LOW CUT WATER SAMPLING DEVICE

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ABSTRACT

An apparatus for sampling well production fluids comprises a vessel having an inner chamber. In addition, the apparatus comprises a hydrocarbon fluids outlet conduit in fluid communication with the inner chamber. Further, the apparatus comprises a well fluids inlet conduit coaxially disposed within the hydrocarbon fluids outlet conduit and in fluid communication with the inner chamber. The well fluids inlet conduit has a first portion extending from the vessel and a second portion extending into the inner chamber. The second portion of the well fluids inlet conduit includes a plurality of openings configured to direct the well production fluids radially outward from the well fluids inlet conduit. Still further, the apparatus comprises a sample fluids outlet in fluid communication with the inner chamber.
LOW CUT WATER SAMPLING DEVICE

CROSS-REFERENCE TO RELATED APPLICATIONS


STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

[0002] Not applicable.

BACKGROUND

[0003] 1. Field of the Invention
[0004] This invention relates generally to the production of hydrocarbons from an earth formation. More particularly, the invention relates to a method and system for sampling a low water-cut hydrocarbon stream.
[0005] 2. Background of the Technology
[0006] In hydrocarbon production operations, water may be produced along with the hydrocarbons. The water is typically intermixed with, or in suspension with crude oil, gas, or other hydrocarbon fluids, but does not form a solution with the hydrocarbon fluids. In general, the percentage of water mixed with hydrocarbons produced from hydrocarbon producing wells, also referred to as the “water cut,” is greater than 10% (by volume). However, some wells produce a very low water cut stream of hydrocarbons. Separation of the water and hydrocarbons in such low cut production streams is typically more difficult as compared to high cut production streams.

[0007] Sampling and analysis of the water produced from a well serves several purposes. For example, during production, the well may be treated with certain compounds to improve production or to prevent certain adverse conditions. Such treatments may include injection of water containing surfactants or polymers. In addition, these treatments may include anticorrosion treatments (corrosion inhibitor added), or treatments to prevent the formation of hydrates or deposition of paraffins or salts. These treatments facilitate transport of the fluid to the surface and/or prevent oil deposition. The relative volumes of the physical and/or chemical characteristics of these treatments in water or other fluids can vary considerably as a function of time. One way to monitor and adjust such treatments is to sample and analyze the produced water to determine the quantities and characteristics of the additives in the water. The water characteristics analyzed and evaluated typically include without limitation, resistivity, density, pH, conductivity, bicarbonate alkalinity, and quantitative elemental analysis. Water samples can also be used to analyze the source of the fluids produced for multi-zonal completion wells. This information may be used in reservoir development and depletion planning.

[0008] One conventional method for sampling water from a produced hydrocarbon stream is to take an isolated direct sample from the pipeline at a single point in time, separate the water, and then analyze the separated water. Thus, with this approach, continuous sampling and analysis of the produced water over time cannot be obtained without repeatedly taking discrete samples from the pipeline. Furthermore, in produced well fluids with low water cut, it is difficult to separate the water and hydrocarbons.

[0009] Accordingly, there remains a need in the art for improved systems and methods for sampling water from a produced hydrocarbon stream. Such systems and methods would be particularly well-received if they offered the potential for continuous sampling over time and could be employed with low water cut hydrocarbon streams.

BRIEF SUMMARY OF THE DISCLOSURE

[0010] These and other needs in the art are addressed in one embodiment by an apparatus for sampling well production fluids. In an embodiment, the apparatus comprises a vessel having an inner chamber. In addition, the apparatus comprises a hydrocarbon fluids outlet conduit in fluid communication with the inner chamber. Further, the apparatus comprises a well fluids inlet conduit coaxially disposed within the hydrocarbon fluids outlet conduit and in fluid communication with the inner chamber. The well fluids inlet conduit has a first portion extending from the vessel and a second portion extending into the inner chamber. The second portion of the well fluids inlet conduit includes a plurality of openings configured to direct the well production fluids radially outward from the well fluids inlet conduit. Still further, the apparatus comprises a sample fluids outlet in fluid communication with the inner chamber.

[0011] These and other needs in the art are addressed in another embodiment by a method of sampling produced well fluids. In an embodiment, the method comprises (a) continuously flowing produced well fluids to a sampling device. The sampling device comprises a vessel having an inner chamber, a hydrocarbon fluids outlet conduit in fluid communication with the inner chamber, and a well fluids inlet conduit coaxially disposed within the hydrocarbon fluids outlet conduit and in fluid communication with the inner chamber. In addition, the method comprises (b) flowing the produced well fluids through the well fluids inlet conduit into the inner chamber of the vessel. Further, the method comprises (c) allowing a sample fluid in the produced well fluids to separate from one or more hydrocarbon fluids in the produced well fluids to a lower portion of the inner chamber under the force of gravity. Still further, the method comprises (d) withdrawing a sample of the sample fluid from the vessel through the sample fluids outlet.

[0012] These and other needs in the art are addressed in another embodiment by an apparatus for sampling well production fluids. In an embodiment, the apparatus comprises a vessel having an inner chamber. In addition, the apparatus comprises a hydrocarbon fluids outlet conduit coupled to the vessel. Further, the apparatus comprises a well fluids inlet conduit extending coaxially through the hydrocarbon fluids outlet conduit into the inner chamber. Still further, the apparatus comprises a sample fluids outlet positioned at a lower end of the vessel and in fluid communication with the inner chamber. Moreover, the apparatus comprises an annulus radially disposed between the hydrocarbon fluids outlet conduit and the well fluids inlet conduit. The annulus has an inlet end in fluid communication with the inner chamber.

[0013] The foregoing has outlined rather broadly the features and technical advantages of the invention in order that the detailed description of the invention that follows may be better understood. Additional features and advantages of the invention will be described hereinafter that form the subject of the claims of the invention. It should be appreciated by those skilled in the art that the conception and the specific embodiments disclosed may be readily utilized as a basis for
modifying or designing other structures for carrying out the same purposes of the invention. It should also be realized by those skilled in the art that such equivalent constructions do not depart from the spirit and scope of the invention as set forth in the appended claims.

0014] Embodiments described herein comprise a combination of features and advantages intended to address various shortcomings associated with certain prior devices, systems, and methods. The various characteristics described above, as well as other features, will be readily apparent to those skilled in the art upon reading the following detailed description, and by referring to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

0015] For a detailed description of the preferred embodiments of the invention, reference will now be made to the accompanying drawings in which:

0016] FIG. 1 is a schematic view of an offshore installation including an embodiment of a low cut water sampler in accordance with the principles described herein;

0017] FIG. 2 is a front view of the low cut water sampler of FIG. 1;

0018] FIG. 3 is a front view of the low cut water sampler of FIG. 1 being supplied produced well fluids and before outputting separated hydrocarbon fluids or water; and

0019] FIG. 4 is an enlarged view of the lower end of the inlet conduit of the low cut water sampler of FIG. 1 being supplied produced well fluids and outputting separated hydrocarbon fluid and water.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

0020] The following discussion is directed to various exemplary embodiments. However, one skilled in the art will understand that the examples disclosed herein have broad application, and that the discussion of any embodiment is meant only to be exemplary of that embodiment, and not intended to suggest that the scope of the disclosure, including the claims, is limited to that embodiment.

0021] Certain terms are used throughout the following description and claims to refer to particular features or components. As one skilled in the art will appreciate, different persons may refer to the same feature or component by different names. This document does not intend to distinguish between components or features that differ in name but not function. The drawings figures are not necessarily to scale. Certain features and components herein may be shown exaggerated in scale or in somewhat schematic form and some details of conventional elements may not be shown in interest of clarity and conciseness.

0022] In the following discussion and in the claims, the terms “including” and “comprising” are used in an open-ended fashion, and thus should be interpreted to mean “including, but not limited to . . . .” Also, the term “couple” or “couples” is intended to mean either an indirect or direct connection. Thus, if a first device couples to a second device, that connection may be through a direct connection, or through an indirect connection via various devices, components, and connections. In addition, as used herein, the terms “axial” and “axially” generally mean along or parallel to a central axis (e.g., central axis of a body or a port), while the terms “radial” and “radially” generally mean perpendicular to the central axis. For instance, an axial distance refers to a distance measured along or parallel to the central axis, and a radial distance means a distance measured perpendicular to the central axis. As used herein, the phrase “low cut” refers to produced well fluids with less than about 10% water composition (by volume), and the phrase “high cut” refers to produced well fluids with greater than about 10% water composition (by volume).

0023] Referring now FIG. 1, an offshore system 10 for producing a completed subterranean wellbore 11 is schematically shown. In this embodiment, system 10 includes an offshore platform 20 at the sea surface 12, a subsea production manifold 30 mounted to a wellhead 31 at the sea floor 13, and a production riser 40 extending from manifold 30 to platform 20. In general, riser 40 is a large-diameter pipe that connects manifold 30 to the floating platform 20. During production operations, well fluids are produced through riser 40 to platform 20, where the produced fluids may be stored, processed, offloaded or combinations thereof. Casing 32 extends from wellhead 31 into subterranean wellbore 11.

0024] System 10 also includes a water sampling device 100 for sampling low cut well fluids produced through riser 40. As will be described in more detail below, device 100 receives samples of produced well fluids from riser 40, separates the water from the produced well fluids, outputs the separated water for subsequent analysis, and outputs the balance of the produced well fluids (following separation of the water). The produced well fluids flowing through riser 40 typically comprise hydrocarbon fluids (e.g. liquid hydrocarbons such as crude oil and/or hydrocarbon gases such as natural gas) and water. Thus, the balance or remainder of the produced well fluids after separation of the water in device 100 is predominantly hydrocarbon fluids, it being understood that such fluids may include small quantities of water, solids (e.g., sand), or other fluids. In this embodiment, a production sample conduit or flowline 50 supplies produced wellbore fluids from riser 40 to sampling device 100. Samples of the water in the produced well fluids in riser 40 may be obtained continuously with device 100 via flowline 50 to determine the composition of the water therein. Although sampling device 100 is shown disposed on platform 20, device 100 may be disposed at any suitable offshore or onshore location. For example, sample flowline 50 may extend from platform 20 to a different offshore or onshore location for sampling with device 100 and subsequent analysis of the separated water.

0025] Referring now to FIG. 2, water sampling device 100 includes a produced well fluids inlet conduit 110, a separator containment vessel 120, a sample fluid outlet 130, a separated hydrocarbon fluids outlet conduit 140, and a hydrocarbon fluids outlet fitting or coupling 150. Vessel 120 has an inner chamber 121. In this embodiment, water is sampled and separated from the produced well fluids, and thus, sample fluid outlet 130 may also be referred to as a water outlet. Inlet conduit 110, water outlet 130, and hydrocarbon outlet conduit 140 are each in fluid communication with inner chamber 121. As will be described in more detail below, produced well fluids, designated with reference numeral 160, enter chamber 121 via inlet conduit 110; separated water samples, designated with reference numeral 161, may be taken from chamber 121 via outlet 130; and hydrocarbon fluids, designated with reference numeral 162 and resulting from the separation of water 161 from well fluids 160, exit chamber 121 via outlet conduit 140 and fitting 150. Flowline 50 previously described is coupled to inlet conduit 110, and thus, supplies produced well fluids to chamber 121 via inlet conduit 110.
In general, separator vessel 120 may be any suitable vessel or container compatible with potentially corrosive well fluids and capable of withstanding relatively high pressures. In particular, vessel 120 is preferably a containment vessel or tank designed and configured to withstand pressures of at least about 285 psi, alternatively about 1,000 psi, alternatively about 5,000 psi, alternatively about 10,000 psi, and alternatively about 20,000 psi. In this embodiment, vessel 120 is an elongate, generally cylindrical tank having an upper end 120a and a lower end 120b opposite upper end 120a. Upper end 120a includes a port 122 and lower end 120b includes a port 123. Conduits 110, 140 extend through port 122 into inner chamber 121, and water outlet 130 is in fluid communication with port 123. Although vessel 120 is a cylindrical upright vessel in this embodiment, in other embodiments the separator vessel (e.g., vessel 120) may have other suitable geometries such as rectangular, spherical, etc. In general, vessel 120 and inner chamber 121 may have any suitable volume. However, for embodiments described herein, vessel 120 is preferably sized such that chamber 121 has a volume between 1 liter and 4 liters.

Referring still to FIG. 2, as previously described, outlet conduit 140 extends through port 122 and is secured to vessel 120. For instance, conduit 140 may be positioned in port 122 and then welded to vessel 120. In this embodiment, outlet conduit 140 is a tubular having a central axis 145, a first or upper end 140a disposed outside and above vessel 120, and a second or lower end 140b disposed within chamber 121. As will be described in more detail below, hydrocarbon fluids 162 flow from chamber 121 into end 140a, through conduit 140, and out end 140a into fitting 150. Thus, lower end 140b may also be referred to as an inlet end, and upper end 140a may also be referred to as an outlet end.

Fitting 150 is coupled to upper end 140a of conduit 140. In this embodiment, fitting 150 is a tubular manifold including a main bore or passage 151, a first lateral bore or passage 152 extending from main bore 151, and a second lateral bore or passage 153 extending from main bore 151. Main bore 151 is coaxially aligned with outlet conduit 140 and has a first or upper end 151a distal conduit 140, and a second or lower end 151b in fluid communication with conduit 140. As will be described in more detail below, lower end 151b receives hydrocarbon fluids 162 from chamber 121 via conduit 140, and thus, may also be referred to as hydrocarbon fluids inlet end 151b. Each lateral bore 152, 153 has an inlet end 152a, 153a, respectively, in fluid communication with main bore 151 between ends 151a, b, and an outlet end 152b, 153b, respectively. In this embodiment, outlet end 152b is in fluid communication with a sensor 154. In general, sensor 154 may comprise any suitable type of sensor or gauge for monitoring one or more parameters of the fluids in chamber 122 such as pressure, temperature, flow rate, etc.

Referring still to FIG. 2, well fluids inlet conduit 110 extends through main bore 151 of fitting 150 and outlet conduit 140 into vessel 120. In this embodiment, inlet conduit 110 is a tubular having a central axis 115, a first or inlet end 110a extending from main bore 151 distal vessel 120, and a second or closed end 110b disposed in chamber 121. Conduit 110 is coaxially aligned with main bore 151 of fitting 150 and outlet conduit 140, and thus, central axes 115, 145 are coincident. Conduit 110 is preferably positioned such that end 110b is disposed in the upper half of separator chamber 121.

The outer diameter of inlet conduit 110 is less than the inner diameter of main bore 151 and outlet conduit 140, and thus, an annulus 114 is radially positioned between inlet conduit 110 and fitting 150, outlet conduit 140. Annulus 114 extends from end 140b of conduit 140 to upper end 151a of main bore 151. Thus, annulus 114 has a first or upper end 114a coincident with upper end 151a of main bore 151 and a second or lower end 114b coincident with inlet end 140b of conduit 140. Annulus 114 is closed off and sealed at upper end 114a with a cap 116 that extends radially across main bore 151 from inlet conduit 110 to fitting 150. However, lower end 114b of annulus 114 is open to chamber 120. Lateral bores 152, 153 are in fluid communication with annulus 114. As will be described in more detail below, hydrocarbon fluids 162 flow from chamber 121 into end 114b of annulus 114, through annulus 114, and out end 114a of annulus 114 into lateral bores 152, 153. Thus, lower end 114b may also be referred to as an inlet end.

Referring now to FIGS. 2 and 4, the portion of inlet conduit 110 extending into chamber 121 includes a plurality of through bores or openings 112 proximal closed end 110b. Openings 112 extend radially through conduit 110 proximal end 110b and allow produced well fluids 160 flowing through conduit 110 to exit inlet conduit 110 in a radial fashion to minimize agitation and mixing of fluids within chamber 121. Accordingly, each opening 112 may be described as an outlet port. As best shown in FIG. 4, in this embodiment, openings 112 are arranged in a plurality of axially spaced rows 112a, b, c, d. Openings 112 within each row 112a, b, c, d are circumferentially spaced about conduit 110, and further, openings 112 in each row 112a, b, c, d are circumferentially offset or staggered relative to the openings 112 in the adjacent row(s) 112a, b, c, d. In this embodiment, each row 112a, b, c, d includes two openings 112 spaced 180° apart, with openings 112 in adjacent rows 112a, b, c, d being circumferentially staggered 90° apart. However, in other embodiments, each row (e.g., each row 112a, b, c, d) may have more or less openings (e.g., openings 112) and/or the openings in each row may be circumferentially spaced by more or less than 180°. Although openings 112 are shown as circular holes in FIG. 4, in general, openings 112 may have any suitable geometry (e.g., oval, rectangular, elliptical, etc.).

Referring again to FIG. 2, water outlet 130 is coupled to vessel 120 and extends from port 123. In this embodiment, outlet 130 includes a valve 131 for selectively opening and closing outlet 130. More specifically, valve 131 has a closed position restricting and/or preventing fluid flow through outlet 130, and an open position allowing fluid flow through outlet 130.

Referring now to FIGS. 1 and 2, during production operations, produced well fluids 160 are supplied to inlet conduit 110 via production sample flowline 50. Fluids 160 flow through conduit 110 and radially outward through openings 112 into chamber 121. As previously described, the radial ejection of the produced well fluids 160 from conduit 110 offers the potential to reduce and/or prevent mixing and agitation of the separated water 161 and hydrocarbon fluids 162 within separator chamber 121. As desired, produced well fluids 160 may be provided to vessel 120 continuously or on a periodic basis.

As best shown in FIG. 2, without being limited by this or any particular theory, due to the difference in densities and the immiscibility between water 161 and hydrocarbon fluids 162 in produced well fluids 160, any water 161 in the produced well fluids 160 begins to migrate or settle to the bottom of separator chamber 121 and the hydrocarbon fluids...
move to the upper portion of chamber 121. In other words, gravity naturally drives the separation of the heavier water 161 from the lighter hydrocarbon fluids 162.

Moving now to FIG. 3, as produced well fluids 160 are supplied to chamber 121 and water 161 separates from hydrocarbon fluids 162, the level of hydrocarbon fluids 162 in chamber 121 begins to rise. When the level of hydrocarbon fluids 162 in chamber 121 is sufficient, the hydrocarbon fluids in the upper portion of chamber 121 exit chamber 121 through annulus 114. The pressure and/or flow of produced hydrocarbon fluids 160 in conduit 110 into chamber 121 prevents hydrocarbon fluids 162 from backflowing into conduit 110 via openings 112. However, hydrocarbon fluids 162 are free to flow through inlet end 114b and annulus 114 to outlets 152a, 153b. Outlet 152a supplies hydrocarbon fluids 162 to sensor 154. Outlet 153b may be connected to a flowline or conduit that may direct the separated hydrocarbon fluids to any desired location (e.g., back into the produced well fluids downstream of conduit 50). Cap 116 prevents hydrocarbon fluids 162 from exiting annulus 114 at upper end 114a. Separated water 161 in the lower portion of chamber 121 may be drawn off through outlet 130 for testing by opening valve 131. Initially, and between sampling of water 161 within chamber 121, valve 131 is preferably closed.

In the manner described, embodiments of sampling devices for sampling produced well fluids (e.g., device 100) rely on gravity separation to cost efficiently separate water or other fluids from the produced hydrocarbon fluids for sampling purposes. In contrast to conventional low cut water sampling devices limited to periodic water sampling, embodiments of device 100 allow for continuous sampling of produced well fluids over a period of time. Furthermore, embodiments of the apparatus provide a very low cost solution to separating the small percentage of water in low cut produced fluids. In addition, embodiments of the apparatus are capable of withstanding extremely high pressures. Although embodiments disclosed herein (e.g., device 100) have been described with respect to separating and sampling water from a produced well fluids stream, it is contemplated that other fluids having a higher density than the produced hydrocarbons may also be separated. Further, although embodiments disclosed herein have been shown and described in conjunction with offshore hydrocarbon producing wells, they may also be used to separate and sample fluids from a produced well fluids in a pipeline, on land, etc.

While preferred embodiments have been shown and described, modifications thereof can be made by one skilled in the art without departing from the scope or teachings herein. The embodiments described herein are exemplary only and are not limiting. Many variations and modifications of the systems, apparatus, and processes described herein are possible and are within the scope of the invention. For example, the relative dimensions of various parts, the materials from which the various parts are made, and other parameters can be varied. Accordingly, the scope of protection is not limited to the embodiments described herein, but is only limited by the claims that follow, the scope of which shall include all equivalents of the subject matter of the claims. Unless expressly stated otherwise, the steps in a method claim may be performed in any order. The recitation of identifiers such as (a), (b), (c) or (1), (2), (3) before steps in a method claim are not intended to and do not specify a particular order to the steps, but rather are used to simply subsequent reference to such steps.

The discussion of a reference is not an admission that it is prior art to the present invention, especially any reference that may have a publication date after the priority date of this application. The disclosures of all patents, patent applications, and publications cited herein are hereby incorporated herein by reference in their entirety, to the extent that they provide exemplary, procedural, or other details supplementary to those set forth herein.

What is claimed is:

1. An apparatus for sampling well production fluids, comprising:
   a vessel having an inner chamber;
   a hydrocarbon fluids outlet conduit in fluid communication with the inner chamber;
   a well fluids inlet conduit coaxially disposed within the hydrocarbon fluids outlet conduit and in fluid communication with the inner chamber, wherein the well fluids inlet conduit has a first portion extending from the vessel and a second portion extending into the inner chamber; wherein the second portion of the well fluids inlet conduit includes a plurality of openings configured to direct the well production fluids radially outward from the well fluids inlet conduit; and
   a sample fluids outlet in fluid communication with the inner chamber.

2. The apparatus of claim 1, wherein the vessel has an upper end, a lower end, and a first port extending through the lower end of the vessel to the inner chamber, wherein the sample fluids outlet is in fluid communication with the first port.

3. The apparatus of claim 2, wherein the vessel has a second port extending through the upper end of the vessel to the inner chamber:
   wherein the hydrocarbon fluids outlet conduit and the well fluids inlet conduit extend through the second port.

4. The apparatus of claim 1, wherein the plurality of openings in the well fluids inlet conduit are arranged in a plurality of axially spaced rows, wherein a plurality of the openings are circumferentially spaced in each row.

5. The apparatus of claim 4, wherein the openings in each row are circumferentially staggered relative to the openings in each axially adjacent row.

6. The apparatus of claim 1, wherein the vessel has a pressure rating of at least about 20,000 psi and the inner chamber has a volume between 1 liter and 4 liters.

7. The apparatus of claim 1, further comprising a hydrocarbon fluids outlet fitting including a main bore and a first lateral bore extending from the main bore:
   wherein the main bore is in fluid communication with the hydrocarbon fluids outlet conduit;
   wherein the well fluids inlet conduit extends coaxially through the main bore.

8. The apparatus of claim 7, wherein an annulus is radially disposed between the well fluids inlet conduit and the hydrocarbon fluids outlet conduit, and radially disposed between the well fluids inlet conduit and the hydrocarbon fluids outlet fitting:
   wherein the annulus extends from an inlet end in fluid communication with the inner chamber and a sealed end opposite the inlet end; and
   wherein the annulus is in fluid communication with the first lateral bore.
9. The apparatus of claim 8, wherein the first lateral bore has an inlet end in fluid communication with the annulus and a hydrocarbon fluids outlet end opposite the inlet end of the first lateral bore.

10. The apparatus of claim 9, wherein the hydrocarbon fluids outlet fitting includes a second lateral bore extending from the main bore;

Wherein the second lateral bore is in fluid communication with the annulus and a sensor.

11. The apparatus of claim 10, wherein the sensor comprises a pressure sensor, a temperature sensor, a flow rate sensor, or a pH sensor.

12. A method of sampling produced well fluids, comprising:

(a) continuously flowing produced well fluids to a sampling device, wherein the sampling device comprises:

a vessel having an inner chamber;

a hydrocarbon fluids outlet conduit in fluid communication with the inner chamber;

a well fluids inlet conduit coaxially disposed within the hydrocarbon fluids outlet conduit and in fluid communication with the inner chamber;

a sample fluids outlet in fluid communication with the inner chamber

(b) flowing the produced well fluids through the well fluids inlet conduit into the inner chamber of the vessel;

(c) allowing a sample fluid in the produced well fluids to separate from one or more hydrocarbon fluids in the produced well fluids to a lower portion of the inner chamber under the force of gravity; and

(d) withdrawing a sample of the sample fluid from the vessel through the sample fluids outlet.

13. The method of claim 12, wherein the sample fluids outlet includes a valve, and wherein (d) comprises opening the valve to withdraw the sample of the first fluid.

14. The method of claim 12, further comprising:

(e) flowing the one or more hydrocarbon fluids from the inner chamber through an annulus radially positioned between the well fluids inlet conduit and the hydrocarbon fluids outlet conduit.

15. The method of claim 14, wherein (e) further comprises allowing the one or more hydrocarbons to flow out of an upper end of the inner chamber of the vessel.

16. The method of claim 14, wherein the sample fluid is water.

17. The method of claim 14, wherein (b) comprises flowing the produced well fluids radially outward from the well fluids inlet conduit through a plurality of openings in the well fluids inlet conduit, wherein the plurality of openings are positioned along a portion of the well fluids inlet conduit extending into the inner chamber of the vessel.

18. The method of claim 12, further comprising testing the sample fluid for pH, composition, resistivity, conductivity, or combinations thereof.

19. An apparatus for sampling well production fluids, comprising:

a vessel having an inner chamber;

a hydrocarbon fluids outlet conduit coupled to the vessel;

a well fluids inlet conduit extending coaxially through the hydrocarbon fluids outlet conduit into the inner chamber;

a sample fluids outlet positioned at a lower end of the vessel and in fluid communication with the inner chamber;

an annulus radially disposed between the hydrocarbon fluids outlet conduit and the well fluids inlet conduit, wherein the annulus has an inlet end in fluid communication with the inner chamber.

20. The apparatus of claim 19, wherein a portion of the well fluids inlet conduit extending into the inner chamber includes a plurality of openings configured to direct the flow of well production fluids radially outward from the well fluids inlet conduit into the inner chamber.

21. The apparatus of claim 19, further comprising a fitting coupled to the hydrocarbon fluids outlet conduit, wherein the fitting includes a first bore:

wherein the well fluids inlet conduit extends coaxially through the first bore of the fitting;

wherein the annulus extends into the fitting and is radially disposed between the well fluids inlet conduit and the fitting.

22. The apparatus of claim 21, wherein the fitting further comprises a second bore extending from the first bore and a third bore extending from the first bore;

wherein the second bore and the third bore are each in fluid communication with the annulus.