



(22) Date de dépôt/Filing Date: 2001/04/24

(41) Mise à la disp. pub./Open to Public Insp.: 2001/10/28

(30) Priorités/Priorities: 2000/04/28 (60/200,241) US;
2001/03/06 (09/799,990) US

(51) Cl.Int.⁷/Int.Cl.⁷ E21B 21/00

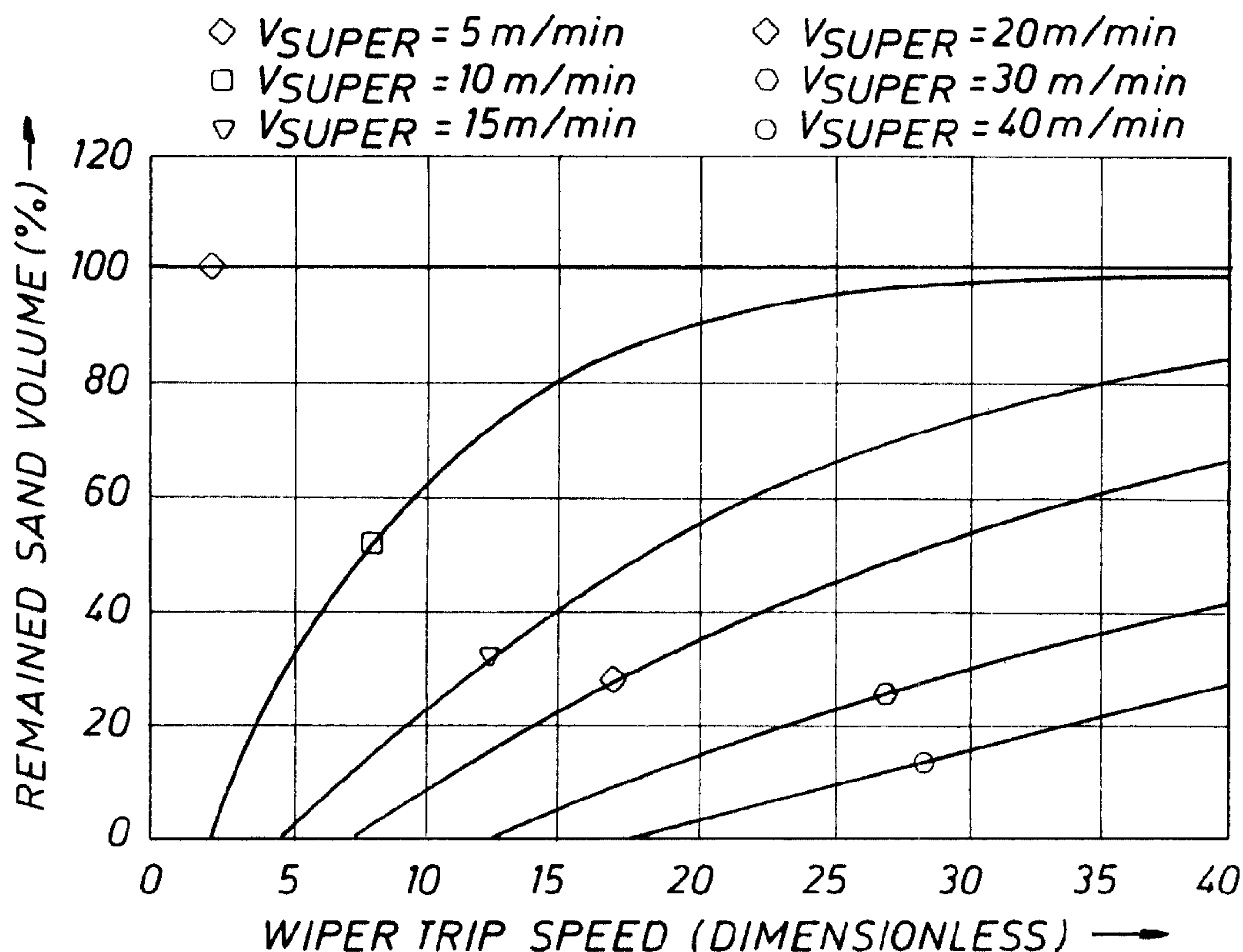
(71) Demandeur/Applicant:
B.J. SERVICES COMPANY, US

(72) Inventeurs/Inventors:
WILDE, GRAHAM B., CA;
WALKER, SCOTT A., CA;
LI, JEFF, CA

(74) Agent: SIM & MCBURNEY

(54) Titre : NETTOYAGE DE PUITS AU MOYEN D'UN SERPENTIN

(54) Title: COILED TUBING WELLBORE CLEANOUT



(57) Abrégé/Abstract:

Method and apparatus for substantially cleaning fill from a borehole, variously including in preferred embodiments disturbing particulate solids of fill while RIH, entraining particulates while POOH, jetting downhole while RIH and jetting uphole while POOH, and controlling at least one of a pump rate regime or a POOH rate regime.



ABSTRACT

Method and apparatus for substantially cleaning fill from a borehole, variously including in preferred embodiments disturbing particulate solids of fill while RIH, entraining particulates while POOH, jetting downhole while RIH and jetting uphole
5 while POOH, and controlling at least one of a pump rate regime or a POOH rate regime.

COILED TUBING WELLBORE CLEANOUT

Field of the Invention

5 This invention is related to cleaning a wellbore of fill, and more particularly, to cleaning an oil/gas wellbore of substantial fill using coiled tubing.

Background of the Invention

10 Solutions exist to an analogous problem in a related field, the problem of cuttings beds in the field of coiled tubing drilling in deviated wells, a field employing different equipment in different circumstances. The solutions are similar but have important distinctions with regard to the instant invention. Some, though not all, practitioners when drilling with coiled tubing (CT) in deviated wells cleanout cutting beds that develop by a wiper trip. Cuttings in a deviated well periodically form beds under CT, uphole of the drilling, notwithstanding the efforts to circulate out all of the
15 cuttings with the drilling fluid. Some practitioners periodically disturb and entrain and circulate out their cuttings beds by dragging the bit and its assembly back uphole, while circulating. This bit wiper trip is a relatively short trip through a portion of the borehole and is interspersed, of course, with periods of drilling where more cuttings are created and are (largely) transported out by the circulation of the drilling fluid.
20 The need for a wiper trip is determined by gauging when a cuttings bed is causing too much drag or friction on the coiled tubing such that it is difficult to lay weight on the bit

 The bit wiper trip typically does not comprise a full pulling out of the hole ("POOH") but rather for only 100 feet or so, progressively increasing as more hole is
25 drilled. The trip length may increase as the hole gets deeper. POOH rates with the bit wiper trip are not known to be scientifically selected using computer modeling. This is not a workover situation that targets substantial cleaning of fill in one wiper trip. A bit and its assembly comprise a costly and elaborate downhole tool for a wiper trip.

 Key distinctions between the instant invention and periodic bit wiper trips
30 include, firstly, the use herein of a far less expensive jetting nozzle as compared to an expensive drilling bit, motor and associated assemblies, to disturb and entrain the fill. A second distinction is the use of rearward facing jets while POOH by the instant invention. A third key distinction is the engineered selection of pump rates and/or

RIH rates and/or POOH rates, based on computer modeling, in order to target a cleanout of the hole in one trip.

In regard to the computer modeling of wells, in general, and further in regard to the modeling of cleanouts per se, it has been known in the art to model a solids/cuttings bed cleanout by modeling circulation in a deviated hole containing coiled tubing. To the inventors' best knowledge, however, it has not been known to model two phase flow in these circumstances nor to model the effects of a dynamic wiper trip while jetting. In particular it has not been known to model a wiper trip involving POOH with a nozzle having uphole pointing jets.

Turning to the well cleanout industry in particular, one problem that has historically faced well owners and operators is the question of whether a well is clean in fact when, during a cleanout, the well is flowing clean with the workover coiled tubing (CT) at target depth (TD). A second problem is that since many of the so-called "routine" cleanouts are not as simple as might be expected, the usual definition of "clean" is likely to be set by local field experience and may not represent what can or should be achieved. A third problem has been determining the question of how clean is clean enough. An ineffective or incomplete well cleanout results in shorter production intervals between cleanouts and increased maintenance.

It costs more to re-do a job than to do it right the first time. The object of the instant invention is to ensure that owners/operators do not incur the costs of recleaning their wells for as long as possible, prolonging well production and maintaining wireline accessibility. A well that requires a cleanout every 12 months between poorly designed, incomplete jobs may last 24 months between properly designed cleanout jobs.

Unless a well is a vertical hole ($<35^\circ$ deviation) with a generously sized completion assembly and moderate bottom hole pressure, cleanout procedures according to conventional practices are likely to leave significant debris or fill in the hole. One further object of the instant invention is to offer a comprehensive engineered approach to CT cleanouts, targeted to substantially clean a hole of fill in one trip.

Summary of the Invention

In one preferred embodiment the invention includes a method for cleaning fill from a borehole comprising disturbing particulate solids by running in hole, in typical cases through substantial fill, with a coiled tubing assembly while circulating at least one cleanout fluid through a nozzle having a jetting action directed downhole. This invention may include creating particulate entrainment by pulling out of hole while circulating at least one cleanout fluid through a nozzle having a jetting action directed uphole. The invention may include controlling at least one of 1) the pump rate of the cleanout fluid and/or 2) the coiled tubing assembly pull out rate such that substantially all particulate solids are maintained uphole of an end of the coiled tubing assembly during pull out. The invention may also include controlling the POOH rate so that equilibrium sand beds are established uphole of the jets, if or to the extent that such beds were not established during running in hole (RIH).

The invention can include in one embodiment a method for cleaning fill from a borehole in one wiper trip comprising jetting downhole, through a nozzle connected to coiled tubing, at least one cleanout fluid during at least a portion of running downhole. The invention can include jetting uphole through a nozzle connected to the coiled tubing at least one cleanout fluid during at least a portion of pulling out of hole. The invention can include pumping during at least a portion of pulling out of hole at least one cleanout fluid at a selected pump rate regime, pulling out of hole for at least a section of the borehole at a selected pulling rate regime, and substantially cleaning the borehole of fill. Preferably the invention includes high energy jetting downhole and low energy jetting uphole.

The invention can include a method for cleaning a borehole of fill comprising sweeping back at least one uphole directed jet connected to coiled tubing while pulling out of hole at a selected pulling rate regime. This invention can include pumping at least one cleanout fluid at a selected pump rate regime down the coiled tubing and out the at least one jet during at least a portion of pulling out of hole. The invention can also include selecting, by computer modeling, at least one of 1) pump rate regime and/or 2) pull out of hole rate regime such that one sweep substantially cleans the borehole of fill.

are contemplated. It is intended that the scope of the invention is not to be limited by the specification, but to be defined by the claims set forth below.

POOH at a rate such that an equilibrium bed is established uphole of the jet.

38. The method of claims 1, 2, 15 or 37 wherein RIH includes running through a portion of substantial fill.

