efficient drilling, run in various tools that perform specific jobs required at certain times in the oil well construction plan, etc. However, the tripping process may also lead to well pressure variations, for example, due to the movement of the drill string resulting in additional drag, inertial and local resistances, and pressure losses. Such pressure variations may induce surge and swab pressures that could affect the well stability leading to a well control intervention.

SUMMARY

[0003a] According to a first aspect, there is provided a system, including: a processing device configured to: determine a tripping operation to be undertaken; calculate a variable tripping speed for the tripping operation to vary a speed of the tripping operation; and generate an output to control operation of a portion of a continuous tripping system to implement the tripping operation at the variable tripping speed, wherein the tripping operation comprises movement of a first tubular segment and a second tubular segment towards a drill floor while being made up without halting or movement of the first tubular segment and the second tubular segment away from the drill floor while being broken out without halting, wherein the processing device is configured to calculate the variable tripping speed based on a depth of a well into which a portion of a pipe of a tubular string comprising at least one of the first segment and the second segment is moving during the tripping operation to establish a speed of the tripping operation while maintaining a well pressure below a first threshold value and above a second threshold value less than the first threshold value at respective depths of the well.

[0003b] According to a second aspect, there is provided a device, including: an input configured to receive a signal indicative of a threshold pressure value of a well; and a processor configured to: calculate a variable tripping speed at which to continuously trip drill pipe into the well, wherein the variable tripping speed is calculated so as to maintain a pressure in the well above the threshold pressure value of the well during a continuous tripping operation; and generate an output to automatically control a speed at which a continuous tripping system continuously trips drill pipe into the well by making-up tubular segments without halting the movement of the tubular segments at a fixed position so as not to exceed the variable tripping speed.

[0003c] According to a third aspect, there is provided a tangible, non-transitory computer-readable medium having computer executable code stored thereon, the computer executable code comprising instructions to cause a processor to: determine a tripping operation to be undertaken;

calculate a variable tripping speed for the tripping operation to vary a speed of the tripping operation based on a depth of a well into which a portion of a pipe of a tubular string comprising at least one of a first tubular segment and a second tubular segment is moving during the tripping operation to establish a speed of the tripping operation while maintaining a well pressure below a first threshold value and above a second threshold value less than the first threshold value at respective depths of the well; and generate an output to control operation of a portion of a continuous tripping system to implement the tripping operation at the variable tripping speed, wherein the tripping operation comprises movement of the first tubular segment and the second tubular segment towards a drill floor while being made up without halting or movement of the first tubular segment and the second tubular segment away from the drill floor while being broken out without halting.

BRIEF DESCRIPTION OF DRAWINGS

[0004] FIG. 1 illustrates an example of an offshore platform having a riser coupled to a blowout preventer (BOP), in accordance with an embodiment;

[0005] FIG. 2 illustrates a front view a drilling rig as illustratively presented in FIG. 1, in accordance with an embodiment;

[0006] FIG. 2A illustrates a front view of the tripping apparatus of FIG. 2, in accordance with an embodiment;

[0007] FIG. 3 illustrates a block diagram of a computing system of FIG. 2, in accordance with an embodiment;

[0008] FIG. 4 illustrates a front view a second drilling rig as illustratively presented in FIG. 1, in accordance with an embodiment;

[0009] FIG. 5 illustrates an isometric view of a movable platform of FIG. 4, in accordance with an embodiment;

[0010] FIG. 6 illustrates a front view of a system inclusive of the tripping apparatus of FIG. 4, in accordance with an embodiment;

[0011] FIG. 7 illustrates a graph of mud loss due to a running in the hole continuous tripping operation and a running in the hole non-continuous tripping operation at a common speed, in accordance with an embodiment;

CLAIMS:

1. A system, comprising:

a processing device configured to:

determine a tripping operation to be undertaken;

calculate a variable tripping speed for the tripping operation to vary a speed of the tripping operation; and

generate an output to control operation of a portion of a continuous tripping system to implement the tripping operation at the variable tripping speed, wherein the tripping operation comprises movement of a first tubular segment and a second tubular segment towards a drill floor while being made up without halting or movement of the first tubular segment and the second tubular segment away from the drill floor while being broken out without halting, wherein the processing device is configured to calculate the variable tripping speed based on a depth of a well into which a portion of a pipe of a tubular string comprising at least one of the first segment and the second segment is moving during the tripping operation to establish a speed of the tripping operation while maintaining a well pressure below a first threshold value and above a second threshold value less than the first threshold value at respective depths of the well.

2. The system of claim 1, wherein the processing device is configured to calculate the variable tripping speed additionally based on a pressure value of a well as the pipe of the tubular string comprising at least one of the first tubular segment and the second tubular segment is moving relative to the well during the tripping operation.

3. The system of claim 1, wherein the processing device is configured to calculate the variable tripping speed as an upper threshold speed of the tripping operation.

4. The system of claim 1, wherein the processing device is configured to determine the tripping operation as comprising running pipe into a well.

5. The system of claim 1, wherein the processing device is configured to determine the tripping operation as comprising pulling pipe out of a well.

6. The system of claim 1, wherein the processing device is configured to generate a tripping schedule to limit the speed of the tripping operation to predetermined levels at predetermined times.

7. The system of claim 6, wherein the processing device is configured to generate the output based upon the tripping schedule.

8. The system of claim 1, wherein the processing device is configured to generate a tripping schedule to limiting the speed of the tripping operation to predetermined levels at predetermined well depths.

9. The system of claim 8, wherein the processing device is configured to generate the output based upon the tripping schedule.

10. The system of claim 1, wherein the processing device is configured to calculate the variable tripping speed dynamically during the tripping operation.

11. A device, comprising:

an input configured to receive a signal indicative of a threshold pressure value of a well; and

a processor configured to:

calculate a variable tripping speed at which to continuously trip drill pipe into the well, wherein the variable tripping speed is calculated so as to maintain a pressure in the well above the threshold pressure value of the well during a continuous tripping operation; and

generate an output to automatically control a speed at which a continuous tripping system continuously trips drill pipe into the well by making-up tubular segments without halting the movement of the tubular segments at a fixed position so as not to exceed the variable tripping speed.

12. The device of claim 11, wherein the processor is configured to calculate the variable tripping speed based on a depth of the well into which a portion of the drill pipe is moving.

13. The device of claim 11, wherein the processor is configured to calculate the variable tripping speed based on the threshold pressure value of the well.

14. The device of claim 11, wherein the processor is configured to generate a tripping schedule to limit the speed at which the continuous tripping system continuously trips drill pipe into the well to predetermined levels at predetermined times.

15. The device of claim 14, wherein the processor is configured generate the output to automatically control operation of the continuous tripping system based upon the tripping schedule.

16. The device of claim 11, wherein the processor is configured to:

calculate a second variable tripping speed at which to continuously trip drill pipe out of the well, wherein the second variable tripping speed is calculated so as to maintain the pressure in the well above the threshold pressure value of the well; and

generate an second output to automatically control a second speed at which the continuous tripping system continuously trips drill pipe out of the well by breaking-out tubular segments without halting the movement of the tubular segments at a second position so as not to exceed the second variable tripping speed.

17. A tangible, non-transitory computer-readable medium having computer executable code stored thereon, the computer executable code comprising instructions to cause a processor to:

determine a tripping operation to be undertaken;

calculate a variable tripping speed for the tripping operation to vary a speed of the tripping operation based on a depth of a well into which a portion of a pipe of a tubular string comprising at least one of a first tubular segment and a second tubular segment is moving during the tripping operation to establish a speed of the tripping operation while maintaining a well pressure below a first threshold value and above a second threshold value less than the first threshold value at respective depths of the well; and

generate an output to control operation of a portion of a continuous tripping system to implement the tripping operation at the variable tripping speed, wherein the tripping operation comprises movement of the first tubular segment and the second tubular segment towards a drill

floor while being made up without halting or movement of the first tubular segment and the second tubular segment away from the drill floor while being broken out without halting.

18. The tangible, non-transitory computer-readable medium of claim 17, wherein the computer executable code comprises instructions to cause the processor to calculate the variable tripping speed based on a pressure value of a well as a pipe of a tubular string comprising at least one of the first tubular segment and the second tubular segment is moving relative to the well during the tripping operation.

19. The tangible, non-transitory computer-readable medium of claim 17, wherein the computer executable code comprises instructions to cause the processor to generate a tripping schedule to limiting the speed of the tripping operation to predetermined levels at predetermined times and predetermined well depths.