

What is claimed is:

1. A downhole fluid flow control system comprising:  
a flow control component having direction dependent flow resistance such that  
production fluid flow traveling through the flow control component in a first direction  
5 experiences a first pressure drop and injection fluid flow traveling through the flow control  
component in a second direction experiences a second pressure drop, the first pressure drop  
being different from the second pressure drop.

2. The flow control system as recited in claim 1 wherein the flow control  
10 component further comprises an outer flow control element, an inner flow control element  
and a nozzle element.

3. The flow control system as recited in claim 1 wherein the flow control  
component further comprises a vortex chamber.  
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4. The flow control system as recited in claim 3 wherein production fluid flow  
entering the vortex chamber travels primarily in a tangential direction.

5. The flow control system as recited in claim 3 wherein injection fluid flow  
20 entering the vortex chamber travels primarily in a radial direction.

6. The flow control system as recited in claim 1 wherein the first pressure drop is  
greater than the second pressure drop.

7. A flow control screen comprising:

a base pipe with an internal passageway, a blank pipe section and a perforated section;

a filter medium positioned around the blank pipe section of the base pipe;

5 a housing positioned around the base pipe defining a fluid flow path between the filter medium and the internal passageway; and

at least one flow control component disposed within the fluid flow path,

wherein the at least one flow control component has direction dependent flow resistance such that production fluid flow in the fluid flow path traveling from the filter medium to the internal passageway experiences a first pressure drop and injection fluid flow  
10 in the fluid flow path traveling from the internal passageway to the filter medium experiences a second pressure drop; and

wherein the first pressure drop is different from the second pressure drop.

8. The flow control screen as recited in claim 7 wherein the at least one flow  
15 control component further comprises a plurality of flow control components disposed within the fluid flow path.

9. The flow control screen as recited in claim 8 wherein the flow control  
20 components are circumferentially distributed about the base pipe.

10. The flow control screen as recited in claim 7 wherein the at least one flow  
control component further comprises an outer flow control element, an inner flow control  
element and a nozzle element.

25 11. The flow control screen as recited in claim 7 wherein the at least one flow control component further comprises a vortex chamber.

12. The flow control screen as recited in claim 11 wherein production fluid flow  
entering the vortex chamber travels primarily in a tangential direction.

30 13. The flow control screen as recited in claim 11 wherein injection fluid flow entering the vortex chamber travels primarily in a radial direction.

14. The flow control screen as recited in claim 7 wherein the first pressure drop is greater than the second pressure drop.

5 15. A flow control screen comprising:  
a base pipe with an internal passageway, a blank pipe section and a perforated section;  
a filter medium positioned around the blank pipe section of the base pipe;  
a housing positioned around the base pipe defining a fluid flow path between the filter medium and the internal passageway; and

10 a flow control section positioned around the perforated section of the base pipe, the flow control section including a plurality of flow control components having direction dependent flow resistance such that production fluid flow traveling from the filter medium to the internal passageway experiences a first pressure drop and injection fluid flow traveling from the internal passageway to the filter medium experiences a second pressure drop, the first pressure drop being different from the second pressure drop.

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16. The flow control screen as recited in claim 15 wherein the flow control components are circumferentially distributed about the base pipe.

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17. The flow control screen as recited in claim 15 wherein each of the flow control components further comprise an outer flow control element, an inner flow control element and a nozzle element.

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18. The flow control screen as recited in claim 15 wherein each of the flow control components further comprises a vortex chamber.

19. The flow control screen as recited in claim 18 wherein production fluid flow entering the vortex chambers travel primarily in a tangential direction.

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20. The flow control screen as recited in claim 18 wherein injection fluid flow entering the vortex chambers travel primarily in a radial direction.

21. A downhole fluid flow control method comprising:

positioning a fluid flow control system having a flow control component with direction dependent flow resistance at a target location downhole;

5 pumping a treatment fluid from the surface into a formation through the flow control component in a first direction such that the treatment fluid experiences a first pressure drop; and

producing a formation fluid to the surface through the flow control component in a second direction such that the formation fluid experiences a second pressure drop,

wherein the first pressure drop is different from the second pressure drop.

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22. The method as recited in claim 21 wherein positioning a fluid flow control system having a flow control component with direction dependent flow resistance at a target location downhole further comprises positioning the fluid flow control system having a flow control component with a vortex chamber at the target location downhole.

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23. The method as recited in claim 22 wherein pumping a treatment fluid from the surface into a formation through the flow control component in a first direction such that the treatment fluid experiences a first pressure drop further comprises pumping the treatment fluid into the vortex chamber such that the treatment fluid entering the vortex chamber travels primarily in a radial direction.

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24. The method as recited in claim 22 wherein producing a formation fluid to the surface through the flow control component in a second direction such that the formation fluid experiences a second pressure drop further comprises producing the formation fluid into the vortex chamber such that the formation fluid entering the vortex chamber travels primarily in a tangential direction.

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## CLAIMS

1. A flow control screen comprising:  
a base pipe with an internal passageway, a blank pipe section and a perforated section;  
a filter medium positioned around the blank pipe section of the base pipe; a housing positioned around the base pipe defining a fluid flow path between the filter medium and the internal passageway; and  
at least one flow control component disposed within the fluid flow path,  
wherein the at least one flow control component has direction dependent flow resistance such that production fluid flow in the fluid flow path traveling from the filter medium to the internal passageway experiences a first pressure drop and injection fluid flow in the fluid flow path traveling from the internal passageway to the filter medium experiences a second pressure drop; and  
wherein the first pressure drop is different from the second pressure drop.
2. The flow control screen as recited in claim 1 wherein the at least one flow control component further comprises a plurality of flow control components disposed within the fluid flow path.
3. The flow control screen as recited in claim 2 wherein the flow control components are circumferentially distributed about the base pipe.
4. The flow control screen as recited in claim 1 wherein the at least one flow control component further comprises an outer flow control element, an inner flow control element and a nozzle element.
5. The flow control screen as recited in claim 1 wherein the at least one flow control component further comprises a vortex chamber.
6. The flow control screen as recited in claim 5 wherein production fluid flow entering the vortex chamber travels primarily in a tangential direction.
7. The flow control screen as recited in claim 5 wherein injection fluid flow entering the vortex chamber travels primarily in a radial direction.

8. The flow control screen as recited in claim 1 wherein the first pressure drop is greater than the second pressure drop.

9. A flow control screen comprising:  
a base pipe with an internal passageway, a blank pipe section and a perforated section;  
a filter medium positioned around the blank pipe section of the base pipe;  
a housing positioned around the base pipe defining a fluid flow path between the filter medium and the internal passageway; and  
a flow control section positioned around the perforated section of the base pipe, the flow control section including a plurality of flow control components having direction dependent flow resistance such that production fluid flow traveling from the filter medium to the internal passageway experiences a first pressure drop and injection fluid flow traveling from the internal passageway to the filter medium experiences a second pressure drop, the first pressure drop being different from the second pressure drop.

10. The flow control screen as recited in claim 9 wherein the flow control components are circumferentially distributed about the base pipe.

11. The flow control screen as recited in claim 9 wherein each of the flow control components further comprise an outer flow control element, an inner flow control element and a nozzle element.

12. The flow control screen as recited in claim 9 wherein each of the flow control components further comprises a vortex chamber.

13. The flow control screen as recited in claim 12 wherein production fluid flow entering the vortex chambers travel primarily in a tangential direction.

14. The flow control screen as recited in claim 12 wherein injection fluid flow entering the vortex chambers travel primarily in a radial direction.

15. A downhole fluid flow control method comprising:  
positioning a fluid flow control system having a flow control component with direction dependent flow resistance at a target location downhole;  
pumping a treatment fluid from the surface into a formation through the flow control component in a first direction such that the treatment fluid experiences a first pressure drop;  
and  
producing a formation fluid to the surface through the flow control component in a second direction such that the formation fluid experiences a second pressure drop,  
wherein the first pressure drop is different from the second pressure drop.

16. The method as recited in claim 15 wherein positioning a fluid flow control system having a flow control component with direction dependent flow resistance at a target location downhole further comprises positioning the fluid flow control system having a flow control component with a vortex chamber at the target location downhole.

17. The method as recited in claim 16 wherein pumping a treatment fluid from the surface into a formation through the flow control component in a first direction such that the treatment fluid experiences a first pressure drop further comprises pumping the treatment fluid into the vortex chamber such that the treatment fluid entering the vortex chamber travels primarily in a radial direction.

18. The method as recited in claim 16 wherein producing a formation fluid to the surface through the flow control component in a second direction such that the formation fluid experiences a second pressure drop further comprises producing the formation fluid into the vortex chamber such that the formation fluid entering the vortex chamber travels primarily in a tangential direction.