter Fischmann ‘794). Applicants respectfully traverse this rejection.

The Office Action asserts that it would have been obvious to modify the teachings of Fischmann to arrive at the method of the present claims. In particular, the Office Action asserts that the claimed range for turbidity (less than 2 NTU) is encompassed within the range taught in Fischmann (less than 5 NTU). Further, the Office Action asserts that since the cleaning method is similar (e.g., includes the use of a mobile suctioning device), it would have been obvious to optimize the process of Fischmann to maintain the color as claimed. Applicants respectfully disagree.

The present invention relates to a method and system for maintaining water quality in large water bodies for recreational uses such as excavated inland structures and floating structures by using a simplified economic filtration system and degreasing system and a mobile suctioning device to clean the bottom of the water body in order to provide an aesthetically appealing coloration to the water body. In contrast, Fischmann ‘794 teaches a method for providing water for industrial purposes. A person of ordinary skill in the art would understand that a method suitable for producing water for industrial purposes would be incompatible with recreational uses.

The claimed method allows replacing conventional centralized filtration systems from traditionally configured swimming pools. The claimed method allows requires smaller filtration equipment and results in much lower energy consumption by replacing the typical three filtration requirements for conventional swimming pools: (1) filtration of the complete water body contained in the pool, (2) filtration of the water suctioned from the bottom that contains settled impurities, and (3) filtration of the surface water drawn by the skimmer system. The claimed method has a need for far less filtration capacity than conventional systems by suctioning a small water flow from the bottom of the large water body and filtering and returning the filtered water to the water body, thus avoiding the filtration of the complete water body. The claimed method, therefore, makes construction and operation of large recreational water bodies technically and economically feasible. In the claimed method, the centralized filtration of skimmed water typically used in pools is replaced by screening of debris, oils and greases through a degreasing

system, and therefore the claimed method considerably reduces energy consumption of maintaining water quality for recreational uses. Further, operation of specific systems in the present method is activated based on information regarding different water quality and physicochemical parameters, including turbidity, color of the bottom of the water body, and/or amount of grease on the surface layer.

On the other hand, Fischmann '794 is directed at providing treated water for industrial purposes. Fischmann '794 discloses purifying the water and eliminating suspended solids by filtering a small fraction of the total volume of water; collecting water and storing such water in a container; and treating the water within periods of 7 days for maintaining a minimum ORP level for a minimum period of time based on the temperature of the water. The method includes applying oxidants to avoid iron and manganese concentrations above 1 ppm, applying coagulants or flocculants to maintain turbidity below 5 NTU, suctioning the bottom water flow before the thickness of settled material exceeds 100 mm, filtering such suctioned water flow and returning the filtered water into the container. The treated water is used in a downstream process for industrial uses. *See* Fischmann '794 throughout, e.g., ¶¶ [0002], and [0074]-[0087].

Since Fischmann '794 teaches water treatment for use in industrial processes, a person of ordinary skill in the art would not be motivated to use an amount of flocculant that is enough to maintain turbidity of the water below 2 NTU, as such a low turbidity level is proper for recreational uses but is not required for industrial uses or industrial applications of water treatment.

The Office Action asserts that Fischmann '794 teaches operating a mobile suctioning device in order to affect the color of the fluid and body of water (¶¶ [0109] and [0121], and Table 3), and that it would have been obvious to optimize the process to modify the extent to which the suctioning device is used or the rate of cleaning to result in the claimed effect. However, Fischmann '794 is not concerned with the color of the bottom, but teaches that the color of the water changed when the water was treated. Table 3 in Fischmann '794 refers to a specific characteristic of the water (the color of the water before the water treatment was light brown), but mentions nothing about the color of the bottom of the tank. The color of the bottom of the water body impacts the visual appearance of the color of the water. Providing a method where the color of the bottom is maintained within a set limit provides an aesthetically appealing coloration to the water in the water body for recreational uses. The settling of impurities can

cause a change in the appearance of color on the bottom of the water body, as the color will become darker and therefore resulting in an appearance of a darker water body. Sampling the water and measuring its color would not provide the same result.

The bottom of the water body in the claimed method typically has a color that lends an aesthetically pleasing color and appearance to the water in the water body, and for example the bottom may comprise a colored material with a white, yellow, or blue color to provide the required tonality (*see* ¶ [0067] of the specification). However, the settling of particulates, solids, flocs, or other impurities to the bottom of the water body will cause a change on the appearance of the color of the water body, as the impurities will make the color of the bottom appear darker than the original color. It is important to note that even though the water quality could be excellent and completely pure, if the bottom of the water body presents a dark coloration or tonality (due to the settling of particles), then the overall tonality of the water body will still be dark, mostly due to the effect of the dark color of the bottom of the water body. A good example are the tropical seas which have beautiful turquoise coloration and where there is white or light sand color, the tonality of the sea is aesthetically pleasing, but where the bottom is covered by rocks and/or algae, the tonality of the water body is completely different and appears darker, due to the effect of the bottom color.

The coloration of the bottom of the water body is important for producing the desired aesthetically appealing effect on the coloration and tonality of the water body. As described in the specification (¶¶ [0066] and [0071]) and further defined in new claim 65, the bottom of the water body has a color (e.g., white, blue, or yellow) that lends a pleasing color and appearance to the water body. Therefore, unlike the method taught in Fischmann '794, the present method is capable of maintaining a water quality that is sufficient for recreational uses, e.g., swimming, while Fischmann '794 provides a water treatment method for industrial purposes and allows the accumulation of sediments up to 100 mm in the bottom, which does not have an objective to provide an aesthetically pleasing tonality to the water body, but for providing water for industrial processes.

Since Fischmann '794 is not concerned with the color nor the tonality of the water body, the operation of the mobile suctioning device in Fischmann '794 is activated based on the thickness of the settled material. The Applicant, who is also the inventor on Fischmann '794, submits that the reason for maintaining the thickness below a threshold level is to avoid

generation of an anaerobic layer which may house anoxic compounds, principally sulphides, that can alter the chemistry of the water and cause damage to the pipes and other equipment of the industrial process. When the layer is too thick, it impedes oxidants reaching the bottom, and anoxic compounds are generated, which can directly affect the industrial downstream process where the treated water is used. On the other hand, as discussed, the present invention aims at providing an aesthetically appealing coloration to the water body, where the bottom of the water body has a color that lends a pleasing color and appearance to the water body to facilitate recreational purposes.

There is nothing in Fischmann '794 that would suggest operating the mobile suctioning device at a rate to maintain the color of the bottom of the structure at a certain level, let alone below 30 % increase in the black component on the CMYK scale. The claimed method aims at providing an aesthetically appealing coloration to the water in the water body for recreational purposes, and therefore recites monitoring to determine the color of the bottom, receiving information regarding the color of the bottom of the water body and activating the suctioning device to adjust the color within a set limit by suctioning the settled particles from the bottom of the water body. On the other hand, Fischmann '794 allows up to 100 mm (about 4 inches) of settled material to accumulate before the bottom is cleaned (*see, e.g.*, ¶¶ [0152]-[0155]) due to specific requirements of the water used for industrial processes.

It should also be noted that the accumulation of sediments on the bottom of a confined body of water used for recreational purposes may present sanitary risks. The presence of amoebas, such as *Naegleria Fowleri* or *Acanthamoebas*, in unsanitary waters has been reported to result in serious infections and even deaths. Generally, these amoebas grow in accumulated sediment at the bottom of water bodies, and are more dangerous when the sediment is re-suspended and the amoebas can enter the human body through the nose and eyes, representing a high risk for potential bathers using the water body. Therefore, it is important to monitor and control the sediment that settles on the bottom of the water body and to remove it in order to control or prevent the growth of undesired organisms, to allow an aesthetically appealing tonality to the water body, as well as being able to visualize the bottom to avoid potential risks to users. Amoebas are generally highly resistant to disinfectants and cannot be easily controlled by simply disinfecting the water. The method of Fischmann '794, which allows accumulation of sediments

on the bottom of up to 100 mm, would not be suitable for the control or elimination of amoebas and could risk propagation of such amoebas.

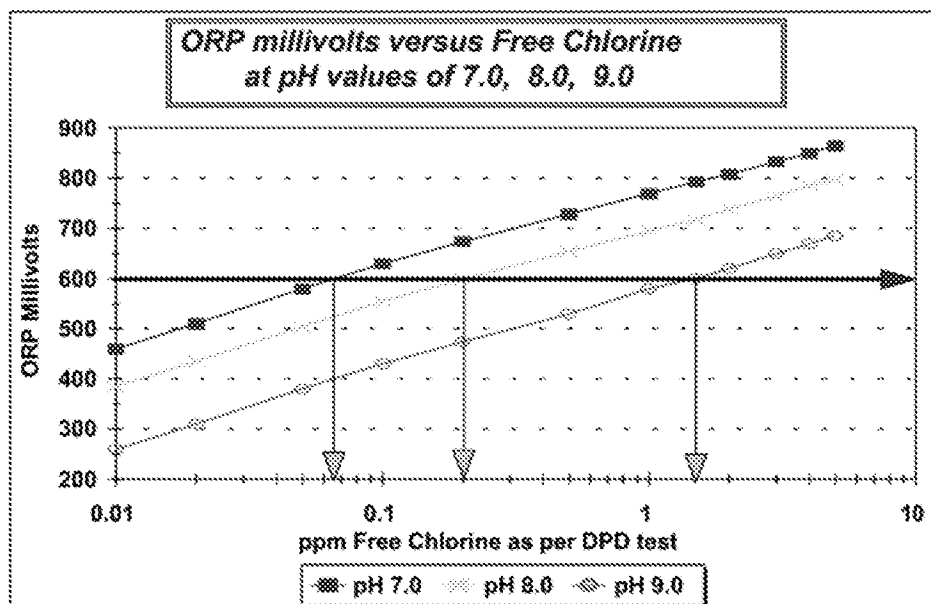
Claim 1 is amended to include the subject matter of Claim 6 to define that operating the suctioning device does not produce resuspension of more than 30 % of the settled particles on the bottom of the water body. Monitoring the color of the bottom and operating the device based on the color, as well as avoiding the resuspension of settled materials provides an added benefit in providing a water body for recreational uses.

Further, the claimed method requires operating a degreasing system to maintain a surface water layer having less than about 20 mg/L of floating greases, wherein greases from a surface water flow into the degreasing system are removed by a separation unit comprising a degreaser, and the water that has passed through the degreaser is returned to the water body. The claimed method is directed to recreational uses, where surface oils and greases are eliminated in order to facilitate swimming and other direct contact uses. Generally, sources of greases and oils in recreational water bodies include, for example, sunscreen, lotions, and creams. Further, when the water body is used for aquatic sports, e.g., boating, oils from motors and other systems can also leak into the water body and remain floating on the surface. The present method addresses these issues by providing for removal of such oils and greases. On the other hand, Fischmann '794 does not teach or suggest a degreasing system for eliminating surface greases, as Fischmann '794 has a different objective and application than the claimed method.

A person of ordinary skill in the art would understand that, in contrast with requirements for recreational water bodies, applying the method of Fischmann '794 for the treatment of a large body of water would result in floating greases accumulating on the surface of the water body and at its borders, and large amounts of settled solids accumulating on the bottom. The color of the bottom would not be visible and therefore the tonality of the water would not be aesthetically pleasing. Resuspension of settled solids could cause sanitary risks, and the water would not comply with the required sanitary and aesthetic characteristics for recreational purposes.

Regarding **claim 2**, the Office Action asserts that Fischmann '794 teaches adding a chlorine based additive to maintain at least a minimum level of free chlorine (ORP) in the water (¶¶ [0160]-[0164]). The Office Action cites Allen (U.S. 5,422,014) as evidence that ORP is a measure of chlorine in a water supply.

Fischmann '794 teaches adding disinfectant agents to the water body in order to maintain a minimum ORP of 500 mV for a minimum period of time based on the temperature of the water. However, ORP is not a direct measure of free chlorine in the water. Allen states that “[s]everal investigations have shown that the HOCl residual can be characterized by the oxygen reduction potential (ORP) of the water, but a number of factors, such as the concentration of cyanuric acid, and the type and quantity of total dissolved solids affect the correlation of ORP with ppm of HOCl. Therefore, an ORP set-point for a control system is typically chosen by stabilizing the water at pH 7.5 and a free chlorine residual of 1.0 to 3.0, and measuring the resulting ORP.” Therefore simply requiring a minimum ORP level does not suffice for a teaching of requiring a minimum free chlorine level in the water. ORP is based on the oxidation capacity of the water, whereas maintaining a free residual chlorine level requires that all specific particles have been oxidized and the free chlorine residual provides a buffer for oxidizing new particles. Therefore, maintaining a free residual chlorine level is not the same as maintaining an ORP level, as the free residual chlorine level depends on pH, climate, and other variables as discussed above. The dependency of the correlation between ORP and free chlorine on pH is exemplified in the figure below, reproduced from a Technical Bulletin by Aquarius Technologies PTY Ltd, available at www.oxyzone.com.au/_assets/ORP_Aquarius_18.pdf.



Requiring minimum ORP in the water does not equate to requiring a minimum free chlorine level.

Moreover, claim 2 recites a specific formula for determining the minimum free chlorine level that is not suggested by Fischmann '794. Specifically, claim 2 recites where the minimum free residual chlorine level is at least $(0.3-0.002(WQI-100))$ ppm. WQI refers to Water Quality Index and is defined in the specification as a dimensionless number that "can be determined by using eight common water quality parameters including dissolved oxygen, fecal coliform bacteria, pH, 5-day BOD (biochemical oxygen demand), total phosphorus, nitrate-nitrogen, turbidity, and total dissolved solids or [] may be determined through empirical methods, algorithms based on experience, and analytical methods" (*see* ¶ [0034]). Fischmann '794 does not teach or suggest using a WQI to determine a minimum residual free chlorine level in the water.

Fischmann '794 fails to teach or suggest all of the elements of the claims. Further, one of ordinary skill in the art would not be motivated to modify Fischmann '794 in the manner suggested in the Office Action. Withdrawal of the rejection is respectfully requested.

2. Claims 7 and 9 are rejected under 35 U.S.C. § 103 as obvious over Fischmann and further in view of Fischmann Torres (U.S. Patent 7,820,055) (hereinafter "Torres"). Applicants respectfully traverse this rejection.

For at least some of the same reasons as discussed above, the cited references do not teach or suggest all of the limitations of the claims. Torres is cited for a teaching of a mobile suctioning device with brushes. However, Torres does not teach or suggest maintaining a particular level of color of the bottom of the structure. Withdrawal of the rejection is respectfully requested.

3. Claims 14-15 are rejected under 35 U.S.C. § 103 as obvious over Fischmann '794 and further in view of Angelilli et al. (U.S. Publication 2011/0137465). Applicants respectfully traverse this rejection.

For at least some of the same reasons as discussed above, the cited references do not teach or suggest all of the limitations of the claims. Angelilli is cited for a teaching that a water treatment system can be operated remotely or onsite. However, Angelilli does not teach or

suggest maintaining turbidity at below 2 NTU or a particular level of color of the bottom of the structure. Withdrawal of the rejection is respectfully requested.

4. Claims 25 and 29 are rejected under 35 U.S.C. § 103 as being obvious over Fischmann ‘794 and further in view of Fischmann (U.S. Publication 2012/0024796) (hereinafter Fischmann ‘796). Applicants respectfully traverse this rejection.

For at least some of the same reasons as discussed above, the cited references do not teach or suggest all of the limitations of the claims. Fischmann ‘796 is cited for a teaching of monitoring the thickness of settled particles, and by doing so, monitoring the color.

The Office Action asserts that because the color and the thickness of settled particles are connected, the color is monitored via the thickness. However, there is no factual support for this conclusion. The color of something cannot be monitored by monitoring the thickness. The color can be perhaps controlled to some degree by monitoring the thickness and activating the cleaning system if the thickness crosses a threshold level, but the color is not monitored. There is no indication in either Fischmann ‘794 or Fischmann ‘796 about a specific color level or a specific color component that would be monitored. Further, there is no teaching or suggestion of activating the mobile suctioning device when the color is outside of a set limit.

Neither Fischmann ‘794 nor Fischmann ‘796 teach activating the mobile suctioning device based on the color of the bottom. Moreover, a person of ordinary skill in the art would not be motivated to modify Fischmann ‘794 in the manner suggested by the Office Action, because Fischmann ‘794 relates to industrial applications. As discussed, Fischmann ‘794 is mainly concerned with the thickness of the settled material in order to avoid adverse consequences (e.g., anaerobic/anoxic reactions) from a layer that is too thick, and allows up to 100 mm (about 4 inches) of settled material to accumulate before the bottom is cleaned. However, it can be assumed that the color of the bottom does not change after the first few millimeters of accumulated material (e.g., at least after the first 5-10 mm). Therefore, after the first few millimeters, there would be no way of knowing when the cleaning system should be activated based on the color of the bottom. Monitoring the color would not be a useful measure of how thick the layer is, and a person of ordinary skill in the art would not be motivated to modify the process in Fischmann ‘794 to employ monitoring the color of the bottom.

The cited references do not teach or suggest all of the limitations of the claims. Withdrawal of the rejection is respectfully requested.

5. Claims 26-27 are rejected under 35 U.S.C. § 103 as obvious over Fischmann ‘794 and further in view of Fischmann ‘796 and Hoots et al. (U.S. Patent 5,411,889). Applicants respectfully traverse this rejection.

For at least some of the same reasons as discussed above, the cited references do not teach or suggest all of the limitations of the claims. Hoots is cited for a teaching of using colorimeters for determining water quality. However, Hoots teaches using colorimetry to detect a chemical specie in a water sample, and does not teach measuring the color of the bottom.

The cited references do not teach determining the color of the bottom or using a colorimeter for doing so. Further, one of ordinary skill in the art would not have been motivated to combine Hoots with Fischmann ‘794 and Fischmann ‘796 because there is no suggestion to measure the color of the bottom, and even if the references were combined, they would not result in the claimed method.

6. Claim 31 is rejected under 35 U.S.C. § 103 as obvious over Fischmann ‘794 and further in view of Jacoby, Jr. et al. (U.S. Patent 6,358,409). Applicants respectfully traverse this rejection.

For at least some of the same reasons as discussed above, the cited references do not teach or suggest all of the limitations of the claims. Jacoby is cited for degreasing water using skimmers. However, Jacoby does not teach or suggest maintaining turbidity at below 2 NTU or a particular level of color of the bottom of the structure. Withdrawal of the rejection is respectfully requested.

7. Claims 32 is rejected under 35 U.S.C. § 103 as obvious over Fischmann ‘794 and further in view of Wilson (U.S. Publication 2014/0190897). Applicants respectfully traverse this rejection.

For at least some of the same reasons as discussed above, the cited references do not teach or suggest all of the limitations of the claims. Wilson is cited for a teaching of degreasing systems having overflow apparatuses. However, Wilson does not teach or suggest maintaining

turbidity at below 2 NTU or a particular level of color of the bottom of the structure. Withdrawal of the rejection is respectfully requested.

8. Claim 32 is rejected under 35 U.S.C. § 103 as obvious over Fischmann '794 and further in view of Sullivan III (U.S. Patent 4,592,291). Applicants respectfully traverse this rejection.

For at least some of the same reasons as discussed above, the cited references do not teach or suggest all of the limitations of the claims. Sullivan is cited for degreasing systems with screens. However, Sullivan does not teach or suggest maintaining turbidity at below 2 NTU or a particular level of color of the bottom of the structure. Withdrawal of the rejection is respectfully requested.

9. Claims 41-42 are rejected under 35 U.S.C. § 103 as being obvious over Fischmann '794 and further in view of Kantor (U.S. Publication 2005/0091934). Applicants respectfully traverse this rejection.

For at least some of the same reasons as discussed above, the cited references do not teach or suggest all of the limitations of the claims. Kantor is cited for compacting the soil when forming bodies of water. However, Kantor does not teach or suggest maintaining turbidity at below 2 NTU or a particular level of color of the bottom of the structure. Withdrawal of the rejection is respectfully requested.

New Claims

New claim 65 is believed to be patentable for at least some of the same reasons as discussed above.

CONCLUSION

In view of the above amendments and remarks, Applicant respectfully requests a Notice of Allowance. If the Examiner believes a telephone conference would advance the prosecution of this application, the Examiner is invited to telephone the undersigned at the below-listed telephone number.

Background on the Commercial Success of the Technology

The present application relates to an innovative and optimized method and system for maintaining water quality in water bodies such as excavated inland structures and floating structures with bottoms comprising flexible membranes for recreational purposes, by using a simplified economic filtration system and degreasing system that requires much smaller filtration equipment than conventional centralized filtration systems and allows consuming significantly lower amounts of energy. The method of the present invention allows activating a chemical application system, a mobile suctioning device, and/or a degreasing system based on the information regarding turbidity, the color of the bottom of the water body, and amount of greases on the surface water layer of the water body to adjust the water quality and physicochemical parameters within their predefined limits.

The world is tending towards more sustainable and ecological practices, where several regulatory agencies throughout the world are promulgating regulations to reduce energy consumption and to lower CO₂ emissions from the maintenance of swimming pools and recreational water bodies. More sustainable operations for treating the water should thus be provided. Water in swimming pools is typically directed to a centralized filtration system from three sources: the main body of water in the pool, the water suctioned from the bottom of the pool containing impurities and water drawn from the surface of the pool by skimmers. Additionally, centralized filtration systems operate according to certain defined periods of time or for certain amounts of hours per day without taking into account the real time condition of the water being treated. The cost and energy demand of operating large pools with conventional centralized filtration systems has caused closures of some large public swimming pools around the world, such as Japan's Ocean Dome and the Fleishhacker Pool in California.

The optimized method and system from the present application replaces conventional filtration systems from traditionally configured swimming pools with a simplified economic filtration system and degreasing system that consumes up to two orders of magnitude less energy, and requires much smaller filtration equipment than conventional filtration systems.

As suggested by the multiple recognitions from many organizations, the Inventor of the present application is considered one of the most important innovators in the world. The Inventor has received many international awards such as Businessman of the Year, the Ernst & Young Entrepreneur of the Year, Avonni Award for Innovator of the Year, National Environmental

Award (2015), National Award from the School of Engineers (2012), Best New Business Award by the Miami Chamber of Commerce, Business Ambassador Award awarded by the Governor of Florida, the DBA Award (Developers and Builders Alliance of the US), which recognized the real estate innovation of the Inventor's company, and also the OPP Award (2011) from the English magazine Overseas Property Professional as the best real estate innovation. The Inventor has been an invited keynote speaker at several conferences throughout the world, for example: Babson College, The University of California in Berkeley, MIT, Harvard, and at the APEC conference in 2011 (U.S.), among many others. The Inventor's technology and its success are being studied at many renowned universities, including Babson College and MIT. Also, the inventor is currently director of the renowned Institute for Applied Sciences Fraunhofer, based in Germany.

The Boston Consulting Group (BCG) valorized the assignee company, Crystal Lagoons, at over 1,800 million US dollars after only one and a half years of operation, as a conservative estimation. Further, in 2015 the Intellectual Property of the recreational lagoon technologies was valued at USD 2.040 billion for tax purposes. It is important to highlight that none of the big technologic companies like Facebook, Google, or Microsoft, have reached such valorization in such short period of time.

The BCG has also estimated that in a timeframe of 15 years, there will be more than 14,000 large water bodies using the technologies from the inventor. The results of the technologies from the inventor have drawn the attention of the world. More than 5,000 publications in worldwide media have been generated, including CNN, The Wall Street Journal, Bloomberg BusinessWeek, Popular Mechanics, Reader's Digest, BBC, TV Galileo, and Fuji. More publications can be found at www.crystal-lagoons.com/press. Also, the National Geographic international magazine of April 2010 has dedicated a special edition to water, and the Inventor's technologies are the only ones mentioned in the technology section.

Today, the inventor's company, Crystal Lagoons, has 12 signed projects in the U.S., in states such as Florida, Texas, and Nevada, and is negotiating more than 33 others, with a total value of more than 33 billion dollars.



Respectfully submitted,

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