CLAIMS

1. A method for treating a feed stream comprising hydrocarbons and an aqueous-based liquid, comprising:

pre-treating a plurality of media composite pellets with an aqueous liquid to produce a plurality of pre-treated media composite pellets, each media composite pellet comprising a mixture of a cellulose-based material and a polymer;

introducing the feed stream to an inlet of a vessel containing the plurality of pre-treated media composite pellets; and

contacting the feed stream with the plurality of pre-treated media composite pellets to produce a treated stream, the treated stream having a predetermined target concentration of the hydrocarbons that is less than a concentration of hydrocarbons in the feed stream.

2. The method of claim 1, wherein the predetermined target concentration of hydrocarbons in the treated stream is less than about 30 ppm.

3. The method of claim 1, wherein contacting the feed stream with the plurality of pre-treated media composite pellets comprises coalescing the feed stream, wherein the predetermined target concentration of hydrocarbons in the treated stream is a reduced concentration of emulsified hydrocarbons relative to the feed stream.

4. The method of claim 3, wherein the concentration of emulsified hydrocarbons in the treated stream is reduced relative to the feed stream by greater than about 50%.

5. The method of claim 1, further comprising:

measuring at least one of a concentration of hydrocarbons in the treated stream and a flow rate of the treated stream;

backwashing the plurality of pre-treated media composite pellets based on at least one of the measured concentration of hydrocarbons in the treated stream and the measured flow rate of the treated stream to produce a hydrocarbon liquid effluent; and

recycling the hydrocarbon liquid effluent to the feed stream.

6. The method of claim 1, wherein pre-treating the plurality of media composite pellets comprises contacting each media composite pellet with the aqueous liquid for a predetermined time interval.

7. A method for treating a feed stream comprising hydrocarbons and an aqueous-based liquid, comprising:

pre-treating a plurality of media composite pellets with an aqueous liquid to produce a plurality of pre-treated media composite pellets, each media composite pellet comprising a mixture of a cellulose-based material and a polymer;

passing the feed stream at a first flux rate through a coalescer containing the plurality of pre-treated media composite pellets to produce a coalesced stream; and

passing the coalesced stream at a second flux rate through a filter device in communication with the coalescer and containing the plurality of pre-treated media composite pellets to produce an effluent stream.

8. The method of claim 7, wherein the first flux rate is in a range of from about 100 to about 200 gpm/ft^2.

9. The method of claim 7, wherein the second flux rate is less than about 15 gpm/ft^2.

10. The method of claim 7, further comprising maintaining a concentration of hydrocarbons in the effluent stream at a predetermined target percent reduction.

11. The method of claim 7, further comprising backwashing at least one of the coalescer and the filter device.

12. The method of claim 11, wherein backwashing the at least one of the coalescer and the filter device is based on a predetermined time interval.

13. The method of claim 11, further comprising measuring a flow rate of the coalesced stream and backwashing the coalescer based on the measured flow rate of the coalesced stream to produce a hydrocarbon liquid effluent.

14. The method of claim 11, further comprising measuring at least one of a flow rate of the effluent stream and a concentration of hydrocarbons in the effluent stream and backwashing the filter device based on at least one of the measured flow rate of the effluent stream and the measured concentration of hydrocarbons in the effluent stream to produce a hydrocarbon liquid effluent.

15. The method of claim 7, wherein pre-treating the plurality of media composite pellets comprises contacting each media composite pellet with the aqueous liquid for a predetermined time interval.

16. A system for treating a feed stream comprising hydrocarbons and an aqueous-based liquid, comprising:

at least one pre-treatment device in communication with an aqueous liquid and containing a plurality of media composite pellets, each media composite pellet comprising a mixture of a cellulose-based material and a polymer, the at least one pre-treatment device configured to produce a plurality of pre-treated media composite pellets;

at least one coalescer in communication with the feed stream and containing a plurality of the pre-treated media composite pellets; and

at least one separator device in communication with the coalescer.

17. The system of claim 16, wherein the separator device is at least one of a filter device, a hydrocyclone, a gravity settling device, and a flotation device.

18. The system of claim 17, wherein the separator device is a filter device containing a plurality of the pre-treated media composite pellets.

19. The system of claim 16, wherein each media composite pellet comprises a concentration of cellulose-based material of at least about 45% by weight.

20. The system of claim 16, wherein the cellulose-based material comprises at least one wood material.

21. The system of claim 16, wherein each media composite pellet has a size distribution in a range of from about 5 mesh to about 10 mesh.

CLAIMS

1. A method for treating an aqueous feed stream comprising hydrocarbons, the method comprising:

pre-treating a plurality of media composite particles with an aqueous liquid to produce a plurality of pre-treated media composite particles, each pre-treated media composite particle comprising a mixture of a cellulose-based material and a polymer;

introducing the feed stream to an inlet of a vessel containing the plurality of pre-treated media composite particles; and

contacting the feed stream with the plurality of pre-treated media composite particles to produce a treated stream, the treated stream having a target concentration of hydrocarbons less than a concentration of hydrocarbons in the feed stream.

2. The method of claim 1, wherein the target concentration of hydrocarbons in the treated stream is less than about 30 ppm.

3. The method of claim 1, wherein contacting the feed stream with the plurality of pre-treated media composite particles comprises coalescing the feed stream, wherein the target concentration of hydrocarbons in the treated stream is a reduced concentration of emulsified hydrocarbons relative to the feed stream.

4. The method of claim 3, wherein the reduced concentration of emulsified hydrocarbons in the treated stream is reduced relative to the feed stream by greater than about 50%.

5. The method of claim 1, further comprising:

measuring at least one of a concentration of hydrocarbons in the treated stream and a flow rate of the treated stream;

backwashing the plurality of pre-treated media composite particles based on at least one of the measured concentration of hydrocarbons in the treated stream and the measured flow rate of the treated stream to produce a hydrocarbon liquid effluent; and

recycling the hydrocarbon liquid effluent to the feed stream.

6. The method of claim 1, wherein pre-treating the plurality of media composite particles comprises contacting each media composite particle with the aqueous liquid for a predetermined time interval.

7. A method for treating an aqueous feed stream comprising hydrocarbons, the method comprising:

pre-treating a plurality of media composite particles with an aqueous liquid to produce pre-treated media composite particles, each pre-treated media composite particle comprising a mixture of a cellulose-based material and a polymer;

passing the feed stream at a first flux rate through a coalescer containing a plurality of the pre-treated media composite particles to produce a coalesced stream; and

passing the coalesced stream at a second flux rate through a filter device in communication with the coalescer to produce an effluent stream, the filter device containing a plurality of the pre-treated media composite particles.

8. The method of claim 7, wherein the first flux rate is in a range of from about 100 to about 200 gpm/ft^2.

9. The method of claim 7, wherein the second flux rate is less than about 15 gpm/ft^2.

10. The method of claim 7, further comprising maintaining a concentration of hydrocarbons in the effluent stream at a predetermined target percent reduction.

11. The method of claim 7, further comprising backwashing at least one of the coalescer and the filter device.

12. The method of claim 11, wherein backwashing the at least one of the coalescer and the filter device is based on a predetermined time interval.

13. The method of claim 11, further comprising measuring a flow rate of the coalesced stream and backwashing the coalescer based on the measured flow rate of the coalesced stream to produce a hydrocarbon liquid effluent.

14. The method of claim 11, further comprising measuring at least one of a flow rate of the effluent stream and a concentration of hydrocarbons in the effluent stream and backwashing the filter device based on at least one of the measured flow rate of the effluent stream and a measured concentration of hydrocarbons in the effluent stream to produce a hydrocarbon liquid effluent.

15. The method of claim 7, wherein pre-treating the plurality of media composite particles comprises contacting each media composite particle with the aqueous liquid for a predetermined time interval.

16. A system for treating an aqueous feed stream comprising hydrocarbons, the system comprising:

at least one pre-treatment device in communication with the feed stream and a source of an aqueous liquid, the at least one pre-treatment device containing a plurality of media composite particles, each pre-treated media composite particle pre-treated with the aqueous liquid and comprising a mixture of a cellulose-based material and a polymer;

at least one coalescer in communication with the feed stream and containing a plurality of the pre-treated media composite particles, the at least one coalescer configured to reduce an amount of emulsified hydrocarbons in the feed stream and generate a coalesced stream; and

at least one separator device in fluid communication with the coalescer configured to separate coalesced hydrocarbons from an aqueous portion of the coalesced stream to generate a treated stream.

17. The system of claim 16, wherein the separator device is at least one of a filter device, a hydrocyclone, a gravity settling device, and a flotation device.

18. The system of claim 17, wherein the separator device is a filter device containing a plurality of the pre-treated media composite particles.

19. The system of claim 16, wherein each media composite particle comprises a concentration of cellulose-based material of at least about 45% by weight.

20. The system of claim 16, wherein the cellulose-based material comprises a wood material.

21. The system of claim 16, wherein each media composite particle has a size distribution in a range of from about 5 mesh to about 10 mesh.