SYSTEMS AND METHODS FOR DETERMINING WATER DEPTH AND EXPLOSIVE DEPTH IN BLASTHOLES

RELATED APPLICATIONS

[0001] This application claims priority to Australian Provisional Patent Application No. 2020904099, entitled SYSTEMS AND METHODS FOR DETERMINING WATER DEPTH AND EXPLOSIVE DEPTH IN BLASTHOLES, filed November 10, 2020, which is hereby incorporated by reference in its entirety.

TECHNICAL FIELD

[0002] The present disclosure relates generally to the field of explosives. More specifically, the present disclosure relates to systems and methods for determining the water depth and explosive depth in blastholes.

SUMMARY

[0002a] An aspect of the present disclosure provides an explosive delivery system comprising: a vehicle; a first reservoir configured to store an explosive mounted to the vehicle; a delivery hose reel mounted to the vehicle; a delivery hose having a central bore that extends a length of the delivery hose from a proximal end to a distal end of the delivery hose and an outlet disposed at the distal end, wherein the delivery hose is configured to deliver the explosive out of the outlet of the delivery hose, wherein the delivery hose is stored on the delivery hose reel; and a plurality of level sensors disposed on an outer surface of the delivery hose and that are dispersed along the delivery hose,

wherein each of the level sensors is configured to determine if the sensor is disposed in water, air, or explosive.

[0002b] Another aspect of the present disclosure provides a sensor system for detecting a presence of water or explosives in a blasthole comprising: an extension member that is configured to be inserted into a blasthole; and a plurality of level sensors that are dispersed along the extension member, wherein each of the level sensors is configured to detect a capacitance and a conductance of a predetermined surrounding area of each level sensor to determine if the level sensor is disposed in water, air, or explosive.

[0002c] Another aspect of the present disclosure provides an explosive delivery apparatus comprising: a sidewall; a central bore that extends a length of the explosive delivery apparatus from a proximal end to a distal end of the explosive delivery apparatus; an outlet disposed at the distal end of the explosive delivery apparatus, a plurality of level sensors disposed on an outer surface of the explosive delivery apparatus and that are dispersed along the explosive delivery apparatus, wherein each of the level sensors is configured to determine if the sensor is disposed in water, air, or explosive; and a communication medium coupled to the explosive delivery apparatus, wherein the communication medium is configured to communicate with the plurality of level sensors.

[0002d] Another aspect of the present disclosure provides a method of dipping, baiting, and loading a blasthole comprising: placing a first vehicle in a vicinity a blasthole, the first

vehicle comprising: unwinding a delivery hose stored on a delivery hose reel from the delivery hose reel, wherein the delivery hose reel is mounted to the vehicle; inserting the delivery hose into the blasthole without performing a separate dipping step to determine a level of any water in the blasthole; determining a level of any water in the blasthole by a plurality of sensors that are disposed along an outer surface of the delivery hose; and loading an explosive into the blasthole through the delivery hose.

[0002e] Another aspect of the present disclosure provides a system for delivering an explosive into a blasthole, comprising: a delivery apparatus configured to deliver the explosive; a nozzle disposed at a distal end of the delivery apparatus; one or more sensors that collects data for one or more parameters in a blasthole; a processing circuitry that controls loading of the explosive into the blasthole, wherein the processing circuitry varies one or more parameters of the explosive based on the data collected from the one or more sensors.

[0002f] Another aspect of the present disclosure provides a method of loading explosive into a blasthole comprising: inserting a delivery hose into the blasthole without performing a separate dipping step to determine a level of any water in the blasthole; determining a level of any water in the blasthole by a first plurality of level sensors that are disposed along a portion of the delivery hose; loading an explosive into the blasthole through the delivery hose; and collecting data regarding one or more parameters in the blasthole via one or more parameter sensors disposed at the distal end of the delivery hose.

[0002g] Another aspect of the present disclosure provides a method of loading explosive into a blasthole comprising: inserting a delivery hose into the blasthole, wherein the delivery hose comprises one or more sensors disposed at a distal end of the delivery hose; sensing one or more parameters in the blasthole with the one or more parameter sensors; adjusting a parameter of the explosive in response to the one or more parameters sensed by the one or more parameter sensors.

BRIEF DESCRIPTION OF THE DRAWINGS

[0003] The written disclosure herein describes illustrative embodiments that are non-limiting and non-exhaustive. Reference is made to certain of such illustrative embodiments that are depicted in the figures, in which:

[0004] FIG. 1 illustrates a side view of one embodiment of a mobile processing unit equipped with an explosives delivery system that includes a delivery apparatus for delivering an explosive into a blasthole according to one embodiment of the present disclosure.