

CLAIMS

WHAT IS CLAIMED IS:

1. A method for monitoring, diagnosing and optimizing operation of a gas lift (GL) system that comprises:
 - collecting measured data representative of a state of a GL system within a well, and further storing the measured data;
 - comparing the measured data to calculated data generated by a model of the well;
 - identifying one or more likely conditions of the GL system based at least in part on mismatches between the measured data and the calculated data;
 - updating the well model to reflect the one or more likely conditions and one or more selected corrections to the one or more likely conditions;
 - generating a plurality of GL system performance curves using the updated well model; and
 - presenting to a user one or more actions recommended to achieve a GL system performance consistent with a GL system operating point on at least one of the plurality of GL system performance curves;
 - accepting a user selection of one of the one or more actions recommended to achieve the GL system performance consistent with the GL system operating point; and
 - initiating a change to one or more GL system settings in response to the accepting of the user selection.
- ~~2. The method of claim 1, further comprising:~~
 - ~~accepting a GL system operating point selection; and~~
 - ~~initiating a change to one or more GL system settings in response to the accepting of the selection.~~
32. The method of claim 1, wherein identifying the one or more likely conditions comprises comparing the measured data to a database of known GL system states.
43. The method of claim 1, wherein the measured data comprises data selected from the group consisting of real-time data, recorded data and simulated data.
54. The method of claim 1, wherein the data representative of the state of the GL system comprises data selected from the group consisting of bottom hole pressure, bottom hole temperature, tube head pressure, tube head temperature, choke size, fluid flow rates, oil

flow rates and water cuts, gas/liquid ratios, injected gas pressure, injected gas temperature, injected gas flow rate and one or more mandrel valve settings.

65. The method of claim 1, further comprising:

generating an advisory message if a value of the measured data is detected outside of an allowable range of values and sending out a corresponding notification to one or more contacts of a distribution list;

creating a task tracking ticket corresponding to the advisory message;

updating the task tracking ticket to include the action recommended and personnel assigned to implement the solution;

updating the task tracking ticket to document implementation of the solution and closing the task tracking ticket; and

generating an additional advisory message and sending out an additional corresponding notification to the one or more contacts each time the task tracking ticket is updated.

76. The method of claim 65, further comprising presenting to at least one of one or more users the current status of the task tracking ticket.

87. The method of claim 65, further comprising determining if at least one of one or more users may view or update the task tracking ticket based upon an access permission structure.

98. A gas lift (GL) monitoring, diagnosing and optimizing system that comprises:

a memory having GL system monitoring, diagnosing and optimizing software; and

one or more processors coupled to the memory, the software causing the one or more processors to:

collect measured data representative of a state of a GL system within a well, and further store the measured data;

compare the measured data to calculated data generated by a model of the well;

identify one or more likely conditions of the GL system based at least in part on mismatches between the measured data and the calculated data;

update the well model to reflect the one or more likely conditions and one or more selected corrections to the one or more likely conditions;

generate a plurality of GL system performance curves using the updated well model; and

present to a user one or more actions recommended to achieve a GL system performance consistent with a GL system operating point on at least one of the plurality of GL system performance curves;

accept a user selection of one of the one or more actions recommended to achieve the GL system performance consistent with the GL system operating point; and initiating a change to one or more GL system settings in response to the accepting of the user selection.

~~10. The system of claim 9, wherein the software further causes the one or more processors to:~~

~~accept a GL system operating point selection; and~~

~~initiate a change to one or more GL system settings in response to the acceptance of the selection.~~

~~119.~~ The system of claim 98, wherein the software further implements a rule-based expert system that identifies the one or more likely conditions at least in part by comparing the measured data to a database of known GL system states.

~~1210.~~ The system of claim 98, wherein the measured data comprises data selected from the group consisting of real-time data, recorded data and simulated data.

~~1311.~~ The system of claim 98, wherein the data representative of the state of the GL system comprises data selected from the group consisting of bottom hole pressure, bottom hole temperature, tube head pressure, tube head temperature, choke size, fluid flow rates, oil flow rates and water cuts, gas/liquid ratios, injected gas pressure, injected gas temperature, injected gas flow rate and one or more mandrel valve settings.

~~1412.~~ The system of claim 98, wherein the software further causing the one or more processors to:

generate an advisory message if a value of the measured data is detected outside of an allowable range of values and send out a corresponding notification to one or more contacts of a distribution list;

create a task tracking ticket corresponding to the advisory message;

update the task tracking ticket to include the action recommended and personnel assigned to implement the solution;

update the task tracking ticket to document implementation of the solution and close the task tracking ticket; and

generate an additional advisory message and send out an additional corresponding notification to the one or more contacts each time the task tracking ticket is updated.

~~15~~13. A non-transitory information storage medium having gas lift (GL) system monitoring, diagnosing and optimizing software that comprises:

- a data collection and storage module that collects measured data representative of a state of a GL system within a well, and further stores the measured data;
- a comparison module that compares the measured data to calculated data generated by a model of the well;
- a condition identifier module that identifies one or more likely conditions of the GL system based at least in part on mismatches between the measured data and the calculated data;
- a model update module that updates the well model to reflect the one or more likely conditions and one or more selected corrections to the one or more likely conditions;
- a performance curve module that generates a plurality of GL system performance curves using the updated well model; and
- a recommended action module that presents to a user one or more actions recommended to achieve a GL system performance consistent with a GL system operating point on at least one of the plurality of GL system performance curves, accept a user selection of one of the one or more actions recommended to achieve the GL system performance consistent with the GL system operating point, and initiate a change to one or more GL system settings in response to accepting of the user selection.

~~16. The storage medium of claim 15, wherein the recommended action module further accepts a GL system operating point selection and initiates a change to one or more GL system settings in response to the selection.~~

~~17~~14. The storage medium of claim ~~15~~13, wherein the condition identifier module comprises rule-based expert system software that identifies the one or more likely conditions at least in part by comparing the measured data to a database of known GL system states.

~~18~~15. The storage medium of claim ~~15~~13, wherein the measured data comprises data selected from the group consisting of real-time data, recorded data and simulated data.

~~19~~16. The storage medium of claim ~~15~~13, wherein the data representative of the state of the GL system comprises data selected from the group consisting of bottom hole pressure, bottom hole temperature, tube head pressure, tube head temperature, choke size, fluid flow rates, oil flow rates and water cuts, gas/liquid ratios, injected gas pressure, injected gas temperature, injected gas flow rate and one or more mandrel valve settings.

~~20~~17. The storage medium of claim ~~15~~13, wherein the software further comprises a task ticket module that:

- generates an advisory message if a value of the measured data is detected outside of an allowable range of values and sends out a corresponding notification to one or more contacts of a distribution list;

- creates a task tracking ticket corresponding to the advisory message;

- updates the task tracking ticket to include the action recommended and personnel assigned to implement the solution;

- updates the task tracking ticket to document implementation of the solution and closes the task tracking ticket; and

- generates an additional advisory message and sends out an additional corresponding notification to the one or more contacts each time the task tracking ticket is updated.