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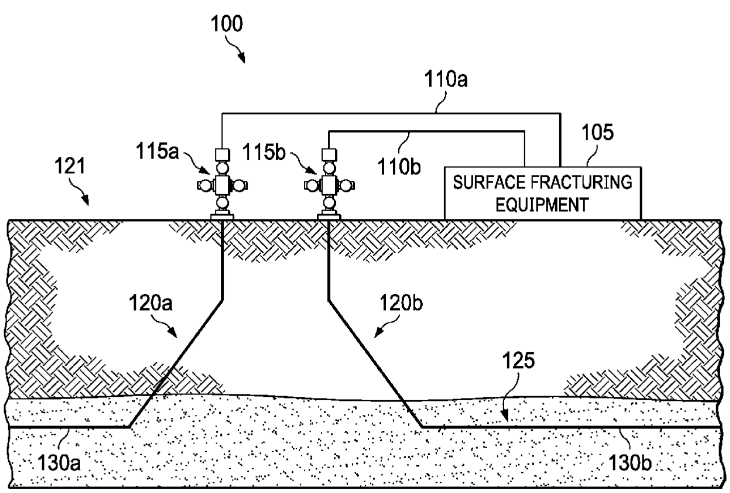

FIG. 1

(57) **Abstract:** A method and system pulse for treating a plurality of wells simultaneously includes applying a high pressure of fracturing fluid to one or more switching valves and repeatedly opening and closing the one or more switching valves to divert the fracturing fluid near instantaneously from one well to the other well to creating a pulse wave into the plurality of wells for fracturing subterranean formations. The one or more switching valves may be a single 3-way valve incorporating the function of two or more switching valves. This technique reduces wear of surface equipment including high pressure pumps that need only provide a constant pressure.

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SIMULFRAC PULSED TREATMENT

BACKGROUND

[0001] The present disclosure relates generally to pulsed fractured treatment of subterranean formations of wells, among other features.

[0002] Oil and natural gas are generally extracted from fissures or other activities created in subterranean strata. To improve extraction of these resources, a well may be subjected to a fracturing process that promotes creation of fractures in a rock formation.

[0003] Pulse fracturing is often used to create or enhance fractures in a rock formation, but one drawback is the increased strain on surface equipment such as hydraulic high pressure pumps, along with associated gear boxes and diesel engines. Traditional pulse fracturing often leads to increased rate of equipment failure due to the pulsing nature of the fracturing process.

[0004] By reducing the amount of strain on the surface equipment, more effective use of the surface equipment such as, for example, the high pressure pumps, blender, manifolds and valves can be achieved, along with lowering the rate of equipment failure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] Illustrative embodiments of the present disclosure are described in detail below with reference to the attached drawings, which are incorporated by reference herein, and wherein:

[0006] FIG. 1 is a generalized schematic view of a plurality of wells in a subterranean formation along with an example system of associated wellheads and surface fracturing equipment, according to principles of the disclosure;

[0007] FIG. 2 is a schematic view of an embodiment of certain surface fracturing equipment, according to principles of the disclosure;

[0008] FIG. 3A-3C are examples of valves of Fig. 2 in different stages of opening and closing, according to principles of the disclosure;

[0009] FIG. 4 is an illustration of a multi-way valve, according to principles of the disclosure;

[0010] FIG. 5 is a flow diagram of steps of performing a pulsed treatment of a plurality of wells, according to principles of the disclosure.

[0011] The illustrated figures are only exemplary and are not intended to assert or imply any limitation with regard to the environment, architecture, design, or process in which different embodiments may be implemented.

DETAILED DESCRIPTION

[0012] In the following detailed description of the illustrative embodiments, reference is made to the accompanying drawings that form a part hereof. These embodiments are described in sufficient detail to enable those skilled in the art to practice the disclosed subject matter, and it is understood that other embodiments may be utilized and that logical structural, mechanical, electrical, and chemical changes may be made without departing from the spirit or scope of the disclosure. To avoid detail not necessary to enable those skilled in the art to practice the embodiments described herein, the description may omit certain information known to those skilled in the art. The following detailed description is, therefore, not to be taken in a limiting sense, and the scope of the illustrative embodiments is defined only by the appended claims.

[0013] As used herein, the singular forms “a”, “an,” and “the” are intended to include the plural forms as well, unless the context clearly indicates otherwise. It will be further understood that the terms “comprise” and/or “comprising,” when used in this specification and/or the claims, specify the presence of stated features, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, steps, operations, elements, components, and/or groups thereof. In addition, the steps and components described in the above embodiments and figures are merely illustrative and do not imply that any particular step or component is a requirement of a claimed embodiment.

[0014] Unless otherwise specified, any use of any form of the terms "connect," "engage," "couple," "attach," or any other term describing an interaction between elements is not meant to limit the interaction to direct interaction between the elements and may also include indirect interaction between the elements described. In the following discussion and in the claims, the terms "including" and "comprising" are used in an open-ended fashion, and thus should be interpreted to mean "including, but not limited to." “Downhole” refers to a direction towards the end or bottom of a well. “Downstream” generally refers to a direction generally towards a wellhead, or towards the end or bottom of a well. The terms “about” or “substantially” refers to within +/- 10%, unless context indicates otherwise.

[0015] The present disclosure relates generally to pulsed fractured treatment of subterranean formations of a plurality of wells. More particularly, the present disclosure relates generally to simultaneous pulsed fractured treatment of a plurality of wells in subterranean formations to reduce wear and equipment failure due to increased or decreased pulsing pumping strain typically associated with traditional fracturing techniques. The system and method herein provides for near instantaneous switching of a single-mode high pressure fracturing fluid to allow two or more wells to be pulsed simultaneously by a single source of high pressure fracturing fluid. The high pressure fracturing fluid is pulsed by using one or more high pressure valves to alternate fluidic flow between two or more wells. This intermittent flow, i.e., pulsed flow, is isolated in an alternating fashion solely to a single well among a plurality of wells, thus leading to increased efficiency in surface equipment and reducing equipment wear. The alternating operation between a plurality of wells leads to multi-well pulsed completions and more effective use of blender, pumps, manifolds and the like at the surface. Moreover, in this way, the surface equipment can service and complete multiple wells often without having to be moved, or disconnected and reconnected again.

[0016] Referring to FIG. 1, a generalized schematic view of a plurality of wells 120a, 120b in a subterranean formation 125, along with associated wellheads 115a, 115b connected to surface fracturing equipment 105 located at the surface 121. The wells 120a and 120b are depicted as horizontal wells 130a, 130b but do not need to be a horizontal well, and could take other forms, e.g., a vertical well. The surface equipment 105 may be interconnected to the wellheads 115a, 115b using corresponding conduits 110a, 110b for conveying hydraulic fracturing fluid to the wells 120a, 120b.

[0017] The hydraulic fracturing fluid may include, for example, water or another liquid mixed with sand or other proppants. The fracturing fluid may be proppant-laden or proppant-free. The fracturing fluid is pumped into subterranean formation 125 to extend or create fractures in subterranean formation 125 and fill the fractures with proppants, which operationally hold open the fractures after pumping of the fracturing fluid has stopped. This permits formation 125 hydrocarbon fluids to more easily flow into the wells 120a, 120b. In some well completion operations, fracturing fluid used in the wells 120a, 120b can include other additives. For example, the fracturing fluid can include acidic chemicals, alkaline chemicals, polymers, or other agents to increase viscosity of the fracturing fluid.

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