

List of high-tech projects and applications of MMM ultrasonic technologies

www.MPI-Ultrasonics.com, www.Mastersonics.com

The list of the most popular traditional and emerging high-tech ultrasonic technologies includes industrial, technological and scientific applications of ultrasound, as follows:

1. **Sonocrystallisation.** Ultrasonically accelerated and stimulated, **micro and nano-crystallization.** Sonicating water towers and water reservoirs to eliminate minerals scaling and to repel, suppress and stop bio flora, algae, and bio films formations. To see ultrasonically-assisted Sonocrystallisation in action, please visit:
http://www.mastersonics.com/documents/mmm_applications/liquids_processing/sonochemistry_and_cavitation/Orchid-Sonicator/.
 Sonocrystallisation related publications can be found here:
http://www.mastersonics.com/documents/mmm_applications/liquids_processing/sonochemistry_and_cavitation/.
2. **Forced, fast precipitation** of solid minerals from liquids (using MMM Ultrasonic technology). Accelerated ultrasonic precipitation, sedimentation, segregation of particles dissolved in liquids. Interesting for heavily contaminated fluids, for mineral and bio-materials extractions, for nuclear decontamination, for liquids charged with scaling and fouling minerals. See here:
http://www.mastersonics.com/documents/mmm_applications/liquids_processing/sonochemistry_and_cavitation/Sonocrystallization/
3. **Nanoparticles in a liquid phase** can be ultrasonically created starting from micro and bigger particles and metal foils. Production of nano-particles (by ultrasonic liquids processing...). For instance, nano-diamonds, or carbon nano-tubes production, including the creation of new medicaments... Thanks to ultrasonic cavitation (during ultrasonic liquids processing) and locally generated high temperature (5000°C) and very high-pressure spots, we can transform specific liquid solution, which has active and technologically precious ingredients, and disintegrate such elements until nano-scale particles, by high intensity sonication. Nano particles are increasingly becoming very advanced, significant and strategic ingredients of new composite materials, new medicaments, new metal alloys, new plastics and rubbers, new electric power storage cells and batteries. For more information please visit here:
http://www.mastersonics.com/documents/mmm_applications/liquids_processing/sonochemistry_and_cavitation/Nano-Diamonds-Reactor/ and here:
http://www.mastersonics.com/documents/mmm_applications/liquids_processing/sonochemistry_and_cavitation/
4. **Nano emulsions, nano polymers, nano-emulsions and nano liposomes** (for nano encapsulation) can also be created using MMM ultrasonic technology. See more here:
http://www.mastersonics.com/documents/mmm_applications/projects-proposals-and-know-how-transfer/Patents/Patent--Liposomes/
5. **Ultrasonically accelerated etching, electrolysis, metal plating,** different electrochemical and chemical processing, liquids flotation, homogenization, degassing... **Electroplating and metallization.** Ultrasonically optimized and stimulated electroplating and metallization (especially for difficult electroplating technologies). Such technology is applicable in the modern electronics industry,

solar cells and integrated circuits production, jewelry, surface protection of metals in almost any industry where metals are used.

6. **Extractions and Sonochemistry.** High intensity sonication of organic and inorganic minerals' content, mixed with specific fluid, solvent or juice, will stimulate, accelerate, homogenize and optimize extraction of active ingredients. This is useful in metallurgical, pharmaceutical and food industry (for accelerated electrolytic and electrochemical processing, for producing medicaments and food ingredients). Flavors and useful ingredients extraction from plants can be realized faster and very efficiently using ultrasonic technology. Coffee and tea plants can be ultrasonically extracted producing extraordinary drinks and stimulating or relaxing beverages. Homogenous liquid solutions with pharmaceutical or nutritive natural and different mineral content can be ultrasonically forced to crystallize, agglomerate and precipitate precious or active particles (this way separating liquid from solid phase). High intensity of MMM ultrasonic activity will also create nanoparticles in treated liquids. Ultrasound is also useful for medical or pharmaceutical extractions from plants and other materials... This is the field of Sonochemistry... (most of the known chemical reactions can be optimized and accelerated, and final products will be significantly improved...). In some cases, new, extraordinary, naturally impossible chemical reactions will be realized. See more here:
http://www.mastersonics.com/documents/mmm_applications/liquids_processing/sonochemistry_and_cavitation/
7. **Water processing and purification.** (1) For instance, if we take sea, salt water (which has many minerals and it is not potable), ultrasonically (and using innocent powder additives) we can directly create sufficiently purified water, which will be OK for agricultural applications (like irrigations). Sonicated agricultural-irrigation water is significantly stimulating growth of plants. (2) From ordinary, healthy, potable water we can separate minerals like calcium, etc., by applying specific ultrasonic radiation and producing forced Sonocrystallisation... See more here:
http://www.mastersonics.com/documents/mmm_applications/liquids_processing/sonochemistry_and_cavitation/Sonocrystallization/
8. **Descaling and Deposits removal.** Water treated ultrasonically (using MMM technology) is not creating scaling and deposits in pipelines, boilers, heat exchangers... MMM sonicated water is becoming free of memory effects and mineral content dissolved in such water will be transformed into nano particles. Such water is medically and biologically very healthy. Boilers, heat exchangers, thermal power plants and nuclear reactors can also be remotely and ultrasonically cleaned from scaling and mineral layers (in real-time, in flow conditions, without stopping the process, being non-intrusive ...). See more here:
http://www.mastersonics.com/documents/mmm_applications/Heat-Exchangers-Descaling/

<https://www.mpi-ultrasonics.com/content/ultrasonic-stress-relief>
9. Pipelines with oil and other fluids can also be **ultrasonically cleaned**, acting externally and internally using short and/or long range, non-intrusive cleaning... MMM ultrasonic cleaning can be 10 times more efficient and faster compared to ordinary ultrasonic cleaning.
10. **Ultrasonic Oil and Water Wells Optimization** (stimulation, deblocking, declogging, and non-intrusive ultrasonic cleaning) ... See more here:

http://www.mastersonics.com/documents/mmm_applications/wells-channels-reservoirs-cleaning/

11. Water conditioning.

In thermoelectric power plants (also nuclear, electric power plants) and big boilers of any kind, we can make ultrasonic water modification (conditioning based on Sonocrystallisation), producing that hard mineral layers will not be created on heaters, heat exchangers and boiler walls... practically MMM ultrasonic processing is separating and precipitating hard particles and other mineral content from water. Water purified on such way (equivalent to certain kind of demineralization by acoustic means) is even able to attack and to remove old, existing scaling, deposits and hard mineral layers, already created on boiler walls and heat exchangers, meaning that such (acoustically-modified) water is chemically active and performing an active cleaning, "eating", destroying, or dissolving stable and hard mineral formations from boilers and pipelines.

12. Artificial and accelerated aging, homogenization and blending of liquids, wines, beverages, and hard drinks.

This application of MMM sonicating technology can significantly improve quality and taste of beverages. In the same time nano-particles will be created (what is improving taste and quality of treated liquids). Such ultrasonically processed liquids do not create scaling and deposits. Several minutes of high intensity ultrasonic MMM treatment corresponds to several years of natural aging. See more here:

http://www.mastersonics.com/documents/mmm_applications/liquids_processing/


13. Agricultural applications of ultrasound:

1° Water for agricultural irrigations (mainly industrial water from rivers, lakes, wells, including muddy waters that are not for drinking, but still useful for irrigation) can be ultrasonically conditioned and modified. Plants treated with such water will grow much faster (because ultrasonic cavitation will change properties of water, by disintegrating different molecular and particles agglomerations, and liberating internally-captured and inactivated minerals) ...

2° Also seeds and grains, if ultrasonically treated before planting, are dramatically increasing plants germination (almost 100% of such seeds will produce new plants). One of the methods for inline, flow-through water conditioning is to use our Clamp-On ultrasonic reactors; see the presentation here:

http://www.mastersonics.com/documents/mmm_applications/big_and_thick_masses_agitation/engine-block-atomizing/

Another way for water sonication and conditioning is to use our resonating rod sonicators; -see here:

 [Spring-mixer.zip](#) 209.7 Mb 21 Mar 2013

(http://www.mastersonics.com/documents/mmm_applications/liquids_processing/)

14. Fish farms ultrasonically protected from algae. See more here:

http://www.mastersonics.com/documents/mmm_applications/projects-proposals-and-know-how-transfer/Patents/Patents--fish-farms/

15. Water polluted with radioactive particles

can be forced by Sonocrystallisation to precipitate radioactive and other particles, and to enable separation of relatively clean

and clear water from a muddy phase, which has a problematic or other mineral content.

16. ULTRASONIC WASTE WATERS PROCESSING FACTS

- -Relatively expensive technology
- -Necessary to use highly educated experts (meaning engineers) ... operational prices are elevated compared to traditional techniques.
- -The durability of ultrasonic equipment will be significantly affected by environmental operating conditions (corrosion, chemical attack of vapors and aggressive chemistry)
- -A necessity to use several levels of liquid processing and preparation, such as mechanical filtering from significant and relatively stable parts, mechanical maceration, mixing and blending before ultrasonic processing, need to apply very high intensity ultrasonic processors (sonicators)...
- -High intensity sonicators (sonotrodes) are wearing and eroding (relatively fast) because of ultrasonic cavitation and ultrasonically intensified chemical activity of wastewaters. Sonotrodes should be periodically inspected and replaced... (high cost). High-level technicians and engineers should be involved.
- -Also, it will be advantageous to inject ozone in wastewaters to secure decontamination...
- -Of course, ultrasonic liquid processing is very much beneficial for wastewaters' fast decontamination... but it is effectively much more expensive compared to traditional, old methods.
- -Good sides of ultrasonic technology in water processing are related to descaling and internal deposits removal from pipelines, heat exchangers, boilers...

17. Biofuels. 1° Production of new fuels and combustion liquids (with better energetic or burning performances) can be realized by using ultrasonic water-fuel homogenization and cavitation- based transformations of different liquid fuels, oils and other petrochemical liquids (presently very much known and hot item with a lot of information on the Internet). 2° Also ultrasonically we can optimize and stimulate biogas production from organic materials, from waste paper, wood chips, plants ..., because ultrasonically treated natural materials, cellulose, waists liquids... are becoming much better for further biological and chemical transformations. This is also interesting for oils and fuels extractions from certain sea algae.

18. Hydrogen production technology. Ultrasonically optimized and accelerated water electrolysis for hydrogen and oxygen mass production. Traditional electrolysis can be enormously accelerated if we introduce ultrasonic vibrations in such processes. There is a chance to accelerate and stimulate direct extraction of hydrogen from diesel...

19. Another way of inline, flow-through liquids with mineral content processing can be realized with MPI Clamp-On ultrasonic reactors is shown in the following presentation:

http://www.mastersonics.com/documents/mmm_applications/big_and_thick_masses_agitation/engine-block-atomizing/

20. Sonicated liquid flow.

Creating long-living and long-penetrating cavitation activity. Developing ultrasonic propulsion engine for boats and submarines. Remote cleaning of oil and water wells and long pipelines can be realized using sonicated water flow or sonicated water jet.

Such strategic projects and technologies will request R&D efforts and significant financing.

- 21. Long range Sonicators.** Ultrasonic fluid jet and sonicated liquid flow for different technological applications, including medical treatment.
- 22. Medical applications.** High power, low frequency ultrasound has many new, medically/therapeutically healthy effects (pay attention that this is very new ultrasonic treatment, different than what is known and practiced in traditional and modern, ultrasonic medical therapy). For more information, see here: www.UltrasonicsRevival.com. For instance, with such (low frequency) ultrasonic treatment, or irradiation, or massage it is possible to activate and stimulate stem cells to start reproducing, creating lost neural cells connections, stimulating neurons to multiply, to remove pain from mechanical and sports- related injuries... to build neural-psychological conditioning for specific situations, like initiating states for faster and better learning, for deeper sleeping, for mental and physical relaxation, for increased and focused perceptual (sensorial and mental) attention in critical situations... (not to mention many similar applications on animals, horses, etc.).
- 23. Ultrasonically stimulated gas injection in liquids.** Ultrasonically stimulated, very fast gasses injection in liquids, including sea water (at ambient temperature and pressure, until saturation, such as CO₂, ozone, toxic gasses etc.). 1° For instance, ozone injection in water is producing water that is very good for total (perfect) biological sterilization (including all odors and poisons neutralization and elimination). 2° The second strategic application is **decarbonization** or forced injection of high-carbon-content burning, waste gasses, CO, CO₂, Sulfur... (for instance, produced by coal power plants...) into stabilized liquids, convenient for extended storage (as a measure for environment protection), or for fertilizers and chemicals production... For more information, see here: http://www.mastersonics.com/documents/mmm_applications/liquids_processing/gas%20injectors/.
First, it is necessary to remove already dissolved gas from water (to apply degassing process using MPI sonicators), and then to inject ozone, CO₂ and other polluting gasses (using MPI ultrasonic gas injectors) ... For instance, MPI Ultrasonic gas injector will facilitate Introduction of CO₂ micro bubbles (until saturation) into degassed seawater (< 20 microns). We can also apply similar technology to inject and stabilize (or chemically transform) other contaminating gasses and fluids in water. This is our present planetary problem (producing global heating and macro-climatic changes).
- 24. Ultrasonic liquids degassing** (at ambient temperature and pressure) is very efficient technology and MPI multi-frequency (MMM-technology) sonicators are very good for such some way acoustically specific and non-linear, but ultrasonic degassing should work well). Important degassing parameters are, ultrasonic power, how many transducers to apply, and how long will be processing time, but it will work very well. Degassing works very well with potable and industrial water. See more here: http://www.mastersonics.com/documents/mmm_applications/liquids_processing/
- 25. Ultrasonically assisted, accelerated and optimized Precious Metals Extractions, Sonochemical Liquids Processing, Mining and Metallurgy.** This is about ultrasonically optimized and accelerated extractions of minerals and metals from natural raw materials.
Example: Accelerated extractions of gold and platinum from sand and granite, or from waste materials and ores remaining after ordinary mining. Mineral (organic and

inorganic) extraction and dissolution (for instance, based on Aqua Regia and Cyanides) could be accelerated from 100 until 1000 times...

Please see one of the presentations (related to extraordinary ultrasonic extractions of precious metals) here:

http://mastersonics.com/documents/mmm_applications/ultrasonic%20extractions%20and%20liquids%20processing.pdf.

- 26. Ultrasonically Assisted Mining or Direct Minerals extraction:** For direct minerals mining (for instance mining of Uranium and radioactive minerals) it is possible to drill boreholes in a soil rich with certain minerals, continuously fill such well with convenient extracting liquid, and submerge MPI, multi-frequency (MMM) ultrasonic transducer in a hole. Ultrasonic activity will dissolve surrounding minerals in a liquid, and it will be sufficient to pump such minerals-saturated liquid and inject new non-saturated fluid... See more here:

http://www.mastersonics.com/documents/mmm_applications/mmm_cleaning/

http://mastersonics.com/documents/mmm_applications/mmm_cleaning/Ultrasonic-Cleaning-technology-transfer-proposal.pdf

- 27. Ultrasonically assisted metallurgy.** Metals in the liquid phase can be ultrasonically transformed into much better alloys than any known, natural, ordinary metallurgical process is producing. Please visit www.UltrasonicMetallurgy.com. Examples of technological results are metals degassing, better alloying, eliminating and integrating non-metallic inclusions, increasing density, improving micro-crystallization, and creating new alloys (which are naturally not mixing). A short presentation is here:

http://mastersonics.com/documents/mmm_applications/ultrasonic_metallurgy/ultrasonic_melt_treatment_presentation_v8.pdf

- 28. Ultrasonically assisted and accelerated extrusion** of plastics, metals, powders, food products, chocolate, clay etc. See more here:

<https://www.mpi-ultrasonics.com/content/ultrasonically-assisted-plastic-extrusion>

- 29. Other Ultrasonically assisted technologies.** Ultrasonically assisted extrusion, injection-molding, machining, cutting, drilling, polishing, grinding, filtering, accelerated aging and stress removal, sintering, powders compacting technologies, etc. See more here:

http://www.mastersonics.com/documents/mmm_applications/machining-drawing-extruding-cutting/

http://www.mastersonics.com/documents/mmm_applications/different_mmm_applications/

- 30. Stress-Relief, Descaling and Deposits removal and preventive maintenance** from heat exchangers, boilers, pipelines (in real time, without stopping a technological process) ... Download and see more, here:

<https://www.mpi-ultrasonics.com/content/ultrasonic-stress-relief>

http://www.mastersonics.com/documents/mmm_applications/Stress-Relief/

 [mmm ultrasonic stress relief.mp4](#) 230 Mb 10 Oct 2016

 [mmm ultrasonic stress relief.zip](#) 219.6 Mb 10 Oct 2016

www.mastersonics.com/documents/mmm_applications/projects-proposals-and-know-how-transfer/Patents/Introducing%20ultrasonic%20energy-for%20agitation%20of%20large%20metal%20parts/

31. Typical, already known and new ultrasonic technologies can significantly profit from MPI's MMM technology (like ultrasonic cleaning, welding, sonochemistry, homogenizing... which are now widely applicable and very much known). See about MMM technology here:

http://mastersonics.com/documents/mmm_basics_presentation.pdf, and here

<https://www.mpi-ultrasonics.com/content/mmm-ultrasonics>

<https://www.mpi-ultrasonics.com/content/applications-multifrequency-structural-actuators>

http://www.mastersonics.com/documents/mmm_applications/projects-proposals-and-know-how-transfer/

http://www.mastersonics.com/documents/mmm_applications/different_mmm_applications/

Each of the above listed applications and trends could be developed on a large industrial and profitable level. MPI-ULTRASONICS can assist and contribute in any of mentioned applications.

COMMENTS:

For instance, let us take the project under 22. This can be addressed as an extraordinary body treatment (for medical therapy) applied to humans, and also applicable on bigger animals.

There are many possibilities (how to develop such projects, equipment, and related business), and some of the proposals are:

1. To design kind of sufficiently large/high/modern-looking stainless-steel cylinder or bath (with stairs, platform, crane or lift, holders, etc.), sufficient that an adult can enter inside (and be taken out, after the treatment). Inside will be water on certain comfortable temperature, with specific medicinal chemistry inside (such as vitamins, tea plants, minerals...).
2. Such stainless-steel bath (reservoir) will be sonorized (sonicated) using specific, high-tech ultrasonic transducers, operating on low ultrasonic frequency (between 20kHz and 40 kHz with modulation) to produce mentioned medical and therapeutic effects. Patient under treatment will enter inside and adjust his (acceptable, comfortable) power level, frequency and signal modulations of ultrasonic vibrations. Of course, water level, temperature and medical or chemical content inside can be regulated and personalized to create an optimal treatment for the specific patient. Such ultrasonic body treatment will take 5 to 10 minutes per patient (per treatment) and be applied a few times per day. Results of such ultrasonic treatment, using the language of ordinary (and also uneducated) people, would be: rejuvenation or getting younger, removing any kind of pain, skin reparation, acting against worst type of skin infections, stimulating body cells of any kind to reproduce, to replace old and missing cells, to make neural stimulation, to make reparations of neural connections like in cases of Parkinson illness, to act against cancerous cells, to activate/mobilize paralyzed people... Of course, such extraordinary ultrasonic treatment will be only for wealthy clients ... The goal could be to establish such ultrasonic therapy

clinics in rich countries (where clients are able to afford such expensive treatment). Practically, we need to produce mentioned ultrasonic bath with all kind of accessories and fixtures, to have a safe operating system, and to enable easy manipulations with patients. Since such project cannot easily pass European and USA regulations (because of legal rules, a monopoly of big companies, competition practices...), we could establish such clinic in certain of countries where it is easier to get an authorization from specific influential persons. See more here: www.UltrasonicsRevival.com

Project: Ultrasonic Nano Water

Ultrasonically modified water (using MMM technology specifically designed sonicators, with very strong and wideband, or white-noise cavitation) is being transformed in nano-water, and it can be used as:

1. Healthy potable water for regular consumption
2. As medicament for body purification and revitalization
3. For preparing different nano-solutions (with organic and inorganic ingredients)
4. For producing different beverages
5. For agricultural watering of plants and activating germination of seeds
6. For fish farms (stimulating fish growth). Also, for animals' farms.
7. For sanitation, disinfection, sterilization (when mixed with added ingredients)

Effects of MMM ultrasonic agitation on water:

Ordinary, natural and other healthy and potable waters always have specific and structurally stable mineral content, usually well and homogeneously dissolved and uniformly distributed (as micrometres size particles, that are not easily penetrating membranes of living cells). This is often calcium and other minerals that are not directly problematic or damaging for humans' health, but susceptible to create scaling, deposits and hard precipitations, when consumed, or treated in technological equipment and boilers. However, drinking some of minerals-charged waters could be problematic on a longer time scale.

Acoustically or ultrasonically treated, water can be structurally decomposed, and reorganized, regarding its mineral content, and involved molecular structures and internal connections of minerals (and it will contain dominant quantity of nanometers size ingredients, able to penetrate living cells easily). ***After MMM ultrasonic processing, modified nano-water is again able to be good cleaning solvent, and to absorb and carry new minerals.***

There are known memory effects related to water structure (still not well explained, but experimentally verifiable). Water can be, on different ways, acoustically or ultrasonically modified, and keep certain structural information, which could have different consequences on health, metabolism and other biology-related situations. ***MMM ultrasonic water processing will erase "old memory signatures", and create new, targeted (desirable) ultrasonic water modification***, with significant content of nano-size structures.

MMM Ultrasonic agitation of water is producing effects such as:

1. ***Wideband Cavitation***, which presents a short living, imploding microbubbles that are locally producing until 5000°C and thousands of bar pressure. Such cavitation bubbles are reacting like micro explosions (or implosions), and making water sanitation, disinfection, passivation and oxidation of minerals and organic content. Practically creating healthy water. Such treated water is not producing mineral scaling and deposits.
2. Specifically created ultrasonic agitation is producing ***effects of accelerated disintegration, deagglomeration and precipitation*** of minerals and other chemicals that are usually present in a potable water. This way, we can easily separate and eliminate all surplus of bigger particles and minerals that are originally present in water. The remaining water (after treatment) is on some way becoming biologically and chemically active, like a sponge or like good, new and non-saturated solvent (since it will dominantly have some kind of nan-structure susceptible to absorb other mineral and organic content, and it will easily penetrate living cells membranes of humans, plants and animals). By drinking such water, we create effects of detoxication, rinsing, or internal body cleaning.
3. In the same time, MMM sonication of water is ***creating specific content of nanoparticles and nanocomposites***. Humans' cells are easily and efficiently absorbing Nano-particles and ultrasonically purified water, what is not the case with ordinary, ultrasonically non-treated potable waters. Usually, mineral content of healthy waters is composed of micro particles dissolved and well homogenized in water. Micro particles are 1000 times bigger than nano-particles and human or plants' cells are stopping such mineral content. Cells membranes are reacting like filters (for micro particles), and we

can get internal calcification and mineralization of living organs and blood vessels. If we transform certain potable water into water content with nanoparticles, such ***nano-water is easily penetrating cells membranes***, cleaning, and watering our body much more efficiently. This way, we could add medicinal and tea plants and active substances in water, transforming water into very useful medicaments (meaning into nano-waters). ***Plants watered with ultrasonically modified water are growing faster*** and reaching a much bigger size, compared to plants watered with ordinary agricultural water. ***Ultrasonic processing of seeds in water is creating almost 100% of germination***. We can realize different ***aging, blending and homogenizing of waters*** using ultrasonic MMM sonic and ultrasonic processing. Genetic content of plants and humans in some cases has significant mutual overlapping, what is supporting ***nano-waters applications for stimulation, optimization, revitalization and internal cleansing of all living species***.

4. Potable waters in urban water supply systems usually have specific, stable (strange, still not well explained, but experimentally verifiable) ***memory effects***, being like some kind of structural water signature. This memory effect sometimes produces a negative impact on humans' behaviors, health and psychological states, including negative effects of scaling and hard deposits. ***MMM Ultrasonic water processing is erasing and eliminating already existing memory situation and making water clean of mentioned structural signatures*** (like deleting memory medium of computer-related memory devices). Similarly, we can (acoustically and optically), modify water structure by implementing certain new and healthy or stimulating structural modification (or by creating new and beneficial memory signature). This way, ***nano-water will become additionally active and healthy with targeted medical properties***. It is already known (and experimentally verifiable) that music applied conveniently on water is structurally modifying water. There are trends and successful activities to make structural modifications of water to react as bacteria and micro species killing or sanitizing substance (just by applying specific acoustic and light processing on a clean water).
5. Ultrasonically modified nano-water can be mixed with different ingredients, in order to create different beverages, technological, pharmaceutical or medical liquids. It is already well known that ***ultrasonically treated wine and other hard drinks are becoming stabilized, aged and with very much improved taste***.
6. ***Ultrasonically, it is possible to inject big quantity of air, different gasses, or ozone in water***. It is also possible to remove gaseous content previously dissolved in water (using different processing). This way it is possible to create ***modified waters for different agricultural applications, for fish farms, sanitation, and biological revitalizations and stimulations***.

PROJECT: WATER WITHOUT DANGEROUS CHEMICAL RESIDUALS

Urban consumption of fresh (as well as other useable waters) that are satisfying present quality and safety standards are often charged with multiple nano-quantity pollutants, chemicals, pharmaceutical and medical residuals, heavy metals, different minerals and poisons, which are below, or far below present official and legally prescribed standards. Present laboratory analyses for certifying water quality are simply not obliging water supply systems to perform measurements of extremely small, or nano quantities, of different dangerous and poisonous ingredients of potable water. Such waters are simply considered as being healthy and acceptable for human consumption. Health-hazardous content of such waters is presently still considered as being within acceptable threshold levels.

Modern and well-developed world communities are increasingly experiencing new medical problems, most probably produced by consuming potable waters with fore-mentioned and dangerous nano-contents of pollutants, such as:

- significant sterility levels,
- cancer related illnesses,
- physical deformations of babies,
- psychological deviations, depressions and mental problems

Nobody is even addressing technological situations how to efficiently eliminate cocktails of nano-ingredients of dangerous chemistry in potable waters.

The way to eliminate such water nano-content is:

- Ultrasonically assisted water ozone processing
- Ultrasonic nano-dissolving of specific metals (like silver, copper etc.) in water
- High intensity wideband ultrasonic cavitation
- Natural sand and active carbon filtration

The effects of ultrasonic ozone treatment are as follows:

- making total biological sterilization and water clarification
- making total poisons oxidation, burning and elimination (transforming all kind of organic and inorganic poisons and dangerous chemical content into neutral and harmless oxides).

By ozone and by ultrasonic cavitation treated water, before being fully sanitized, healthy and potable, should pass certain natural filtration (using traditionally known good filtration methods) in order to eliminate larger particles, and to dissipate dissolved ozone. Such water can be considered as free of any dangerous content.

In addition, such water will be clean of memory-related, structural formatting, and can be used for medical and pharmaceutical applications.

Other of aforementioned ultrasonic processing methods are only auxiliary, beneficial and additional in cases of very critically polluted waters.

MPI has relevant ultrasonic technology for addressing mentioned problems.

Each of the above listed applications and trends could be developed on a large industrial and profitable scale. MPI-ULTRASONICS can assist and contribute in any of mentioned applications.

Vibrations, oscillations, resonant states and unified theory of macro and microcosmic matter-waves phenomenology is here (e-book for download):

http://mastersonics.com/documents/revision_of_the_particle-wave_dualism.pdf

www.UltrasonicsWorldGroup.com

www.MPI-Ultrasonics.com

www.UltrasonicMetallurgy.com

www.Mastersonics.com

Short Strategic Projects Resume:

1. Ultrasonic agitation of big and small, arbitrary shaped metal masses for stress relief, deposits removal, descaling, and cleaning. Not necessary to stop the process. Ultrasonic agitators can be installed externally and make liquids processing and stress relief internally or structurally. There are different ways for such installations, such as Clamp-On, direct by screwing or welding, combined axial-radial-torsional... Applications: heat exchangers, tubular conduits, boilers, power reactors... See here: <https://www.mpi-ultrasonics.com/content/ultrasonic-stress-relief>
2. Ultrasonically assisted metallurgy (www.UltrasonicMetallurgy.com)
3. Ultrasonic Liquids Processing and Sonochemistry for:
Mineral extractions, precipitations, removal of deposits, pipelines maintenance, boilers and heat exchangers preventive and continuous maintenance, nano powders technologies, waste-waters treatment, clean and potable water processing, swimming pools and water reservoirs maintenance, cleaning and optimization, oil and water pipelines, deep freshwater wells ultrasonic cleaning, heat exchangers and nuclear reactors cleaning in real time, without stopping operation, decolmating and maintenance...
4. Ultrasonic Sonochemical mining based on minerals extractions and sonochemistry. By drilling deep boreholes (for instance with diameters about 200 mm large), and when reaching geological layers with mining raw materials (with minerals or ores), we fill such hole with water or suitable liquid and submerge ultrasonic transducer (sonorod) inside. Sonorod will perform dissolving, mixing and extraction of minerals, and we can pump such saturated fluid (with dissolved, useful oxides, salts, and minerals), and use it for further electrochemical processing (like electrolysis). This way, mining of critical, dangerous, radioactive and similar minerals will become much more straightforward.
5. Medical and therapeutic application of high power, industrial, low frequency ultrasound (in relation to MMM ultrasonic treatment of human body) are still presenting an unexplored field of useful applications... but this is a specific field, and we need significant and complex support (chain of activities and relations). See more here: www.UltrasonicRevival.com
6. Ultrasonic Powders Compacting in sintering technologies.
7. Ultrasonically assisted extrusion, injection molding, and mixing.
8. Ultrasonically stimulated and accelerated gases injection in different liquids. For instance, air, ozone CO₂, waist gasses... injectors. Ultrasonic liquids sterilization, by ozone injection, CO₂ injection in water, and/or ultrasonic degassing...
9. Agricultural applications of ultrasound: almost 100% of seeds germination, and water optimization for watering...
10. Sonochemistry related, ultrasonically stimulated modifications of complex, acoustically non-linear, biological and similar liquids, with combined axial-radial and turbulent or vortex agitation. Liquid processing and changes are much better and

faster, compared to a simple, fixed frequency and uniform ultrasonic activity sonicators.

11. Accelerated solid matter precipitation, sedimentation, and granulation (from a liquid phase). Suitable for combination with filtering technologies. Also good for pharmaceutical production of active substances.
12. Rotating friction welding combined with ultrasonic vibrations. Ordinary welding combined with ultrasonic vibrations is also possible.
13. Surface cleaning/grinding/smoothing/sand-blasting combined with ultrasonic vibrations of the metal part under processing.
14. Sonicated water-jet with abrasive particles for manual ultrasonic cleaning and surface finishing of big objects.
15. Resonating wires as a carrier for high-power ultrasonic vibrations.
16. Resonating wires for atomizing liquids including liquid metals.
17. Resonating wires for friction-based surface smoothing, grinding and cleaning.
18. Resonating wires for stress relief.
19. Combined high power laser beams and ultrasonic agitation (for additive metallurgy, 3D printing, welding, stress relief, degassing, grain refinement...)
20. Ultrasonic propulsion or jet engine based on fluidic friction removal.
21. We can offer assistance and equipment in Ultrasonic Welding, Cutting, Sieving, Machining... The only question here relates to proper organizing and support...
22. Descaling and deposits removal from heat exchangers, boilers, pipelines, nuclear and other power plants...
23. Additive metallurgy, 3D laser, plasma and welding printing combined with ultrasonic agitation.
24. Water processing, nano-water, ...
25. Ultrasonically assisted mineral, organic and inorganic extractions
26. Ultrasonic liquid metals and liquid glass processing.
27. Nano-Liposomes and nano-emulsions production for nano-encapsulation for pharmaceutical applications (cancer treatment)
28. Fish farms protection from algae and biofilm
29. Ultrasonic Metal welding

30. Algae and barnacle removal from big navy ships, boats, yachts...

31. New MMM technology of ultrasonic cleaning...

www.MPI-Ultrasonics.com

www.UltrasonicsWorldGroup.com

www.UltrasonicMetallurgy.com

www.UltrasonicsRevival.com

