## CLAIMS

1. A centrifugal compression system, comprising:
an inlet configured to receive a fluid stream from a well head or separator;
an outlet; and
a liquid injection port configured to introduce a liquid into the fluid stream and create a multiphase fluid;
a fluid treatment device, the fluid treatment device being a slug suppressor, an atomizing device, or a combination thereof;
a centrifugal compressor configured to compress the multiphase fluid;
a feedback loop including a controller to control the liquid introduced into the liquid injection port such that when a discharge parameter corresponding to a pressure ratio of the centrifugal compressor exceeds a first predetermined point, the controller increases the pressure ratio by increasing the quantity of liquid introduced into the compression system corresponding to an increase of the pressure ratio above and/or on a left side of a surge line without causing surge or pulsate backflow through the centrifugal compressor; and
a recycle line to recycle a portion of the compressed multiphase fluid to the centrifugal compressor.

2. The centrifugal compression system of claim 1, wherein the centrifugal compressor is a multistage compressor.

3. The centrifugal compression system of claim 2, wherein the liquid injection port is also coupled to an interstage passage of the centrifugal compressor.

4. The centrifugal compression system of claim 3, further comprising a plurality of liquid injection ports, wherein at least one liquid injection port is also coupled to a separate interstage passage of the centrifugal compressor.

5. The centrifugal compression system of claim 3, further comprising a plurality of liquid injection ports, wherein at least one liquid injection port is configured to pass a different liquid than is passed by another liquid injection port.

6. The centrifugal compression system of claim 3, further comprising a plurality of liquid injection ports, wherein the quantity of liquid injected to each liquid injection port is individually controlled.

7. A method of operating a centrifugal compression system, comprising:
passing a fluid stream to an inlet of a centrifugal compressor inlet;
in a liquid injection port, injecting a quantity of liquid into the fluid stream to create a multiphase fluid;

passing the multiphase fluid through a fluid treatment device, wherein the fluid treatment device is a slug suppressor, an atomizing device, or a combination thereof;
compressing the multiphase stream in a centrifugal compressor;
using a feedback loop including a controller, controlling the quantity of liquid introduced into the liquid injection port such that when a measured discharge parameter corresponding to a pressure ratio of the centrifugal compressor exceeds a first predetermined point, the controller increases the pressure ratio by increasing the quantity of liquid introduced into the compression system corresponding to an increase of the pressure ratio above and/or on a left side of a surge line without causing surge or pulsate backflow through the centrifugal compressor; and
recycling a portion of the compressed multiphase fluid to the centrifugal compressor.

8. The method of claim 7, wherein introducing the quantity of liquid comprises atomizing the quantity of liquid.

9. The method of claim 7, wherein introducing the quantity of liquid further comprises injecting liquid into the centrifugal compressor inlet.

10. The method of claim 7, wherein introducing the quantity of liquid further comprises injecting liquid into an interstage passage of the centrifugal compressor.

11. The method of claim 10, wherein introducing the quantity of liquid comprises injecting liquid into a plurality of interstage passages of the centrifugal compressor.

12. The method of claim 10, wherein introducing the quantity of liquid comprises injecting liquid into the centrifugal compressor through a plurality of liquid injection ports.

13. The method of claim 12, wherein at least one liquid injection port is configured to pass a different liquid than is passed by another liquid injection port.

14. The method of claim 12, wherein the quantity of liquid passed by at least one liquid injection port is individually controlled.

15. The centrifugal compression system of claim 1, wherein the liquid injection port is coupled to the inlet.