

CLAIMS

1. A cross-flow membrane filtration channel used in filtration of a liquid feed, the channel comprising:

5 an inlet and an outlet, wherein a centreline of the channel is defined from the inlet to the outlet;

 the liquid feed in the channel, the liquid feed comprising particulate foulants, wherein a direction of flow of the liquid feed in the channel is defined along the centreline from the inlet to the outlet of the channel; and

10 at least one liquid-permeable membrane configured for filtration of the particulate foulants in the liquid feed based on size of the particulate foulants and for filtered liquid permeate to pass through the at least one liquid-permeable membrane, the channel being defined by the at least one liquid-permeable membrane,

 wherein at least one surface of the channel is inclined at an angle away from the
15 centreline of the channel in the direction of liquid feed flow in the channel, such that the particulate foulants in the liquid feed embark on trajectories away from the at least one liquid-permeable membrane to thereby reduce fouling of the at least one liquid-permeable membrane.

- 20 2. The cross-flow membrane filtration channel of claim 1, wherein the at least one surface comprises the at least one liquid-permeable membrane.

3. The cross-flow membrane filtration channel of claim 2, wherein the at least one liquid-permeable membrane is one of: a flat sheet membrane, a tubular membrane, or a
25 hollow fibre membrane.

4. The cross-flow membrane filtration channel of claim 2, wherein the channel comprises two liquid-permeable membranes, the channel being defined by the two liquid-permeable membranes that form two surfaces, and both surfaces are inclined away
30 from the centreline of the channel in the direction of liquid feed flow in the channel.

5. The cross-flow membrane filtration channel of claim 1, wherein the at least one surface comprises a non-permeable wall of the channel.

6. The cross-flow membrane filtration channel of claim 1, wherein the channel comprises a spacer insert at a downstream end of the channel to effect inclination of the at least one surface of the channel.

5 7. The cross-flow membrane filtration channel of claim 1, wherein the liquid feed in the channel comprises an oily liquid feed.

8. A filtration module used in filtration of a liquid feed, the module comprising a plurality of cross-flow membrane filtration channels comprising:

10 the liquid feed in the channels, the liquid feed comprising particulate foulants; and each of the channels in the plurality of cross-flow membrane filtration channels comprises a channel selected from at least one of:

A) a cross-flow membrane filtration channel comprising:

15 an inlet and an outlet, wherein a centreline of the channel is defined from the inlet to the outlet, wherein a direction of flow of the liquid feed in the channel is defined along the centreline from the inlet to the outlet of the channel; and

20 at least one liquid-permeable membrane configured for filtration of the particulate foulants in the liquid feed based on size of the particulate foulants and for filtered liquid permeate to pass through the at least one liquid-permeable membrane, the channel being defined by the at least one liquid-permeable membrane,

wherein at least one surface of the channel is inclined at an angle away from a centreline of the channel in a direction of liquid feed flow in the channel, and

25 wherein the at least one surface comprises the at least one liquid-permeable membrane;

B) a cross-flow membrane filtration channel comprising:

an inlet and an outlet, wherein a centreline of the channel is defined from the inlet to the outlet, wherein a direction of flow of the liquid feed in the channel is defined along the centreline from the inlet to the outlet of the channel; and

30 at least one liquid-permeable membrane configured for filtration of the particulate foulants in the liquid feed based on size of the particulate foulants and for filtered liquid permeate to pass through the at least one liquid-permeable membrane, the channel being defined by the at least one liquid-permeable

membrane,

wherein at least one surface of the channel is inclined at an angle away from the centreline of the channel in the direction of liquid feed flow in the channel,

wherein the at least one surface comprises the at least one liquid-permeable membrane, and

wherein the at least one liquid-permeable membrane is one of: a flat sheet membrane, a tubular membrane, or a hollow fibre membrane;

C) a cross-flow membrane filtration channel comprising:

an inlet and an outlet, wherein a centreline of the channel is defined from the inlet to the outlet, wherein a direction of flow of the liquid feed in the channel is defined along the centreline from the inlet to the outlet of the channel; and

at least one liquid-permeable membrane configured for filtration of the particulate foulants in the liquid feed based on size of the particulate foulants and for filtered liquid permeate to pass through the at least one liquid-permeable membrane, the channel being defined by the at least one liquid-permeable membrane,

wherein at least one surface of the channel is inclined at an angle away from the centreline of the channel in the direction of liquid feed flow in the channel,

wherein the at least one surface comprises the at least one liquid-permeable membrane, and

wherein the channel comprises two liquid-permeable membranes forming two surfaces and both surfaces are inclined away from the centreline of the channel in the direction of liquid feed flow in the channel; or

D) a cross-flow membrane filtration channel comprising:

an inlet and an outlet, wherein a centreline of the channel is defined from the inlet to the outlet, wherein a direction of flow of the liquid feed in the channel is defined along the centreline from the inlet to the outlet of the channel; and

at least one liquid-permeable membrane configured for filtration of the particulate foulants in the liquid feed based on size of the particulate foulants and for filtered liquid permeate to pass through the at least one liquid-permeable membrane, the channel being defined by the at least one liquid-permeable membrane,

wherein at least one surface of the channel is inclined at an angle away from

the centreline of the channel in the direction of liquid feed flow in the channel, and
wherein the at least one surface comprises a non-permeable wall of the
channel, and

wherein the particulate foulants in the liquid feed in each of the channels embark on
5 trajectories away from the respective at least one liquid-permeable membrane to thereby
reduce fouling of the respective at least one liquid-permeable membrane.

9. The filtration module of claim 8, wherein each of the channels in the plurality of cross-
flow membrane filtration channels comprises the channel of C), and wherein each
10 channel in the plurality of cross-flow membrane filtration channels is oriented with its
liquid feed flow direction opposite to a liquid feed flow direction of an adjacent
channel in the plurality of cross-flow membrane filtration channels.

10. The filtration module of claim 8, wherein the liquid feed in the plurality of cross-flow
15 membrane filtration channels comprises an oily liquid feed.

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