CLAIMS

1. A system for monitoring purity of fluid, comprising

a duct (2) connecting to a fluid source (1), which includes

a first valve (211) for directing the fluid flowing from the fluid source (1) into the duct (2), or portions thereof, as a sample;

a purity sensor (22) disposed downstream of the first valve (211); and

one or more pressure regulators for controlling pressure within the duct (2), or portions thereof;

wherein the duct (2), or portions thereof, is of an environment with a desired pressure for measuring a purity level of the sample by the purity sensor (212),

wherein the duct (2) further comprises a phase conversion unit (24) located upstream of the purity sensor (22) for converting the sample from a liquid phase into a gaseous phase, and

wherein the or each pressure regulator includes either one, or a combination of

a first pressure regulator (231b) disposed downstream of the phase conversion unit (24), for regulating the pressure of the sample after it passes through the phase conversion unit (24), and

a second pressure regulator (232b) disposed upstream of the purity sensor (22), for regulating the pressure of the sample before it passes through the purity sensor (22), and

wherein the duct (2) further comprises a return structure provided upstream of the first valve (211) and connected upstream of the fluid source (1) that allows fluid that entered the duct (2) to return to the fluid source (1).

2. The system according to claim 1, wherein the desired pressure ranges from 0.9 bar to 5 bar.

3. The system according to claim 1 or claim 2, wherein the duct (2) further comprises a second valve (212) located downstream of the purity sensor (22) for

purging the sample therefrom.

4. The system according to claim 3, further comprising at least one processor (252) that operates a combination of modules that include

a master control module (2521) for at least controlling either one or a combination of the first valve (211), the second valve (212);

a recorder module (2523) for recording the purity level of the sample and storing it in a memory unit (253); and

a comparison module (2524) for comparing the purity level of the sample with a threshold.

5. The system according to claim 4, wherein the processor (252) further operates one or a combination of modules that include

a timing module (2525), for controlling the frequency of monitoring;

a security module (2527), for protecting the system from unauthorized use; and

a user interface module (2528), for compiling purity levels that were recorded through the recorder module (2523) for them to be displayed on a human-machine interface unit (3).

6. The system according to claim 4 or claim 5, further comprising an alert unit (4) that produces either one or both audio and visual stimuli when the purity level of the sample is below the threshold.

7. The system according to any one of the preceding claims, wherein the fluid is either one of liquid carbon dioxide or gaseous carbon dioxide.

8. A method for monitoring purity of fluid, comprising the steps of

directing the fluid from a fluid source (1) into a duct (2) of a system for monitoring the purity of fluid, as a sample; and

measuring a purity level of the sample within the duct (2) by a purity sensor (22);

wherein the duct (2), or portions thereof, is of an environment with a desired pressure for measuring the purity level of the sample by the purity sensor (22), and whereby the duct (2), includes

a first valve (211) for directing the fluid flowing from the fluid source (1) into the duct (2), or portions thereof, to form the sample, the purity sensor (22) being disposed downstream of the first valve (211);

a return structure provided upstream of the first valve (211) and connected upstream of the fluid source (1) that allows fluid that entered the duct (2) to return to the fluid source (1);

one or more pressure regulators for controlling pressure within the duct (2), or portions thereof; and

a phase conversion unit (24) located upstream of the purity sensor (22) for converting the sample from a liquid phase into a gaseous phase, whereby the or each pressure regulator includes either one, or a combination of

a first pressure regulator (231b) disposed downstream of the phase conversion unit (24), for regulating the pressure of the sample after it passes through the phase conversion unit (24), and

a second pressure regulator (232b) disposed upstream of the purity sensor (22), for regulating the pressure of the sample before it passes through the purity sensor (22).

9. The method according to claim 8, further comprising the step of converting the sample within the duct (2) from a liquid phase into a gaseous phase by the phase conversion unit (24) prior to measuring the purity level of the fluid by the purity sensor (22).

10. The method according to claim 9, further comprising either one or both the steps of

regulating the pressure of the sample after it passes through the phase conversion unit (24), by the first pressure regulator (231b); and

regulating the pressure of the sample before it passes through the purity sensor (22) by the second pressure regulator (232b).

11. The method according to any one of claims 8 to 10, wherein the desired pressure ranges from 0.9 bar to 5 bar.

12. The method according to any one of claims 8 to 11, further comprising the step of purging the sample from the duct (2) through a second valve (212) upon measuring the purity level of the fluid.

13. The method according to claim 12, further comprising the steps of

controlling either one or both the first valve (211) and the second valve (212) to open or shut, through a master control module (2521);

recording the purity level of the sample, through a recorder module (2523); and

comparing the purity level of the sample with a threshold, through a comparison module (2524).

14. The method according to claim 13, wherein the step of comparing the purity level of the sample with a threshold further comprises the steps of

determining that the purity level of the sample is below the threshold;

producing either one or both audio and visual stimuli using an alert unit (4); and

preventing further flow of the fluid into the fluid source (1).

15. The method according to claim 13 or claim 14, further comprising the step of compiling the purity levels that were recorded by the recorder module (2523) to be displayed on a human-machine interface unit (3), through a user interface module (2528).