

Efficient Impact Transfer on Bio Tissues in Wet Contact by the Water Clarified in Tube Condition

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ABSTRACT

The natural water cycle is the largest transportation system and the major climate cooling element together with photosynthesis and wind powered by the sun. Water is a pure substance that picks and carries a huge load during its natural cycle on the earth, in the bio systems, in washing and cleaning, in medical care as well as in agriculture, power generation and industrial processes. It gets rid of the load by evaporation powered by the sun and wind, and leaves the civilization waste in the waters. The eco systems suffer increasing amount of toxins, drug and pharmaceutical residues, nutrients, various chemicals, micro plastics, resistive microbe growth, unbalanced algae, and low oxygen. Water evaporation as well as photosynthesis and related cooling capacity have been shrunk significantly by extension of the civilization. It's urgent to refresh waters and food chains as well as to improve wastewater treatment so that it can be sprayed on ground, plants, roofs and walls as well as on photo voltaic panels and other similar heat sources for evaporated climate cooling. It's beneficial to switch heat sources to combined power generation and climate cooling. OxTube, a new water treatment innovation clarifies water matrices in tube condition with nature respect within seconds by four seamless phases as follows; separation of dissolved substances, activation of molecules, clarification and dissolving of desirable substances.

It separates and removes dissolved gases like radon, carbon dioxide, hydrogen sulfide and hydrocarbon, chemicals like drug and pharmaceutical residues, and dissolved solids like iron, manganese compounds, calcium, fluorine and phosphorus. Efficiency of the versatile clarification is based on kinetic energy of the flow, even mixing and high collision probability of molecules in hermetic tube condition. Water is able to transfer positive as well as negative impacts in to bio systems. Health and wellness impacts of dissolved air on bio tissues in wet contact were identified during the research and test runs of the new water clarification innovation. Comparable iron gets rusted right away in this clarified and aerated water but it could take years in dry air. Wet food spoils instantly, but dried food can be stored for years in dry condition. Wanted health recovery impact can be transferred on and in bio tissues by dissolving desirable substances in the water at the same time with clarification and disinfection.

Keywords: Water Clarification; Water Purification; Water Treatment; Water Oxygenation; Particle Separation; Tube Flotation; Pharmaceuticals Removal; Toxins Removal; Radon Removal; Water Disinfection; Combined Water Clarification; Impact Transfer in Wet Contact

Introduction

The natural water cycle is the world's largest transportation system and the major climate cooling element together with photosynthesis and wind powered by the sun. Water is a pure substance that carries a huge load during its cycle on the earth, in the bio systems, in washing and cleaning, in medical care as well as in agricultural and industrial processes. Water gets rid of the load by evaporation powered by solar heat and wind, and leaves it in the ponds, lakes and seas. The waters and eco systems suffer increasing amount of toxins, drug and pharmaceutical residues, nutrients, various poisons, many other

chemicals, micro plastics, and unbalanced microbe growth, algae and low oxygen. A lot of water evaporation cool has lost by extension of civilization, open area building and construction, and underground sewerage systems. The civilization heat sources can be turned to climate cooling by the proper water treatment and buffering, large area water evaporation and photosynthesis [1]. Just giving an example, low efficient photo voltaic panels could be cooled and their efficiency enhanced by evaporation of clarified wastewater on panel surfaces, so electricity can be generated and the climate cooled at the same. Waste heat of the power plants and data centers could be switched on evaporative coolers as well. Hybrid and decentralized waste water

treatment should be carefully considered instead of centralized one with good reason [2]. Further, combined water systems and energy generation would provide huge economic benefits, too.

Water is able to transfer positive as well as negative impacts in to bio systems in wet contact [3,4]. Positive health and wellness impacts of dissolved air on bio tissues were identified first during the research and test runs of the water treatment technology integrated in a hydro turbine. Regarding interaction in the wet contact iron gets rusted immediately in this clarified and aerated water but it could take years in dry air. Wet food spoils instantly, but dried food can be stored for years in dry condition. Wanted health recovery impact can be transferred on and in bio tissues by dissolving desirable substances in the water at the same time with clarification and disinfection.

Water Clarification in Tube Condition

OxTube Integrated water clarification in tube condition, related devices, some practical case studies and some combined treatment practices are presented here [5-7]. The clarification in tube consists of four seamless treatment phases and as the fifth step a firm gas bubble generation in the flow as follows:

1. Separation of dissolved substances
2. Activation of molecules
3. Immediate clarification reactions

4. Replacement dissolving

5. Bubble generation in water flow for combined flotation and clarification

Figure 1 describes the conversion process of OxTube Water Clarification in tube condition [7]. Figure 2 illustrates OxTube Integrated Water Clarification visibly. Separation of dissolved substances and molecular activation are performed in the DuOx Nozzel just before the gas suction and feed. Desirable clarification reactions are initiated immediately after the cyclone eye caused by the split water flow. Gas like air is fed in the cyclone eye by suction without additional energy. The air flow in to the water by the free suction could be over ten times of water in volume. So, the flow speed increases and density of the air water mixture reduces respectively, too. Amount of gas and bubbles can be managed simply by valve control. However, particles start to attach on bubbles already in OxTube and the following tubes by flotation that is beneficial in the flotation systems. Further, viscosity of the air water mixture is much lower than water has, and dynamic pressure increases by the factor of flow speed to the power of two. This results high conversion efficiency and low losses by means of water mass flow. Bubbles mixed in water can be used for reduction of water resistance in piping and in ship cruising [8]. Figure 3 shows separation and clarification efficiency of OxTube Clarification in case of a household water. Iron content over the standard limit was identified visibly in this case. OxTube is used for iron removal with sand filtering, and Ca removal with CO₂ feed and lamella.

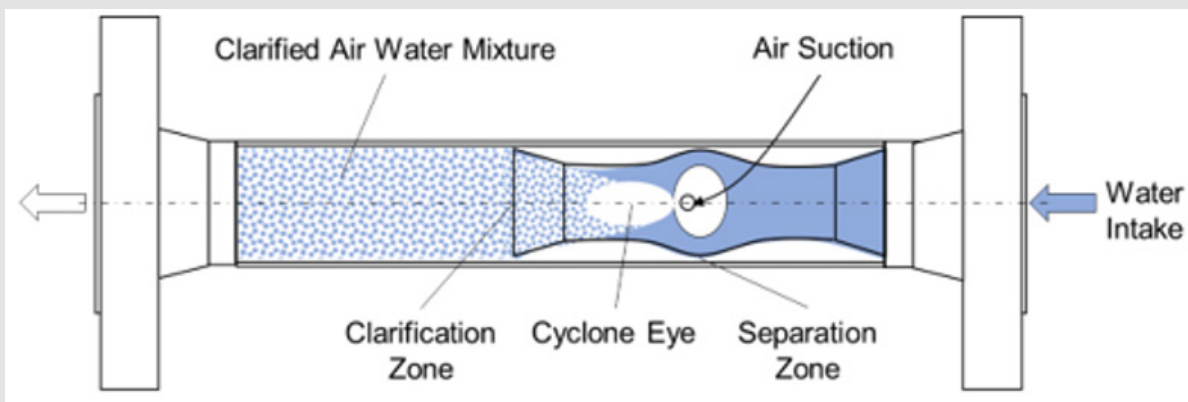


Figure 1: Conversion Process of OxTube Water Clarification in Tube Condition [7].

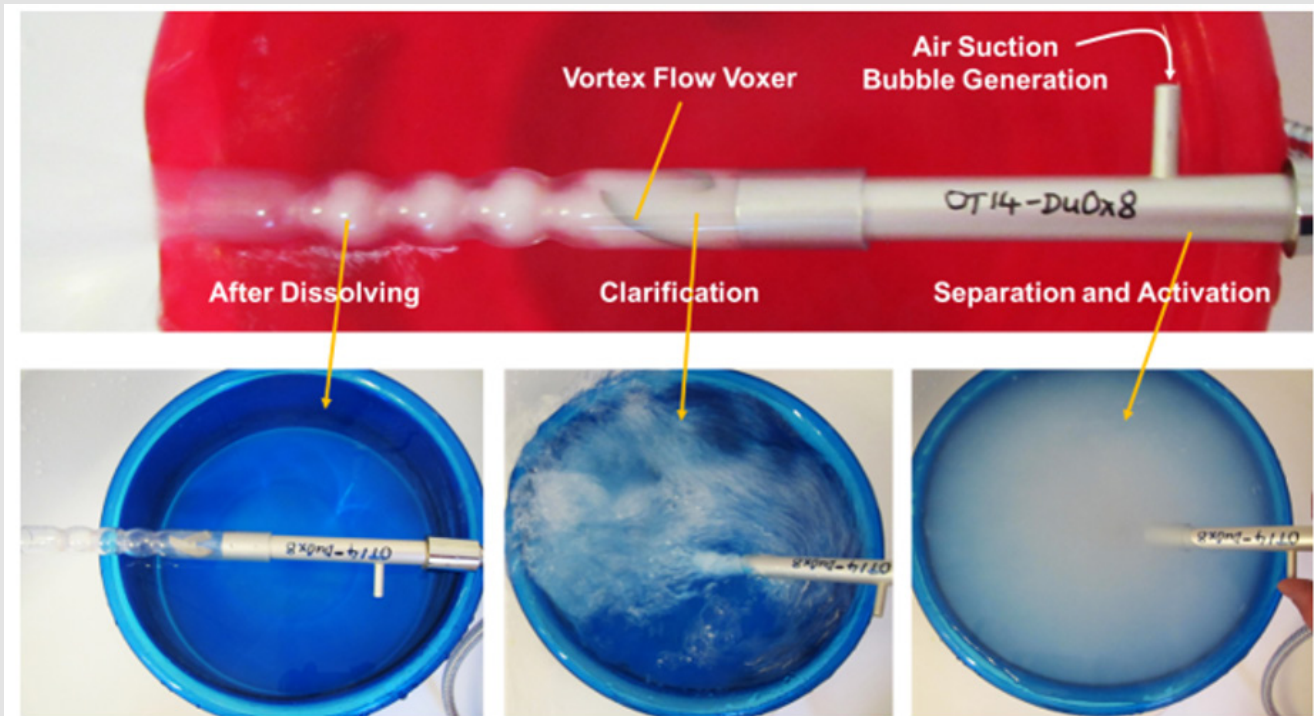


Figure 2: OxTube Water Clarification in Tube Condition visibly illustrated. Four seamless phases separation of dissolved substances, molecular activation, clarification and after-dissolving are seen in the photos from right to left.

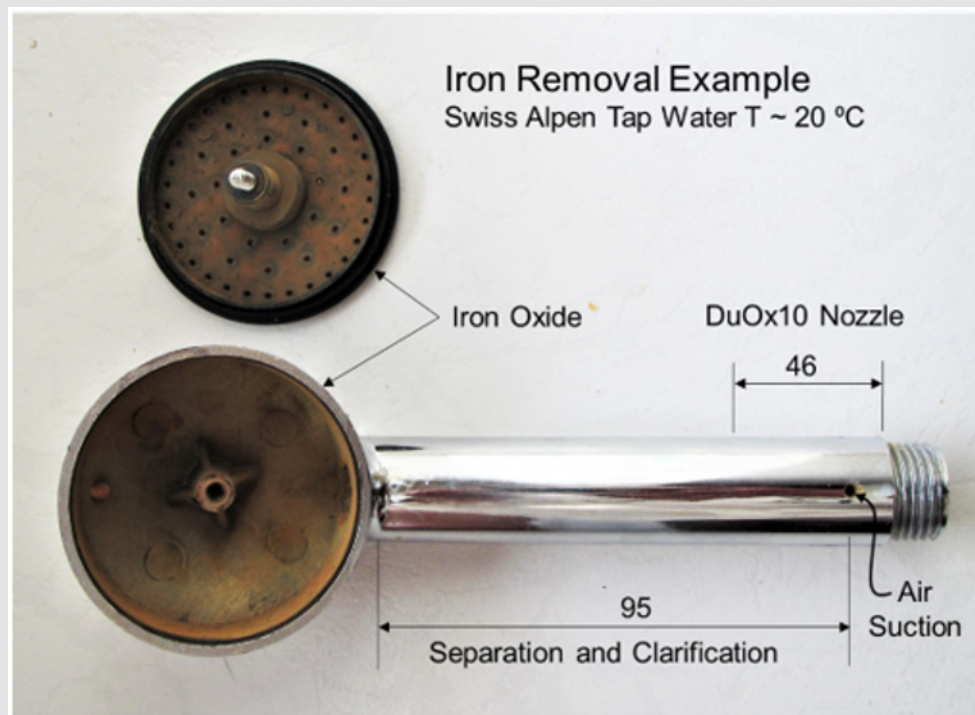


Figure 3: Separation and clarification efficiency of DuOx Nozzle. Iron Oxide sticks just after the Seamless Clarification on surfaces [4]. Separation and oxidation time is 0.1 s. Iron can be removed by a sand filter in practice.

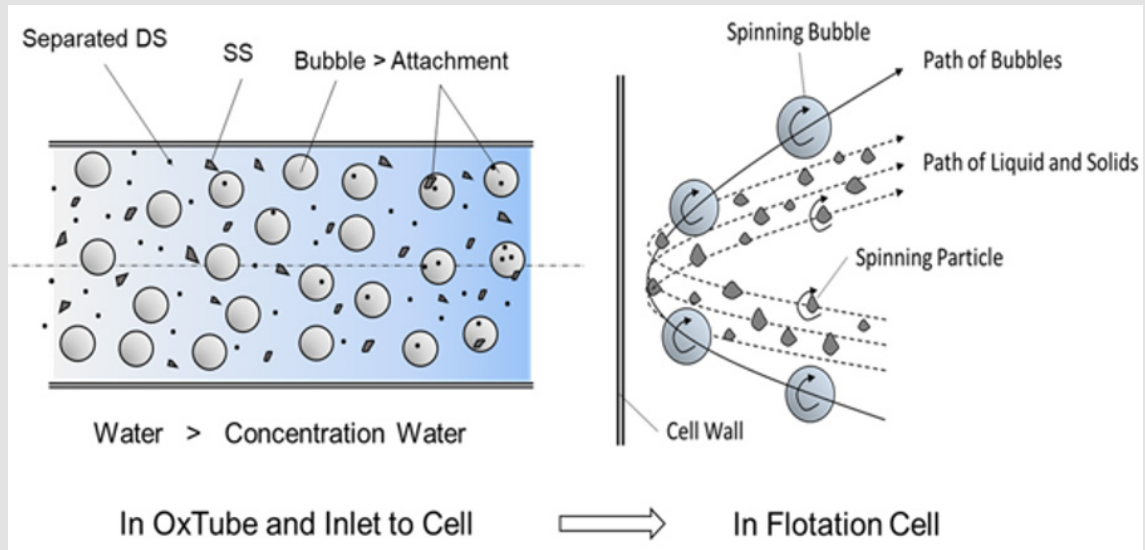
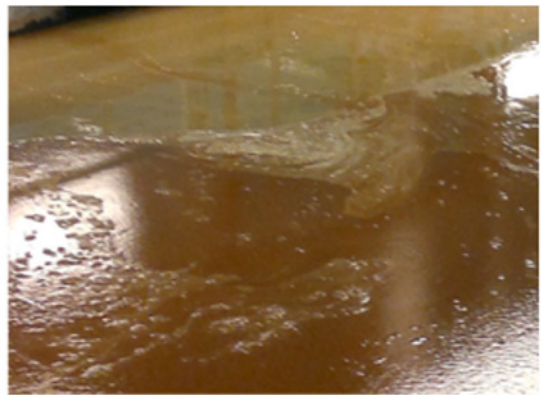


Figure 4: OxTube Machine generates bubbles and even mixture in the hermetic tube condition. Collision probability of particles and bubbles is high, and particle attachment happens already in OxTube and the following tubes before the flotation cell [9,10].

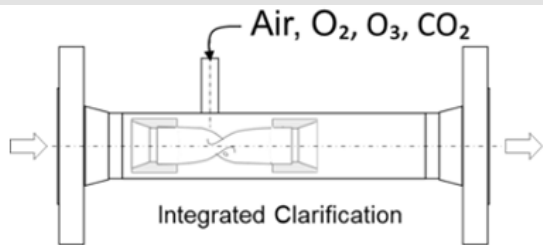


OxTube Flotation



Diffuser Flotation

Figure 5: An Industrial Case. OxTube generates a lot of bubbles that attach efficiently particles and lift them on to surface as seen on the left. Particle free water in blue is seen on the left edge. The water is pumped through OxTube from a natural lake in Finland. On the right the same water is floated by a compressed air diffuser.



Separation
Activation
Clarification
Aeration

Disinfection 100 %
Drugs and Pharmaceuticals 99 %
Separation of Rn, Fe, Mn, Ca etc.
Saturated Aeration
Clarification and Refreshing

Figure 6: OxTube Machine, its main functions in one and major results achieved [7].

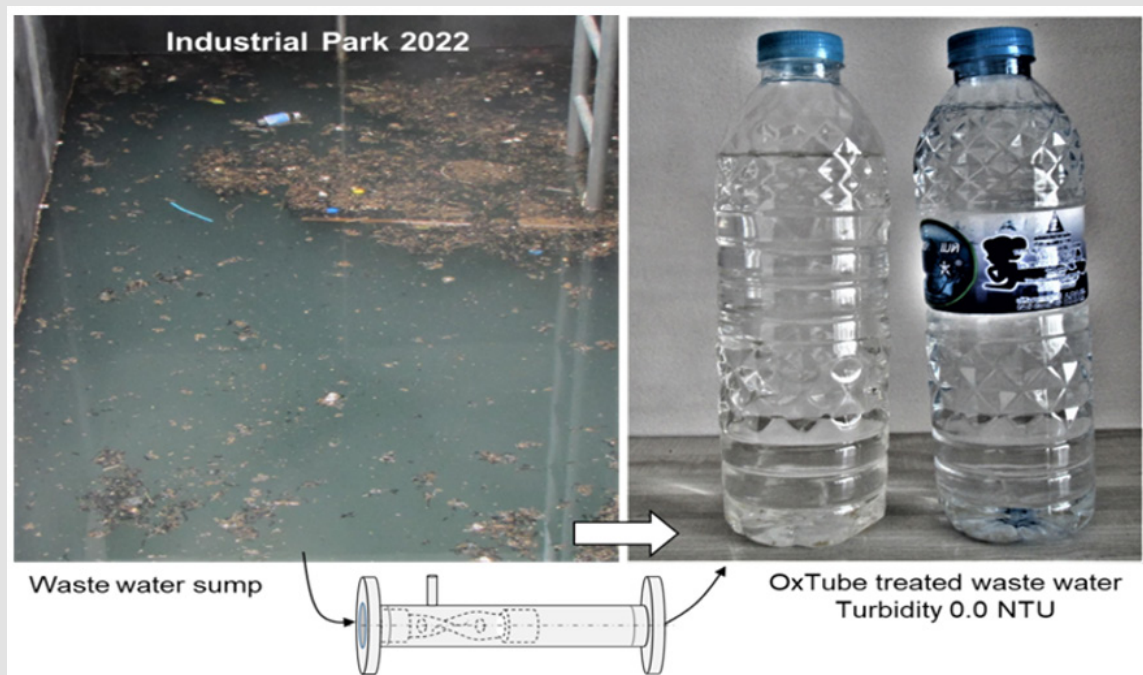


Figure 7: OxTube test runs of an industrial waste water resulted turbidity of 0.0 NTU. The clarified water is recyclable in industrial process use [12]. The waste water is clarified and aerated, and with ozone feed the water is disinfected, too.

OxTube generates a lot of bubbles, even mixture of water and bubbles and an efficient particle attachment in the tube condition as illustrated in Figure 4 [9,10]. Collision probability of particles and bubbles is high following with great particle attachment. The mixture of bubbles, attached particles and water is led in a simple open vessel, and the foam of bubbles and particles on the water surface is wiped out. Further, the particle attachment can be easily enhanced by a vortex flow in the simple flotation cell [9,10]. Water clarification, disinfection, oxygenation and particle removal by flotation can be combined by feeding mixture of ozone and air through the OxTube Machine. Capital and operational costs are reduced significantly. Figure 5 illustrates visibly efficiency of the Tube Flotation and its great potential to clarify various waters. The brown foam flouted just by OxTube aeration of the intake water from a lake in Finland. Clarified water can be seen on the left edge in blue. Flotation performance of a modern diffuser is seen on the right with the same lake water. Figure 6 presents major combined clarification functions of OxTube Machine, and results achieved in brief. OxTube Clarification is easy to integrate in several water systems like described in [8,10,11]. Figure 7 illustrates an example of some industrial case studies that resulted turbidity of 0.0 NTU by one run of the industrial wastewater through OxTube with air suction [12].

Combined Clarification, Disinfection and Various Toxins Removal

Disinfection of various water matrices including communal and hospital waste water can be disinfected by feeding ozone instead of air [3,5]. Table 1 presents results in the case of disinfection of a hospital waste water. Microbe reduction of 100 percent was achieved together with clarification and oxygenation of over 20 mgO₂/l. Ozone residues were measured negligible. Over 60 percent reduction on bacteria and viruses was achieved only with air suction and one through run [3,5]. Pharmaceutical and drug residues are a fast growing disaster in natural waters and ground. In purified waste water outtake of a city waste water plant 35 pharmaceutical and 7 chemical residues were found [5,6,13] and led continuously to waters nearby. These toxins are said to be little or even negligible but the fact is amount of the toxin residues all over is increasing and becoming dangerous for the nature balance. OxTube efficiency in removal of pharmaceutical residues from the city waste water can be seen in Table 2. About 90 percent of these 35 various residues were separated, split, activated, clarified and removed only by one run through OxTube Machine with ozone feed within 0.5 second in to an open vessel without any filters [5,6]. Two runs result 99 percent reduction of these drug and pharmaceutical residues including 7 chemicals identified. The city waste water was clarified, disinfected and oxygenated at the same time with removal of the drugs and chemicals. The present waste water purification systems in the comparable tests separated and removed less than 20 percent of the residues which can't be seen acceptable.

Table 1: Disinfection efficiency of the Integrated Water Clarification of OxTube: 100 % Reduction of E. coli and MS2 achieved with O3 feed of 2 l/min within 0.7 second, oxygen concentration raised over 20 mgO₂/l and negligible ozone residues measured / Savonia University of Applied Sciences in Kuopio [5,3].

Disinfection of Hospital Waste Water/THL Summary April 3,2018												
Sample	E.coli FMY/ml	Log-red	Reduction%	MS2 PFU/ml	Log-red	Reduction%	T °C	EC µS/cm	pH	Turbidity NTU	O ₃ Res mg/I	O ₂ mg/I
Test water	2			1			12,8	283	7,73	0,68	0,03	10,26
Inoculum	2500 000			870 000								
0mgO ₃ /I	1700 000		32,00	340 000		60,92	12,4	285	7,88	0,46	0,02	11,65
1,43 mgO ₃ /I	<0,001(MR.)	>9,23	99,99999994	<2 (MR.)	>5,27	>99,995	13,2	285	7,81	0,31	0,10	>20
1,27 mgO ₃ /I	<0,001(MR.)	>9,23	99,99999994	<2 (MR.)	>5,27	>99,995	12,6	294	7,83	0,27	0,14	>20
1,11 mgO ₃ /I	<0,001(MR.)	>9,23	99,99999994	<2 (MR.)	>5,27	>99,995	12,9	288	7,73	0,44	0,10	>20
0,95 mgO ₃ /I	<0,001(MR.)	>9,23	99,99999994	<2 (MR.)	>5,27	>99,995	14,3	279	7,84	0,37	0,10	>20
0,79 mgO ₃ /I	<0,001(MR.)	>9,23	99,99999994	<2 (MR.)	>5,27	>99,995	14,0	289	7,85	0,44	0,08	>20
0,61 mgO ₃ /I	<0,001(MR.)	>9,23	99,99999994	<2 (MR.)	>5,27	>99,995	14,0	287	7,74	0,40	0,07	>20

Table 2: Brief Summary on Removal of 35 pharmaceuticals from the purified city waste water of Kuopio Finland with OxTube Combined Clarification, Disinfection and Oxygenation compared to two advanced treatment systems [6,4,13].

Various pharmaceuticals of 35	OxTube Ozone Treatment			Present UV Method 1			Present UV Method 2		
	Initial µg/I	Residue µg/I	Reduction %	Initial µg/I	Residue µg/I	Reduction %	Initial µg/I	Residue µg/I	Reduction %
Total Load Reduction of Pharmaceuticals	20,158	2,041	89,9	17,755	14,556	18,0	17.712	14,666	17,2

Reduction of the following pharmaceutical residues was measured higher than 95 percent in one through run of 0.5 second:

- Cetirizine C₂₁H₂₅N₂ClO₃ 99.9 percent
- Diclofenac C₁₄H₁₁NCl₂O₂ 99.7 percent
- Losartan C₂₂H₂₃N₆ClO 99.6 percent
- Furosemide C₁₂H₁₁N₂ClO₅S 97.0 percent
- Citalopram C₂₀H₂₁N₂FO 97.0 percent
- Piperacillin C₂₃H₂₇N₅O₇S 97.0 percent
- Mirtazapine C₁₇H₁₉N₃ 96.4 percent
- Quetiapine C₂₁H₂₅N₃O₂S 95.0 percent

Table 3 shows a comparison of OxTube to two modern clarification systems based on the tests performed at Savonia University of Applied Technology. OxTube removed these substances of 71 percent within 0.5 second without any filters. Two through runs might result over 90 percent reduction within one second together with disinfection, clarification and oxygenation. There are many chemicals used decades and led in to the nature and food chains like DDT, aldrin, chlordane, chloroform, bromoform and hexachlorobenzene. OxTu-

be clarification in tube condition might be able to split and remove these hazardous chemical residues from waters due to their chemical similarity to pharmaceuticals above. WHO has listed, among others, the following chemicals are to be restricted and removed from waste and natural waters:

- Aldrin C₁₂H₈Cl₆
- Dieldrin C₁₂H₈Cl₆O
- Chlordane C₁₀H₆Cl₈
- Heptachlor C₁₀H₅Cl₇ and heptachlor epoxide C₁₀H₅Cl₇
- DDT, Dichlorodiphenyltrichloroethane C₁₄H₉Cl₅
- Lindane (gamma-hexachlorocyclohexane) C₆H₆Cl₆
- Methoxychlor C₁₆H₁₅Cl₃O₂
- Bromoform CHBr₃
- Chloroform CHCl₃
- Bromodichloromethane CHBrCl₂
- Hexachlorobenzene C₆Cl₆

Table 3: Removal of 7 substances from the purified city waste water of Kuopio Finland with OxTube Combined Clarification [6,13].

Chemicals	OxTube Ozone Treatment			Present UV Method 1			Present UV Method 2		
	Initial µg/l	Residue µg/l	Reduction %	Initial µg/l	Residue µg/l	Reduction %	Initial µg/l	Residue µg/l	Reduction %
Benzotriazole	2,8	0,896	68	2,5	1	63	2,4	2	<20
5-Methylbenzotriazole	0,83	0,191	77	1,7	1,4	<20	1,7	1,4	<20
4-acetamidoantipyrine	0,29	0,015	95	0,19	0,15	21	0,18	0,15	<20
4-formylaminoatipyrine	0,077	0,022	71	0,06	0,04	52	0,07	0,06	<20
Warfarin	0,007	0,020	<20	0,025	0,02	24	0,024	0,02	<20
Caffeine	0,022	0,018	<20	0,022	0,018	<20	0,017	0,011	52
verapamil	0,012	0,010	<20	0,012	0,01	<20	0,012	0,01	24
Total Load Reduction	4,038	1,162	71,2	4,509	2,638	41,5	4,403	3,651	17,1

According to common understanding the best ways to remove radon from water are with granular activated carbon, various aeration methods and in many cases water distilling [14]. However, only OxTube Machine was able to remove Rn out of ground water in an invitational competition in The Philippines. OxTube heavy gas removal facility WTU is presented in Figure 8. It is applied in radon gas re-

moval in intake of the ground water. Performance of the Rn removal can be seen in Table 4 [15,16]. In this case two WTU facilities with a compressor were installed in the present ground water intake after the pump for ground water. The intake water is clarified and aerated at the same time with Rn removal. In principle other radioactive residues could be removed from cooling water of a nuclear power plant.

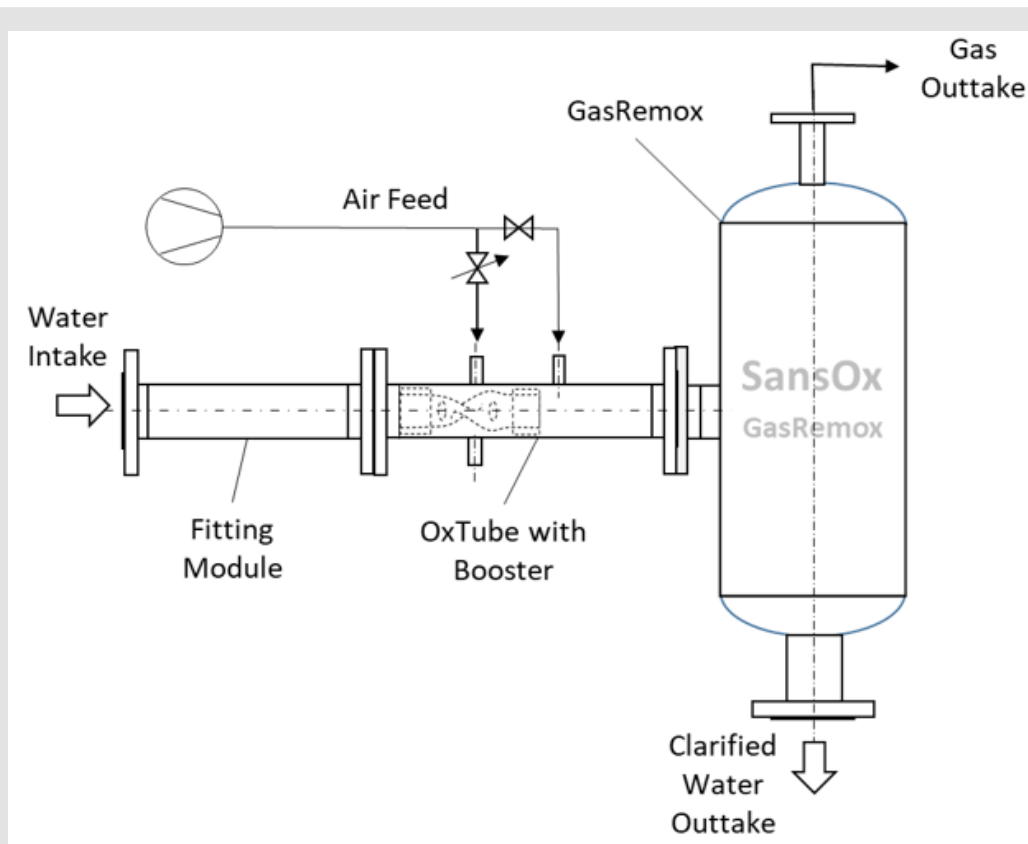


Figure 8: WTU, Water Treatment Unit of heavy gas like Rn and CO₂ removal. Compressed air is used in heavy gas blow-up and water clarification [10,11].

Table 4: Radon gas removal by two WTUs with compressed air and Boosters from a ground water intake [15,16].

Water Flow	Date of Sample	Monitoring Data					Rn Removal Bq/I				
		Pressure psi					Raw Water	Treated Water	Reduction Bq/I	Reduction%	Acceptance
		Pump out	OxTube1	OxTube 2	Distr.Line	Δ					
62.5m ³ /h	1809-19	60	52	48	60	0	55	9	46	83.6	Passed
	1909-19	60	52	48	60	0	50	8	42	84.0	Passed
	2309-19	60	52	48	60	0	53	4	49	92.5	Passed
	2409-19	60	52	48	60	0	52	5	47	90.4	Passed
	2509-19	60	52	48	60	0	51	4	47	92.2	Passed
	2609-19	60	52	48	60	0	47	5	42	89.4	Passed
	3009-19	60	52	48	60	0	43	8	35	81.4	Passed
	0110-19	60	52	48	60	0	52	7	45	86.5	Passed
	0210-19	60	52	48	60	0	45	6	39	86.7	Passed
	0310-19	60	52	48	60	0	47	6	41	87.2	Passed
	0710-19	60	52	48	60	0	57	8	49	86.0	Passed
	0810-19	60	52	48	60	0	56	6	50	89.3	Passed
	0910-19	60	52	48	60	0	50	5	45	90.0	Passed
	1410-19	60	52	48	60	0	42	6	36	85.7	Passed
	1510-19	60	52	48	60	0	52	6	46	88.5	Passed
	2810-19	60	52	48	60	0	50	7	43	86.0	Passed
Requirement							52	11		79.0	

Air Impacts Transfer on Tissues in Wet Contact

OxPro down scaled from OxTube treats the water in flowing condition in its hermetic tube. It splits molecular and ionic structures, activates and separates soluble ingredients in the water, and replaces these by air gases that are sucked by vacuum in the nozzle zone. The water is clarified and air gas dissolved in OxPro Tap and Shower hand set. A demonstration of OxPro Tap clarification is illustrated in Figure 9. Further, lot of air bubbles are generated and mixed in the water flow as seen in Figures 2 & 9. Over 500 individuals and professionals have been used so far OxPro treated Water for various tissue deceases and orally in order to improve metabolism. The treated Water transfers impacts of clean air immediately in to tissues like skin, nails and hair, and orally to metabolism in the wet contact, Figure 10. Further, surface tension of the treated water is reduced which enhances the interaction between the water and bio tissues. Naturally, desirable

substances in general can be dissolved in the water such a way that improves the interaction and impact transfer. Evaporation of the water rinsed on skin leaves a productive thin film of the clarification as illustrated in Figure 11. An example of many quick wound recoveries is presented in Figure 12. Skate blades dig two deep wounds and several small wounds on the arm in a clash of players. After disinfection the wounds were only rinsed with the OxPro Water four times a day. Total recovery of the wounds was identified after seven days just by rinsing the clarified water on the wounds four times a day. The water care was initiated on the second day of the injury.

Health and wellness impacts of the OxPro treated water are discussed briefly in reference [4]. DuOx Nozzle can be integrated easily in various devices like in shower and tap devices, and in various water purification systems



Figure 9: Demonstration of OxPro Tap with Swiss household water. Separation of dissolved ingredients and molecular activation without air suction on the right, and integrated clarification on the left. OxPro Tap is shown in the middle [4].

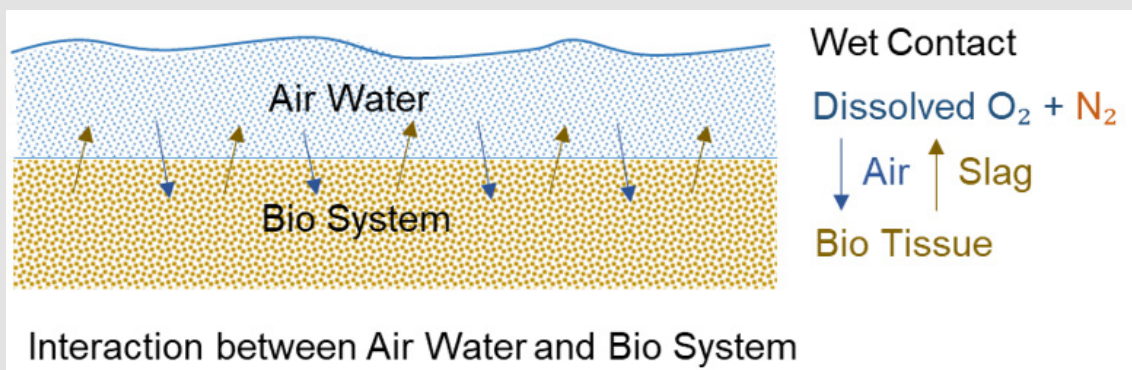


Figure 10: Transfer of Air Impact in to bio tissues in wet contact [4].

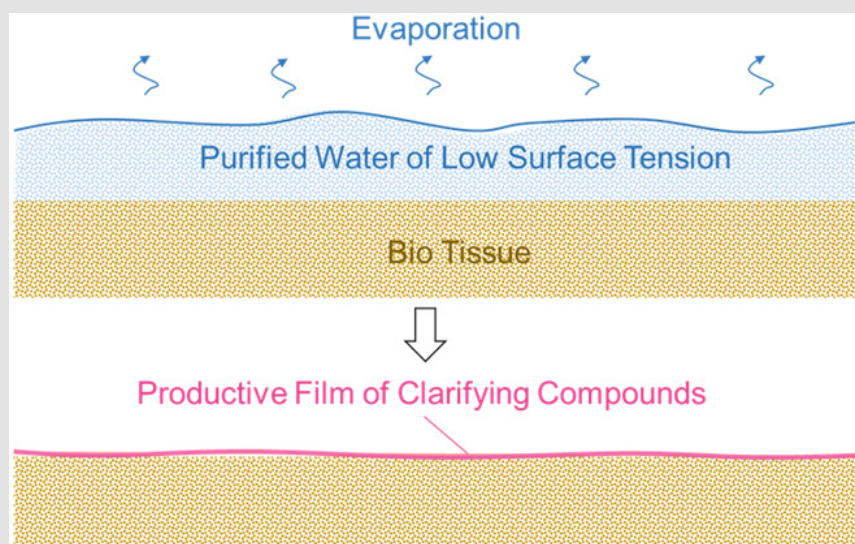


Figure 11: The OxTube Purified Water forms a thin film of the clarifying compounds on wounded skin after evaporation of the rinsed water.

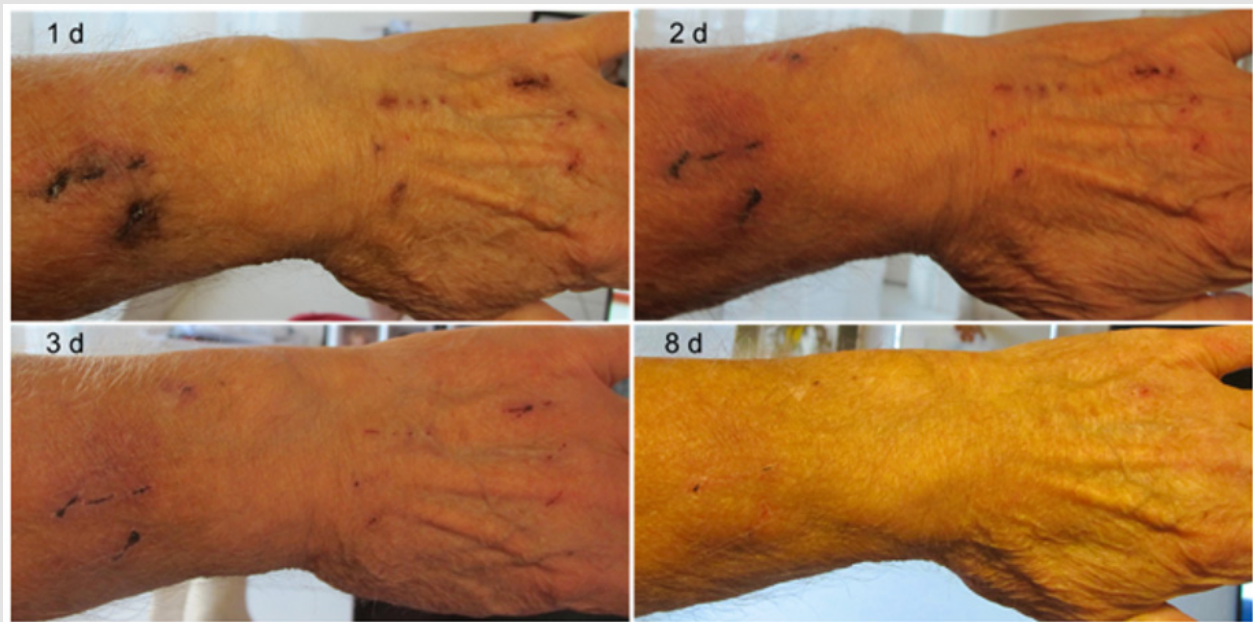


Figure 12: Ice Hockey Injury Recovery within a week. Skate blades dig two deep wounds on the arm in a clash of players. After disinfection the wounds were only rinsed with the OxPro Water four times a day.

The OxPro treated water was mixed-in in a fish aquarium about one third of its volume. In couple of days the fishes turned brighter in color and more social in behavior, and further, algae disappeared and plant leaves turned from dark brown to green. It's said, plain household water would kill fishes. Many ponds and lakes in various countries have been refreshed by OxTube Clarification with help of

recovered food chains and nature balance. Only minor portion of the natural water was clarified in the cases just by providing to the vital forces of nature a peak effect on refreshing and bio balance. The cat in Figure 13 enjoys every day OxTube clarified test water in the laboratory. She finds and drinks always only OxTube clarified test water although it is hard to reach.



Figure 13: The cat involved select always the OxTube Clarified water even it is hard to catch.

Summary

OxTube Water Clarification in tube condition has been applied successfully in removal of pharmaceuticals, radon gas, calcium, manganese and iron from various water matrices, and in disinfection of wastewaters with ozone feed. Pharmaceutical residues in total over 24 µg/l were removed 90 percent by OxTube Machine combined with Clarification and Disinfection within 0.5 second in one through run [6]. Two through runs result 99 percent reduction. Radon removal from 57 to 8 Bq/l is achieved continuously in five installations of ground water intakes at four Water Plants. Disinfection of a hospital wastewater with ozone feed resulted 100 percent microbe reduction, and clarification and oxygenation of the wastewater at the same time. Reduction of viruses of 60 percent was achieved just by air suction without any other gas and chemicals feed. Two runs with air might result about 80 percent and four runs 97 percent reduction. Microbe growth and variation are reduced with just clean air suction and eliminated with ozone feed. Combined disinfection and drug removal in tube condition doesn't cultivate resistance of viruses. Hybrid and decentralized waste water treatment should be carefully considered instead of centralized one with good reason [2]. In principle the wastewater can be clarified by OxTube in sewage drain on the way back to the nature. However, it's definitely a better way to clarify wastewater combined with other water systems promoting recycling and evaporation cooling. OxTube Machine is easy to be integrated in and combined with present water systems. The DuOx nozzle can be integrated in hydro turbines combined with power generation and water clarification.

Combined fountain and water clarification by integration of DuOx Nozzle reduces energy consumption in to half or more. The tube clarification should be started at all the water intakes already due to fact that waters content already too much waste, drug residues, radon and micro plastics. Seas and oceans - refuse dumps of the water cycle - can be refreshed by integrating OxTube Machines in ship structures. A cruising ship can clarify sea water of 200 000 cubic meter a day without additional fuel consumption. There are more opportunities to be solved by water treatment in respect of the nature. It's urgent to refresh waters and food chains as well as to improve wastewater treatment so that it can be sprayed on ground, plants, roofs and solar panels for evaporation and local cooling. During the research and test runs in product development the clarified water was found a bit slippery and its surface tension reduced. It has a significant impact on skin, hair and nails, and taste and mouth hygiene as well. Further, eczemas and various wounds recovered fast without additional medical

care, and signs of metabolism improvement was reported by people and professionals involved in test runs. Pure air and water have certain health features, and mixing and dissolving these deeply together the healthy impacts and impact transfer speed are multiplied in wet contact.

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