CLAIMS

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

a vessel comprising a feed stream inlet fluidly connected with the feed stream and a treated stream outlet fluidly connected with a treated stream; and

a filter bed positioned within the vessel and comprising a first layer of filter media disposed on a second layer of filter media in a direction of flow of the fluid to be treated,

wherein at least the first layer comprises a plurality of composite media pellets defining gaps therebetween and configured to load an amount of the hydrocarbons from the feed stream thereon, each of the plurality of composite media pellets comprising a mixture of a cellulose-based material and a polymer,

wherein the filter media of the second layer is further configured to load an amount of the hydrocarbons from the feed stream thereon, the filter media of the second layer also having a smaller particle size and a greater specific gravity relative to the filter media of the first layer, and

wherein the second layer of filter media comprises walnut shells.

2. The system of claim 1, wherein the second layer also comprises a plurality of composite media particles, each of the plurality of composite media particles of the second layer also comprising a mixture of a cellulose-based material and a polymer.

3. The system of claim 1, wherein the second layer comprises a plurality of composite media particles, each of the plurality of composite media particles of the second layer also comprising a mixture of a cellulose-based material and a polymer, and wherein the second layer further comprises an additive effective to provide the second layer with a greater specific gravity than the first layer.

4. The system of claim 1, wherein a volume of the first layer is at least twice that of a volume of the second layer.

5. The system of claim 1, further comprising:

a draft tube located within the vessel and positioned within the first layer of filter media and the second layer of filter media;

a gas inlet in communication with the draft tube;

a source of gas in communication with the gas inlet;

a backwash fluid inlet fluidly connected to a source of backwash fluid and at least one of the first layer of filter media and the second layer of filter media; and

a contaminant outlet fluidly connected to the vessel.

6. A process for treating a feed stream comprising hydrocarbons and an aqueous-based liquid, the process comprising:

introducing the feed stream to a vessel containing a first layer of filter media disposed on a second layer of filter media in a direction of flow of the feed stream, wherein at least the first layer comprises a plurality of composite media pellets defining gaps therebetween, each of the composite media pellets comprising a mixture of cellulose-based material and a polymer, and wherein the filter media of the second layer comprises a smaller particle size and greater specific gravity relative to the filter media of the first layer; and

contacting the feed stream with the first layer of filter media and subsequently the second layer of filter media to load an amount of the hydrocarbons from the feed stream on the first layer and the second layer of filter media and to produce a treated stream having a concentration of hydrocarbons less than a concentration of hydrocarbons in the feed stream,

wherein the second layer of filter media comprises walnut shells.

7. The process of claim 6, wherein the second layer also comprises a plurality of composite media particles, each of the composite media particles comprising a mixture of cellulose-based material and a polymer, and wherein the second layer further comprises an additive effective to provide the second layer with a greater specific gravity than the first layer.

8. The process of claim 6, wherein the feed stream further comprises suspended solids, and wherein contacting the feed stream with the first layer of filter media and the second layer of filter media produces a treated stream having a concentration of suspended solids less than a concentration of suspended solids in the feed stream.

9. The process of claim 6, further comprising:

passing a gas through a draft tube in a direction counter a flow of the feed stream, the draft tube located within the vessel and positioned within the first layer of filter media and the second layer of filter media and forming a peripheral zone positioned between a sidewall of the draft tube and a sidewall of the vessel;

passing a backwash fluid through the first and second layers of filter media and the peripheral zone in a direction counter the flow of the feed stream; and

removing at least a portion of the hydrocarbons from the vessel.