A method, apparatus and composition are described for safe energy delivery down hole resulting in increased recovery of subterranean hydrocarbons. The method utilizes the reaction of non-alkane fuels and selective oxidizers which are non-selective toward alkane chemical compounds. The energy released in the subterranean reaction is utilized to heat the wellbore, the formation or the formation hydrocarbons thereby lowering fluid viscosity and permitting greater flow especially for heavy oils. Further, safe delivery of oxidizers can be accomplished without limit on depth as the selective oxidizer may be delivered to point of use down hole as most all formations of interest contain primarily alkane hydrocarbons and will not react with the non-alkane selective oxidizer. In addition some products of reaction may be insoluble in water and can be utilized for fluid loss prevention, fluid diversion, abrasive drilling and as proppants.
METHOD, APPARATUS AND COMPOSITION TO INCREASE RECOVERY OF HYDROCARBONS BY REACTION OF SELECTIVE OXIDIZERS AND FUELS IN THE SUBTERRANEAN ENVIRONMENT

CROSS-REFERENCE TO RELATED APPLICATIONS


TECHNICAL FIELD

[0002] Embodiments of the present invention are generally directed toward enhanced oil and gas production by means of the thermal stimulation of formation hydrocarbons in situ or in the wellbore during production.

BACKGROUND ART

[0003] It is well known in the oil and gas industry that production from oil wells will increase upon heating the oil and thereby lower the viscosity of that oil. This is especially true for the more viscous heavy oil and tar sand deposits where incremental changes in temperature can lead to an order of magnitude change in viscosity. To date there have been but a few successful thermal methods utilized for production from heavy oil deposits. Those being fire flooding and steam based methods including: Cyclic Steam Stimulation (CSS), steam flooding and Steam Assisted Gravity Drainage (SAGD). The steam methods are economically and thermodynamically constrained to deposits shallower than around 3000 ft (DOE Office of Petroleum Reserve—Strategic Unconventional Fuels, Jun. 18, 2007. Fact Sheet: U.S. Heavy Oil Resource Potential). Whereas, fire flooding involves the injection of oxygen in the form of air typically and depending upon the specifics of the formation water may also be injected. Although the fire flooding method has produced very desirable results in some cases it suffers from two main problems. The first of which is safety related in that the oxygen utilized can be an unwanted fire and explosive hazard when combined with natural gas either at the injection well or at the production well. Another issue with fire flooding technology is the use of a gaseous oxidizer in which the compressor horse power requirements and available installed well casing place a depth limit of utilizations to shallower formations. It is estimated that in the U.S. alone there are almost 100 billion barrels of “heavy oil” resource of original oil in place (DOE Office of Petroleum Reserve—Strategic Unconventional Fuels, Jun. 18, 2007. Fact Sheet: U.S. Heavy Oil Resource Potential). Hence, a significant resource remains out of technical reach. What is needed is a method to safely produce energy in the form of heat where it is needed: down hole and at depths greater than 3,000 ft and as far as the drill bit can go. This fact is and has been well recognized by the U.S. government noting that “Project Deep Steam” was conducted in the late 1970’s. The program followed two paths: The first attempting to produce well bore tubulars with better insulation capability so that surface steam could be injected further. The second path was to make a combustor that operated down hole which was fed propellants from the surface, namely diesel and oxygen (air). The down hole steam generator portion of the program is documented in technical report: B. W. Marshall, Sandia National Laboratories, May, 1983. SAND83-0145/1, Field Test of Two High-Pressure, Direct Contact Downhole Steam Generators, Vol I. Air/Diesel System. Both of these efforts produced minimal technical success but only the down hole combustor was utilized in a short lived commercial operations and at that was utilized no deeper than 2500 ft (A. B. Donaldson, 1997, SPE 38276, Reflections on a Downhole Steam Generator Program, 1997 SPE Regional Meeting, Long Beach, Calif., 25-27 Jun. 1997).

[0004] In addition there are at present electrical bottom hole heaters which are also restricted to fairly shallow depths and suffer from a major heat transfer defect in that the produced flow takes the heat away from bottom hole where it is needed (Prats, M., 1985. Thermal Recovery: 2nd ed. Richardson, Tex.: SPE Monograph Series, Volume 7, pp. 119-121).

[0005] The present disclosure discloses inter alia a method whereby a liquid oxidizer can be safely delivered to any presently known depth that a liquid fuel may also be delivered. There does exist prior methods for delivery of liquid oxidizers to bottom hole locations. Smith teaches a method to deliver hydrogen peroxide (U.S. Pat. No. 8,047,285 and U.S. patent application Ser. No. 12/424,376 and Ser. No. 13/028,883). The present disclosure is superior to this prior method utilizing hydrogen peroxide, for example, in that hydrogen peroxide can create oil field hazards by several means. The primary of these hazards being that oxygen is produced by decomposing the hydrogen peroxide from which if the system is improperly operated may form a combustion/explosive mixture with methane either down hole or in the production lines. While the intention would be to consume all of this oxygen an explosion hazard is still present and must be accounted for. Example embodiments of the present disclosure utilize what is known to those in the art as a “selective oxidizer,” or an oxidizer that will only be made to react with particular compounds and ignore or greatly reduce reaction with others. This disclosure teaches example embodiments using a selective oxidizer composition that is non-selective with respect to alkane chemistry. This use greatly increases the safe operation in a fuel rich environment such as a hydrocarbon reservoir given that almost all produced hydrocarbons are of alkane chemistry. In addition in certain aspects of the aforementioned Smith patents and applications (U.S. Pat. No. 8,047,285 and U.S. patent application Ser. No. 12/424,376 and Ser. No. 13/028,883) make use of energy release from decomposition of hydrogen peroxide using a catalyst whereas the present disclosure does not require the presence of catalyst for reaction and heat release.

SUMMARY

[0006] Embodiments of the present invention are related to enhanced production of hydrocarbons from hydrocarbon bearing subterranean formations. More specifically enhanced production is achieved, for example, by thermal stimulation of a wellbore bottom hole, near the wellbore, and/or far afield in the formation depending upon the specific embodiment apparatus. The present invention is novel in that, for example, bottom hole and reservoir energy release is accomplished by reaction of selective oxidizers that are non-selective toward alkane chemistry. Hence, selective oxidizers are nonreactive with a vast majority of naturally occurring reservoir and produced hydrocarbons resulting in a much safer production of hydrocarbons from subterranean formations than existing
methods of oxidizer utilization in the oil and gas industry. This novelty, for example, further increases the depth at which oxidizers can be deployed in subterranean formations, for example such depth being limited only by the reach of a drill bit.

[0007] The present invention is in one of its simplest embodiments, for example, would consist of a system in which two separated tanks would rest upon the surface of the earth near an existing wellbore which is utilized for hydrocarbon production. One of the tanks would hold a liquid fluid system containing an oxidizer which is non-selective toward alkane chemistry. The second tank would hold a liquid fluid system containing a fuel which would be chemically non-alkane. These two liquids would be pumped through separate fluid conduits which are inside the aforementioned well bore or one of the fluid conduits being the aforementioned well bore. The two liquids would be pumped simultaneously and in chemical proportion to maximize energy release. The two separate fluid conduits would only permit the two fluid systems to come into contact at a desired down hole location. After the two fluid systems contact one another they will mix, react and produce energy heating the nearby materials. In addition, for example, the energy released or any possible water insoluble reaction products can be utilized for other fluid mechanical operations.

[0008] It is to be expressly understood, however, that the embodiments described herein, and each of the figures, are provided as examples and for the purpose of illustration and description only and they and all of the terms such as “the invention” or “the present invention” are not intended as a definition of the limits of the scope or embodiments of the invention. The priority application or any changes or differences, including any typographical or grammatical changes, between the present disclosure and priority to U.S. Provisional Patent Application No. 61/795,016 should not be read to limit or impair the scope of the present disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] FIG. 1 illustrates one of the preferred embodiments utilized in a vertical well wherein the selective oxidizer is pumped down the well bore and a non-alkane fuel is pumped down the coiled tubing. The two materials react with one another down hole in the wellbore and out in the formation, releasing energy.

[0010] FIG. 2 illustrates one of the preferred embodiments wherein the thermal stimulation step described in FIG. 1 is now put on production.

[0011] FIG. 3 illustrates one of the preferred embodiments utilized in a horizontal well wherein the selective oxidizer is pumped down the wellbore and a non-alkane fuel is pumped down coiled tubing. The two materials react with one another down hole in the horizontal section of the wellbore and out in the formation, releasing energy.

[0012] FIG. 4 illustrates one of the preferred embodiments wherein the thermal stimulation step described in FIG. 3 utilizes production via a second horizontal wellbore.

[0013] FIG. 5 illustrates one of the preferred embodiments wherein the selective oxidizer is pumped down coiled tubing and the non-alkane fuel is pumped down a second coiled tubing. The two materials mix and react with one another in the bottom hole assembly. The resulting reaction products and energy released are co-mingled with production fluids as they are produced up the well bore, thereby resulting in an increased temperature of the produced fluids and hence permitting increased production by decreasing the fluid viscosity, for example.

DETAILED DESCRIPTION

[0014] As used herein, “a” or “an” includes one or more. Where the present disclosure refers to “perforations” it should be understood to include “one or more perforations.”

[0015] As used herein, “surface” or “surface of the earth” refers to locations approximately at, or at or near the surface of the earth.

[0016] As used herein, “hydraulic fracturing” refers to a method of injecting a fluid above the fracture pressure of a subterranean reservoir into which the fluid is injected, or any propagation of fractures in a reservoir in strata (e.g. a rock layer) as a result of a pressurized fluid.

[0017] As used herein, “stimulation” refers to a method of injection a fluid below the hydraulic fracture pressure of a reservoir wherein the fluid is being injected.

[0018] As used herein “proppant” refers to any solid material that has sufficient strength to resist the overburden forces of the earth in a reservoir into which it is introduced or pumped, for example, any material that will keep a hydraulic fracture open, during or following a fracturing treatment, including for example particles which are permeable or primitive to gas.

[0019] As used herein “fluid system” refers to fluids that contain chemicals, and/or catalyst, and/or proppants.

[0020] As used herein “conduit” refers to a fluid transmission path that contains a fluid and any pressure of such a fluid.

[0021] As used herein “strata” includes a particular depth below the surface of the earth of solids, liquids, and gas constituents that comprise the earth. Strata as used herein refer to any and all particular subterranean depths.

[0022] As used herein the term “reservoir” includes a deposit of substances in any formation, stratum or strata.

[0023] As used herein “fluid” or “fluids” is defined as any liquid, plasma, gas, gel, foam, slickwater, or other substance that can deform, for example, under shear stress.

[0024] As used herein “alkane” refers to chemical compounds that consist only of hydrogen and carbon atoms and are bonded exclusively by single bonds without any cycles. Also known as a saturated hydrocarbon. Examples include methane, ethane, propane containing one, two and three carbon atoms respectively. Alkanes and Cycloalkanes are presently known to represent approximately 80% of the average crude oil composition depending upon specific natural deposits (Wikipedia, 2012. Petroleum. Available at: <http://en.wikipedia.org/wiki/Petroleum> as of Dec. 4, 2012.) Whereas, for example, the hydrocarbons present in natural gas and natural gas liquids are almost completely alkane chemistry depending upon specific natural deposits.

[0025] As used herein “alkene” refers to chemical compounds that consist only of hydrogen and carbon atoms containing at least one carbon-to-carbon double bond. Also known as unsaturated hydrocarbons. These chemical compounds are typically industrially produced by hydrocarbon cracking of natural gas liquids.

[0026] As used herein “alkyne” refers to chemical compounds that consist only of hydrogen and carbon atoms containing at least one carbon-to-carbon triple bond.

[0027] As used herein “alcohol” refers to organic chemical compounds containing at least one hydroxyl group bonded to
a carbon atom. Examples are ethanol, methanol and glycerol which is a polyol (an alcohol having more than one hydroxyl group).

[0028] As used herein “selective oxidation” refers to the preferential attack by oxygen within an oxidizing agent on one or more of the chemical components in a material.

[0029] Embodiments of the present invention relate to use of thermal energy to increase recovery of subterranean hydrocarbons and ultimately to increase hydrocarbon recovery from a specific formation or strata. The embodiments of this invention, for example, direct energy where it is most efficiently utilized in the near bottom hole, near well bore, and far afield in the formation from the well bore. The example embodiments outlined in the present disclosure are directed toward deep (>3000 ft) heavy oil, high paraffin content crude oils, oil sands, high kerogen strata such as oil shale where increases in local temperature result in significant changes in fluid viscosity. However, embodiments of the present invention may also find use with, for example but not limited to, hydraulic fracturing and enhanced oil recovery due to the nature of the products of reaction.

[0030] In one embodiment the energy is released near well bore and the reaction products are comingle with the fluids produced from a formation resulting in increased temperature and better flow assurance of formation fluids including hydrocarbons up the wellbore to the surface of the earth. In another embodiment the energy is released partially in the wellbore near the perforations through the well casing allowing fluid communication between the wellbore and the formation and also near the wellbore out into the formation depending on flow rates and reaction rates. This release of energy results, for example, in near wellbore heating of fluids, and after a heat soaking period the reaction products and formation hydrocarbons are then produced to the surface of the earth.

[0031] In one embodiment the energy is released partly in the wellbore but mostly in the near wellbore and far afield in the formation. In this embodiment, the far afield is heated and swept with the reaction products and is produced out of another well, for example. Additionally, in this embodiment acidic reductive leaching agents may also be injected into the formation or near locations where the selective oxidizer reactions have occurred in order to react with reaction products of the first energy producing reaction.

[0032] Attention is first directed to FIG. 1, which shows a preferred embodiment of an injection system 100 implementing certain aspects of the present invention, for example. Referring to FIG. 1 there is a well casing 20 that is disposed into a wellbore 11. Well casing 20 has perforations 12 that allow a fluid 16, which is the mixed combination of fluid 15 and fluid 14, inside well casing 20 to flow out into a subterranean formation 18 where a selective oxidation reaction is completed resulting in energy release and reaction products 17 near wellbore, for example. Injection system 100 further includes tank components 1 and 6 in fluid communication with the well casing 20. In one embodiment a fluid 14, at least partially comprising a selective oxidizing agent that is non-selective toward alkane chemistry is injected using a pump 2 through a conduit 3 into well casing 20. A fluid 15 contained in a tank 6 is at least partially comprised of a non-alkane fuel which is injected using a pump 5 through a coiled tubing conduit 9 down to near perforations 16 through a bottom hole assembly 13. In one embodiment, a bottom hole assembly 13 is designed to jet out fluid 15 into fluid 14 facilitating mixing and becoming a fluid 16 prior to delivery through perforations 12 and out into a formation 18. A coiled tubing 9 is placed into well casing 20 via an injection head 4, a stripper 8 and a lubricator 19. A production conduit 7 is closed during this operation, for example. In one embodiment pumps 5 and 2 are operated above hydraulic fracture pressure of formation 18 and at least a portion of reaction products 17 are used as a proppant. In another embodiment pumps 5 and 2 are operated below hydraulic fracture pressure of a formation 18, for example. Alternatively or in addition, a fluid 14 could be injected substantially at the same time as a fluid 15 or alternating or in proportions being oxidizer rich or alternatively fuel rich. And or in addition, coiled tubing 9 could be replaced by those knowledgeable in the art with a capillary tubing or a production tubing and hung off at or near surface 10. Alternatively, a fluid 15 could be at least partially comprised of selective oxidizer which is non-selective toward alkanes, and a fluid 14 at least partially comprised of non-alkane fuel.

[0033] FIG. 2 shows a preferred embodiment of an injection system 300 as identified in FIG. 1 wherein a bottom hole assembly 13 has been withdrawn into a lubricator 12. Pumps 2 and 5 are non-operational and injection conduit 3 is closed, for example. Recovery back to a surface 10 of formation 18 hydrocarbons via a casing 16 inside a wellbore 11, where hydrocarbons are mixed at least partially with reaction products 17 of FIG. 1, is accomplished through a conduit 7 on surface 10. A fluid 14 and a fluid 15 contained in a tank 1 and a tank 6 remain ready during production operations, as does a coiled tubing 9 rigged up through an injection head 4 and a stripper 8. The embodiment outlined in FIG. 2 could also be utilized in the case of a horizontal wellbore, for example.

[0034] FIG. 3 & FIG. 4 show a preferred embodiment of an injection system 300 implementing certain aspects of the present invention, for example. Referring to FIG. 3 & FIG. 4 there is a well casing 20 that is disposed into a wellbore 11. Well casing 20 has perforations 12 in a horizontal section of well casing 20 that allow a fluid 16 (a mixture of fluid 14 and fluid 15) inside well casing 20 to flow out into a subterranean formation 18 where a selective oxidation reaction is completed resulting in energy release and reaction products 17 near wellbore 11. Injection system 300 further includes tank components 1 and 6 in fluid communication with the well casing 20. In one embodiment, a fluid 14 partially comprising a selective oxidizing agent that is non-selective toward alkane chemistry is injected using a pump 2 through a conduit 3 into well casing 20. A fluid 15 contained in a tank 6 is at least partially comprised of a non-alkane fuel which is injected using a pump 5 through a coiled tubing conduit 9 down to near perforations 16 through a bottom hole assembly 13. In one embodiment, a bottom hole assembly 13 is designed to jet out fluid 15 into fluid 14 facilitating mixing and becoming a fluid 16 prior to delivery through perforations 12 and out into a formation 18. A coiled tubing 9 is placed into a well casing 20 via an injection head 4, a stripper 8 and a lubricator 19. Production conduit 7 is closed during this embodiment. In one embodiment, pumps 5 and 2 are operated above hydraulic fracture pressure of a formation 18 and at least a portion of reaction products 17 are used as a proppant. In another embodiment, pumps 5 and 2 are operated below hydraulic fracture pressure of a formation 18, for example. Alternatively or in addition, a fluid 14 could be injected substantially at the same time as a fluid 15 or alternating or in proportions being oxidizer rich or alternatively fuel rich. And or in addition, coiled tubing 9 could be replaced by those knowledgeable in the art with a capillary tubing or a production tubing and hung off at or near
the surface 10. And or in addition another preferred embodiment, as shown in FIG. 4 (which depicts the same elements nos. 1 through 20 of FIG. 3), allows for production of subterranean fluids 21 including hydrocarbons from a formation 18 to be recovered back to a surface 10 by as second horizontal well with a well casing 22 and brought to surface 10 by means of an artificial lift mechanism 23 such as a pumpjack.

FIG. 5 illustrates another preferred embodiment of the present invention with an injection system 500 implementing certain aspects of the present invention, for example. Referring to FIG. 5 there is a well casing 21 that is disposed into a wellbore 11. Well casing 21 has perforations 12 that allow a formation fluid 17 inside well casing 21. Fluids 14 and 15 are simultaneously injected via separate coiled tubing 3 and 9 and contact one another and react inside the bottom hole assembly 13. The mixed and reaction products of 14 and 15 is the discharge fluid 16 of the bottom hole assembly. A combination of fluids 17 and 16 mix and become fluid 18, which includes hydrocarbons from a formation 20, flow to the surface 10 and are produced via a conduit 7. Injection system 500 further includes tank components 1 and 6 in fluid communication with the well casing 21. In one embodiment, a fluid 14, at least partially comprising a selective oxidizing agent that is non-selective toward alkane chemistry, is injected using a pump 2 through a conduit 3 into well casing 21. A fluid 15 contained in a tank 6 is at least partially comprised of a non-alkane fuel which fluid is injected using a pump 5 through a coiled tubing conduit 9 down to near perforations 12 through a bottom hole assembly 13. A coiled tubing 3 and 9 are placed into well casing 21 via an injection head 4, a stripper 8 and a lubricator 19, for example. Alternatively or in addition, a fluid 14 could be injected substantially at the same time as a fluid 15 or alternating or in proportions being oxidizer rich or alternatively fuel rich. And or in addition, the coiled tubing 3 and 9 could be replaced by those knowledgeable in the art with a capillary tubing or a production tubing and hung off at or near the surface 10.

It is understood that known aspects of hydraulic fracturing can be used in conjunction with embodiments of the present invention. As such, in addition, fluid 14 and/or fluid 15 of FIGS. 1, 2, 3, 4 & 5 can also contain at least in part, as known by those knowledgeable in the art, friction reducers, gelling agents, and/or propping agents or propping agents, for example.

In another preferred embodiment, members of the permanganate family are selected at least in part as the selective oxidizing agents in fluid 14 of FIGS. 1, 2, 3, 4 & 5, for example. An additional embodiment utilizes alkenes, alkynes and/or alcohols at least in part as a fuel in fluid 15 of FIGS. 1, 2, 3, 4 & 5. For example, a preferred embodiment utilizing saturated potassium permanganate (~22 wt %) in water initially at 60°C (140°F) as the fluid 14 of FIGS. 1, 2, 3, 4 & 5, and utilizing an alcohol, glycerol for example, as a fuel of fluid 15 of FIGS. 1, 2, 3, 4 & 5, accomplishes a chemical reaction which creates an approximate adiabatic reaction temperature of 135°C (275°F). The balanced chemical reaction for this described embodiment can be written as:

\[ 3 \text{C}_2\text{H}_5\text{(OH)}_2 + 14 \text{KMnO}_4 + 358.7 \text{H}_2\text{O} \rightarrow 14 \text{MnO}_2 + 14 \text{KOH} + 9 \text{CO}_2 + 363.7 \text{H}_2\text{O} \]

In an additional embodiment, one of the reaction products 17 of FIGS. 1, 2, 3, 4 and reaction products 16 of FIG. 5 can be utilized as a propellant in hydraulic fracturing which in the case of permanganate selective oxidizer solutions for a fluid 14 would be the insoluble solid of Manganese Dioxide (MnO2), for example. Alternatively or in addition, reductive leaching agents such as sucrose in an acid solution such as sulfuric acid may be utilized at least in part as a fluid 15 of FIGS. 1, 2, 3, 4 & 5. As such, the reaction products 17 of FIGS. 1, 2, 3, & 4 and reaction products 16 of FIG. 5 may be further reacted leading to the balanced chemical reaction creating soluble and low toxicity Manganese Sulfate:

\[ 24 \text{MnO}_2 + 3\text{C}_2\text{H}_5\text{OH} + 24\text{H}_2\text{O} \rightarrow 24 \text{MnSO}_4 + 3\text{CO}_2 + 35\text{H}_2\text{O} \]

As described, embodiments of the present invention are fundamentally different than other prior methods such as those disclosed in U.S. patent application publications nos. US2012/0160486, US2012/0175114, US2012/0175115 & US2012/0175116 which utilize permanganates in the subterranean environment. For instance, these prior disclosures relate to the use of oxidizers for chemical modification of in situ kerogen. As such, permanganates are mentioned merely as an example of an oxidizer and make no mention of the use of selective oxidizers, for example. In addition, the mentioned prior disclosures differ from embodiments of the present invention in that the prior disclosures use a fuel that is already in the formation, whereas an embodiment of the present invention, for example, utilizes a fuel which is pumped down from surface and is at least partially a non-alkane chemical. A further difference is that embodiments of the present invention, for example, relate to energy generation down hole to create temperature changes whereas the aforementioned prior disclosures relate only to chemical manipulation.

U.S. Pat. No. 4,648,835 discloses a bottom hole combustor design utilizing air, water and fuel from surface, and ignition methods and chemistry to make steam in the well bore down hole. Example embodiments of the present invention teaches new and novel aspects not covered under said patent, those being delivery of a selective oxidizer that is non-selective toward alkanes, for example. U.S. Pat. No. 4,648,835 utilizes air containing oxygen that will oxidize with alkane chemistry whereas, for example, the present invention will not prefer to oxidize alkane chemical fuels. In addition, example embodiments of the invention disclosed herein inject a liquid fluid, for example, whereas the aforementioned U.S. patent uses gaseous oxidizers. In addition, in the aforementioned U.S. patent, energy release is inside the well bore whereas in example embodiments of the present invention energy release may occur at least partially out into the formation, for example.

U.S. Pat. No. 5,004,050 utilizes oxidizers inside a device placed inside the well bore as a portion of dielectrics that are set off by electrical discharge thereby creating a shockwave that travels into the formation, where such oxidizers are in some specific mentions similar to oxidizers in example embodiments of the invention herein. Example embodiments of the present invention, however, are different in that oxidizers are utilized to create thermal energy and not as dielectrics for creation of pressure energy, for example. In addition the method described by U.S. Pat. No. 5,004,050 utilizes oxidizers and not selective oxidizers as is the case for the present invention.

U.S. Pat. No. 5,967,233 discloses pumping liquid oxidizers, which in some specific mentions are similar to example embodiments of the invention herein, into a coal formation and permitting the oxidizer to react with the formation resulting in increased methane production. Example embodiments of the present invention, however, are different in that they utilize selective oxidizers which are non-selective
4. The method of claim 1 wherein the selective oxidizing agent is at least partially comprised of one of the following chemical compounds: Sodium Dichromate (Na₂Cr₂O₇), Ammonium Permanganate (NH₄MnO₄), Calcium Permanganate (Ca(MnO₄)₂), Sodium Permanganate (NaMnO₄), Potassium Permanganate (KMnO₄) and combinations thereof.

5. The method of claim 1 wherein the fuel is at least partially comprised of Glycerol (C₃H₈O₃).

6. The method of claim 1 wherein at least one additional fluid system comprises an acid.

7. The method of claim 6 wherein at least a portion of the acid is Sulfuric acid (H₂SO₄).

8. The method of claim 1 wherein at least one additional fluid system comprises a basic agent.

9. The method of claim 8 wherein at least a portion of the basic agent is Sodium Hydroxide (NaOH).

10. The method of claim 1 wherein at least one additional fluid system comprises a reductive leaching agent.

11. The method of claim 10 wherein at least a portion of the reductive leaching is comprised of one of the following materials: Sucrose (C₁₂H₂₂O₁₁), molasses, glucose (C₆H₁₂O₆), Ferric Sulfate, Ferrous Chloride, elemental Iron, Hydrogen Peroxide and combinations thereof.

12. The method of claim 1 wherein the injected fluid system is heated above surface ambient temperature prior to injection.

13. The method of claim 1 wherein the additional fluid system is heated above surface ambient temperature prior to injection.

14. The method of claim 1 wherein at least one conduit is a continuous tube having a distal end below the surface and a proximal end in said wellbore.

15. The method of claim 14 wherein at least a portion of the said reaction occurs within a distal end reactor attached to said continuous tube.

16. The method of claim 1 wherein at least one conduit is a continuous tube having a distal end below the surface and a proximal end above the surface of the earth.

17. The method of claim 16 wherein at least a portion of the said reaction occurs within a distal end reactor attached to said continuous tube.

18. The method of claim 1 wherein the injection of the additional fluid system is injected simultaneously with the selective oxidizing agent fluid system.

19. The method of claim 1 wherein the injection of the additional fluid system is injected alternating with the selective oxidizing agent fluid system.

20. The method of claim 1 wherein the reaction of the selective oxidizing agent with the additional fluid system occurs at least partially in the wellbore.

21. The method of claim 1 wherein the reaction of the selective oxidizing agent with the additional fluid system occurs at least partially in the formation.

22. The method of claim 1 wherein the injection of said fluid systems occurs at a pressure sufficient to hydraulically fracture at least one subterranean stratum.

23. The method of claim 1 wherein the injection of said fluid systems occurs at a pressure below hydraulic fracture pressure of at least one subterranean stratum.

24. The method of claim 1 wherein at least a portion of the products of reaction of the said selective oxidizing agent and the said fuel are utilized as a proppant material.
25. The method of claim 24 wherein the product of reaction is Manganese (IV) Dioxide (MnO₂).

26. The method of claim 24 wherein the product of reaction is Chromium (III) Oxide (Cr₂O₃).

27. The method of claim 1 wherein the fuel is at least partially comprised of one of the following: Bitumen, Asphaltene, Resin, Aromatic Hydrocarbons, Kerogen, Alkenes, Alkynes, Alcohols and combinations thereof.

28. The method of claim 1 wherein recovery back to surface of subterranean hydrocarbons is through said wellbore.

29. The method of claim 1 wherein recovery back to surface of subterranean hydrocarbons is through wellbores other than those wherein said oxidizing agent was injected.

30. The method of claim 1 wherein the reaction of said oxidizing agent and fuel is fuel rich.

31. The method of claim 1 wherein the reaction of said oxidizing agent and fuel is oxidizer rich.

32. The method of claim 1 wherein the additional fluid system is at least partially composed of one of the following: friction reducer, proppant, gelling agent and combinations thereof.

33. The method of claim 1 wherein the injected fluid system is at least partially composed of one of the following: friction reducer, proppant, gelling agent and combinations thereof.

34. The method of claim 1 wherein the subterranean hydrocarbons recovered back to surface may be visually inspected for color to determine efficiency of said energy release.

35. The method of claim 1 wherein at least a portion of the products of reaction of the said selective oxidizing agent and the said fuel are utilized for drilling, abrasive drilling, perforating or cutting.

36. The method of claim 1 wherein at least a portion of the products of reaction of the said selective oxidizing agent and the said fuel are utilized for flow diversion or fluid loss prevention.

37. An injection system operable for use with one or more selective oxidizing agents and operable for use in recovering one or more hydrocarbons from a formation, strata, and/or at least one subterranean reservoir, comprising:
   a. a first fluid container operable to contain at least a first fluid;
   b. a second fluid container operable to contain at least a second fluid;
   c. a plurality of pumps operable to pump one or more fluids;
   d. a wellbore extending at least partially below ground;
   e. a well casing contained at least partially inside said wellbore, said well casing: operable to be in communication with said first fluid container and/or with said second fluid container; and comprising one or more perforations in said well casing permitting a fluid inside said well casing to flow out of said well casing;

f. one or more conduits operable for delivering a fluid into said well casing, including one or more conduits operable for delivering a fluid into said well casing or to a selected location down or near bottom of said wellbore;

g. one or more conduits operable for recovery of one or more hydrocarbons;

h. said injection system comprising further limitations, wherein said injection system comprises:
   i. a selective oxidizing agent comprising oxygen, wherein said selective oxidizing agent is operable for preferential attack by oxygen on a plurality of chemical components in a material wherein said plurality of chemical components are not of alkane chemistry, and/or said oxidizing agent is operable to be non-selective toward alkane chemistry;
   ii. a non-alkane fuel which is a fluid;
   iii. wherein said first fluid at least partially comprises a said selective oxidizing agent, wherein a said first fluid is injected into said well casing utilizing one or more pumps of said plurality of pumps;
   iv. wherein said second fluid at least partially comprises a said non-alkane fuel, wherein utilizing one or more pumps of said plurality of pumps a said second fluid is injected into said well casing down to at or near bottom of said wellbore;
   v. wherein said injection system is operable to cause said first fluid and said second fluid and/or a mixture thereof to flow through one or more of said perforations of said well casing;
   vi. wherein at a time after said first fluid and said second fluid are injected into said well casing, said first fluid and said second fluid and/or a mixture thereof are operable to cause an oxidation reaction outside and/or substantially outside said well casing resulting in an energy release and creation of reaction products.

38. The injection system as claimed in claim 37, said injection system with further limitations comprising:
   a. a first set of one or more conduits operable for delivering a fluid into said well casing;
   b. a second set of one or more conduits operable for delivering a fluid into said well casing to a selected location down said wellbore;
   c. wherein said first fluid is injected via said first set of one or more conduits and said second fluid is injected via said second set of one or more conduits; or wherein said second fluid is injected via said first set of one or more conduits and said first fluid is injected via said second set of one or more conduits; and,
   d. wherein said injection system is operable to permit said first fluid and said second fluid to come into contact at a selected location down said wellbore, and/or after flowing out of one or more perforations in said well casing into said subterranean reservoir.

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