INHIBITING SCALE DEPOSITION IN OILFIELD TUBULARS

Method for preventing scale deposition in a fluid that includes water and ions that can produce scale precipitation and deposition flowing through a well and/or other oil field tubular comprising arranging a liquid whistle for producing acoustic waves in the fluid in the tubular, and allowing at least part of the fluid that flows through the tubular to pass through the liquid whistle to generate acoustic waves.
INHIBITING SCALE DEPOSITION IN OILFIELD TUBULARS

The present invention relates to inhibiting the deposition of scale in a fluid that includes water and ions that can precipitate as scale and subsequently be deposited in a conduit, or to removing a scale layer that is formed in the conduit. In the specification and in the claims, ‘inhibiting the deposition of scale’ will be used to refer to both preventing the deposition of scale and to removing a scale layer. The fluid can further include oil and gas.

Common scales that are encountered are BaSO₄, CaSO₄, CaSO₄.2H₂O, SrSO₄ and CaCO₃.

The conduit through which the fluid flows can be a well tubular through which well fluids are passed to surface, or a pipeline.

The present invention particularly relates to preventing scale deposition by applying acoustic energy in the form of acoustic waves in the fluid.

The cleaning action of acoustic waves is well known, see for example USA patent specification No. 3 648 769.

It is further known to remove sulphate scale by applying low-frequency acoustic energy, see International patent application publication No. 96/07 763.

The known methods require that external energy is supplied to the device that generates the acoustic waves.

German patent publication DE 2927671 discloses a method for preventing scale deposition in a heat exchanger at the earth surface. The known device units acoustic waves in a compact heat exchanger chamber to inhibit scale deposition primarily on the outer well of a coiled heating tube inside the chamber.
It is an object of the present invention to provide a method for inhibiting scale deposition in an elongate well or other oilfield tubular by applying acoustic waves without supplying external energy to the device that generates the acoustic waves.

Accordingly the method according to the present invention for preventing scale deposition in a fluid that includes water and ions that can produce scale precipitation and deposition, which fluid flows through a well and/or other oilfield tubular, comprises the steps of arranging a liquid whistle for producing acoustic waves in the fluid in the tubular, and allowing at least part of the fluid that flows through the conduit to pass through the liquid whistle to generate acoustic waves.

A whistle is a device for generating acoustic waves in a liquid-containing fluid, which device comprises a nozzle and a blade that is arranged downstream of the nozzle. During normal operation liquid flowing out of the nozzle forms a jet that impinges on the blade and flows over the blade. The jet flow generates vortices in the fluid perpendicular to the fluid flow, which vortices cause the blade to vibrate and acoustic waves are generated. Examples of liquid whistles are described in USA patent specifications No. 3 176 964 and No. 5 858 107.

An advantage of the present invention is that the fluid flowing through the conduit drives the acoustic whistle. Because the fluid flowing through the conduit drives the acoustic whistle no external power source is needed.

Suitably the acoustic whistle is so designed that at the prevailing flow rates the frequency of the acoustic waves emitted by the whistle is in the range of from 20 Hz to 30 kHz.
Suitably more than one liquid whistle is arranged in the conduit.
CLAIMS

1. Method for inhibiting scale deposition in a fluid that includes water and ions that can produce scale precipitation and deposition, which fluid flows through a well and/or other oilfield tubular, which method comprises the steps of arranging a whistle for producing acoustic waves in the fluid in the tubular, and allowing at least part of the fluid that flows through the tubular to pass through the whistle to generate acoustic waves.

2. The method of claim 1, wherein a series of whistles are arranged at selected intervals along at least part of the length of the tubular.

3. The method of claim 2, wherein said intervals are between 1 and 100 m.

4. The method of any preceding claim, wherein the tubular is a production tubing in an oil and/or gas production well.

5. The method of claim 1, wherein the whistle exits acoustic waves having a frequency in the range from 20 Hz to 30 kHz.
# INTERNATIONAL SEARCH REPORT

## A. CLASSIFICATION OF SUBJECT MATTER

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

## B. FIELDS SEARCHED

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Maximum documentation searched (classification system followed by classification symbols)

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

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

- WPI Data
- EPO-Internal
- PAJ
- COMPENDEX

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

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<td>US 5 717 181 A (COLGATE SAMUEL O) 10 February 1998 (1998-02-10) figure 3; example 3</td>
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<td>A</td>
<td>DE 29 27 671 A (RUMMEL THEODOR PROF DR ING) 29 January 1981 (1981-01-29) page 5, paragraph 3; figure 2</td>
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Further documents are listed in the continuation of box C. Patent family members are listed in annex.

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- **E** earlier document published on or after the international filing date
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- **O** document referring to an oral disclosure, use, exhibition or other means
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- **T** later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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- **Y** document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

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Authorized officer: Gruber, M
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Form PCT/ISA/210 (patent family annex) (July 1992)