

AN APPARATUS ADAPTABLY USABLE IN A SYSTEM AND A CONFIGURATION METHOD ASSOCIATED THEREWITH

5 Field Of Invention

The present disclosure generally relates to an apparatus which can correspond to a universal controller which can be adaptably/flexibly configured for a plurality of operations in a system.

10 Background

The following discussion of the background to the invention is intended to facilitate an understanding of the present invention. However, it should be appreciated that the discussion is not an acknowledgment or admission that any of the material
15 referred to was published, known or part of the common general knowledge in any jurisdiction as at the priority date of the application.

In an industry which is relatively diverse, there are usually various areas which may require at least some form of monitoring and/or control.

20

Conventionally, a dedicated monitoring instrument/controller would be assigned to one area. Appreciably, there will be a need to provide multiple monitoring instruments and/or controllers to adequately cater to the operational requirements of a diverse industry.

25

Moreover, within each of the aforementioned areas, there could be multiple sub-areas which could also require a dedicated monitoring instrument and/or controller.

30

Furthermore, given multiple monitoring instruments and/or controllers, operations (e.g., checking the monitoring instruments and/or setting controls) would need to be carried out in a rather labor intensive manner. For example, an operator would need to move from place to place simply to check the monitoring instruments.

As such, it can be appreciated that operational requirements are not met in an efficient, user friendly and cost efficient manner.

5 The present disclosure contemplates that there is therefore a need for a solution which addresses, at least in part, one or more of the forgoing problems.

Summary of the Invention

In accordance with an aspect of the disclosure, an apparatus is provided. Preferably, the apparatus can be suitable to be adaptably/flexibly used in a system.

10 The system can be associated with a plurality of operations such as

- 1) tank storage,
- 2) fluid (e.g., fuel) loading and/or unloading
- 3) preventive maintenance control for applications such as long routine sensors (for example tube skin thermocouple inside a furnace heater or multipoint in

15 a reactor).

Preferably, each of the plurality of operations can be associated with at least one device which is capable of being coupled to the apparatus.

20 The apparatus can include at least one user interface module and a processor module, according to an embodiment of the disclosure. The apparatus can, as an option, further include one or both of a connection module and a communication module, according to another embodiment of the disclosure.

25 The processor module can be coupled to the user interface module. Moreover, the connection module can be coupled to the processor module and the communication module is coupled to the processor module.

The apparatus can be configured to one or both of receive at least one input signal and generate at least one input signal. The input signal(s) can be communicated to

30 the processor module for processing to generate at least one processor signal.

Preferably, the apparatus can be adaptably/flexibly used in the system in a manner such that the apparatus is configurable as any one of a slave device, a master device and a power supply device, or any combination thereof, relative to the device(s) associated with the plurality of operations.

5

In one embodiment, when the apparatus is configured as a slave device, the apparatus can be configured to receive at least one input signal corresponding to at least one command signal to generate at least one processor signal. The command signal(s) can, for example, be received by the apparatus via one or both of the connection module and the communication module. Additionally, the processor signal(s) generated based on the command signal(s) can be communicated from the apparatus (e.g., to a device coupled to the apparatus) via one or both of the connection module and the communication module.

15 In another embodiment, when the apparatus is configured as a master device, the user interface module can be configured to generate at least one input signal to generate at least one processor signal corresponding to at least one control signal. The control signal can be communicated to the device(s) coupled to the apparatus. Preferably, the control signal(s) can be communicated via one or both of the connection module and the communication module. Preferably, based on the control signal(s), at least one feedback signal can be communicated from the device(s) to the apparatus. The feedback signal(s) can, for example, correspond to one or both of a graphical based presentation and a textual based presentation. Further preferably, one or more operations of the device(s) can be controlled based on the control signal(s) communicated from the apparatus.

20 In yet another embodiment, when the apparatus is configured as a power supply device, the apparatus can be configured to supply power to the device(s) connected to the apparatus. In this regard, the apparatus can, as an option, further include one or both of a power module and an auxiliary supply module.

The power module can be coupled to the connection module. The auxiliary supply module can be coupled to one or both of the power module and the connection

module. Preferably, the auxiliary supply module is capable of being charged via one or both of the power module and the connection module. Preferably, the apparatus can be configured to supply power to the device(s) connected to the apparatus via the auxiliary supply module.

5

In accordance with another aspect of the disclosure, a configuration method associated with the apparatus is provided.

The configuration method can include a master configuration step, a slave
10 configuration step and a supply configuration step.

Brief Description of the Drawings

Embodiments of the disclosure are described hereinafter with reference to the following drawings, in which:

15

Fig. 1 shows a field operation system which can include an apparatus, a source part and an operation part, according to an embodiment of the disclosure;

Fig. 2a and Fig. 2b show the apparatus of Fig. 1 in further detail wherein the
20 apparatus can include a connection module, according to an embodiment of the disclosure;

Fig. 3a and Fig. 3b show an exemplary arrangement in relation to the connection module of Fig. 2, according to an embodiment of the disclosure;

25

Fig. 4a to Fig. 4c show various exemplary operational scenarios associated with the operation part of Fig. 1, according to an embodiment of the disclosure; and

Fig. 5 shows a configuration method in association with the field operation system of
30 Fig. 1, according to an embodiment of the disclosure.

Detailed Description

The present disclosure contemplates that within an industry which is relatively diverse, there are various areas (e.g., processes, control and/or maintenance) which may require at least some form of monitoring and/or control. One such industry is the oil and gas industry. In the oil and gas industry, tank storage, fuel loading and/or preventive maintenance (e.g., for long routine sensors such as tube skin thermocouple inside a furnace heater or multipoint in a reactor) are examples of the aforementioned areas.

As discussed earlier, a dedicated instrument is conventionally allocated for each of the aforementioned areas. In this regard, the present disclosure contemplates a need for an apparatus which is versatile. Specifically, the apparatus can be capable of being, or corresponding to, a universal instrument platform which can cater to one or more operational requirements associated with the aforementioned areas.

More specifically, the apparatus can be configured so as to be suitable for use in multiple areas associated with, for example, the oil and gas industry.

Yet more specifically, the apparatus can be configured to carry one or more applications (e.g., software based application(s)) which can be suited for monitoring and/or control based operation(s) in relation to, for example, tank storage, fuel loading and/or preventive maintenance.

Appreciably, with a universal instrument platform, a good field-instruments based operation can be facilitated. Specifically, flexibility and interchangeability can be facilitated since such an apparatus can be flexibly/interchangeably (i.e., versatile) used/applied without the need for extensive reconfiguration (i.e., hardware and/or software based reconfiguration) during the process/processes of monitoring and/or control in relation to various areas (tank storage, fuel loading and/or preventive maintenance) in an industry (e.g., oil and gas industry).

The foregoing will be discussed in further detail with reference to Fig. 1 to Fig. 5 hereinafter.

Referring to Fig. 1, a field operation system 100 is shown, in accordance with an embodiment of the disclosure. The field operation system 100 can be associated with an industry such as the oil and gas industry.

5

The field operation system 100 (i.e., referable to as “system 100” hereinafter) can include an apparatus 110, a source part 120 and an operation part 130. The apparatus 110 can be coupled to the source part 120. The apparatus 110 can be further coupled to the operation part 130.

10

Earlier mentioned, the apparatus 110 can correspond to a universal instrument platform and can be configured to carry one or more applications (e.g., software based applications).

15

The source part 120 can correspond to a power source from which the apparatus 110 can draw power. The power source can, for example, be a direct current (DC) based source or an alternating current (AC) based source. Specifically, the source part 120 can correspond to a power source supplying power to the apparatus 110.

20

The operation part 130 can correspond to the earlier mentioned areas associated with an industry. For example, the operation part 130 can correspond to one or more of the following exemplary operations in association with, for example, the oil and gas industry:

1) tank storage

25

2) fluid (e.g., fuel) loading and/or unloading

3) preventive maintenance control for applications such as long routine sensors (e.g., tube skin thermocouple inside a furnace heater or multipoint in a reactor).

30

Generally, the apparatus 110 can be configured to carry one or more applications which suit operation requirement(s) associated with the operation part 130. For example, the apparatus 110 can be flexibly programmed for operation

requirement(s) associated with tank storage, fluid loading, fluid unloading and/or preventive maintenance control.

The apparatus 110 will be discussed in further detail with reference to Fig.2 hereinafter.

Fig. 2a and Fig. 2b show the apparatus 110 in further detail, in accordance with an embodiment of the disclosure. Specifically, Fig. 2a shows an exterior view of the apparatus 110 and Fig. 2b shows an interior view of the apparatus 110, in accordance with an embodiment of the disclosure.

Referring to Fig. 2a, the apparatus 110 can include a casing 212. The casing 212 can, for example, be an EX d II B T6GB/IP65 rated explosion-proof type housing.

The casing 212 can include a face 212a shaped and dimensioned to carry one or more user interface modules 214 such as one or both of a display module 214a and a keypad module 214b. The display module 214a can, for example, be a non-touch screen based display or a touch screen based display. The keypad module 214b can, for example, be an alphanumeric based keypad assembly with push buttons.

Preferably, the user interface modules 214 can be carried by the casing 212 in a manner so as to be accessible to a user. In one example, the display module 214a can be carried at a face 212a of the casing 212 in a manner so as to be visually perceivable by a user. In another example, the keypad module 214b can be carried at a face 212a of the casing 212 in a manner so that a user can press one or more buttons of the keypad module 214b.

Referring to Fig. 2b, the casing 212 can be shaped and dimensioned to carry a processor module 216 and a connection module 218. The casing 212 can, as an option, be further shaped and dimensioned to carry one or both of a power module 220 and a communication module 222. As a further option, the casing 212 can be shaped and dimensioned to carry an auxiliary supply module 224.

Preferably, the processor module 216, the power module 220, the communication module 222 and/or the auxiliary supply module 224 can be carried within the casing 212. In this regard, the processor module 216, the power module 220, the communication module 222 and/or the auxiliary supply module 224 can be considered to be carried by the casing 212 in a manner such that user accessibility is impeded. Additionally, the connection module 218 can preferably be carried in a manner such that a portion of the connection module 218 is carried within the casing and another portion of the connection module 218 is exposed to user view. Appreciably, the portion of the connection module 218 carried within the casing 212 is not readily accessible to a user whereas the portion of the connection module 218 which is exposed to user view can be readily accessible by a user.

The processor module 216 can be coupled to the connection module 218. The processor module 216 can be further coupled to the power module 220. The processor module 216 can yet be further coupled to the communication module 222. The power module 220 can be further coupled to the connection module 218. The communication module 222 can be further coupled to one or both of the connection module 218 and the power module 220. The auxiliary supply module 224 can be coupled to one or both of the connection module 218 and the power module 220. The auxiliary supply module 224 can be further coupled (not shown) to one or more of the interface module(s) 214, the processor module 216 and the communication module 222, or any combination thereof.

Moreover, the processor module 216 can be coupled (not shown) to one or more of the interface modules 214. For example, the processor module 216 can be coupled to one or both of the display module 214a and the keypad module 214b.

The processor module 216 can, for example, correspond to a microprocessor. The connection module 218 can, for example, correspond to an assembly of Input/Output (I/O) ports/connectors. The power module 220 can, for example, correspond to a regulator/convertor (i.e., voltage regulator/convertor) component. The communication module 222 can, for example, correspond to a transceiver. The

auxiliary supply module 224 can, for example, correspond to a power supply storage reservoir component.

Earlier mentioned the apparatus 110 can draw power from the source part 120 (i.e., which can correspond to a power source such as a DC based source or an AC based source).

The source part 120 can be coupled to the connection module 218 such that power can be drawn by the apparatus 110 from the source part 120 via the connection module 218. The power module 220 can be configured to regulate and/or convert supply drawn via the connection module 218. For example, 230VDC/110VAC can be supplied by the source part 120 and the power module 220 can be configured to regulate and/or convert 230VDC/110VAC so that a regulated voltage suitable (e.g., 5VDC, 10VDC and/or 24VDC) for use by various components (e.g., interface module(s) 214, processor module 216 and/or communication module 222) of the apparatus 110 can be generated.

In this regard, various components (e.g., interface module(s) 214, processor module 216 and/or communication module 222) of the apparatus 110 can be powered by one or both of the source part 120 (i.e., if supply from the source part 120 is already suitable for use by various components of the apparatus 110) and the power module 220. Moreover, the auxiliary supply module 224 can be charged by one or both of the source part 120 and the power module 220 so as to store power supply. The stored power supply can, for example, be used as a backup supply (i.e., in the event there is supply disruption at the source part 120 and/or the power module 220). The stored power can further, for example, be used as a supply source which can be provided by the apparatus 110 to one or more other parts (e.g., operation part 130) in the system 100. In this regard, the apparatus 110 can be configured to function as a source supply in a manner analogous to the source part 120.

Generally, one or more of the user interface modules 214 (e.g., a touch-screen based display module 214a and/or the keypad module 214b) can be operated by a user in a manner so as to generate one or more input signals. Furthermore, the

communication module 222 can be configured to receive one or more input signals. Yet furthermore, the connection module 218 can be configured to receive one or more input signals. In this regard, one or more input signals can be generated and/or received via the user interface module(s) 214, the connection module 218
5 and/or the communication module 222.

The input signal(s) can be communicated to the processor module 216 for further processing to generate one or more processor signals. In this regard, it is appreciable that the processor module 216 can be configured to generate processor
10 signal(s) based on the input signal(s) communicated from any one of the user interface module(s) 214, the connection module 218 and the communication module 222, or any combination thereof. Input signal(s) communicated from the interface module(s) 214, the connection module 218 and the communication module 222 can be referred to as first input signal(s), second input signal(s) and third input signal(s)
15 respectively. In this regard, processor signal(s) generated based on the first input signal(s), the second input signal(s) and the third input signal(s) can be referred to as first processor signal(s), second processor signal(s) and third processor signal(s) respectively.

The processor signal(s) can be communicated from the processor module 216 to any one the user interface module(s) 214, the connection module 218 and the communication module 222, or any combination thereof. For example, the processor signal(s) can be communicated to the display module 214a, the connection module 218 and/or the communication module 222.
20

Appreciably, processor signal(s) communicated to the display module 214a can be processed by the display module 214a in a manner so as to produce one or more graphic signals which can be visually perceived by a user. Processor signal(s) can be communicated to the connection module 218 and/or the communication module
25 222 for further communication from the apparatus 110.

Processor signal(s) can be communicated from the apparatus 110 (i.e., via one or both of the connection module 218 and the communication module 222) for the

purpose(s) of, for example, providing one or more control commands. In this regard, processor signal(s) communicated from the apparatus 110 (i.e., via one or both of the connection module 218 and the communication module 222) can, for example, correspond to control signal(s). This will be discussed later in further detail with

reference to Fig. 4.

In this regard, it is appreciable that one or both of the connection module 218 and the communication module 222 can be configured (i.e., one or both of hardware based configuration and software based configuration) to facilitate communication of signals to (i.e., receipt) and/or from (transmit) the apparatus 110. Specifically, the connection module 218 and/or the communication module 222 can, for example, be configured to facilitate receipt of input signal(s) by the apparatus 110. Moreover, the connection module 218 and/or the communication module 222 can, for example, be configured to facilitate transmission of processor signal(s) (e.g., control signal(s)) from the apparatus 110.

Appreciably, the apparatus 110 can be configured as one or both of a master device and a slave device in the system 100. Moreover, as mentioned earlier, the apparatus 110 can be configured as a source supply device (i.e., function as a supply source to other part(s) in the system 100). In this regard, it can be appreciated that the apparatus 110 can be used flexibly and/or interchangeably utilized in the system 100. As such, the apparatus 110 can correspond to a versatile universal instrument platform which can facilitate a good field-instruments based operation in the system 100. These will be discussed later in further detail with reference to Fig. 4.

Fig. 3a and Fig. 3b show an exemplary arrangement in relation to the connection module 218, according to an embodiment of the disclosure. Specifically, an exemplary hardware based configuration for the purpose of facilitating communication of signals to (i.e., receipt) and/or from (transmit) the apparatus 110 is shown in Fig. 3a. Additionally, an exemplary hardware based configuration for the purpose of configuring the apparatus 110 as a source supply device is shown in Fig. 3b.

As shown in Fig. 3a, the connection module 218 can include a plurality of connection ports (i.e., “J1” to “J10”). The plurality of connection ports can, for example, be grouped into a first group (e.g., “J1,” “J2” and “J3”), a second group (e.g., “J4” and “J5”) and a third group (e.g., “J6”). Each group can include one or more connection ports. The first group can relate to power supply, the second group can relate to incoming communication (i.e., receipt of signals by the apparatus 110) and the third group can relate to outgoing communication (i.e., transmission of signals from the apparatus 110). Moreover, a communication (incoming/outgoing) based connection port can, in general, be associated with one or more channels and can be associated with one of analog based communication and digital based communication. Furthermore, a connection port can be one or both of an input type connection port and an output type connection port.

Specifically, in one exemplary configuration:

- J1 = Pulse terminal, up to 2-channel Pulse Input
- J2 = 24VDC Power Supply Terminal, Output Max Current $\leq$ 5A
- J3 = 110/230 VAC Power Supply Terminal
- J4 = Discrete terminal, up to 8-channel Discrete Output
- J5 = Analog Terminal, up to 4-channel Analog Input and 2-channel Analog Output
- J6 = Communication Terminal, up to 1-channel CAN and 2-channel RS-485
- J7 = Discrete Terminal, up to 2 channel Discrete Output of Active/Passive with NO/NC contact
- J8 = Discrete Terminal, up to 2 channel Discrete Output of Active/Passive with NO/NC contact
- J9 = Discrete Terminal, up to 8 channel Discrete Output of 110VAC contact
- J10 = Discrete terminal, up to 4 channel Discrete Output of Active/Passive with NO contact

As shown in Fig. 3b, an exemplary hardware based configuration for the purpose of configuring the apparatus 110 as a source supply device is shown, according to an embodiment of the disclosure.

Specifically, the source part 120 (e.g., supplying 110VAC to the apparatus 110) can be coupled to a connection port (e.g., "J3") in the first group. The connection port "J3" can, in turn, be coupled to the power module 220. The power module 220 can be configured to convert supply (e.g., 110VAC) received from the source part 120 to a regulated supply (e.g., 24VDC). The power module 220 can be coupled to another connection port (e.g., "J2") in the first group. One or more other instruments/equipment 300 associated with the operation part 130 can be coupled to the connection port "J2". In this regard, a regulated supply can be provided to one or more instruments/equipment 300 coupled to the apparatus 110 via the connection port "J2".

Earlier mentioned, the apparatus 110 can be configured as one or both of a master device and a slave device in the system 100. Additionally, the apparatus 110 can be configured as a source supply device (i.e., function as a supply source to other part(s) in the system 100). Furthermore, the apparatus 110 can be configured as a redundant network. These will be discussed in the context of various exemplary operational scenarios associated with the operation part 130 with reference to Fig. 4 hereinafter.

Fig. 4a illustrates a first exemplary operational scenario 400a associated with operation part 130, according to an embodiment of the disclosure. The first exemplary operational scenario 400a can generally relate to an operation such as tank storage. Specifically, the first exemplary operational scenario 400a can relate to monitoring of one or more tanks 402a at a tank site 402. In this regard, the apparatus 110 can correspond to a universal/central monitoring device.

A tank 402a can be shaped and dimensioned to carry, for example, fluid (e.g., petroleum/chemicals) which can be loaded onto delivery trucks for delivery from the tank site 402.

Each tank 402a can include a monitoring unit (not shown) which can include a transceiver. The monitoring unit can be configured to monitor tank status of the tank 402a. Tank status can be associated with, for example, information concerning fluid level within the tank 402a, temperature within the tank 402a, structural integrity of the tank 402a and/or tank insulation. Information associated with the tank status can be communicated as one or more status signals from the transceiver of the monitoring unit to the apparatus 110. Information associated with the tank status can, for example, be obtained via one or more requisite sensor(s) and/or predefined communication protocol.

Status signal(s) can be received by the communication module 222 and further communicated to the processor module 216 for processing to generate/produce processor signal(s). In this regard, the status signal(s) can correspond to one or more feedback signal(s). The feedback signal(s) can correspond to the earlier mentioned input signal(s) which can be communicated from the communication module 222 to the processor module 216 for further processing to generate/produce the processor signal(s).

The processor signal(s) can, for example, be further communicated to the display module 214a which can be further configured to further process the processor signal(s) in a manner so as to provide one or both of a graphical based presentation 404a and a textual based presentation 404b of information associated with tank status.

Appreciably, the tank site 402 may include a plurality of tanks 402a (e.g., up to sixteen tanks 402a or more than sixteen tanks 402a). In this regard, the apparatus 110 can be configured to communicate with the monitoring unit associated with each of the plurality of tanks 402a. Specifically, status signals from the tanks 402a can be communicated to the apparatus 110 for centralized based monitoring. Communication of status signals can be real-time based or time-delay based. More specifically, a user can, for example, use the apparatus 110 to monitor tank statuses of a plurality of tanks 402a without needing to rely on a dedicated monitoring

equipment for each tank 402a. In this regard, the apparatus 110 can facilitate convenient and efficient monitoring of tank statuses (e.g., a user needs only to monitor tank statuses at one location and the need for installing individual equipment such as readers for each tank 402a can be avoided).

5

Moreover, tank statuses for the tanks 402a can effectively be consolidated (i.e., data collation) for data analysis at the apparatus 110. Therefore, one or more data trends can be derived using the apparatus 110. As an option, data collated can be stored in the apparatus 110 for future retrieval if desired. In this regard, the apparatus 110 can further include a storage module (not shown) for storing data. The storage module can, for example, be coupled to the processor module 216.

10

In general, the apparatus 110 can be coupled to the monitoring unit(s). A user (i.e., an operator) can generate input signal(s) via a user interface module 214 to generate processor signal(s) corresponding to control signal(s). The control signal(s) can be communicated via the communication module 222 to the monitoring unit(s). Based on the control signal(s) received, the monitoring unit(s) can be configured to communicate the status signal(s) to the apparatus 110.

15

In this regard, the apparatus 110 can be considered a master device relative to the monitoring unit(s). Conversely, the monitoring unit(s) can be considered slave device(s) relative to the apparatus 110.

20

As an option, the apparatus 110 can be configured to supply power to the monitoring unit(s). Specifically, power can provided to the monitoring unit(s) by the auxiliary supply module 224 via the connection module 218. In this regard, it is appreciable that the apparatus 110 can be configured as a source supply device to the monitoring unit(s).

25

Appreciably, the apparatus 110 can be configured as one or both of a master device and a source supply device.

30

Fig. 4b illustrates a second exemplary operational scenario 400b associated with operation part 130, according to an embodiment of the disclosure. The second exemplary operational scenario 400b can generally relate to an operation such as fluid loading and/or unloading. Specifically, the second exemplary operational scenario 400b can relate to field batch control for the purpose(s) of loading and/or unloading. Specifically, the apparatus 110 can, for example, be operated in standalone mode where a user (e.g., an operator) can, using the apparatus 110, control/monitor batch delivery operations at the aforementioned tank site 402.

A tank 402a in the tank site 402 can include a valve 405. The apparatus 110 can correspond to a field batch controller for, for example, loading and/or unloading of one or more delivery vehicles 406 such as the aforementioned truck(s). The truck(s) 406 can be used for the purpose of loading/unloading, for example, fluid (e.g., petroleum/chemicals) from/to the tank(s) 402a via the valve(s) 405. Specifically, the apparatus 110 can be configured to control the valve(s) 405 of one or more tank(s) 402a to control flow of fluid into/out of the tank(s) 402a.

Using the apparatus 110, an operator can, for example, control loading of fluid from one or more tanks 402a to a truck 406 for transport/delivery from the tank site 402. Control of fluid loading can be based on one or both of preprogramming (i.e., automatic based) and user customized control (i.e., manual based control).

In one example, the apparatus 110 can be configured to store one or more recipes (i.e., blending ratio and/or predefined loading control procedure(s)). Specifically, there can be a plurality of tanks 402a in the tank site 402 and each tank 402a can contain a different fluid. More specifically, one tank 402a can contain a first type of fluid and another tank 402a can contain a second type of fluid. The first type of fluid can be a different fluid from the second type of fluid. Based on a stored recipe, the apparatus 110 can be operated to control, for example the ratio of the first type of fluid and the second type of fluid being loaded to a truck 406. In this regard, a truck 406 can be loaded using the apparatus 110 based on preprogramming.

In another example, the apparatus 110 can be configured for operation by an operator to manually control of ratio of the first type of fluid and the second type of fluid being loaded to a truck 406. Specifically, the apparatus 110 may be preprogrammed with one or more recipes, but a desired ratio may still not be available. In this regard, the present disclosure contemplates that it can be useful to provide an operator with the option of manually adjusting the ratio (i.e., a ratio which is not available based on any of the preprogrammed recipes).

By manner of controlling the loading of fluid from one or more tanks 402a, it is appreciable that precision (e.g., a blend of fluid being loaded based on precise ratio control) during the loading process can be facilitated.

In general, the apparatus 110 can be coupled to the valve(s) 405 (i.e., electronics which can be associated with the valve(s) 405). A user (i.e., an operator) can generate input signal(s) via a user interface module 214 to generate processor signal(s) corresponding to control signal(s). The control signal(s) can, for example, be communicated via the communication module 222 to the valve(s) 405. Based on the control signal(s) received, the valve(s) 405 can be configured to control flow of fluid. Specifically, operation of the valve(s) 405 can be considered to be controlled based on the control signal(s).

In this regard, the apparatus 110 can be considered a master device relative to the valve(s) 405. Conversely, the valve(s) 405 can be considered slave device(s) relative to the apparatus 110.

As an option, the apparatus 110 can be configured to supply power to the valve(s) 405 (i.e., electronics which can be associated with the valve(s) 405). Specifically, power can be provided to the electronic(s) associated with the valve(s) 405 by the auxiliary supply module 224 via the connection module 218. In this regard, it is appreciable that the apparatus 110 can be configured as a source supply device to the valve(s) 405.

Appreciably, the apparatus 110 can be configured as one or both of a master device and a source supply device.

Furthermore, it is appreciable that the apparatus 110 can be configured as a master control for the purpose of fluid loading/unloading. In this regard, it is appreciable that the apparatus 110 can be considered a master device relative to the valve(s) 405

Fig. 4c illustrates a third exemplary operational scenario 400c associated with operation part 130, according to an embodiment of the disclosure. The third exemplary operational scenario 400c can generally relate to preventive maintenance control. In this regard, the apparatus 110 can correspond to a preventive maintenance controller.

As shown, the apparatus 110 can be coupled to a container 408 (e.g., one or more tanks 402a, one or more reactors or one or more heaters) which can carry one or more sensors 410 (e.g., one or more long routine sensors). The sensor(s) 410 can be configured to transmit one or more sensor signals to the apparatus 110. The sensor signal(s) can, for example be received by the apparatus 110 via the communication module 222.

The sensor signal(s) can be indicative of general container characteristics (e.g., mechanical and/or electrical) such as temperature, resistance or insulation (e.g., of conductor wires within the container 408).

Moreover, sensor signal(s) can be received by the communication module 222, and further communicated to the processor module 216 for processing to generate/produce processor signal(s). For example, by receiving the sensor signal(s), the communication module 222 can effectively be considered to be "listening" (i.e., receive) to the sensor signal(s) when the sensor(s) 410 transmit the sensor signal(s). In this regard, the sensor signal(s) can correspond to one or more feedback signals. The feedback signal(s) can correspond to the earlier mentioned input signal(s) which can be communicated from the communication module 222 to

the processor module 216 for further processing to generate/produce the processor signal(s).

The processor signal(s) can, for example, be further communicated to, for example, the display module 214a which can be further configured to further process the processor signal(s) in a manner so as to provide one or both of a graphical based presentation 412a and a textual based presentation 412b of general characteristics associated the container 408. In this regard, the processor signal(s) can, for example, correspond to/can, for example, be used as preventive data.

In general, the apparatus 110 can be coupled to the sensor(s) 410. A user (i.e., an operator) can generate input signal(s) via an interface module 214 to generate processor signal(s) corresponding to control signal(s) (e.g., in analogous manner to user action of entering one or more commands). For example, one or more commands can be entered for the purpose of selecting one or more different user interfaces, making a selection in connection with monitoring different catalyst bed temperature sensors, call for initial configuration data, entering new chronicle of every turnaround and/or ensuring one or more up-to-date preventive reports detailing every human intervention can be generated.

In one embodiment, the control signal(s) can be communicated via the communication module 222 to the sensor(s) 410. Based on the control signal(s) received, the sensor(s) 410 can be configured to communicate the sensor signal(s) to the apparatus 110. In this regard, the apparatus 110 can be considered a master device relative to the sensor(s) 410. Conversely, the sensor(s) 410 can be considered slave device(s) relative to the apparatus 110.

As an option, the apparatus 110 can be configured to supply power to the sensor(s) 410. Specifically, power can provided to the sensor(s) 410 by the auxiliary supply module 224 via the connection module 218. In this regard, it is appreciable that the apparatus 110 can be configured as a source supply device to the sensor(s) 410. Appreciably, the apparatus 110 can be configured as one or both of a master device and a source supply device.

Moreover, information concerning general characteristics associated with one or more containers 408 can effectively be consolidated (i.e., data collation) for data analysis at the apparatus 110. Therefore, one or more data trends can be derived using the apparatus 110.

5

As an option, data collated can be stored in the apparatus 110 for future retrieval if desired. In this regard, the operation part 130 can be associated with a computer (not shown). The apparatus 110 can be coupled (e.g., via the connection module 218 and/or the communication module 222) to the computer for, for example, data
10 retrieval which can be used for future data analysis. Specifically, the computer can be configured to generate and communicate one or more command signals to the apparatus 110 for the purpose of data retrieval (i.e., in the form of one or more data signals being communicated from the apparatus 110 to the computer based on the command signal(s)). The command signal(s) can, for example, be received by the
15 apparatus 110 via one or both of the connection module 218 and the communication module 222.

The command signal(s) can be further communicated to the processor module 216 for processing to generate/produce processor signal(s) (e.g., in association with
20 extracting/retrieving one or more relevant portions the aforementioned collated data). In this regard, the command signal(s) can correspond to the earlier mentioned input signal(s) which can be communicated from the connection module 218 to the processor module 216 for further processing to generate/produce the processor signal(s). Processor signal(s) generated based on the command signal(s) can
25 correspond to the data signal(s). The data signal(s) can be communicated from the apparatus 110 to the computer via the connection module 218.

In this regard, the apparatus 110 can be considered a slave device relative to computer. Conversely, the computer can be considered a master device relative to the apparatus 110. As an option, the apparatus 110 can be configured to supply
30 power to the computer.

Therefore, it is further appreciable that the apparatus 110 can be configured as any one of a master device, a slave device and a source supply device, or any combination thereof.

In general, it is appreciable that the apparatus 110 can be adaptably used in the system 100 in that the apparatus 110 can be flexibly configured as any one of a slave device, a master device and a power supply device, or any combination thereof.

As mentioned earlier, the system 100 includes an operation part 130 which can be associated with a plurality of operations (e.g., operations such as tank storage as discussed with reference to the first exemplary operational scenario 400a, fluid loading and/or unloading as discussed with reference to the second exemplary operational scenario 400b and preventive maintenance control as discussed with reference to the third exemplary operational scenario 400c).

Each of the plurality of operations can be associated with at least one device (e.g., monitoring unit(s) per the first exemplary operational scenario 400a, valve(s) 405 per the second exemplary operational scenario 400b, the sensor(s) 410 per the third exemplary operational scenario 400c and/or the computer per the third exemplary operational scenario 400c). Examples of monitoring unit(s) can include tank gauging system(s) and/or level transmitter(s). Additionally, the sensor(s) 410 can correspond to, for example, long routine sensor(s). Furthermore, the at least one device can, for example, include flow meter(s) which can be coupled to the valve(s) 405.

Further earlier mentioned, the apparatus 110 can include at least one user interface module 214 and a processor module 216 which can be coupled to the user interface module(s) 214. The apparatus 110 can be configured to one or both of receive at least one input signal and generate at least one input signal. The input signal(s) can be communicated to the processor module for processing to generate at least one processor signal.

Yet further earlier mentioned, the apparatus 110 can be adaptably used in the system 100 in that the apparatus 110 can be flexibly configured as a slave device, a master device and/or a power supply device.

Specifically, the apparatus 110 is adaptably usable in the system 100 in a manner such that the apparatus 110 is configurable as a slave device, a master device and/or a power supply device relative to the device(s) (e.g., monitoring unit(s), valve(s) 405, sensor(s) 410 and/or computer) associated with one or more of the
5 aforementioned plurality of operation(s).

When the apparatus 110 is configured as a slave device, the apparatus 110 can be configured to receive at least one input signal corresponding to at least one command signal (e.g., from the computer per the third exemplary operational
10 scenario 400c) to generate at least one processor signal (e.g., corresponding to at least one data signal(s)).

When the apparatus 110 is configured as a master device, the user interface module(s) 214 can be configured to generate at least one input signal to generate at
15 least one processor signal corresponding to at least one control signal communicable to at least one device (e.g., monitoring unit(s), valve(s) 405 and/or sensor(s) 410).

Moreover, when the apparatus 110 is configured as a power supply device, the
20 apparatus 110 can be configured to supply power to the device(s) (e.g., monitoring unit(s), valve(s) 405, sensor(s) 410 and/or computer) connected to the apparatus 110.

Referring to Fig. 5, a configuration method 500 in association with the system 100 is
25 shown in accordance with an embodiment of the disclosure.

Specifically, the configuration method 500 can be in association with the apparatus 110, according to an embodiment of the disclosure.

30 The configuration method 500 can include a master configuration step 502, a slave configuration step 504 and a supply configuration step 506.

With regard to the master configuration step 502, the apparatus 110 can be configured as a master device relative to at least one device associated with one or more of the aforementioned plurality of operations (e.g., monitoring unit(s) per the first exemplary operational scenario 400a, valve(s) 405 per the second exemplary operational scenario 400b and/or the sensor(s) 410 per the third exemplary operational scenario 400c).

With regard to the slave configuration step 504, the apparatus 110 can be configured as a slave device relative to at least one device associated with one or more of the aforementioned plurality of operations (e.g., the computer per the third exemplary operational scenario 400c).

With regard to the supply configuration step 506, the apparatus 110 can be configured as a power supply device to supply power to at least one device associated with one or more of the aforementioned plurality of operations (e.g., monitoring unit(s) per the first exemplary operational scenario 400a, valve(s) 405 per the second exemplary operational scenario 400b, the sensor(s) 410 per the third exemplary operational scenario 400c and/or the computer per the third exemplary operational scenario 400c).

In view of the foregoing, it is appreciable that the apparatus 110 can, in one example, correspond to/be configured as a predictive controller in the sense that the apparatus 110 can, in one embodiment, continuously monitor readings from one or more sensors (e.g., the aforementioned sensor(s) 410), record readings (e.g., collate data in the context of recording data as discussed earlier) from the sensor(s), characterize the electrical parameter(s) of the sensor(s). Moreover, readings can, in one embodiment, be recorded periodically. Furthermore, the apparatus 110 can be configured to, for example, analyze the recorded readings (e.g., one or more relevant portions of the collated data) to derive one or more trends. In this regard, when configured as a predictive controller (e.g., in analytical mode), the apparatus 110 can be associated with trending functionality.

A user can, for example, extract recorded data from the apparatus 110 using, for example, the aforementioned computer. At the computer, a comparison chart can be generated (i.e., with primary reference to recorded data associated with, for example, an initial configuration associated with one or more portions/parts (e.g., the apparatus 110, the source part 120 and/or the operation part 130) of the field operation system 100. The comparison chart can, for example, be useful in providing the user with some form of predictive maintenance reference for exemplary applications such as long routine sensor(s) applications.

This can be useful/helpful in that appropriate indication/justification can be afforded concerning whether the sensor(s) need to be preventively replaced (e.g., the sensor(s) 410 can be replaced before/just before occurrence of an event of breakdown/malfunction) during turnaround windows associated with the operation part 130. Particularly, this can be useful/helpful in situations where the operation part 130 (e.g., in relation to Refinery & Petrochemical Heaters and Reactors) is associated with limited turnaround window frequency (e.g., a turnaround window may occur only every four to five years) and long lead time may be required for replacement of faulty device(s) (e.g., a long routine sensor).

Hence it may be advantageous to anticipate when device(s) may fail and replace the relevant device(s) during a turnaround window as opposed to waiting for such device(s) to actually fail before performing replacement works. Specifically, the present disclosure contemplates that if it can be predicted (i.e., based on the aforementioned trending functionality) that a device may fail/malfunction outside of a turnaround window, it would be prudent to preemptively replace that device during the next available/nearest turnaround window so as to avoid/ at least minimize disruption(s) to the operations associated with the operation part 130.

Moreover, in relation to the aforementioned first exemplary operational scenario 400a associated with operation part 130, the apparatus 110 can generally be considered to be configured as a tank side indicator. When configured as a tank side indicator, the apparatus 110 can be configured to monitor multiple tanks 402a. Therefore, the apparatus 110 can be associated a multiple tank side indication

function in which remote tank indication of a plurality of tanks 402a (e.g., up to 16 tanks) can be available.

Appreciably, the apparatus 110 can, in one embodiment of the disclosure, be configured as a universal controller which can include the functionality of a predictive controller, a tank Side Indicator and/or a field batch controller.

It should be further appreciated by the person skilled in the art that variations and combinations of features described above, not being alternatives or substitutes, may be combined to form yet further embodiments.

In one example, aside blending of fluid (i.e., blending ratio), the apparatus 110 can be useful for additive injection processes in refineries or chemical plants.

In another example, the apparatus 110 can further include an identifier module 214c such as a card reader. A user can use an identifier token (e.g., an identity card) which can be used to authorize the user to, for example, extract data (extracted data can, for example, be associated with system Trending data, Initial configuration data etc.) from the apparatus 110 (i.e., for the aforementioned purpose of data retrieval). Data can, for example, be extracted for offline based analysis. Specifically, in one embodiment, a user can use an authorized card (i.e., an example of the aforementioned identifier token) to contact (e.g., by manner of tapping) the card reader (i.e., an example of the aforementioned identifier module 214c) to extract historian data (i.e., data recorded by the apparatus 110) which can be communicated to a computer (as discussed earlier) for offline based analysis with one or more reports capable of being generated. Alternatively, the apparatus 110 can be configured to communicate the extracted data to a cloud based network.

Earlier mentioned, command signal(s) can be generated and communicated from the computer. It is appreciable that command signal(s) can, alternatively, be communicated from the identifier module. Specifically, the identifier token (e.g., an identity card) can, for example, be configured (e.g., by manner of near field based communication and/or by manner of contact based communication such as

swiping/tapping) to generate one or more identifier signals which can be communicated to the identifier module (i.e., a card reader). The identifier module can be configured to receive the identifier signal(s) and verify/determine whether the user associated with the identifier token is authorized to retrieve data from the apparatus 110. Upon successful verification, data can be retrieved from the apparatus 110 in analogous manner as discussed earlier with reference to the computer corresponding to a master device relative to the apparatus 110. In this regard, the identifier signal(s) can be analogous/respond to the aforementioned command signal(s).

Therefore, it is appreciable that command signal(s) can be generated and communicated from one or both of the computer and the identifier module, according to an embodiment of the disclosure.

In yet another example, in the field operation system 100, more than one apparatus 110 can be provided as redundancy. Specifically, a plurality of apparatus 110 can be provided in the field operation system 100. In the event one of the apparatuses 110 malfunction, one or more other apparatuses 110 can function as backup.

In this regard, the system 100 can include a plurality of apparatuses 110, according to an embodiment of the disclosure. When the system 100 includes a plurality of apparatuses 110, each apparatus 110 can be configured to communicate with one or more other apparatuses 110 in a manner such that the apparatuses 110 can be configured in the analogous manner (i.e., configuration setup of one apparatus 110 can be communicated to another apparatus 110 to set that apparatus 110 based on the received configuration setup) to provide redundancy in the event one of the apparatuses 110 malfunction.

In the foregoing manner, various embodiments of the disclosure are described for addressing at least one of the foregoing disadvantages. Such embodiments are intended to be encompassed by the following claims, and are not to be limited to specific forms or arrangements of parts so described and it will be apparent to one

skilled in the art in view of this disclosure that numerous changes and/or modification can be made, which are also intended to be encompassed by the following claims.

Claim(s)

1. An apparatus suitable to be adaptably usable in a system associated with a plurality of operations, the apparatus comprising:

5 at least one user interface module;

a processor module coupled to the user interface module,

wherein the apparatus is configurable to at least one of receive at least one input signal and generate at least one input signal, the at least one input signal being communicable to the processor module for processing to generate at least one processor signal,

10 wherein the each of the plurality of operations is associated with at least one device which is capable of being coupled to the apparatus,

wherein the apparatus is adaptably usable in the system in a manner such that the apparatus is configurable as at least one of a slave device, a master device and a power supply device relative to the at least one device,

15 wherein when configured as a slave device, the apparatus can be configured to receive, from the at least one device, at least one input signal corresponding to at least one command signal to generate at least one processor signal,

wherein when configured as a master device, the user interface module is configurable to generate at least one input signal to generate at least one processor signal corresponding to at least one control signal communicable to the at least one device configurable to communicate at least one feedback signal corresponding to at least one of:

a graphical based presentation and

25 a textual based presentation,

the communicated feedback signal being indicative of information concerning general characteristics associated with at least one device corresponding to a reactor carrying at least one long routine sensor and the general characteristics being capable of being consolidated for data analysis at the apparatus, the general characteristics comprising temperature and resistance, and the communicated feedback signal being based on temperature and resistance for the purpose of preventive maintenance control associated with the reactor, and

30 wherein when configured as a power supply device, the apparatus is configured to supply power to the at least one device connected to the apparatus.

35

2. The apparatus as in claim 1, wherein the apparatus further comprises at least one of a connection module and a communication module,

wherein the connection module is coupled to the processor module and the communication module is coupled to the processor module.

5 3. The apparatus as in claim 2,

wherein when configured as a slave device, at least one command signal is receivable is receivable by the apparatus via at least one of the connection module and the communication module, and

10 wherein the processor module is configured to generate at least one processor signal based on at least one command signal.

4. The apparatus as in claim 3, wherein the processor signal generated based on the command signal is communicable from the apparatus via at least one of the connection module and the communication module.

15

5. The apparatus as in claim 2,

wherein when configured as a master device, at least one control signal is communicable via at least one of the connection module and the communication module to the device connected to the apparatus.

20

6. The apparatus as in claim 5,

wherein based on the control signal, at least one feedback signal is communicable from the device to the apparatus.

25 7. The apparatus as in claim 1,

wherein the device coupled to the apparatus, when configured as a master device, carries at least one component configured to communicate at least one feedback signal, corresponding to at least one of a graphical based presentation and a textual based presentation, to indicate general characteristics within the coupled device.

30

8. The apparatus as in claim 6,

wherein operation of the device is controlled based on the control signal communicated from the apparatus.

35

9. The apparatus as in claim 2 further comprising at least one of a power module and an auxiliary supply module,

wherein the power module is coupled to the connection module, and
wherein the auxiliary supply module is coupled to at least one of the power
module and the connection module, and
wherein the auxiliary supply module is capable of being charged via at least
5 one of the power module and the connection module.

10. The apparatus as in claim 9, wherein when configured as a power supply
device, the apparatus is configured to supply power to the device connected to the
apparatus via the auxiliary supply module.

10

11. The apparatus as in claim 1, wherein the user interface module is configurable
to generate at least one input signal corresponding to at least one command for the
purpose of generating at least one up-to-date preventive report detailing every human
intervention.

15