medium is adapted to acquire the gas lift well parameter data form the form sensors in the gas lift well and provides them to the computer program product for executing the gas lift well performance evaluating methods.

According to a first aspect, there is provided a computer implemented method for evaluating the performance of a gas lift well, the method comprising:

injecting a tracer into an annulus formed between a well casing and a production tubing of the gas lift well, the annulus including a lift gas, the gas lift well including one or more points of communication between the annulus and the production tubing, wherein each of the one or more points of communication corresponds to a valve position;

measuring, over a period of time, a concentration of the tracer present in a substance retrieved from the gas lift well;

adjusting the measured concentration of the tracer upon the condition that a pattern present in:

(1) a plot of a baseline tracer concentration comprises substantial instability; or

(2) a plot of a plurality of collected real time key well parameter data comprises substantial instability, wherein each of the key well parameters comprises at least one of: at least one of: (i) a plurality of pressures in the production tubing, each of the plurality of pressures corresponding to one of the plurality of ranges of well depth, (ii) a flow rate of the lift gas in the production tubing, (iii) a temperature in the production tubing, (iv) a parameter that represents a frictional force opposing flow in the production tubing, (v) a parameter that represents an effect of gravity on flow in the production tubing, (vi) a ratio of a gaseous phase to a non-gaseous phase in the substance retrieved from the gas lift well, (vii) a flow rate of one or more gases present in the substance retrieved from the gas lift well, (viii) a flow rate of one of more liquids present in the substance retrieved from the gas lift well, (ix) a well head pressure, and (x) a separator pressure; and generating one or more fractals by graphically representing the adjusted tracer concentration and the collected key well parameter data in a multi-dimensional time dependent plot for diagnosing an abnormal condition in the gas lift well.

According to a second aspect, there is provided a gas lift well surveillance kit for evaluating the performance of a gas lift well according to the first aspect, wherein the gas lift surveillance kit comprises

a separator;

a tracer measurement device;

a device for sensing and measuring pressure and temperature;

a flow regulation device;

a data collection and storage device;

a non-transitory computer-readable medium;

at least one of a power source, a pressure gauge, and tubing for connecting the gas lift well surveillance kit to the gas lift well, and wherein at least one of: the tracer measurement device is a spectrometer, the data collection and storage device is a datalogger, and the device for sensing pressure and temperature is a transducer.

According to a third aspect, there is provided a computer-implemented method for evaluating the performance of a gas lift well, the method comprising:

pre-calibrating a dynamic simulator with one or more key well parameter data; and

performing at least one transient simulation of the gas lift well on the dynamic simulator to obtain a corresponding transient variant of the one or more key well parameters data, wherein the one or more key well parameters is selected from the group consisting of injection rate, casing mechanical layout, injection pressure, injection temperature, lift gas specific gravity, total produced liquid rate, water cut, formation gas rate, tubing head pressure (THP), casing head pressure (CHP), production separator pressure, production manifold pressure, production temperature and tracer concentration.

## BRIEF DESCRIPTION OF DRAWINGS

[0018] FIG. 1 is a schematic depiction of a gas lift well surveillance kit in accordance with one or more embodiments of the invention.

[0019] FIG. 2A is a schematic depiction of a gas lift well surveillance kit in accordance with one or more embodiments of the invention shown connected to a single completion gas lift

well.

[0020] FIG. 2B is a schematic depiction of a gas lift well surveillance kit in accordance with one or more embodiments of the invention shown connected to a dual completion gas lift well.

[0021] FIG. 3 depicts a flowchart illustrating a method for evaluating the performance of a gas lift well in accordance with one or more embodiments of the invention.

[0022] FIG. 4 depicts a flowchart illustrating a method in accordance with one or more embodiments of the invention.

[0023] FIG. 5 depicts a flowchart illustrating a method in accordance with one or more embodiments of the invention.

[0024] FIGS. 6A-6B depict sample graphical representations in accordance with one or more embodiments of the invention.

[0025] FIGS. 7A and 7C depict sample graphical representations of raw data in accordance with one or more embodiments of the invention.