US 20120067571A1

(19) **United States**

(12) **Patent Application Publication**

BOERRIGTER et al.

(10) **Pub. No.: US 2012/0067571 A1**

(43) **Pub. Date: Mar. 22, 2012**

(54) **METHODS FOR PRODUCING OIL AND/OR GAS**

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(21) Appl. No.: **13/233,691**

(22) Filed: **Sep. 15, 2011**

Related U.S. Application Data

(60) Provisional application No. 61/384,121, filed on Sep. 17, 2010.

Publication Classification

(51) **Int. Cl.**
E21B 43/22 (2006.01)

(52) **U.S. Cl.** **166/270.1**

(57) **ABSTRACT**

A method for producing oil from an underground formation comprising injecting an enhanced oil recovery formulation into a first well in the formation, the enhanced oil recovery formulation comprising a foam; floating the foam on top of the oil, in order to force the oil towards a second well in the formation; and producing the oil and/or gas from the second well.

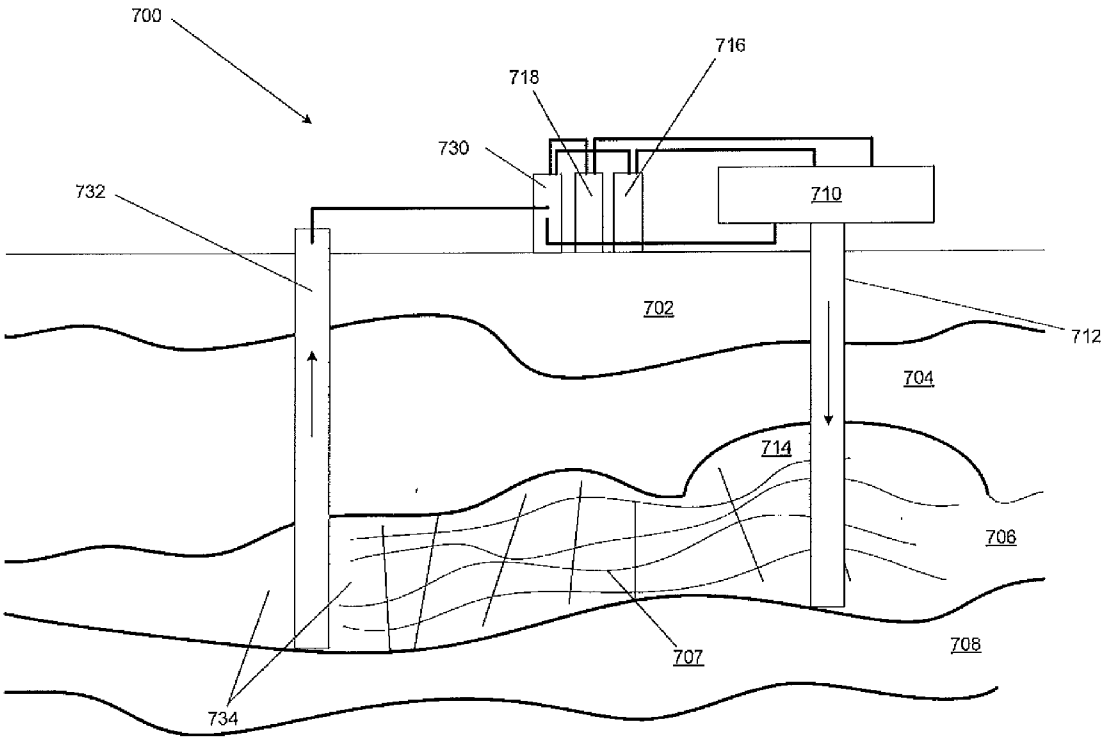
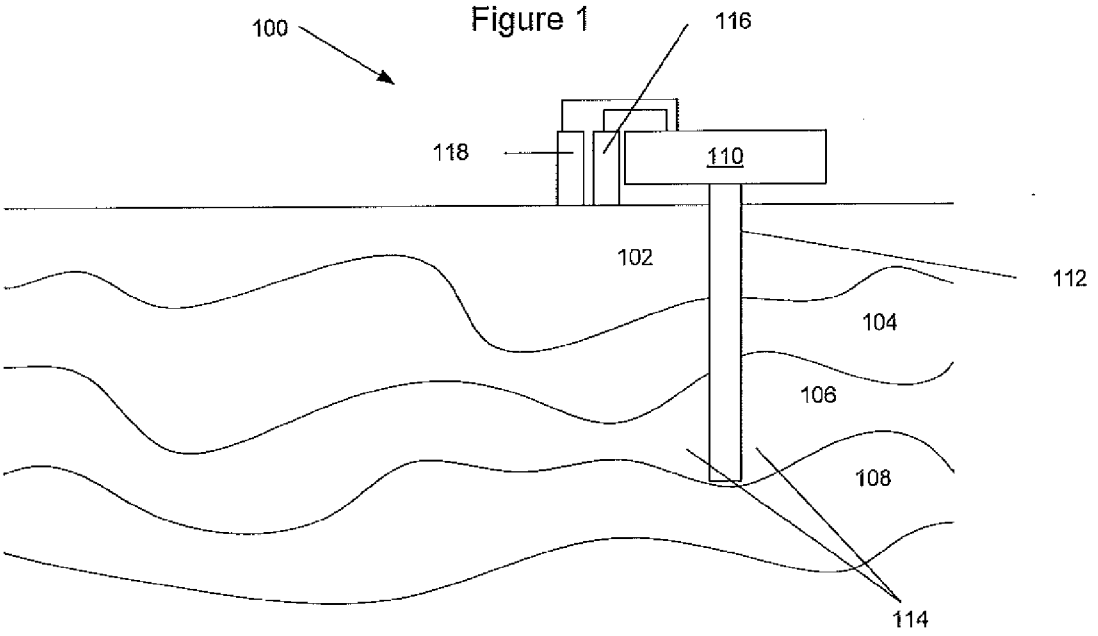


Figure 1



- Prior Art -

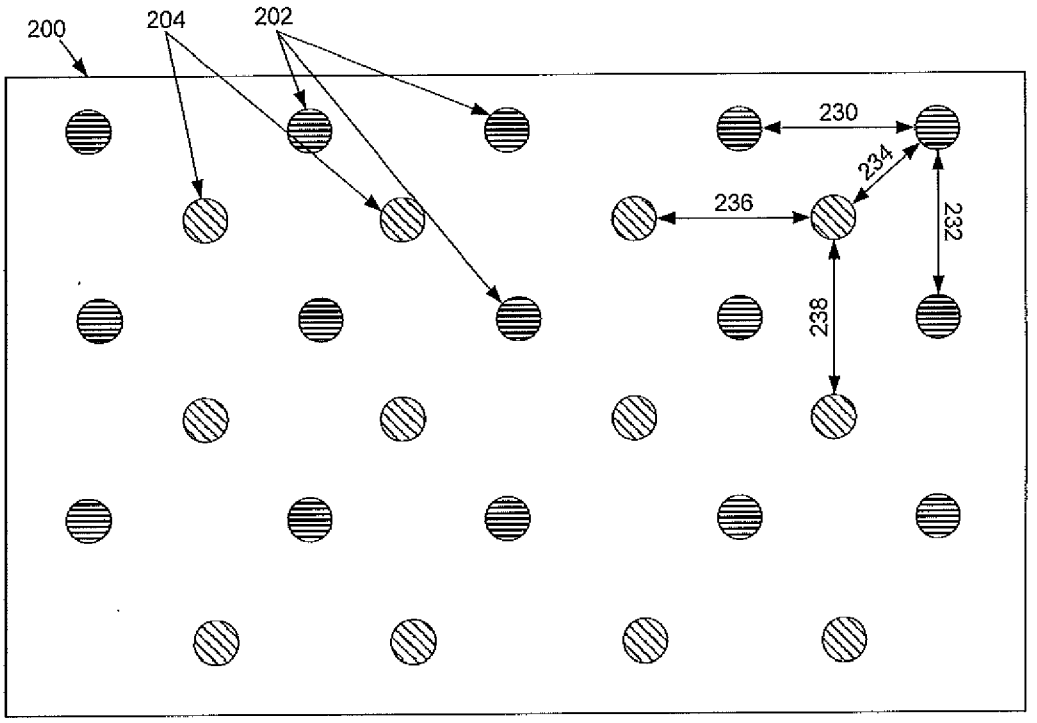


Figure 2

Figure 3

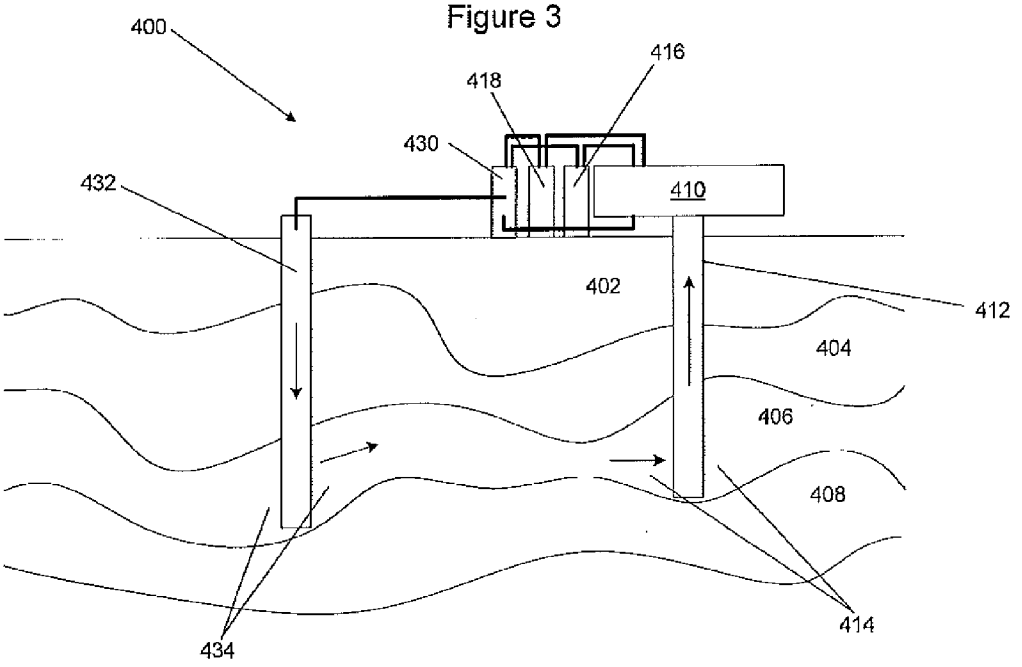


Figure 4

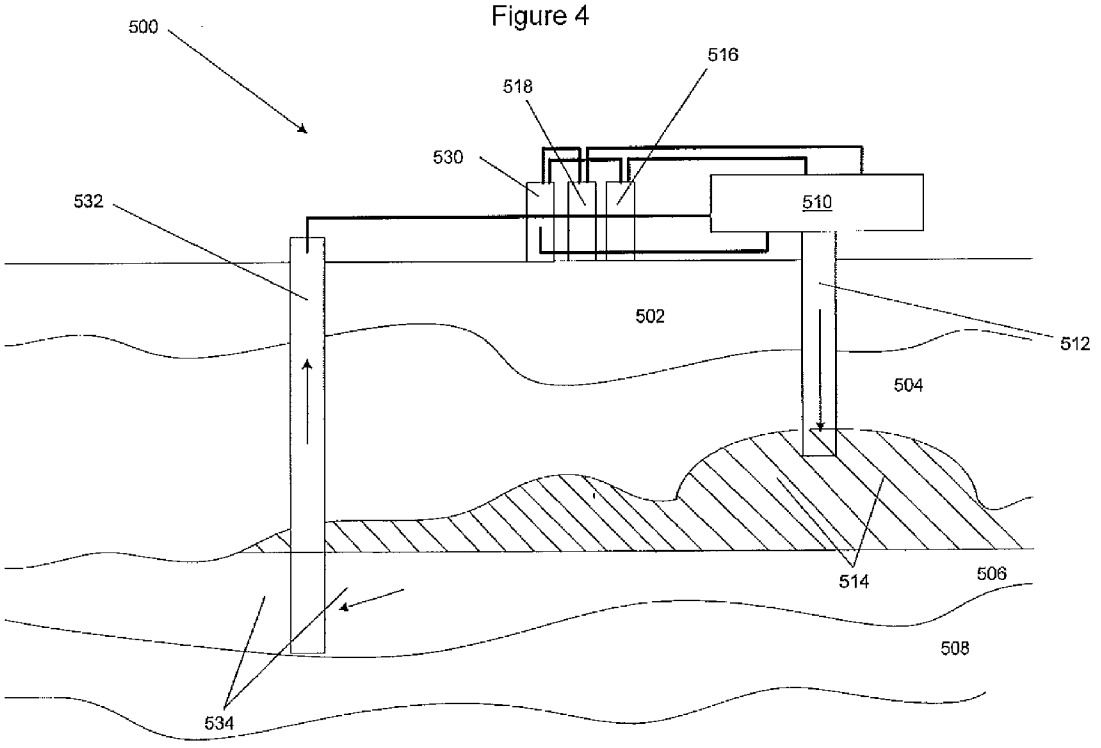


Figure 5

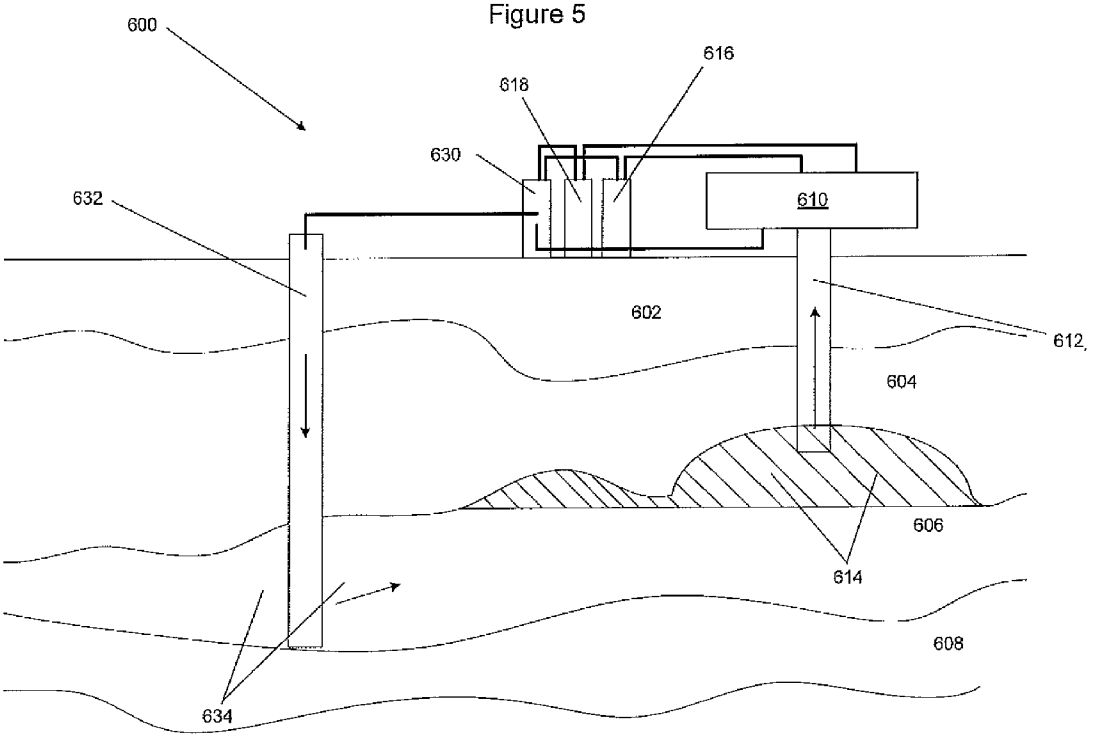
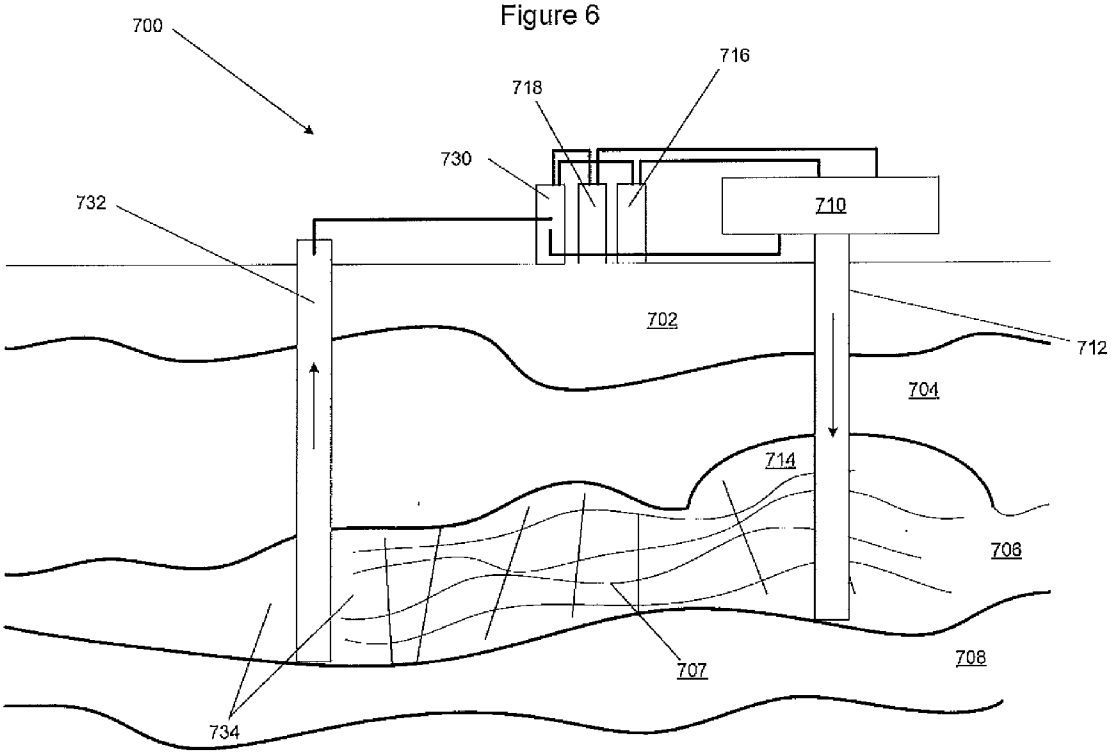


Figure 6



METHODS FOR PRODUCING OIL AND/OR GAS

PRIORITY CLAIM

[0001] This application claims priority to U.S. Provisional Application No. 61/384,121 entitled "METHODS OF PRODUCING OIL AND/OR GAS" filed on Sep. 17, 2010.

FIELD OF THE INVENTION

[0002] The present disclosure relates to methods for producing oil and/or gas.

BACKGROUND OF THE INVENTION

[0003] Enhanced Oil Recovery (EOR) may be used to increase oil recovery in fields worldwide. There are three main types of EOR, thermal, chemical/polymer and gas injection, which may be used to increase oil recovery from a reservoir, beyond what can be achieved by conventional means—possibly extending the life of a field and boosting the oil recovery factor.

[0004] Thermal enhanced recovery works by adding heat to the reservoir. The most widely practiced form is a steam-drive, which reduces oil viscosity so that it can flow to the producing wells. Chemical flooding increases recovery by reducing the capillary forces that trap residual oil. Polymer flooding improves the sweep efficiency of injected water. Miscible injection works in a similar way to chemical flooding. By injecting a fluid that is miscible with the oil, trapped residual oil can be recovered.

[0005] Referring to FIG. **1**, there is illustrated prior art system **100**. System **100** includes underground formation **102**, underground formation **104**, underground formation **106**, and underground formation **108**. Production facility **110** is provided at the surface. Well **112** traverses formations **102** and **104**, and terminates in formation **106**. The portion of formation **106** is shown at **114**. Oil and gas are produced from formation **106** through well **112**, to production facility **110**. Gas and liquid are separated from each other, gas is stored in gas storage **116** and liquid is stored in liquid storage **118**.

[0006] PCT Patent Application WO 2010/40202 discloses a Steam-Over-Solvent Injection in Fractured Reservoirs (SOS-FR) carried out by treating a fractured hydrocarbon bearing formation penetrated by a well with a first phase of injecting a formation compatible aqueous fluid into the fractured hydrocarbon bearing formation through the well, a second phase of injecting a hydrocarbon solvent into the fractured hydrocarbon bearing formation through the well and at least a third phase of repeating the first phase after the second phase. PCT Patent Application WO 2010/40202 is herein incorporated by reference in its entirety.

[0007] U.S. Patent Application Publication 2009/0260809 discloses methods of generating subsurface heat for treatment of a hydrocarbon containing formation. Methods include providing steam to at least a portion of a hydrocarbon containing formation from a plurality of locations in a wellbore. The steam is hotter than a temperature of the portion. The steam is heated in the wellbore by combusting a stream comprising hydrogen sulfide in the wellbore. Heat from the combustion transfers to the steam. The steam provided the portion at a first location in the wellbore is hotter than steam provided at a second location in the wellbore along the length of the wellbore, where the first location is further from a surface of the formation than the second location along the length of the wellbore. U.S. Patent Application Publication 2009/0260809 is herein incorporated by reference in its entirety.

[0008] U.S. Patent Application Publication 2009/0056941 discloses method for producing oil and/or gas comprising a method for producing oil from an underground formation comprising injecting an enhanced oil recovery formulation and a gas into a first well in the formation; forming a mixture comprising the enhanced oil recovery formulation and the oil in the formation; forming a gas cap with the injected gas; forcing the formulation and oil mixture towards a second well in the formation; and producing the formulation and oil mixture from the second well. U.S. Patent Application Publication 2009/0056941 is herein incorporated by reference in its entirety.

[0009] U.S. Pat. No. 4,232,741 discloses that portions of a subterranean reservoir are temporarily plugged by injecting an aqueous liquid solution which contains nitrogen gas-generating reactants, a foaming surfactant and a pH controlling system arranged so that the solution remains relatively unreactive within the well but forms a relatively immobile foam within the pores or other openings within the reservoir formation. U.S. Pat. No. 4,232,741 is herein incorporated by reference in its entirety.

[0010] There is a need in the art for improved systems and methods for enhanced oil recovery. There is a further need in the art for improved systems and methods for enhanced oil recovery using gas oil gravity drainage. There is a further need in the art for improved systems and methods for enhanced oil recovery in fractured reservoirs.

SUMMARY OF THE INVENTION

[0011] In one aspect, the invention provides a method for producing oil from an underground formation comprising injecting an enhanced oil recovery formulation into a first well in the formation, the enhanced oil recovery formulation comprising a foam; floating the foam on top of the oil, in order to force the oil towards a second well in the formation; and producing the oil and/or gas from the second well.

[0012] Advantages of the invention include one or more of the following:

[0013] Improved systems and methods for enhanced recovery of hydrocarbons from a formation with a gas and/or a foam.

[0014] Improved systems and methods for enhanced recovery of hydrocarbons from a formation with a gas lighter than oil and a liquid heavier than oil.

[0015] Improved compositions and/or techniques for secondary and/or tertiary recovery of hydrocarbons.

[0016] Improved systems and methods for enhanced oil recovery.

[0017] Improved systems and methods for enhanced oil recovery in fractured reservoirs.

[0018] Improved systems and methods for enhanced oil recovery using a foam.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019] FIG. **1** illustrates an oil and/or gas production system.

[0020] FIG. **2** illustrates a well pattern.

[0021] FIG. **3** illustrates an oil and/or gas production systems.

[0022] FIG. **4** illustrates an oil and/or gas production method.

[0023] FIG. **5** illustrates an oil and/or gas production system.

[0024] FIG. **6** illustrates an oil and/or gas production system.

DETAILED DESCRIPTION OF THE INVENTION

[0025] FIG. **2**:

[0026] Referring now to FIG. **2**, in some embodiments, an array of wells **200** is illustrated. Array **200** includes well group **202** (denoted by horizontal lines) and well group **204** (denoted by diagonal lines).

[0027] Each well in well group **202** has horizontal distance **230** from the adjacent well in well group **202**. Each well in well group **202** has vertical distance **232** from the adjacent well in well group **202**.

[0028] Each well in well group **204** has horizontal distance **236** from the adjacent well in well group **204**. Each well in well group **204** has vertical distance **238** from the adjacent well in well group **204**.

[0029] Each well in well group **202** is distance **234** from the adjacent wells in well group **204**. Each well in well group **204** is distance **234** from the adjacent wells in well group **202**.

[0030] In some embodiments, each well in well group **202** is surrounded by four wells in well group **204**. In some embodiments, each well in well group **204** is surrounded by four wells in well group **202**.

[0031] In some embodiments, horizontal distance **230** is from about 5 to about 1000 meters, or from about 10 to about 500 meters, or from about 20 to about 250 meters, or from about 30 to about 200 meters, or from about 50 to about 150 meters, or from about 90 to about 120 meters, or about 100 meters.

[0032] In some embodiments, vertical distance **232** is from about 5 to about 1000 meters, or from about 10 to about 500 meters, or from about 20 to about 250 meters, or from about 30 to about 200 meters, or from about 50 to about 150 meters, or from about 90 to about 120 meters, or about 100 meters.

[0033] In some embodiments, horizontal distance **236** is from about 5 to about 1000 meters, or from about 10 to about 500 meters, or from about 20 to about 250 meters, or from about 30 to about 200 meters, or from about 50 to about 150 meters, or from about 90 to about 120 meters, or about 100 meters.

[0034] In some embodiments, vertical distance **238** is from about 5 to about 1000 meters, or from about 10 to about 500 meters, or from about 20 to about 250 meters, or from about 30 to about 200 meters, or from about 50 to about 150 meters, or from about 90 to about 120 meters, or about 100 meters.

[0035] In some embodiments, distance **234** is from about 5 to about 1000 meters, or from about 10 to about 500 meters, or from about 20 to about 250 meters, or from about 30 to about 200 meters, or from about 50 to about 150 meters, or from about 90 to about 120 meters, or about 100 meters.

[0036] In some embodiments, array of wells **200** may have from about 10 to about 1000 wells, for example from about 5 to about 500 wells in well group **202**, and from about 5 to about 500 wells in well group **204**.

[0037] In some embodiments, array of wells **200** is seen as a top view with well group **202** and well group **204** being vertical wells spaced on a piece of land. In some embodiments, array of wells **200** is seen as a cross-sectional side view with well group **202** and well group **204** being horizontal wells spaced within a formation.

[0038] The recovery of oil and/or gas with array of wells **200** from an underground formation may be accomplished by any known method. Suitable methods include subsea production, surface production, primary, secondary, or tertiary production. The selection of the method used to recover the oil and/or gas from the underground formation is not critical.

[0039] In some embodiments, oil and/or gas may be recovered from a formation into a well, and flow through the well and flowline to a facility. In some embodiments, enhanced oil recovery, with the use of an agent for example steam, water, a surfactant, a gas, a foam, a polymer flood, and/or a miscible agent, may be used to increase the flow of oil and/or gas from the formation.

[0040] In some embodiments, an enhanced oil recovery agent is injected into well group **202**, and oil is recovered from well group **204**. In some embodiments, well group **202** may be used for injecting a enhanced oil recovery agent, and well group **204** may be used for producing oil and/or gas from the formation for a first time period; then well group **204** may be used for injecting a enhanced oil recovery agent, and well group **202** may be used for producing oil and/or gas from the formation for a second time period, where the first and second time periods comprise a cycle.

[0041] In some embodiments, multiple cycles may be conducted which include alternating well groups **202** and **204** between injecting a enhanced oil recovery agent, and producing oil and/or gas from the formation, where one well group is injecting and the other is producing for a first time period, and then they are switched for a second time period.

[0042] In some embodiments, a cycle may be from about 12 hours to about 1 year, or from about 3 days to about 6 months, or from about 5 days to about 3 months.

[0043] In some embodiments, oil as present in the formation prior to the injection of any enhanced oil recovery agents has a viscosity of at least about 100 centipoise, or at least about 500 centipoise, or at least about 1000 centipoise, or at least about 2000 centipoise, or at least about 5000 centipoise, or at least about 10,000 centipoise. In some embodiments, oil as present in the formation prior to the injection of any enhanced oil recovery agents has a viscosity of up to about 5,000,000 centipoise, or up to about 2,000,000 centipoise, or up to about 1,000,000 centipoise, or up to about 500,000 centipoise.

[0044] Releasing at least a portion of the enhanced oil recovery agent and/or other liquids and/or gases may be accomplished by any known method. One suitable method is injecting the enhanced oil recovery formulation into a single conduit in a single well, allowing the formulation to soak, and then pumping out at least a portion of the formulation with gas and/or liquids. Another suitable method is injecting the enhanced oil recovery formulation into a first well, and pumping out at least a portion of the enhanced oil recovery formulation with gas and/or liquids through a second well. The selection of the method used to inject at least a portion of the enhanced oil recovery formulation and/or other liquids and/or gases is not critical.

[0045] In some embodiments, the enhanced oil recovery formulation and/or other liquids and/or gases may be pumped into a formation at a pressure up to the fracture pressure of the formation.

[0046] FIG. **3**:

[0047] Referring now to FIG. **3**, in some embodiments of the invention, system **400** is illustrated. System **400** includes underground formation **402**, formation **404**, formation **406**,

and formation **408**. Production facility **410** is provided at the surface. Well **412** traverses formation **402** and **404** has openings at formation **406**. Portions of formation **414** may be optionally fractured and/or perforated. As oil and gas is produced from formation **406** it enters portions **414**, and travels up well **412** to production facility **410**. Gas and liquid may be separated, and gas may be sent to gas storage **416**, and liquid may be sent to liquid storage **418**. Production facility **410** is able to produce and/or store enhanced oil recovery formulation, which may be produced and stored in production/storage **430**.

[0048] Enhanced oil recovery formulation is pumped down well **432**, to portions **434** of formation **406**. Enhanced oil recovery formulation traverses formation **406** to aid in the production of oil and gas, and then the enhanced oil recovery formulation, oil and/or gas may all be produced to well **412**, to production facility **410**. Enhanced oil recovery formulation may then be recycled, by re-injecting the formulation into well **432**.

[0049] In some embodiments, a quantity of enhanced oil recovery formulation or enhanced oil recovery formulation mixed with other components may be injected into well **432**, followed by another component to force enhanced oil recovery formulation or enhanced oil recovery formulation mixed with other components across formation **406**, for example air; water in gas or liquid form; carbon dioxide; nitrogen; water mixed with one or more salts, polymers, and/or surfactants; carbon dioxide; other gases; other liquids; and/or mixtures thereof.

[0050] In some embodiments, well **412** which is producing oil and/or gas is representative of a well in well group **202**, and well **432** which is being used to inject enhanced oil recovery formulation is representative of a well in well group **204**.

[0051] In some embodiments, well **412** which is producing oil and/or gas is representative of a well in well group **204**, and well **432** which is being used to inject enhanced oil recovery formulation is representative of a well in well group **202**.

[0052] FIG. **4**:

[0053] Referring now to FIG. **4**, in some embodiments of the invention, system **500** is illustrated. System **500** includes underground formation **502**, formation **504**, formation **506**, and formation **508**. Production facility **510** is provided at the surface. Well **512** traverses formation **502** and **504** has openings at formation **506**. Gas and/or a gas containing foam may be injected into and then trapped in the upper portions of formation **506**, which may include dome structure **514**, for example since the gas is floating on a denser oil in the formation. As oil and gas is produced from the lower portions **534** of formation **506**, it travels up well **532** to production facility **510**. Gas and liquid may be separated, and gas may be sent to gas storage **516**, and liquid may be sent to liquid storage **518**. Production facility **510** is able to produce and/or store enhanced oil recovery formulation, which may be produced and stored in production/storage **530**.

[0054] Enhanced oil recovery formulation is pumped down well **512**, to portions **514** of formation **506**. Enhanced oil recovery formulation is lighter than the oil and/or gas in formation **506**, and due to the buoyancy of the oil recovery formulation, oil and/or gas is trapped in the lower portions **534** of formation **506**. Enhanced oil recovery formulation traverses formation **506** to aid in the production of oil and gas, and then the oil and/or gas in formation **506** and enhanced oil recovery formulation may all be produced to well **532**, to production facility **510**.

[0055] Enhanced oil recovery formulation may then be recycled, by re-injecting the formulation into well **512**.

[0056] In some embodiments, enhanced oil recovery formulation includes gas, gas mixed with water and a surfactant to form a foam, or other light gases or liquids, for example natural gas, methane, carbon dioxide and/or nitrogen.

[0057] In some embodiments, well **532** which is producing oil and/or gas is representative of a well in well group **202**, and well **512** which is being used to inject enhanced oil recovery formulation is representative of a well in well group **204**.

[0058] In some embodiments, well **532** which is producing oil and/or gas is representative of a well in well group **204**, and well **512** which is being used to inject enhanced oil recovery formulation is representative of a well in well group **202**.

[0059] FIG. **5**:

[0060] Referring now to FIG. **5**, in some embodiments of the invention, system **600** is illustrated. System **600** includes underground formation **602**, formation **604**, formation **606**, and formation **608**. Production facility **610** is provided at the surface. Well **612** traverses formation **602** and **604** has openings at formation **606**. The oil and/or gas may be trapped in the upper portions of formation **606**, which may include dome structure **614**, for example since the oil and/or gas is floating on a denser enhanced oil recovery formulation. As oil and gas is produced from the upper portions of formation **606**, which may include dome **614**, it travels up well **612** to production facility **610**. Gas and liquid may be separated, and gas may be sent to gas storage **616**, and liquid may be sent to liquid storage **618**. Production facility **610** is able to produce and/or store enhanced oil recovery formulation, which may be produced and stored in production/storage **630**.

[0061] Enhanced oil recovery formulation is pumped down well **632**, to portions **634** of formation **606**. Enhanced oil recovery formulation is denser than the oil and/or gas in dome **614**, and causes a buoyancy for oil and/or gas to trap it in the upper portions of formation **606**, including dome **614**. Enhanced oil recovery formulation traverses formation **606** to aid in the production of oil and gas, and then the enhanced oil recovery formulation may all be produced to well **612**, to production facility **610**. Enhanced oil recovery formulation may then be recycled, by re-injecting the formulation into well **632**.

[0062] In some embodiments, enhanced oil recovery formulation includes water, water with additives such as polymers, alkalis, and/or surfactants, or other dense liquids, for example carbon disulfide or carbon disulfide formulations.

[0063] In some embodiments, well **612** which is producing oil and/or gas is representative of a well in well group **202**, and well **632** which is being used to inject enhanced oil recovery formulation is representative of a well in well group **204**.

[0064] In some embodiments, well **612** which is producing oil and/or gas is representative of a well in well group **204**, and well **632** which is being used to inject enhanced oil recovery formulation is representative of a well in well group **202**.

[0065] FIG. **6**:

[0066] Referring now to FIG. **6**, in some embodiments of the invention, system **700** is illustrated. System **700** includes underground formation **702**, formation **704**, formation **706**, and formation **708**. Production facility **710** is provided at the surface. Well **712** traverses formation **702** and **704** has openings at formation **706**. Portions of formation **706** form dome **714**, which may trap liquids and/or gases. Formation **706** has fractures, karsts, and/or vugs **707** which provide a low resistance fluid path from well **712** to well **732**, and vice versa. As

liquids and/or gases are produced from formation **706**, they travel up well **732** to production facility **710**. Gas and liquid may be separated, and gas may be sent to gas processing/storage **716**, and liquid may be sent to liquid processing/storage **718**. Production facility **710** is able to produce and/or store enhanced oil recovery formulation, which may be produced and stored in production/storage **730**.

[0067] In a first step, a first enhanced oil recovery formulation is pumped down well **712**, to portions **734** of formation **706**. Enhanced oil recovery formulation traverses formation **706** to aid in the production of oil and/or gas from fractures, karsts, and/or vugs **707**, and then the enhanced oil recovery formulation and oil and/or gas may all be produced to well **732**, to production facility **710**. Enhanced oil recovery formulation may then be recycled, for example by re-injecting the formulation into well **712**.

[0068] In some embodiments, in another step, a second enhanced oil recovery formulation, which is denser than oil and/or gas in formation **706** is injected at the bottom of well **712**, near the interface of formations **706** and **708**. The enhanced oil recovery formulation injection rate may be adjusted to be near the imbibition rate of the formulation into the matrix surrounding the fractures, karsts, and/or vugs **707**. The formulation and oil and/or gas are produced from a middle portion of well **712** in between the first enhanced oil recovery formulation with a low density and the second enhanced oil recovery formulation with a high density. Since oil and/or gas is denser than the first enhanced oil recovery formulation, the oil and/or gas sinks below the first enhanced oil recovery formulation. In addition, since oil and/or gas is lighter than the second enhanced oil recovery formulation, the oil and/or gas floats above the second enhanced oil recovery formulation.

[0069] In some embodiments, a first enhanced oil recovery formulation, which is less dense than oil and/or gas in formation **706** is injected at the top portion of well **712** in dome **714**, near the interface of formations **706** and **704**. The enhanced oil recovery formulation injection rate may be adjusted to be near the imbibition rate of the formulation into the matrix surrounding the fractures, karsts, and/or vugs **707**. The formulation and oil and/or gas are produced from a bottom of well **732**, near the interface of formations **706** and **708**. Since oil and/or gas is less dense than formulation, formulation causes the oil and/or gas to sink. Oil and/or gas naturally sinks below formulation from upper elevation near injection at well **712**, to lower elevation production at well **732**.

[0070] It will be appreciated by those of skill in the art that if a gas is injected into well **712**, it will quickly flow through the fractures, karsts, and/or vugs **707**, across formation **706** to well **732**, and not interface with the oil and/or gas in the matrix. For that reason, the gas is injected into well **712** in a foam to create a pressure drop along the fracture to encourage more of the gas to enter into the matrix.

[0071] In some embodiments, well **732** which is producing oil and/or gas is representative of a well in well group **202**, and well **712** which is being used to inject enhanced oil recovery formulation is representative of a well in well group **204**. In some embodiments, well **732** which is producing oil and/or gas is representative of a well in well group **204**, and well **712** which is being used to inject enhanced oil recovery formulation is representative of a well in well group **202**.

[0072] In some embodiments, oil and/or gas produced may be transported to a refinery and/or a treatment facility. The oil and/or gas may be processed to produced to produce commercial products such as transportation fuels such as gasoline and diesel, heating fuel, lubricants, chemicals, and/or polymers. Processing may include distilling and/or fractionally distilling the oil and/or gas to produce one or more distillate fractions. In some embodiments, the oil and/or gas, and/or the one or more distillate fractions may be subjected to a process of one or more of the following: catalytic cracking, hydrocracking, hydrotreating, coking, thermal cracking, distilling, reforming, polymerization, isomerization, alkylation, blending, and dewaxing.

Illustrative Embodiments

[0073] In one embodiment of the invention, there is disclosed a method for producing oil from an underground formation comprising injecting an enhanced oil recovery formulation into a first well in the formation, the enhanced oil recovery formulation comprising a foam; floating the foam on top of the oil, in order to force the oil towards a second well in the formation; and producing the oil and/or gas from the second well. In some embodiments, the first well further comprises a first array of wells, and the second well further comprises a second array of wells, wherein a well in the first array of wells is at a distance of 10 meters to 1 kilometer from one or more adjacent wells in the second array of wells. In some embodiments, the underground formation is beneath a body of water. In some embodiments, the foam is injected into one or more fractures in the formation. In some embodiments, the method also includes injecting a second enhanced oil recovery formulation into the formation, the second enhanced oil recovery formulation being denser than the oil, further comprising floating the oil on the second enhanced oil recovery formulation. In some embodiments, the first array of wells comprises from 5 to 500 wells, and the second array of wells comprises from 5 to 500 wells. In some embodiments, the enhanced oil recovery formulation comprises gas and a surfactant. In some embodiments, the enhanced oil recovery formulation comprises a gas selected from nitrogen, carbon dioxide, natural gas, and other hydrocarbon gases having from one to four carbon atoms. In some embodiments, the second enhanced oil recovery formulation comprises a carbon disulfide formulation. In some embodiments, the underground formation comprises a oil having a viscosity from 100 to 5,000,000 centipoise. In some embodiments, the enhanced oil recovery formulation is less dense than the oil. In some embodiments, the oil floats on the enhanced oil recovery formulation.

[0074] Those of skill in the art will appreciate that many modifications and variations are possible in terms of the disclosed embodiments of the invention, configurations, materials and methods without departing from their spirit and scope. Accordingly, the scope of the claims appended hereafter and their functional equivalents should not be limited by particular embodiments described and illustrated herein, as these are merely exemplary in nature.

1. A method for producing oil from an underground formation comprising:

injecting an enhanced oil recovery formulation into a first well in the formation, the enhanced oil recovery formulation comprising a foam;

floating the foam on top of the oil, in order to force the oil towards a second well in the formation; and

producing the oil and/or gas from the second well.

2. The method of claim **1**, wherein the first well further comprises a first array of wells, and the second well further

comprises a second array of wells, wherein a well in the first array of wells is at a distance of 10 meters to 1 kilometer from one or more adjacent wells in the second array of wells.

3. The method of claim **1**, wherein the underground formation is beneath a body of water.

4. The method of claim **1**, wherein the foam is injected into one or more fractures in the formation.

5. The method of claim **1**, further comprising injecting a second enhanced oil recovery formulation into the formation, the second enhanced oil recovery formulation being denser than the oil, further comprising floating the oil on the second enhanced oil recovery formulation.

6. The method of claim **2**, wherein the first array of wells comprises from 5 to 500 wells, and the second array of wells comprises from 5 to 500 wells.

7. The method of claim **1**, wherein the enhanced oil recovery formulation comprises gas and a surfactant.

8. The method of claim **1**, wherein the enhanced oil recovery formulation comprises a gas selected from the group consisting of nitrogen, carbon dioxide, natural gas, and hydrocarbon gases other than natural gas having from one to four carbon atoms.

9. The method of claim **5**, wherein the second enhanced oil recovery formulation comprises a carbon disulfide formulation.

10. The method of claim **1**, wherein the underground formation comprises an oil having a viscosity from 100 to 5,000,000 centipoise.

11. The method of claim **1**, wherein the enhanced oil recovery formulation is less dense than the oil.

12. The method of claim **1**, wherein the oil floats on the enhanced oil recovery formulation.

* * * * *