Asset Overview

SulphCo: Section 363 Sale

Sonocracking™ Technology to Desulfurize Crude Oil

pluritas

Mark Thomann
mark@pluritas.com
(415) 963-3790 ext. 107

Craig Carothers
craig@pluritas.com
(415) 963-3790 ext. 102

Rob Aronoff
rob@pluritas.com
(415) 963-3790 ext. 101

201 California Street, Suite 650, San Francisco, California 94111

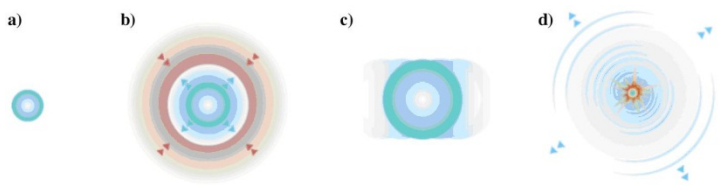
Overview

- SulphCo was founded in 1999 as an energy technology company focused on the development and commercialization of an oxidative desulfurization ("ODS") process for liquid petroleum streams including crude oil products, crude oils, natural gasoline and condensate streams.
- SulphCo's oxidative desulfurization process consisted of (1) the ultrasound assisted conversion of the sulfur compounds to their oxidized analogs employing its patented and proprietary Sonocracking™ technology, and (2) the subsequent removal of these oxidized compounds via adsorption, extraction, water wash or other similar separation techniques.

Overview (Cont.)

- SulphCo was engaged in the business of developing and commercializing a patented and proprietary Sonocracking™ technology.
- The Sonocracking™ technology is based upon the novel use of high power ultrasonics - the application of high energy, high frequency sound waves - in conjunction with catalyst and oxidant regimes to alter the molecular structure of crude oil fractions (i.e., petroleum products), crude and natural gas condensates, and crude oil.
- The Sonocracking™ process is designed to enhance the quality of petroleum products, condensates and crude oil by oxidizing identifiable sulfur species, enabling those oxidized sulfur compounds to be processed and removed using cost effective, conventional, and commercially available techniques.

Overview (Cont.)



- SulphCo's Sonocracking™ technology and IP was based on research done by Dr. Teh Fu Yen, a University of Southern California chemical engineering professor.
- SulphCo's focus is on using high power ultrasound in conjunction with catalyst and oxidant regimes to reduce the sulfur in oil – thereby meeting the ultra low sulfur diesel sulfur specifications (10 to 15 parts per million) set by the European Union, Japan, and the US.
- Testing has occurred in SulphCo's facility in the United Arab Emirates, with some testing also in Nevada.

Overview (Cont.)

SulphCo IP For Sale

- 8 issued US patents
- Foreign counterparts in:
  - Argentina
  - Canada
  - China
  - Colombia
  - Europe
  - Indonesia
  - Korea
  - Mexico
  - Philippines
  - Russia
  - Venezuela
- No Known Encumbrances
- Other Non-Patent IP is included in sale

IP Assets Available for Purchase

- US 6,402,939 (Priority: 9/28/2000)
- US 6,500,219 (Priority: 3/19/2001)
- US 6,652,992 (Priority: 12/20/2002)
- US 6,827,844 (Priority: 10/23/2002)
- US 7,275,440 (Priority: 11/18/2004)
- US 7,300,566 (Priority: 3/17/2004)
- US 7,408,290 (Priority: 2/28/2005)
- US 7,559,241 (Priority: 5/27/2004)
- Foreign Equivalents
- Registered Trademarks: SulphCo™, Sonocracking™, Sonocracker™, Sonic Cracking™, Sonic Cracker™, Sonocracked Crude™

Market Application and Strategic Opportunity

- Multi-Billion dollar annual market for desulphurization of diesel fuel and other petroleum products
- Technology is a **KEY** strategy in complying with ever-tightening environmental regulations throughout the world

Bankruptcy Filing

- Case No. 11-37949 commenced with the filing of a voluntary petition for relief under Chapter 7 of the United States Bankruptcy Code by SulphCo, Inc. (the “Debtor”) on September 16, 2011 (the “Petition Date”).
- The Trustee intends to sell the intellectual property assets and related assets pursuant to Section 363 of the US Bankruptcy code.
- Pluritas, LLC, a transactions advisory firm specializing in intellectual property (“IP”), has been retained to market the IP assets on behalf of the bankruptcy Estate of SulphCo, Inc. (the “Estate”).
- The case is currently pending in the United States Bankruptcy Court for the Southern District of Texas (Houston) (‘the “Court”).
  - Lowell Cage was appointed Trustee on the same date.
  - In December 2011, SulphCo was granted a motion to sell assets under Bankruptcy Code Section 363.
  - Pluritas, LLC was retained to sell the patents, trademarks, copyrights, trade secrets and related hardware/prototypes, software, and know-how.

The SulphCo Technology

- SulphCo's technology is based on the ultrasound-assisted oxidative desulfurization ("ODS") of oil-based streams. ODS encompasses the selective oxidation and subsequent removal of sulfur compounds in a hydrocarbon based stream. The most attractive oxidant is hydrogen peroxide (H_2O_2) as it yields water as byproduct.

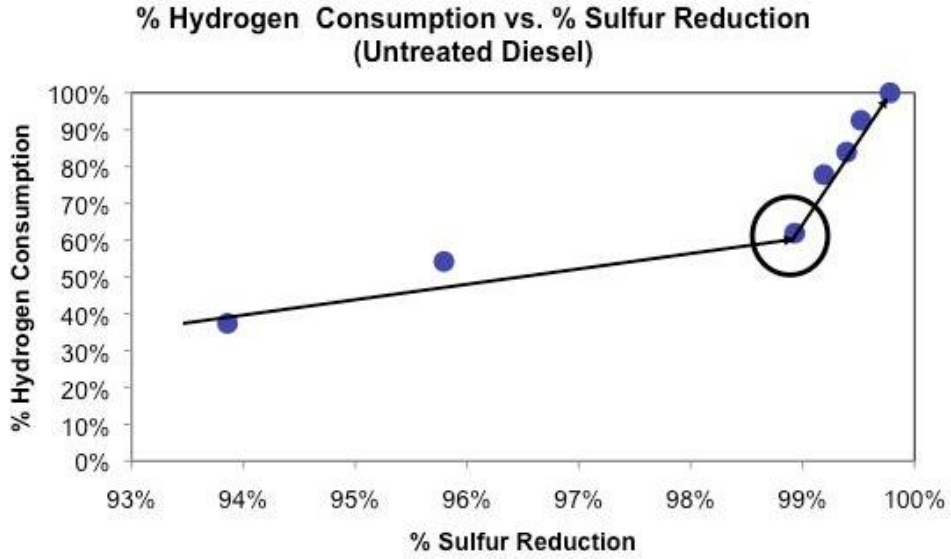
Technology Overview

SulphCo's Technology vs. Alternatives

- SulphCo's proprietary Sonocracking™ technology employs high power ultrasound to accelerate oxidative desulfurization (ODS), an attractive alternative to hydrodesulfurization (HDS), the currently practiced method of desulfurization.

- In order to meet stringent regulatory limits for ultra low sulfur diesel (ULSD), the HDS process requires extremely high hydrogen and energy consumption operating conditions to treat the most refractory sulfur compounds.

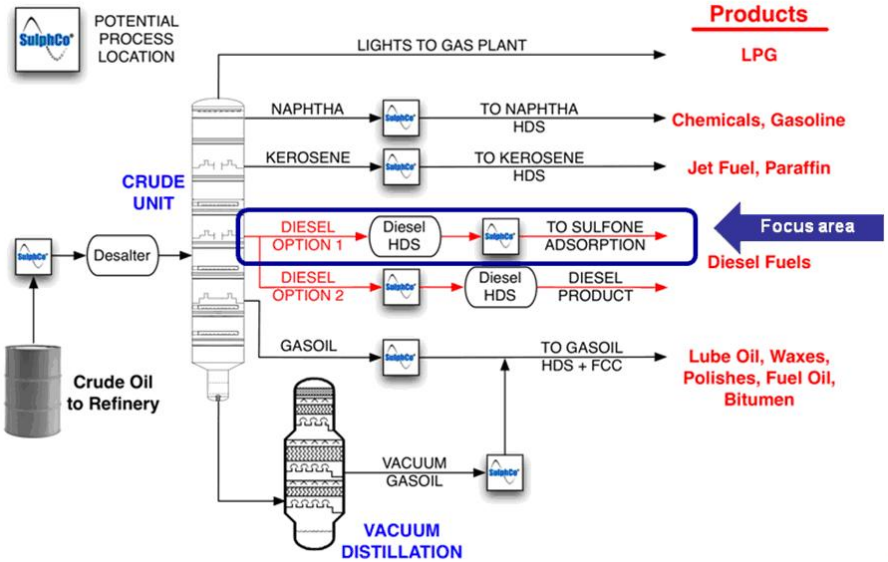
- The figure graphically portrays the level of hydrogen consumption as a function of sulfur removal from a typical diesel feed during the HDS process – removal of the last 1% of sulfur requires 40% of the total hydrogen needed.

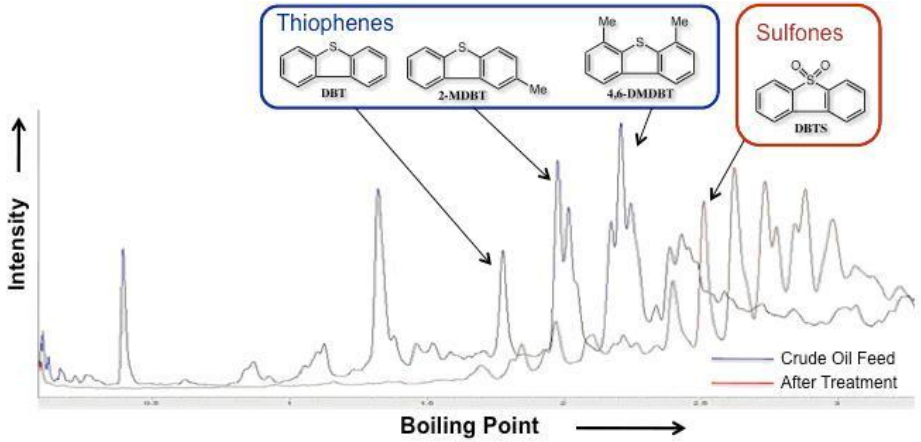


Technology Overview (Cont.)

Benefits to Using SulphCo's Solution

- In contrast, SulphCo's ultrasound assisted ODS Sonocracking™ technology is a potentially more cost effective and energy efficient alternative to HDS.
- The lower capital cost and smaller equipment footprint suggest a multitude of potential placement options in refinery or other operating settings (see lower left figure).
- SulphCo's Sonocracking™ technology has the potential to create substantial value when applied to crude oils – the drastically increased boiling point of sulfones and sulfoxides compared to their sulfidic analogs allows a redistribution of sulfur species from lower boiling, higher value fractions into higher boiling, lower value fractions in the straight run distillation of the crude oil (see lower right figure).





Ultrasound-assisted oxidative desulfurization

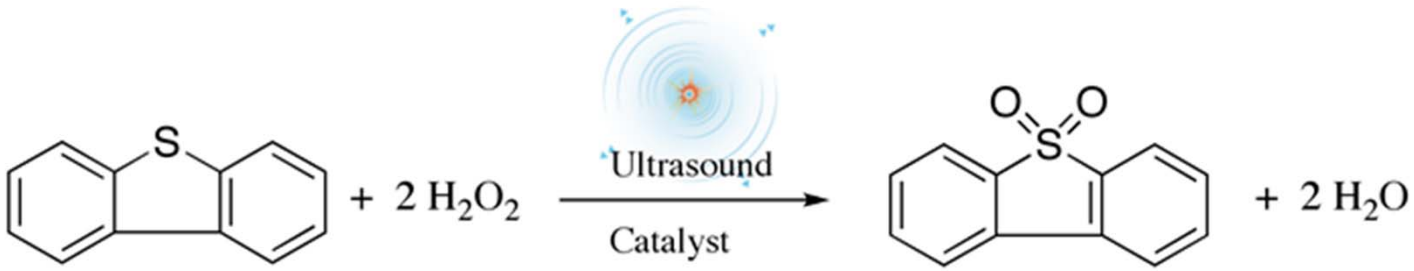


Figure 1

Ultrasound Breakthrough

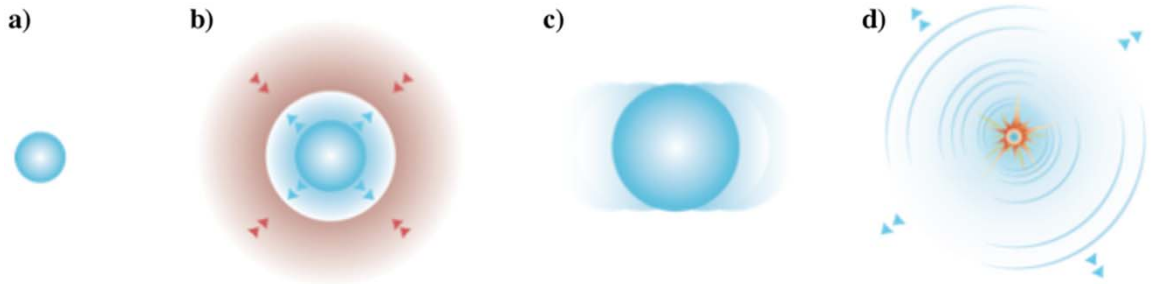
- In contrast to ODS reaction conditions described in scientific and patent literature, SulphCo's Sonocracking operating conditions allow the ODS reaction to occur at comparably mild temperatures (ambient temperature to ~100 degrees Celsius) and pressures (typically 20-40 psi).
- Despite the mild operating conditions the chemical transformation occurs at very low residence times of only 500 milliseconds or less.
- The key to this extraordinary reactivity at mild reaction conditions lies in the high-power ultrasound employed.

How it works

- SulphCo's proprietary oxidative desulfurization (ODS) process consumes less energy, releases less greenhouse gas emissions, and improves oil density compared to alternatives in the market.
- Ultrasound can accelerate chemical reactions through cavitation. As the incoming stream (hydrocarbon stream mixed with the aqueous phase containing hydrogen peroxide and a suitable catalyst) passes by the ultrasound probe the creation of bubbles is induced at the sites of refraction owing to the "tearing" of the liquid by the negative pressure of the intense ultrasonic waves.
- The bubbles then oscillate under the effect of positive pressure, growing to an unstable size as the wave fronts pass through. The bubbles eventually burst, generating excess heat and pressure in and around every micrometer and sub-micrometer sized bubble. This cavitation phenomenon induced by the ultrasound results in strong mixing, high shear and mass transport between the aqueous and the oil phase enabling the ODS reaction to occur at comparably mild conditions.
- The resulting oxidized sulfur species – typically sulfoxides and sulfones – have significantly increased boiling points and polarity compared to the corresponding sulfidic species enabling the use of alternative sulfur removal techniques such as absorption, extraction and distillation. In addition, oxidation of low molecular weight sulfur species and most mercaptans leads to water soluble sulfur species that can easily be separated by a typical water wash.

How it works

Ultrasound induced cavitation stages from the generation of a bubble (a) through its growth to an unstable size (b and c) to the implosion resulting in the release of localized energy.



Key Technical Benefits

- The patented technology represents an attractive option to remove sulfur content from a natural gasoline, Diesel, and other product streams.
- The use of ultrasound allows the process to occur at low residence times (<500 ms) using small reactor volumes.
- The oxidized sulfur compounds after treatment of natural gasoline streams with ultrasound-assisted ODS technology exhibit high solubility in water.
- Instead of complex post-processing separation schemes, removal of the oxidized sulfur compounds can be achieved with a basic water wash, a fundamental advantage.

Sonocracking™ Benefits

- Avoid the need for high pressure HDS in the production of ULSD.
- Reduce or eliminate incremental hydrogen production due to lower HDS requirements.
- Increase HDS catalyst life by allowing operation at lower temperatures and pressures resulting in fewer turnarounds and downtime.
- De-bottleneck existing HDS units leading to increased throughput and lower unit cost.
- Be a lower cost alternative to HDS for low volume applications or CAPEX constrained projects.
- Upgrade off-road diesel and heating oil to higher value ULSD.
- Reduce the volume of high sulfur diesel downgraded to residual fuel.
- Decrease the requirements for expensive blending components such as biodiesel.
- Increase the flexibility of crude oil feed slates by providing the ability to use lower quality crude oils to produce on-spec product.
- Reduce the carbon footprint because less hydrogen is required and produced.
- Further reduce carbon emissions due to the lower HDS operating temperatures and pressures than high pressure HDS operations require.

Successful Commercial-Scale Validation Trials

- The first commercial–scale Trials Achieved sulfur levels below 20ppm
  - All samples “sweet” by the Doctor Test (ASTM D4952 – 09 Standard Test Method for Qualitative Analysis for Active Sulfur Species in Fuels and Solvents)
  - Average operating costs were attractive at less than $1/bbl
  - Feed rates of up to 3000 BPD natural gasoline having a sulfur range of 150-500ppm
  - Trials of 40+ hours of continuous operation demonstrated robustness and stability

The technology was proven to be valuable, scalable and relevant to a wide range of product streams

Commercial Opportunity

- The SulphCo intellectual property captures innovations that are central to this profit-enhancing desulphurization technology.
- The SulphCo innovations are the result of many man-years and millions of dollars of R&D and successful commercial-scale proof-of-concept testing.
- The patented technology is applicable to various market segments in the oil and natural gas industry, including:
  - ❖ Production of low sulfur diesel fuel,
  - ❖ Crude and natural gas condensate products, and
  - ❖ Processing of “transmix” from petroleum product pipelines.

Commercial Opportunity (Cont.)

- The technology dramatically lowers the cost of improving the quality of crude oil fractions, crude and natural gas condensates, and crude oil and provide other bottom-line enhancing operational benefits.
- The patented technology also allows for significant carbon dioxide emission reductions because of a dramatic reduction in the hydrogen required to meet ULSD (ultra low sulfur diesel) specifications.
- The successful commercialization of this technology will provide a lower capital and operating cost option for the treatment of complex sulfur compounds and reduction of carbon dioxide emissions.

The Assets

SulphCo Patent Portfolio

- 8 issued US patents (Earliest Priority: September 28, 2000).
- Ex-US equivalent patents create a global portfolio.
- Patents relate to removing sulfur from crude oil using ultrasound and oxidants (e.g., aqueous hydrogen peroxide).
- Directly applicable to the oil desulfurization market.

SulphCo Assets

- The following assets are also for sale, to the degree they are in the custody of the Bankruptcy Trustee:
  - Trade secrets / Know-How
  - Hardware / Prototypes
  - Trademarks / Copyrights

Encumbrances

- No known encumbrances in the Oil and Gas field of use
- Potential for limited encumbrance in other fields of use depending upon how the bankruptcy court rules on any objections that may be filed (additional details available through the court or Pluritas)

Summary of the Sale Process

Now Through 07/11	Diligence Period
07/11	Non-binding letters of intent are due;
07/11 thru 07/18	Letters of Intent are reviewed with Q&A with bidders esp. with respect to their proposed APA revisions (if any)
07/18	Qualified Bidders are identified and notified
07/23	Qualified Bidders are required to execute the APA and provide a 10% deposit
07/24	Auction Sale of Sulphco IP assets. Potential bidders may participate in person or by proxy or via teleconference arranged through the court.

This 363 sale of the Assets will be "As Is" without representation or warranty of any kind.

Diligence Guide

Public Virtual Data Room: www.pluritas.com/campaigns/sulphco.shtml

- ✓ SulphCo Asset Overview (this document)
- ✓ Patent Documents
- ✓ Commercial-Scale Trial Report
- ✓ Technology Summaries
- ✓ Technology White Papers
- ✓ Sale Process and Bidding Instructions
- ✓ Asset Purchase Agreement (ASA) provides detailed transaction terms
- ✓ Confidentiality Agreement for access to confidential materials

Additional information is available under NDA:

- ✓ Economic Models including Chemical Cost Profiles
- ✓ Mass Balances

Diligence Guide (Cont.)

Technical and IP Diligence calls may be arranged through Pluritas to include experts who are knowledgeable about the IP and the markets to which they apply.

For further information, interested bidders should send inquiries to one of the following Pluritas partners:

Mark Thomann
Partner
mark@pluritas.com
(415) 963-3790 x107

Rob Aronoff
Managing Partner
rob@pluritas.com
(415) 963-3790 x101

Craig Carothers
General Counsel
craig@pluritas.com
(415) 963-3790 x102

Pluritas Profile

Pluritas is a transaction advisory firm specializing in divestitures, acquisitions, and mergers where Intellectual Property (IP) is a major component of the transaction.

We provide arms-length sell side transaction services to all owners of IP assets. We provide arms-length buy side transaction services to a select group of Corporate Clients.

We expertly navigate the risks and nuances for all parties involved with transacting IP, yielding a 'safer' and more comfortable transaction climate for all participants.

We also strongly differentiate ourselves by our track record of success, as well as by integrating seasoned professionals with deep industry, technical and IP expertise into every engagement.

US Patent No. 6,402,939 – Representative Claim

Claim

‘939 Patent, Claim 1

A method for removing sulfides from a liquid fossil fuel, said method comprising:

(a) combining said liquid fossil fuel with an acidic aqueous solution comprising water and a hydroperoxide to form a multiphase reaction medium, said acidic aqueous solution having a pH equal to that of a 1-30% by volume aqueous hydrogen peroxide solution;

(b) applying ultrasound to said multiphase reaction medium for a time sufficient to cause oxidation of sulfides in said fossil fuel to sulfones; and

(c) extracting said sulfones to yield an organic phase that is substantially sulfone-free.

US Patent No. 6,500,219 – Representative Claim

Claim

‘219 Patent, Claim 1

A sulfur-depleted diesel fuel, prepared by a process comprising:

(a) combining a sulfide-containing diesel fuel having a cetane index of greater than 50.0 with an aqueous fluid and a hydroperoxide and an aliphatic C15-C20 hydrocarbon to form a multiphase reaction medium;

(b) continuously passing said multiphase reaction medium through an ultrasound chamber in which ultrasound is applied to said multiphase reaction medium for a time sufficient to cause oxidation of sulfides in said sulfide-containing diesel fuel to sulfones;

(c) permitting said multiphase reaction medium upon emerging from said ultrasound chamber to separate spontaneously into aqueous and organic phases; and

(d) isolating said organic phase from said aqueous phase, said organic phase thus isolated being said sulfur-depleted diesel fuel.

US Patent No. 7,275,440 – Representative Claim

Claim

‘440 Patent, Claim 1

Apparatus for generating ultrasonic vibration, said apparatus comprising:

an ultrasonic horn,

a loop-shaped ultrasonic transducer of magnetostrictive material operatively joined to said ultrasonic horn to generate mechanical vibrations and to transmit vibrations so generated to said ultrasonic horn, said ultrasonic transducer comprised of a plurality of plates of magnetostrictive material alternating with layers of dielectric material and wound with drive coils arranged to produce magnetostrictive forces in said ultrasonic transducer in response to voltages applied across said drive coils, and

a power source for imposing a periodically varying voltage across said drive coils.

US Patent No. 6,652,992 – Representative Claim

Claim

‘992 Patent, Claim 1

An ultrasonic horn comprising a hollow body adjoined to a solid rod, said solid rod having a longitudinal axis and terminating in an end surface transverse to said axis, said hollow body and said solid rod having external surfaces of a titanium-based metal except for at least a central portion of said end surface being of a silver-based metal.

US Patent No. 6,827,844 – Representative Claim

Claim

‘844 Patent, Claim 1

A continuous process for removing sulfides from a liquid fossil fuel, said process comprising:

(a) combining said liquid fossil fuel with an aqueous fluid and a dialkyl ether having a normal boiling point of 25 C. or higher, said dialkyl ether having the formula R1OR2 in which R1 and R2 are either individual monovalent alkyl groups or together form a single divalent alkyl group and the total number of carbon atoms in R1 and R2 is from 3 to 7, to form a multiphase reaction medium;

(b) continuously passing said multiphase reaction medium through an ultrasound chamber in which ultrasound is applied to said multiphase reaction medium for a time sufficient to cause conversion of sulfides in said sulfide-containing liquid fossil fuel to sulfones;

(c) permitting said multiphase reaction medium upon emerging from said ultrasound chamber to separate spontaneously into aqueous and organic phases; and

(d) isolating said organic phase from said aqueous phase, said organic phase thus isolated being said liquid fossil fuel with sulfides removed.

US Patent No. 7,300,566 – Representative Claim

Claim

‘566 Patent, Claim 1

A process for treating a petroleum residuum to convert components of said residuum having boiling temperatures ranging from about 400° F. to about 800° F. prior to treatment to products having boiling points that are lower by at least about 20° F., said process comprising:

(a) combining said petroleum residuum with an aqueous liquid and an additive selected from the group consisting of liquid aliphatic C15-C20 hydrocarbons and dialkyl ethers to form an emulsion,

(b) exposing said emulsion to ultrasound,

(c) recovering an organic phase from said emulsion after said exposure.

US Patent No. 7,408,290 – Representative Claim

Claim

‘290 Patent, Claim 1

An ultrasonic generator for delivering high-power ultrasonic energy to a varying load, comprising:

a variable frequency waveform generator;

a pulse width modulator coupled with said waveform generator and configured to provide an output signal;

an isolated gate bipolar transistor (IGBT), having a gate that is coupled with the output of said pulse width modulator,

a voltage source coupled across the collector and emitter of said IGBT, said IGBT configured to amplify the output signal from said pulse width modulator to produce an amplified signal; and

a magnetostrictive transducer having a coil configured to receive the amplified signal, so as to deliver high-power ultrasonic energy to a varying load.

US Patent No. 7,559,241 – Representative Claim

Claim

‘241 Patent, Claim 1

A flow-through reactor for the continuous treatment of a liquid material with ultrasound, said flow-through reactor comprising:

a reaction vessel,

an elongate ultrasonic horn having first and second opposing end surfaces, said ultrasonic horn mounted to said reaction vessel with said first end surface extending into the interior of said reaction vessel,

an electrical power source,

an ultrasonic transducer operatively connecting said electrical power source to said second end surface of said ultrasonic horn to convert said electrical energy from said electrical power source to ultrasonic vibrations in said ultrasonic horn, and

entry and exit ports in said reaction vessel arranged to cause liquid material entering said reaction vessel to strike said first end surface and flow across said first end surface before leaving said vessel through said exit port.

NOTICE

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