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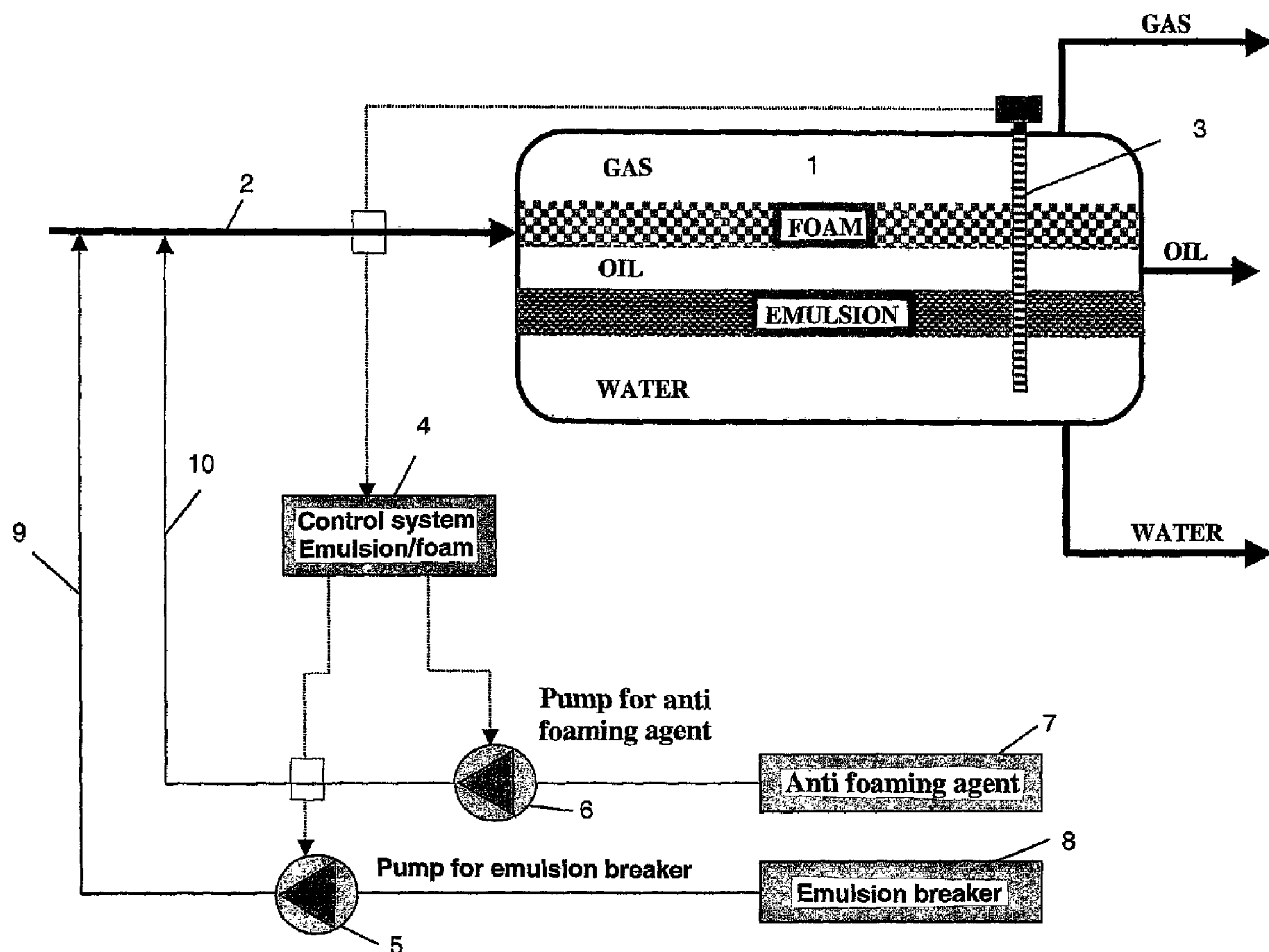
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(54) Title: METHOD FOR THE OPTIMALIZATION OF THE SUPPLY OF CHEMICALS



(57) Abrégé/Abstract:

A method for optimising the use of chemicals, in particular the use of antifoaming agents and emulsion breakers, for gas/oil/water fluid in oil processing plants on the seabed, onshore or offshore. The chemicals are dosed on the basis of the effect they have on

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the thickness of the foam layer and the emulsion layer, respectively, of the fluid. The fluid may expediently be supplied to and separated in a separator (1); the measurement of the emulsion and foam layers is performed by a measuring device (3), which emits signals to a control device (4), which controls the operation of pumps (5, 6), which, in turn, pump, at all times, the measured quantity of chemical to the fluid to be separated.

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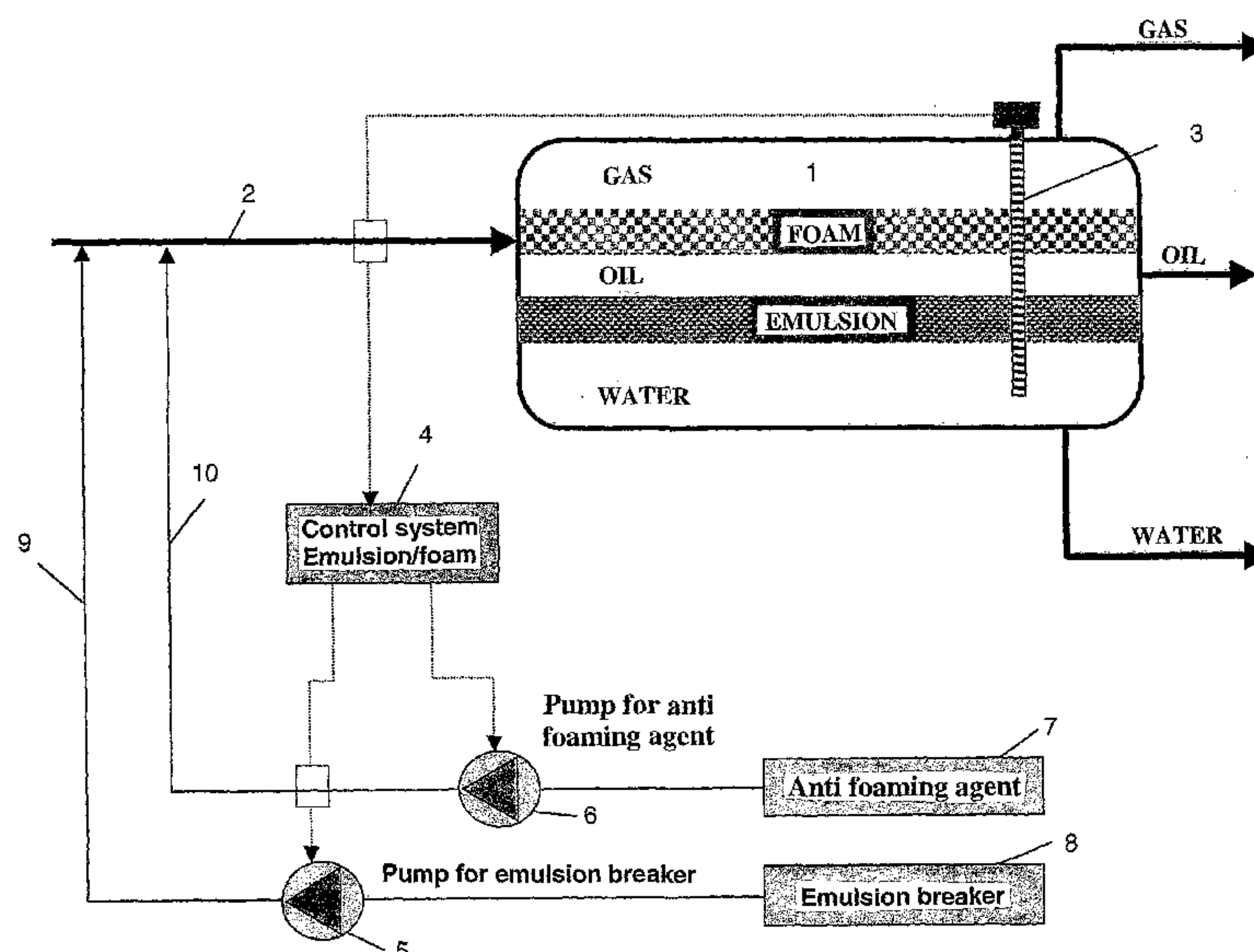
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(54) Title: METHOD FOR THE OPTIMALIZATION OF THE SUPPLY OF CHEMICALS



(57) Abstract: A method for optimising the use of chemicals, in particular the use of antifoaming agents and emulsion breakers, for gas/oil/water fluid in oil processing plants on the seabed, onshore or offshore. The chemicals are dosed on the basis of the effect they have on the thickness of the foam layer and the emulsion layer, respectively, of the fluid. The fluid may expediently be supplied to and separated in a separator (1); the measurement of the emulsion and foam layers is performed by a measuring device (3), which emits signals to a control device (4), which controls the operation of pumps (5, 6), which, in turn, pump, at all times, the measured quantity of chemical to the fluid to be separated.

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10 Method for the optimization of the supply of chemicals

The present invention concerns a method for optimising the use of chemicals, in particular the use of antifoaming agents and emulsion breakers, in oil processing plants on the seabed, onshore or offshore.

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Auxiliary chemicals such as antifoaming agents and emulsion breakers must virtually always be used in the processing of oil, where the separation of gas, oil and water is a main operation.

20

Such auxiliary chemicals are dosed manually today by the pumps being adjusted up and down on the basis of rates through the plant and the degree of foaming and separation problems in the process, assessed visually and subjectively on the basis of the operating situation in the plant. The common method of adding auxiliary chemicals is to adjust the dosage when problems are discovered. Days often pass between adjustments. Psychologically, it is easier to increase the dosage when problems are experienced than to reduce it. As finding the optimal point entails both reducing and increasing the dosage by trial and error, this is an operation that is very difficult to carry out. A chemicals company is therefore often called in and, for example, this company finds a new chemical.

25

Such practice is imprecise and often leads to the overdosing of auxiliary chemicals, chemicals that are often characterised as environmentally harmful.

30

The present invention represents a method for dosing chemicals that produces precise addition of chemicals and thus reduces the costs of such chemicals and spares the environment from unnecessary and harmful discharges.

35

The present invention is characterised in that the chemicals are dosed on the basis of the effect they have on the thickness of the foam layer and the emulsion layer, respectively, of the fluid, as defined in the attached claim 1.

5 Dependent claims 2-4 define advantageous features of the present invention.

The present invention will be described in further detail in the following with reference to the attached drawings, where:

10 Fig. 1 shows a diagram that illustrates a typical dosage/effect relation.

Fig. 2 shows a diagram of a separator tank with an associated diagram that illustrates the composition of the various layers in the tank,

15 Fig. 3 shows a diagram of the method in accordance with the present invention,

Fig. 4 shows an alternative embodiment of the solution shown in Fig. 3, and

20 Fig. 5 shows a typical dosage curve for the method in accordance with the present invention.

25 Up to today, it has been common only to use simple level and interface sensors plus temperature and pressure meters in separators, for example separators for the separation of water from oil.

30 However, in recent years, it has become more common to install one or more density profile meters, which, in addition to the liquid surface and the oil/water interface, also register the density profile through the separator. This provides quantitative information on the intermediate phases in a separator such as the foam phase and emulsion phase (see Fig. 2).

There are currently several principles on the market that are used in commercial density profile meters:

- 5 Meters that are based on multilevel gamma radiation (sources and detectors).
- Meters that are based on multilevel capacitance measurement.
- Meters that are based on multilevel induction measurement.

10 In addition to density profile meters, water-cut meters, i.e. meters that measure the quantity of water in oil in an oil/water fluid flow, are becoming part of the standard instrumentation of separators.

The principal idea of the present invention is to control the dosage of chemicals, in particular antifoaming agents and emulsion breakers, on the basis of the effect they
15 have on the thickness of the foam layer and emulsion layer, respectively, in the separator.

The effect of the chemicals is generally dependent on the dosage. Most chemicals have an "optimal" dosage that produces the greatest effect at an optimisation point as shown
20 in Fig. 1. The vertical axis in Fig. 1 shows the effectiveness of a chemical, while the horizontal axis shows the dosage. As the figure shows, both overdosing and underdosing will produce a reduced effect. It is therefore important to dose correctly at all times.

25 Fig. 2 shows a diagrammatic example of a gas/oil/water separator in which the content of the separator may be, from top to bottom, gas, foam, oil, emulsion (of water and oil) and water. To the right of the separator is a corresponding diagram illustrating the relation between height and density for the various layers.

30 The method in accordance with the present invention involves controlling the dosage of chemicals, in particular antifoaming agents and emulsion breakers, on the basis of the effect they have on the thickness of the foam layer and emulsion layer, respectively, in the separator. Fig. 3 shows a diagram of the method on which the present invention is based. Gas/oil/water are supplied to a separator tank 1 from a well or similar (not

shown) via a supply line 2. Various layers of gas, foam, oil, emulsion and water are formed in the tank. A measuring device 3 registers the state of the various layers and emits a signal to a control device 4, which, in turn, controls pumps 5 and 6. These pumps pump the necessary quantity of chemical (antifoaming agent or emulsion
5 breaker) from the reservoirs 7, 8 to the supply line 2 via lines 9, 10 on the basis of the signals from the control device 4.

The control criteria for the method in accordance with the present invention may, for example, on the basis of what is shown in Fig. 3, involve:

- 10 - minimising the thickness of the foam and emulsion layers, i.e. maximising the possible separation in the separator on the basis of the addition of chemicals, and
- meeting maximum requirements for the thickness of the foam and emulsion layers in the separator, i.e. minimising the use of chemicals on the basis of the separation ability of the separation system.

15

The method requires measurement, using the measuring device 3, of the density profile over the height of the separator, showing the thickness of the foam and emulsion layers.

Fig. 4 shows an alternative solution in which a water-cut meter 11 is arranged on the
20 outlet line 14 to measure the water quantity in the separated oil phase and an oil-in-water meter 12 is arranged on the outlet line 15 to measure the oil concentration in the separated water phase flowing from the separator 1. These measurements may, to good advantage, be entered in adjustment algorithms in the control device 4 to improve the precision of the control method.

25

However, the actual dosages required for the antifoaming chemical and the emulsion breaker vary continuously with major properties and process parameters such as:

The chemical interface (gas/liquid and oil/water interfaces) is a result of all surfactants in
30 the oil and water phases. Auxiliary chemicals such as scale inhibitors, hydrate inhibitors, wax inhibitors and corrosion inhibitors are all more or less surfactive, and changes in their dosages affect the chemical composition of the gas/liquid and oil/water interfaces. In addition, the chemical composition will also be affected by the water-cut and the gas/liquid ratio in the process flow (since the interface concentration is the quantity of

surfactant divided by the interface area in the system). Other major parameters that affect the interface chemistry are system pressure, system temperature and well composition (since the oil composition may vary in the reservoir).

5 The interface area consists of the gas/liquid and oil/water interface areas, i.e. the total of the drop and bubble surfaces, respectively. The interface area for the foam phase is also determined by the flow rate, the gas/liquid ratio and the bubble size distribution. The interface area for the emulsion phase is also determined by the flow rate, the water-cut and the drop size distribution.

10 The properties and parameters that determine the dosage required for antifoaming agents and emulsion breakers are numerous and very complicated (often impossible) to measure. Therefore, a practice for manual adjustment of the dosage was previously established.

15 The proposed dosing method will continuously optimise the overall effect of all the parameters and the properties as stated above, and the method in accordance with the present invention will, therefore, ensure perfect dosing at all times.

20 The saving on chemicals when using the method in accordance with the present invention may be significant, as suggested in Fig. 5, in which the diagram shows dosing in a separation process for oil/water over a period of time. The dotted line shows the addition of chemicals using the manual adjustment method commonly used at present, while the unbroken line shows dosing for the corresponding process using the method in accordance with the present invention.

25

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Claims

1. A method for optimising the use of chemicals, in particular the use of antifoaming agents and emulsion breakers, for gas/oil/water fluid in oil processing plants on the seabed, onshore or offshore.
5 characterised in that the chemicals are dosed on the basis of the effect they have on the thickness of the foam layer and the emulsion layer, respectively, of the fluid.
- 10 2. A method in accordance with claim 1, characterised in that the chemicals are an antifoaming agent and/or an emulsion breaker.
- 15 3. A method in accordance with claims 1 and 2, in which the fluid is supplied, via a supply line (2), to a separator (1) and is separated in the separator (1), characterised in that
20 the measurement of the emulsion and foam layers is performed by a measuring device (3), which emits signals to a control device (4), which controls the operation of pumps (5, 6), which, in turn, pump, at all times, the measured quantity of chemical to the fluid to be separated.
4. A method in accordance with claim 3, characterised in that
25 the chemicals are added in the supply line (2).
5. A method in accordance with claims 3 - 4, characterised in that
30 a water-cut meter (11) on the outlet line (14) measures the water quantity in the separated oil phase and an oil-in-water meter (12) on the outlet line (15) measures the oil concentration in the separated water phase flowing from the separator (1); these measurements are used in the adjustment algorithms in the control device (4) to improve the precision of the control method.

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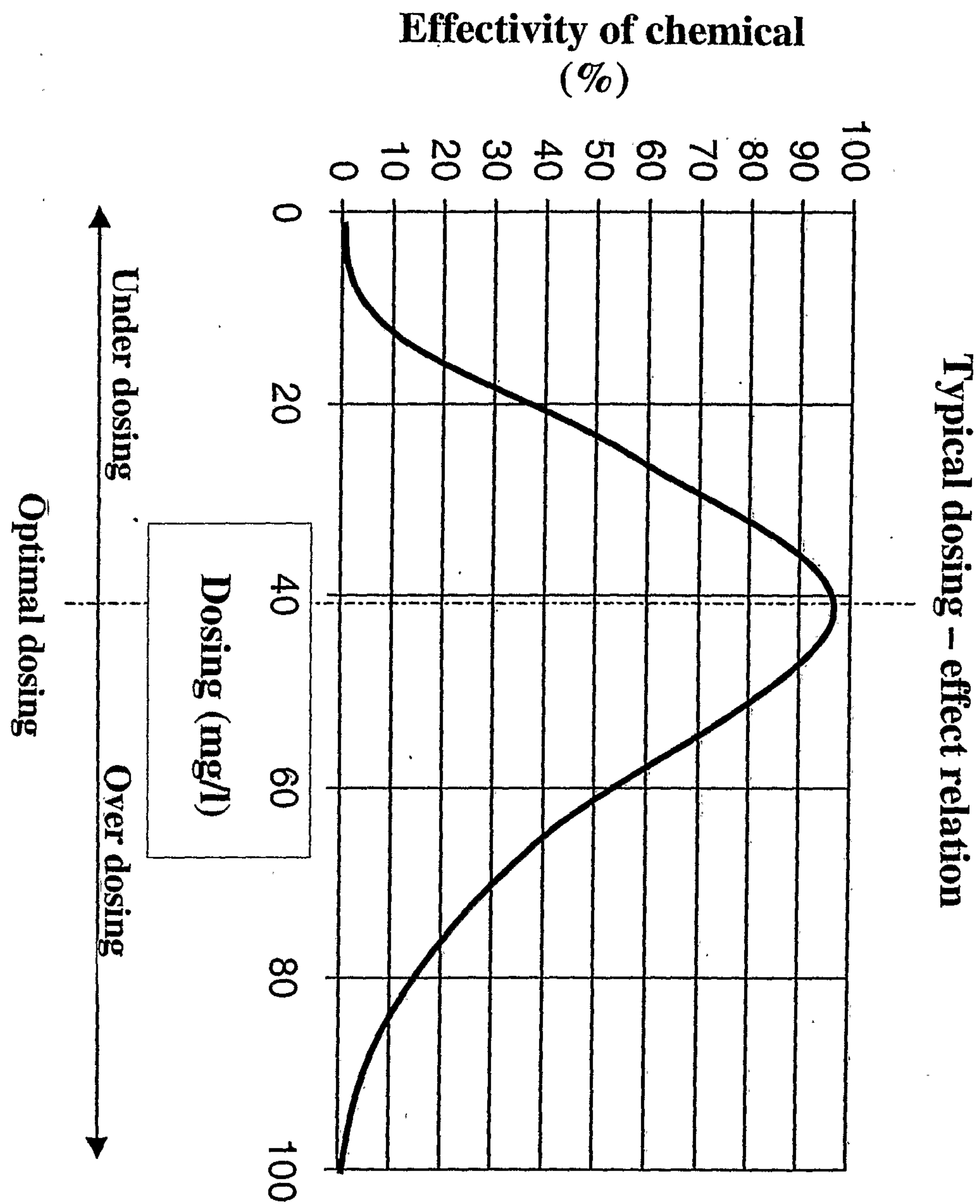


Fig. 1

Fig. 2

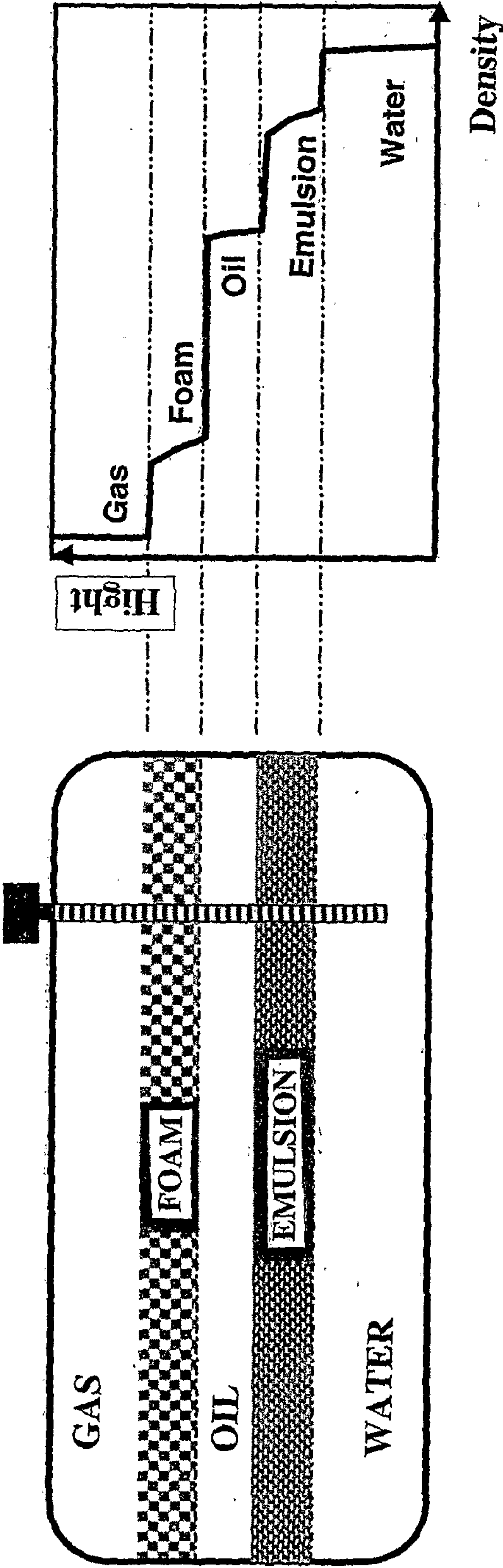


Fig. 3

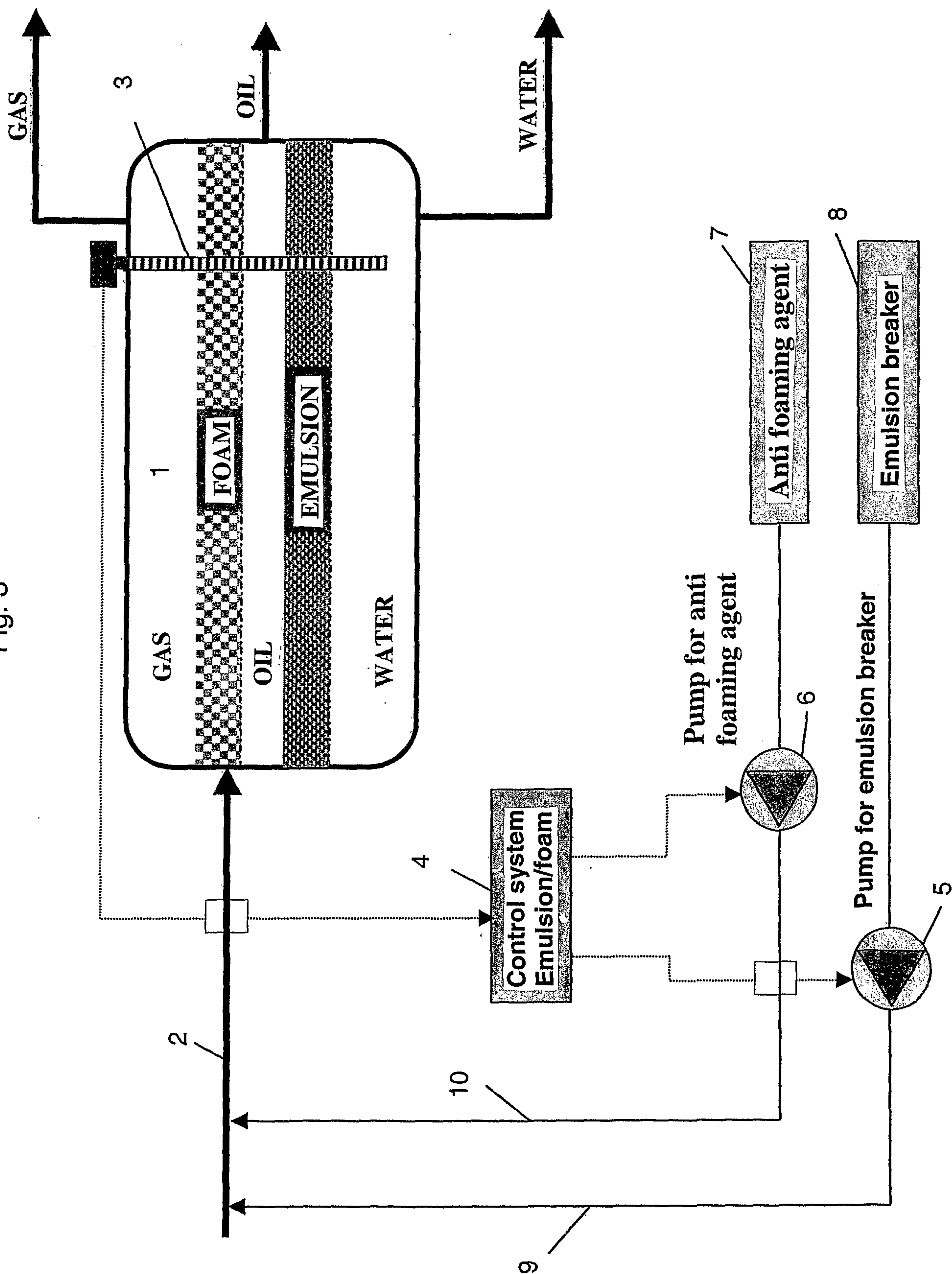


Fig. 4

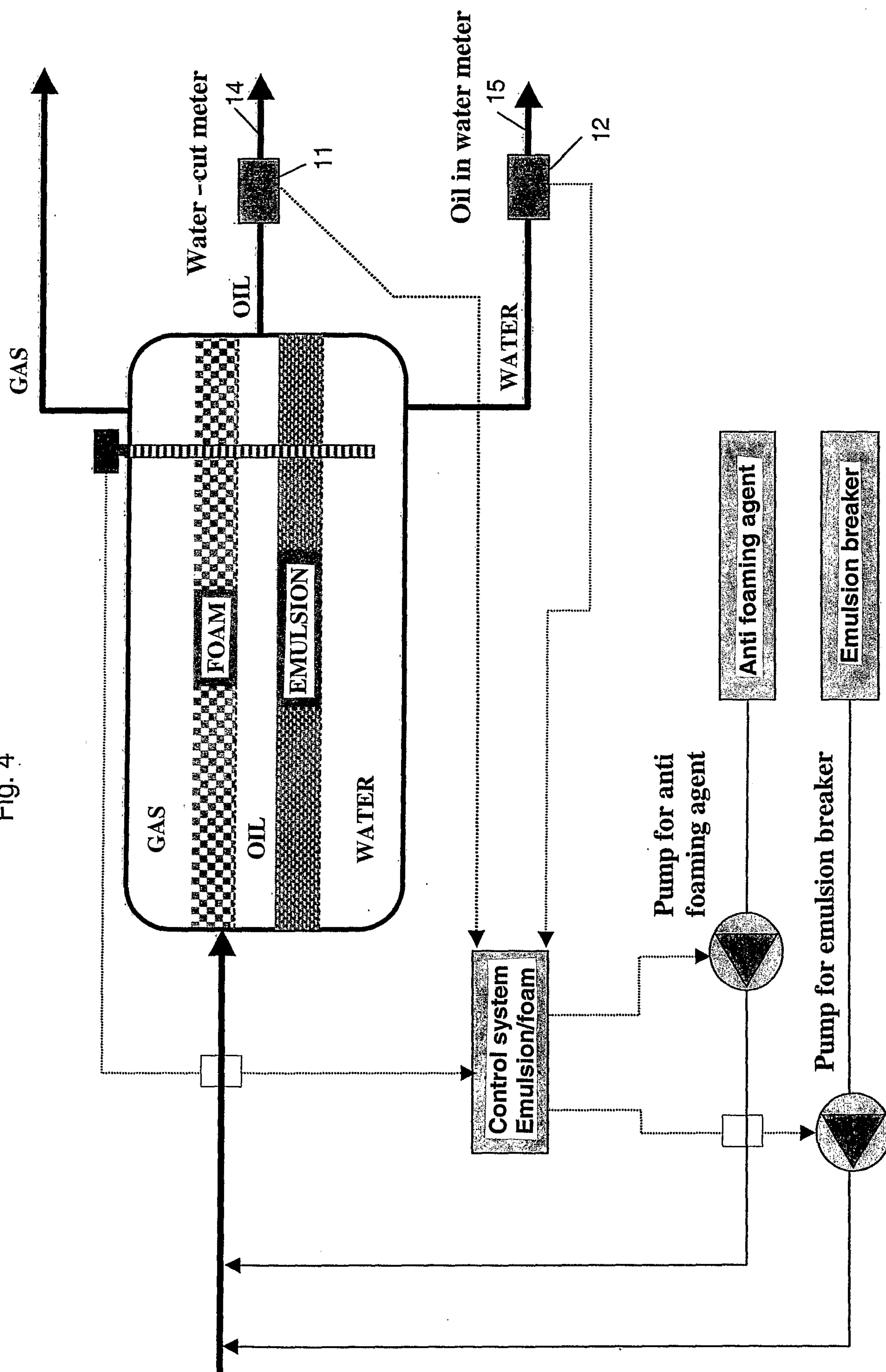


Fig. 5

