CLAIMS

What is claimed is:

1. A method of filtering a liquid feed, comprising:

a) passing a liquid feed in a single pass mode through a single pass tangential flow filtration (SPTFF) system that comprises:

a plurality of stacked filtration modules that are fluidly connected, each filtration module comprising:

a single manifold segment comprising a first manifold for receiving and carrying the feed into the filtration module, a second manifold for receiving and carrying retentate out of the filtration module, and a third manifold for receiving and carrying permeate through the filtration module; and

a plurality of TFF cassettes that are stacked on one or both faces of, and are fluidly connected to, the manifold segment, wherein each manifold segment is stacked with the adjoining manifold segment and the manifolds in any adjoining manifold segment in adjacent filtration modules are coupled to create a centralized serial flow path through the system for feed and retentate;

a feed inlet on the first filtration module in the system; and

a retentate outlet on the last filtration module in the system,

wherein at least one filtration module further comprises valves on flow channels between the TFF cassettes, wherein the cassettes are processed in parallel when the valves are open, or in series when the valves are closed;

the SPTFF system having a liquid flow path that is parallel through the cassettes in each filtration module and serial through each manifold segment in adjacent filtration modules by coupling the first manifold in each manifold segment to the second manifold of an adjacent manifold segment, such that the retentate of one module serves as the feed for the manifold segment of the next filtration module, except that the first manifold in the manifold segment of the first filtration module in the system is connected to the feed inlet and the second manifold in the manifold segment of the last filtration module in the system is connected to the retentate outlet; and

b) recovering the retentate and permeate from the system in separate containers without recirculation through the SPTFF system, thereby filtering the liquid feed.

2. The method of claim 1, wherein the first and second manifolds in the manifold segment contain a seal or a valve.

3. The method of claim 1, wherein each filtration module contains one or more TFF cassettes on one or both faces of the manifold segment.

4. The method of claim 1, wherein the filtration area for each filtration module is about 20 m^2 or less.

5. The method of claim 1, further comprising a diafiltration step, wherein the diafiltration step includes concentration and dilution steps.

6. The method of claim 1, wherein the SPTFF system further comprises a diafiltration solution reservoir for diafiltration solution and a conduit for delivering diafiltration solution to a feed reservoir.

7. The method of claim 1, wherein the SPTFF system further comprises one or more of: a sampling port, a T-line for in-line buffer addition, a pressure sensor, and a diaphragm for a pressure sensor.

8. The method of claim 1, wherein the SPTFF system lacks diverter plates.

9. The method of claim 1, wherein the last filtration module in the SPTFF system includes at least two TFF cassettes having a diverter plate between adjacent TFF cassettes to create a liquid flow path that is sent through the at least two TFF cassettes.

10. The method of claim 4, wherein the filtration area for each filtration module is selected from about 10 m^2, about 1.0 m^2 or about 0.1 m^2.

11. The method of claim 1, wherein SPTFF system includes a diafiltrate pump having multiple pump heads, each containing diafiltrate solution addition and permeate removal flow lines.

12. The method of claim 1, wherein the filtration modules can have the same or different filtration areas from each other.

13. The method of claim 1, wherein the manifolds in the single manifold segment have the same diameter throughout the filtration system or the manifolds in the single manifold segment have progressively smaller diameters from single manifold segment to single manifold segment.