Abstract: The system includes a modular drum unit disposed in a first skin. The modular drum unit may include a drum and a winch. The system also includes a power pack unit disposed in a second skin. The power pack unit may comprise a power source. The system also includes a cable assembly for electrically coupling the modular drum unit to the power pack unit. The cable assembly includes a power connector with a connector type incorporating design constraints from both the modular drum unit and the power pack unit.
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SYSTEMS AND METHODS FOR A MODULAR DRUM WITH A COMMON POWER PACK UNIT

BACKGROUND

The present disclosure relates generally to well drilling operations and, more particularly, to modular drum equipment for well drilling and logging operations.

Existing well drilling operations require information on formation characteristics to aid in drilling decisions. Numerous measurement techniques are used, including logging while drilling (LWD), measuring while drilling (MWD), and wireline tests. In wireline tests, for example, a wireline with sensing equipment is lowered downhole. The wireline is typically wound around a wireline drum. The wireline drum configuration may differ at each rig. For example, some may include integrated control, some may include separate power connections or no power source at all, each may include a different connector to transmit data from the wireline drum, etc. Utilizing the on-site drum is therefore problematic, as different converters and equipment may be required at each drill site to operate the wireline drum. Additionally, the differences in configuration may increase error rates. What is needed is a common modular drum assembly that can be easily deployed and operated at any drilling site.

FIGURES

Some specific exemplary embodiments of the disclosure may be understood by referring, in part, to the following description and the accompanying drawings.

Figure 1 illustrates a well with an existing wireline system.

Figure 2 illustrates an example modular drum assembly with a common power pack according to aspects of the present disclosure.

Figure 3 illustrates an example modular drum assembly with a common power pack according to aspects of the present disclosure.

Figure 4 illustrates an example method incorporating aspects of the present disclosure.

While embodiments of this disclosure have been depicted and described and are defined by reference to exemplary embodiments of the disclosure, such references do not imply a limitation on the disclosure, and no such limitation is to be inferred. The subject matter disclosed is capable of considerable modification, alteration, and equivalents in form and function, as will occur to those skilled in the pertinent art and having the benefit of this disclosure. The depicted and described embodiments of this disclosure are examples only, and
not exhaustive of the scope of the disclosure.

DETAILED DESCRIPTION

The present disclosure relates generally to well drilling operations and, more particularly, to Modular Drum with a Common Power Pack Unit for use in well drilling operations.

Illustrative embodiments of the present disclosure are described in detail herein. In the interest of clarity, not all features of an actual implementation may be described in this specification. It will of course be appreciated that in the development of any such actual embodiment, numerous implementation-specific decisions must be made to achieve the specific implementation goals, which will vary from one implementation to another. Moreover, it will be appreciated that such a development effort might be complex and time-consuming, but would nevertheless be a routine undertaking for those of ordinary skill in the art having the benefit of the present disclosure.

To facilitate a better understanding of the present disclosure, the following examples of certain embodiments are given. In no way should the following examples be read to limit, or define, the scope of the disclosure. Embodiments of the present disclosure may be applicable to horizontal, vertical, deviated, or otherwise nonlinear wells or in any type of subterranean formation. Embodiments may be applicable to injection wells as well as production wells, including hydrocarbon wells.

In certain embodiments according to the present disclosure, rig equipment may be modularized for easy deployment and use at any drill site. This includes providing common measurement and control system connections and providing a common power unit to power the modular wireline drum.

Fig. 1 shows an existing drilling rig that includes an integrated wireline drum. The wireline drum 102 is mounted on the rig 104 above the borehole 106, where it raises and lowers the logging tools 108 by spooling and unspooling the wireline using winch 110. The winch 110 and logging tools 108 require power to operate. Power requirements and configurations for the winch and logging tools may be different at each drilling rig. For example, in the drilling rig shown in Fig. 1, the winch 110 and logging tools 108 may not be connected to a power source. Without an external power source, the wireline operations cannot commence. Connecting an external power source, however, may be problematic. Some rigs may require that the power be connected at the top of the rig, requiring additional equipment. Additionally, the power requirements and connection type for the winch 110 and logging tools 108 may vary from rig to rig. Providing sufficient power to a remote rig site may require power
equipment specifically tailored to a particular rig configuration, which may or may not be capable of powering a different rig configuration, or power equipment that can be readily configure to many different configurations, which increases expense.

Controlling the wireline drum 104, winch 110, and logging tools 108 may also be problematic. Like the power connections, the wireline drum 104 and winch 110 may not have a readily accessible interface. For example, the wireline drum 104 and winch 110 may simply include a port with non-standard connection, requiring external controls. Like the power connection, the port may be located at the top of the rig or elsewhere, depending on the individual rig configuration. The non-standard connection of the port may require multiple converters and additional equipment to match. Additionally, the wireline drum controls may include internal logic that must be matched in order to properly control the wireline drum winch.

Fig. 2 illustrates an embodiment of a modular drum and power pack unit according to aspects of the present disclosure. As can be see, the assembly of Fig. 2 may include multiple modular units: modular drum unit 201, power pack unit 202, and control unit 203. The modular drum unit 201 may include a modular drum 201a on which a wireline is spooled. Although the drum described in Fig. 2 is a wireline drum, the modular drum may be used in many well operations, including LWD, MWD, wired drillpipe, coiled tubing (wired and unwired), and be wound with wireline, coil tubing, or slickline. The modular drum may further include a hydraulic winch 201b, by which the wireline can be spooled and unspooled.

As can be seen, each of the modular units, including the modular drum unit 201, may be implemented in a free standing structure, such as a skid. The skid may be shipped out to a rig site when wireline operations are required, or alternatively, the module can be incorporated into the rig itself. Although the modular units are shown divided, some or all of the modular units may be combined into a single skid. For example, the modular drum unit 201 and control unit 203 may be combined into a single skid, integrating the drum and the control for the drum into a single structure. Likewise, some or all of the units may be further subdivided. Additionally, as would be apparent to one of skill in the art in view of this disclosure, additional functionality can be added to some or all of the modular units 201, 202, and 203.

Each of the modular units may be a constructed out of a cuboid steel frame. In the case of the modular drum unit 201, the frame may include a steel base to which the drum 201a is attached. The modular drum unit 201 may also include a cable assembly 201c, 201d. The cable assembly may include a connector and internal logic to connect and interface equipment disposed in the modular drum unit 201 with external equipment, such as control unit 203 and power pack unit 202. When control and/or power equipment are integrated into the
modular drum unit 201, the cable assembly may comprise wiring harnesses internal to the modular drum unit 201 necessary to operate the drum 201a and winch 201b.

The cable assembly 201c, 201d may include a connector incorporating design constraints from both the modular drum unit and external equipment. For example, the connector may include pin locations and layout based, at least in part, on circuitry in both the modular drum unit and the external equipment. The pin layout on a particular connector may be specific to the equipment it connects, such that the connector cannot be used to connect pieces of equipment for which the cable is not designed. In Fig 2, the connector may be disposed at a distal end of a cable connected to the cable assembly, at 210 and 212. In other embodiments, the connector may itself be integrated into modular units. Each of the connectors 210 and 212 may be designed for and dedicated to connecting with a particular type of external equipment. For example, connector 210 may have a power connector type and may be rated to safely transfer a predetermined amount of power to the modular drum unit 201 within a certain pin arrangement. Likewise, connector 212 may have a control connector type and may be designed for and dedicated to connecting the modular drum unit 201 with a control unit, such as control unit 203, incorporating a pin arrangement common to both the modular drum unit 201 and the control unit 203. In some embodiments, the connector 212 may have a pre-determined pin structure, which couples logic, circuitry, and control in the control unit 203 with the correct wired channel in the cable assembly 201c and modular drum unit 201.

In certain embodiments, the power pack unit 202 may be specifically configured and rated to provide power to the modular drum unit 201. The modular drum unit 201 may be manufactured to have a standard, common power requirement, meaning that the power pack unit 202 may be used interchangeably with multiple modular drum units. In some embodiment, the power pack may also power elements the control unit 203 via the cable assemblies and connectors disposed in the modular drum unit 201. The power pack unit 202 may further power the logging tools 218 via the wireline 220.

As would be appreciated by one of ordinary skill in the art in view of this disclosure, the power pack unit 202 may be comprised of a power source, such as a generator, batteries, solar panels, etc., electrically coupled to power control components, such as transformers, switches, etc. In certain embodiments, the power pack unit may include a diesel engine to power the hydraulic winch 201b incorporated in the modular drum unit 201. The power pack unit 202 may also include internal logic to control the power provided to the other modular elements in the system.
The control unit 203 may include the interface 203a through which a rig operator or other user controls the winch 201b. This may include various physical buttons, switches, joysticks, etc. Internal circuitry of the control unit 203 may receive control commands via the interface and generate control signals. The control signals may be transmitted through a cable to the modular drum unit 201. The control signals may cause the drum 201a to spool or unspool the wireline 220, changing the location of the logging tools 218.

The control unit 203 may also include internal logic for receiving and processing measurements 203b from the logging tools 218. In some embodiments, both the modular drum unit 201 and the control unit 203 may include logic to implement a universal interface language. The logging tools may receive power through wireline 220 from the power pack unit 202 via the modular drum unit 201. The logging tool 218 may transmit measurements, such as reservoir measurements and borehole measurements, though the wireline 220 to the control unit 203 via the modular drum unit 201. The internal logic for receiving and measuring processing measurement from the logging tools may be part of the internal logic of a computer system 203b disposed within the control unit 203. Like the winch control 203a, the computer system may include an interface such as a monitor and keyboard, through which a rig operator or user may view and process the measurements received from the logging tools. In certain other embodiments, the control unit 203 may transmit the measurements through a wired or wireless communications system to a remote location. In such instances, a computer system at the remote location may receive the measurements and process the measurements remotely.

In wireline operations, the connection between the modular drum unit 201 and the control unit 203 may include a communication bus, through which depth measurements are sent from logging tools 218 on the wireline 220 to the control unit 203. The control unit 203 may also receive telemetry information, a video feed, and tension measurements from the modular drum. Additionally, the control unit 203 may include the logic and mechanism for performing an emergency shutdown of the modular drum unit 201 in response to downhole or environmental changes.

Although the modular drum is shown on a separate skid in Fig. 2, in certain embodiments, the modular drum unit 201 may be incorporated in a rig at a location similar to the wireline drum shown in Fig. 1. In those embodiments, the connector for both the power and control of the modular drum unit 201 may be run to ground level. When wireline operation are required, a common power pack and control unit, such as power pack unit 202 and control unit 203 in Fig. 2, may be shipped to the site and plugged directly into the connectors. The connectors may differ in configuration, assuring that the power pack is attached to the connector
for power and the control unit is attached to the connector for control. This configuration saves
time compared to existing drums, as the connections are common and no conversions, etc. are
required.

Fig. 3 illustrates a different embodiment of a modular drum with a power pack unit according to aspects of the present disclosure. The embodiment of Fig. 3 generally incorporates the control unit into the modular drum unit 301. As can be seen, the wireline 320 extends from the drum 301a and down borehole 330 via pulley 340. Controlling the depth of the wireline 320, and therefore the logging tools 350, can be effectuated via controls 301 at the modular drum assembly 301 via controls 301b, instead of in a separate control unit. Likewise, the measurements from the logging tools 350 can be received directly at the modular drum unit 301 as computer 301c, incorporated directly into the modular drum unit 301.

The embodiment shown in Fig. 3 also includes an antenna 301d attached to the modular drum unit 301. As mentioned previously, the measurements received from the logging tools 350 may be transmitted offsite. The measurements may be received at computer system 301c and transmitted offsite via antenna 301d. The antenna 301d may be for example a short wave antenna or an antenna for long range transmission, such as satellite transmission. Likewise, the antenna 301d may receive signals from offsite relating to, for example, control of the logging system or the processing of logging measurements.

The modular drum unit 301 may receive power from power pack unit 302 via a cable assembly and cable 310. The cable assembly in Fig. 3 may not include an integrated cable. Rather, cable 310 may be a separate component, including standardized connectors for connecting to both the modular drum unit 301 and the power pack unit 302.

As can be seen, power pack unit 302 includes both an engine and power circuitry. As mentioned previously, the engine may be, for example, a diesel engine connected to an alternator, converting rotational motion to electrical power. The power circuitry may receive the electrical power from the alternator and through power circuitry, such as transformers, etc., condition the power and divide the power into separate channels for transmission through cable 310 to modular drum unit 301.

Fig. 4 illustrates an example method incorporating aspects of the present disclosure. At step 401, the method may include receiving at a rig site a modular drum unit including at least a drum and a winch. The modular drum unit may be housed individually in a skid. In some embodiments, such as the embodiment shown in Fig. 3, the modular drum unit may also include control and measurement equipment. The modular drum unit may be designed to utilize a pre-determined amount and type of power to run the equipment included within the
modular drum unit.

At step 402, the method may include receiving at a rig site a power pack unit. The power pack unit may include a power source, such as batteries, solar panels, diesel engines, etc. The power pack unit may also include power circuitry for conditioning and limiting the power output by the power pack unit. The power circuitry may be designed to output the predetermined power level and type required by the modular drum unit.

At step 403, the method may include connecting the power pack unit with the modular drum unit using at least one cable with a pre-determined, common connector type. In some embodiment, such as in Fig. 2, both the modular drum unit and the power pack unit may have integrated cables, one with a male connector, and one with a female connector. The connectors may be designed to match, providing the appropriate power level to each element of the modular drum unit. In other embodiments, such as in Fig. 3, a separate cable may be used to connect the power pack unit to the modular drum unit. In such embodiments, the modular drum unit and the power pack unit may each include integrated female connectors, for example, and both ends of the cable may include male connectors, so that the system may be easily assembled on site with little worry about incorrect connections.

Therefore, the present disclosure is well adapted to attain the ends and advantages mentioned as well as those that are inherent therein. The particular embodiments disclosed above are illustrative only, as the present disclosure may be modified and practiced in different but equivalent manners apparent to those skilled in the art having the benefit of the teachings herein. Furthermore, no limitations are intended to the details of construction or design herein shown, other than as described in the claims below. It is therefore evident that the particular illustrative embodiments disclosed above may be altered or modified and all such variations are considered within the scope and spirit of the present disclosure. Also, the terms in the claims have their plain, ordinary meaning unless otherwise explicitly and clearly defined by the patentee. The indefinite articles "a" or "an," as used in the claims, are defined herein to mean one or more than one of the element that it introduces.
What is claimed is:

1. An system for formation testing at a well site, comprising:
   a modular drum unit disposed a first skid, wherein the modular drum unit includes
   a drum and a winch;
   a power pack unit disposed in a second skid, wherein the power pack unit
   comprises a power source; and
   a cable assembly to electrically couple the modular drum unit to the power pack
   unit, wherein the cable assembly includes a power connector incorporating design constraints
   from both the modular drum unit and the power pack unit.

2. The system of claim 1, further comprising a control unit electrically coupled to
   the modular drum unit via a control cable assembly, wherein the control cable assembly includes
   a control connector incorporating design constraints from both the modular drum unit and the
   control unit.

3. The system of claim 2, wherein the control unit is disposed in a third skid.

4. The system of claim 3, wherein the control unit includes a winch control interface
   and a computing system.

5. The system of claim 4, wherein the computing system receives measurements
   from logging tools deployed in a borehole.

6. The system of claim 1, wherein the modular drum unit further includes a winch
   control interface and a computing system.

7. The system of claim 1, wherein the power source is a diesel engine.

8. The system of claim 4, wherein the logging tools are wireline logging tools.
9. An system for formation testing at a well site, comprising:
a modular drum unit disposed a first skid, wherein the modular drum unit includes
a drum and a hydraulic winch;
a power pack unit disposed in a second skid, wherein the power pack unit
comprises a power source and power control circuitry;
a control unit disposed in a third skid, wherein the control unit comprises a winch
control interface and a computing system;
a first cable assembly to electrically couple the modular drum unit to the power
pack unit; and
a second cable assembly to electrically couple the modular drum unit to the
control unit.

10. The system of claim 9, wherein the first cable assembly includes a power
connector incorporating design constraints from both the modular drum unit and the power pack
unit.

11. The system of claim 10, wherein the second cable assembly includes a control
connector incorporating design constraints from both the modular drum unit and the control unit.

12. The system of claim 11, wherein the control unit further comprises an antenna.

13. The system of claim 9, wherein the power source comprises at least one of a
battery array, a solar panel, and a diesel engine.

14. The system of claim 9, wherein the drum is wrapped with one of a wireline, a
coil tubing, or a slickline.

15. The system of claim 14, wherein the computing system receives measurements
from logging tools.

16. The system of claim 15, wherein the measurements are received at the
computing system through the second cable assembly.
17. The system of claim 16, wherein the control unit receives power from the power pack unit through the second cable assembly.

18. A method for formation testing at a rig site, comprising:
   receiving at the rig site a modular drum unit disposed a first skid, wherein the modular drum unit includes a drum and a hydraulic winch;
   receiving at the rig site a power pack unit disposed in a second skid, wherein the power pack unit comprises a power source and power control circuitry; and
   connecting the power pack unit with the modular drum using at least one cable assembly with a power connector incorporating design constraints from both the modular drum unit and the power pack unit.

19. The method of claim 18, further comprising receiving at the rig site a control unit disposed in a third skid, wherein the control unit comprises a winch control interface and a computing system.

20. The method of claim 19, further comprising connecting the control unit with the modular drum using at least one cable assembly with a connector incorporating design constraints from both the modular drum unit and the power pack unit.
FIG. 2
401

RECEIVING AT A RIG SITE A MODULAR DRUM UNIT

402

RECEIVING AT A RIG SITE A POWER PACK UNIT

403

CONNECTING THE POWER PACK UNIT WITH THE MODULAR DRUM USING AT LEAST ONE CABLE ASSEMBLY

FIG. 4
A. CLASSIFICATION OF SUBJECT MATTER

INTERNATIONAL application No

PCT/US2011/047006

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

E21B  B65H  B66D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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