

CTI Water Treatment Process



From Science to Technology

Introduction

Water management has always been a vital step in the development and production of oil/gas resources. Moderate volumes of water are required as an input for multiple activities in conventional oil/gas development. Additionally, water is produced by all oil/gas wells, ranging from minimal volumes early in the life of a well to large volumes late in the life of a well. However, clean wide scale development of shale resources for oil and gas production.

The innovation that has been most critical in making the development of shale resources economically viable, multistage water needs. Fracing requires large volumes of water as an input into the well (volumes vary, but typical jobs are often in the 10,000200,000 barrel range). Roughly 1040% of the water pumped into the well during hydraulic fracturing returns to the 60 days of the life of the well. In order to maintain efficient production rates over the life of a well, it is common practice to refrac wells one or more times, typically at 3 to year intervals. Additionally a larger number of wells must be drilled to effectively drain a shale field than a conventional oil/gas field. All of these factors amount to a Massive volume of water that must be managed over the life of a shale field, significantly more than is typical in the development and production of a conventional field.

Between 2 and 6 million gallons of water are needed for each frac.

Objective



- Reduce demands for freshwater**
- Reduce environmental impact of brine disposal**
- Ensure supplies of water for well drilling and completions for natural gas development in the Shale**
- Develop water management methods and technology**

GreenHunter is estimating that the 2011 water disposal market in the Marcellus alone was \$1.3\$1.7 billion, and in 10 years the market will be \$1522 billion. In the Eagle Ford shale play in Texas, disposal fee cost as much as \$0.80+/bl and an average \$3.00 \$6.00 /bl hauling fee. And with an estimated 800 new oil & gas wells drilled there in 2011, the market just keeps getting bigger. In 2011 the water disposal market was estimated to be \$500\$800 million, and in 10 years they are guesstimating that local market will be worth \$69 billion.



Applications

Recycling Oil and Natural Gas Industry

Treat fracturing fluids onsite to control bacteria, scale, biofouling and corrosion

Treat flow back and produced waters to be reused in hydraulic fracturing operations

Recycle 100% of production, flow back and petroleum industry waste waters to be reused in current and future operations

Reduce or eliminate water acquisition, transportation, treatment and disposal costs

Increase production efficiencies by effectively destroying bacteria and eliminating the potential for scale, biofouling and microbiologically induced corrosion (MIC)

Eliminate the use of toxic chemicals, further eliminating health, safety and environmental issues associated with chemical consumption, transportation and handling

Preserve vital natural water resources for current and future generations

Coal-Fired Power Plant Wastewater Treatment

producing electricity. It also has a much debated reputation for being an unclean energy source and is highly regulated.

One of the greatest challenges facing Coal fired power plant operators is how to minimize the environmental impact of their operations while increasing production output.

With its chemical free wastewater treatment technology, we can help operators increase production capacity, while adhering to environmental regulations.

Refinery Water Treatment

Petroleum refineries rely on clean water sources for a variety of processes, from crude oil desalting to hydro processing units and cooling towers. Effective operation of systems is critical to sustainable and reliable operations, and today's water treatment challenges can directly impact the effectiveness of bacteria and corrosion control, compromising the integrity of key pieces of heat transfer equipment and negatively affecting the energy efficiency of process units. Cavitation is a chemical free, wastewater treatment technology from CTi that will help refinery operators meet ever more rigorous refinery effluent water quality standards.

For Agriculture

In California alone, some 200 waste treatment facilities produce approximately 4.0 million acre feet of treated wastewater annually (CA State Water Resources Control Board survey). There is widespread and increasing interest in reusing treated wastewater for beneficial and environmentally safe purposes. Currently, only about 10% (400,000 acre feet) of this resource is directly reused. Of the 10% reused, 48% (193,500 acre feet) is used for agricultural irrigation, and another 20% (78,500 acre feet) for landscape irrigation and impoundment.



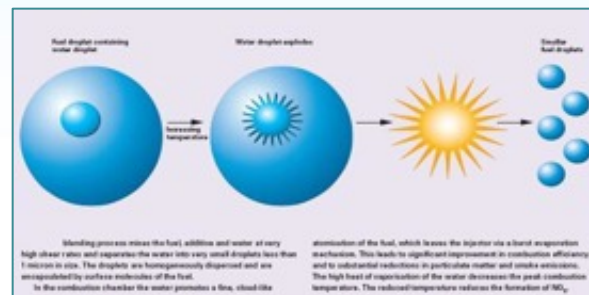
Applications cont.

Industrial Wastewater Treatment Solutions

Food and Beverage
Pharmaceutical
Pulp and Paper
Textiles
Manufacturing Process
Marine Industry
Mining Process Water
Municipal Water
Management
Automotive

Our Cavitation waste water system reduces:

Biochemical Oxygen Demand
Total Suspended Solids
Phosphorus
Several types of dissolved metals
Fats
Oils
Grease



Patented Technology

MULTISTAGE CAVITATION DEVICE The flow through cavitation device is provided for mixing and manipulating fluids that comprises feeding a fluidic mixture in a multistage flowthrough hydrodynamic cavitation system, subjecting said fluid to a controlled multistage cavitation and continuing the treatment for a period of time sufficient for obtaining desirable changes in the physical and/or chemical properties and generating upgraded products

Patent # 20100290307

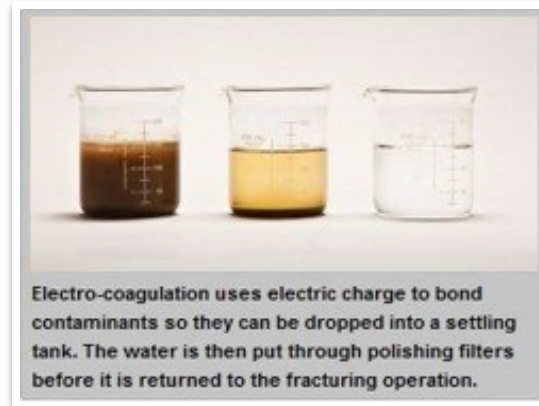
CAVITATION GENERATOR A method and device are provided for mixing and manipulating fluids that comprises feeding fluid in a multistage flowthrough hydrodynamic cavitation system, subjecting said fluid to a controlled multistage cavitation and continuing the treatment for a period of time sufficient for obtaining desirable changes in physical and/or chemical properties and generating upgraded products.

Patent # 20100103768

HIGHTHROUGHPUT CAVITATION AND ELECTROCOAGULATION APPARATUS The invention relates to a cavitation and electrocoagulation reactor comprising a hollow cylindrical cathode having a cylindrical anode coaxially disposed therein to form an annular interelectrode gap between the contact surfaces.

An inlet sleeve and an outlet sleeve disposed in the respective inlet and outlet of the cathode and abutting against opposite ends of the anode seal the interelectrode gap from the respective inlet and outlet of the cathode. A set of channels disposed in the wall of the inlet sleeve connect the inlet to the interelectrode gap. Similarly, a set of openings disposed in the outlet sleeve connect the interelectrode gap to the cathode outlet. An electrical source has first and second terminals respectively connected to the anode and the cathode. The method for removing contaminants from a contaminated fluid flow involves the simultaneous application of hydrodynamic cavitation and electrocoagulation to the contaminated fluid flow.

Patent Appl. # 20110147231



PROCESS TO REMOVE IMPURITIES FROM TRIACYLGLYCEROL OIL The present invention is directed to a process to remove impurities from triacylglycerol oil including mixing the oil and a fluidic agent, pumping the mixture through a flowthrough hydrodynamic cavitation apparatus at a predetermined inlet pump pressure, creating hydrodynamic cavitation in the mixture, maintaining the hydrodynamic cavitation for a predetermined period of time, moving the impurities from the oil to the fluidic agent, and then separating the fluidic agent from the oil. The impurities can include phytosterols, sterol glucosides, acylated sterol glucosides, in which case the fluidic agent is water, an alkali hydroxide, an inorganic base, an organic base, phosphoric acid, citric acid, acetic acid or a mixture thereof. The impurities may also include phosphatides, in which case and the fluidic agent comprises water and an enzyme such as phospholipase, a lipid acyltransferase or a mixture thereof.

Patent Appl. # 2011/079276

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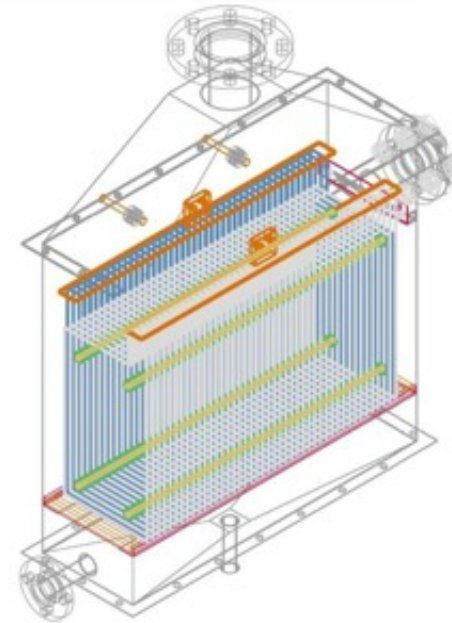
BACKGROUND OF THE INVENTION

The invention relates to an apparatus and method of purification and treatment of potable water, ground water, industrial water, sewage water, etc. and has numerous applications in drinking water production, food, chemical, oil, energy, wood, pulp and paper industries, mining and metal processing and similar industries. Removable contaminants include metals, petroleum products, colloidal particles, living species, organics, dyes, polymers, surface active compounds and other matter whose concentration can be decreased to the allowable levels in one pass through the apparatus. The proposed water treatment method and the device generates changes in the fluidic flow's velocity, pressure, temperature, voltage, resistance and chemical composition and physical properties in order to reduce the concentration of impurities. The simultaneous action of hydrodynamic cavitation, electrocoagulation and the coagulants and active chemical species formed in situ provide a unique synergistic effect.

Proprietary coating nonsacrificial anode
Long Life minimum 2 to 5 years life span
Low maintenance cost



Propriety Nano Water Treatment EC Unit



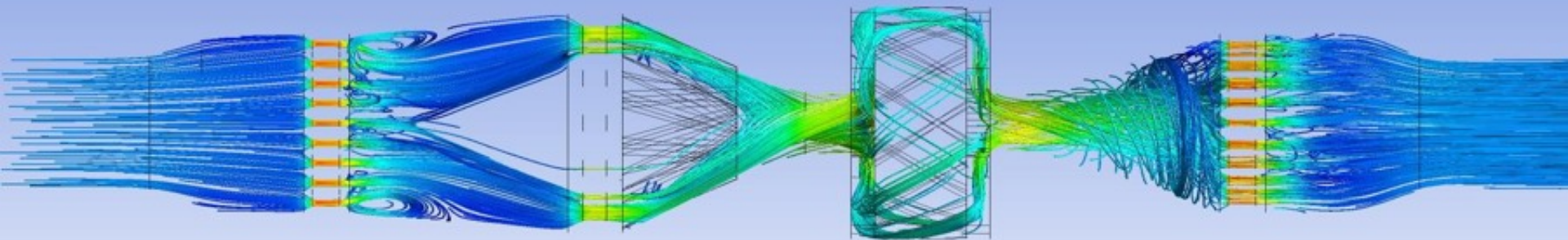
Patented MultiStages Cavitation Reactors

ADVANTAGES AND BENEFITS

ANSYS
v12.1

CTI Cavitation Electrocoagulation system designed to reduce electricity requirements, and miniaturization of the needed power supplies. Both the treatment of wastewater prior to discharge and the reuse of wastewater have become absolute necessities. There is, therefore, an urgent need to develop innovative, more effective and inexpensive techniques for treatment of wastewater.

Our patented technology and patent pending cavitation-electrocoagulation process presents the opportunity to maximize the beneficial re-use of resource materials, minimize transportation and disposal costs, as well as their associated liabilities.



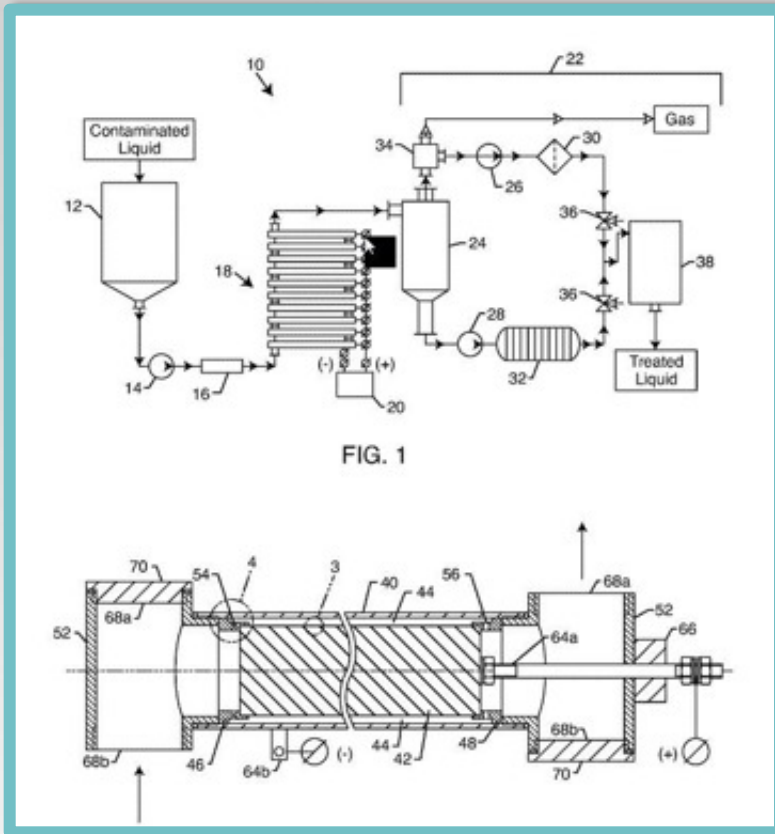
Operating costs can be dramatically reduced. No longer need to pay for reagent chemicals, can reduce polymer consumption, reduce filter press operations, reduce solid sludge generation. Lower (or zero) use of reagents dramatically reduces the amount of sludge produced resulting in lower disposal costs. Could be 40% to 60% reduction in sludge over chemical methods.

System Capabilities

Removes heavy metals
Removes suspended and colloidal solids
Breaks oil emulsions in water
Removes fats, oil, and grease
Removes complex organics
Destroys & removes bacteria, viruses, and cysts
Processes multiple contaminants

- Low capital costs
- Low operating costs
- Low power requirements
- No chemical additions
- Low maintenance
- Minimal operator attention
- Handles a wide variation in the waste stream
- Sludge minimization
- Treats multiple contaminants
- Water reuse resulting in zero discharge

MOBILE CAVIGATION WASTE WATER TREATMENT SYSTEM



The method for removing contaminants from a contaminated fluid flow comprises the steps of generating hydrodynamic cavitation in the contaminated fluid flow. Such contaminated fluid flow is simultaneously exposed to an applied electric field from a non sacrificial titanium anode. Radicals of the contaminated fluid flow and its constituents are formed by the simultaneous hydrodynamic cavitation and exposure to the electric field. The contaminants in the contaminated fluid flow are coagulated as a result of the radical formation. The coagulated contaminants are then separated from the contaminated fluid flow resulting in a purified fluid flow.

Process Cost

The overall costs of recycling one barrel of water once we are in full production will be equal 25%28% of the cost of cleaning that same barrel via conventional methods.

Scalability

Capacities from 20GPM to 500GPM
700 barrel day to 17000 barrel/day. Multisystems for larger capacities.

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