

A composition comprising an amine oxide and a tenside and use thereof in petroleum field

DESCRIPTION

5 The present invention relates to a composition comprising an amine oxide and a surfactant and to the use thereof in the cleaning of refinery plants, petrochemical plants and storage tanks for crude oil.

STATE OF PRIOR ART

10 The refinery plants, petrochemical plants and storage tanks for crude oil have to be periodically subjected to maintenance and cleaning. Above all crude oils containing high concentration of sulphur are particularly fouling and produce organic and inorganic sulphides which adhere to the walls and to the filling of the apparatuses and which are particularly dangerous and difficult to be removed.

15 Before opening such apparatuses for the stop and maintenance, it is necessary adopting safety procedures to avoid the explosion hazard (due to mixtures of hydrocarbons with air), fire hazard (due to reactive and pyrophoric sulphides) and generally danger situations for the operators which have to perform the cleaning and maintenance interventions.

20 For these reasons the by now consolidated routine procedure is to decontaminate the apparatus with vapour and/or chemical products in hot aqueous solution, before opening it. The present invention proposes the use of a mixture of chemicals which have important advantages with respect to those currently used on the market, in particular from the environmental impact point of view.

25 Under the term "chemical washing" an activity for removing deposits of various nature is meant, for the cleaning and subsequent optimum restarting of the industrial apparatus.

Usually the washing is necessary when the amount and/or nature of the deposits is such as not to allow anymore the usual running of the plant: the "chemical" term is almost always inserted to underline that the washing is performed by using chemical substances (solvents, detergents, acids or bases) and often it is opposed to the mechanical removal of the deposit itself, which can be made manually once opened the apparatus.

30 By definition, the chemical washing can be performed without opening the plant, which would be impossible to do in case of the mechanical removal (apart from very complex exceptions, such as automatic removal means, pre-inserted in the plant itself).

The "reclamation" or "decontamination" is the activity, always necessary at time of stopping the refinery plants (columns, separators, flare lines, etc.) and the petrochemical plants (reactors, separation columns, etc.), allowing the safe opening of the plants themselves, by giving the possibility of working afterwards directly inside the apparatus for the final cleaning and possible repairs. Upon opening the plants, the problems preventing the operators from entering immediately are:

- High concentration of VOC (Volatile Organic Compounds) which make the environment toxic for men
- Concentrations of hydrocarbons in the explosivity range which, upon the minimum trigger and upon the first inlet of small amounts of air, could cause explosions of very serious impact on men and on the plant
- Presence of pyrophoric iron sulphide (it is a type of deposit which forms when there are sulphides in the process fluid, therefore practically always in refinery and often in petrochemical plants; the iron sulphide is a so thin powder that the reactivity with air is very high, it sets on fire spontaneously upon contact and it can cause fires with very high temperatures with situations dangerous for men and destructive for the plant).
- Presence of carbonaceous deposits which cover the pyrophoric iron sulphide: the manual procedure for removing such deposits can bring to light the pyrophoric deposit, by causing huge risks for the operators assigned to the cleaning.

In order to avoid all described dangerous situations, the traditional technique provides an "evaporation" procedure for quite long time (two-three days), that is a cleaning performed with high temperature vapour introduced into the apparatus, until complete removal of the dangerous vapours; the vapour further guarantees the wetting of the pyrophoric iron sulphide, by allowing to open the apparatus in safety, always continuing to wet the deposit in order not to make it to set on fire.

The procedures performed with such mode are long (and a stopped plant is a very relevant cost), uncertain (the deposit has to be continuously wet, it can still set on fire) and it has high impact (the odour of the vapour introduced into the plant and then set free in the atmosphere for several days is often unsustainable for the populations around the industrial site).

The prior art proposes several technologies, mostly based upon inserting chemical products in vapour or recirculating hot water: one of the most used ones is a mixture of surfactants and enzymes very effective in cleaning, which release oxygen in a controlled way and which then oxidize the iron sulphide by wholly eliminating it. Such technology allows the safe opening of the plant just after one day (or little

more), by gaining much time, by eliminating, or almost eliminating, the fire hazard due to the pyrophoric iron sulphide and by reducing considerably the impact of bad smells outside the industrial site.

US5462607 discloses for the first time the use of a mixture of a surfactant (Lauryldimethylamine Oxide) coupled to enzymes, for cleaning the industrial plants. In this patent a separate heating of the solution containing the above mentioned mixture is assumed, with strong formation of foam which then is then used, itself, for cleaning the apparatus: the assumption which is provided is that the cleaning force of the mixture is mostly given by the enzymes which would react even with the sulphur-treated gases by eliminating them, whereas the surfactant mostly would be used to disintegrate the carbonaceous deposits and to form a great quantity of foam. In the patent US 5551989 the applicant itself changes the aim a little bit, by declaring that it is the surfactant which reacts with the sulphur-treated gases. The enzymes then take the second place, whereas the surfactant plays the most important role: to say the truth these are substances which have an Amine-Oxide group, with a very labile Nitrogen-Oxygen dative bond. It is then likely that with a strong heating these substances release oxygen and are then able to oxidize the sulphur compounds existing in the deposits fouling the plant. These substances further are optimum surfactants, attacking and disintegrating fats, oils and residual hydrocarbons existing in the apparatus, by performing a strong cleaning action.

US5642743 describes a closed and pressurized system wherein the surfactant/enzyme mixture can be used for cleaning process apparatuses, another positive feature of the product is introduced (column 1, line 25): once at rest, after having cleaned the plant from oils, fats and deposits, the oily portion separates easily from the aqueous solution, which then can be discharged easily (and the oily portion, recovered).

This important feature of the mixture is highlighted in other patents (US5660732 and US5686297); to say the truth, in the common practice, it is very important that, after a brief period of rest, the washing solution separates quickly from the oily portion and it then can be discharged towards the plant for treating the waste water which every refinery or petrochemical plant compulsorily should have. The important parameters which this water should have are:

- Low COD: this parameter represents often a bottleneck for the disposal facility, sized for a certain quantity of waste water and for absorbing a certain organic load of the water itself. During the stopping phases, when indeed decontaminations are performed, usually huge amounts of water are used, bigger than the usual running routine of the plant. Then, the plant for the

disposal of waste water is already under “stress”, surely it cannot bear additional heavy amounts of water with high organic load and then high COD.

- Low toxicity: in the washing water there are pollutants which had accumulated in the plant and then which have an impact towards the bacteria of the biological plant for treating the waste water. The same product used for decontamination can be borne not very well by such bacteria.

US 2011/0120958, still by the same applicant, proves that there is a problem for disposing the water contaminated by the oily residues removed from the plants and from the residues of the product itself used for decontamination. On the first page (par.008) it is declared that the object of the invention is to decrease the COD of the waste water and then the impact thereof on the disposal biological plant. Actually, the mentioned product (ZYME-FLOW) includes the Amine – Oxide surfactant having a not unimportant biocidal power, with high concentrations not compatible with the bacteria of the disposal plant. As states on page 3 par.0024 of the patent, the water containing the product is treated with Iron salts to eliminate the surfactant (LaurylDimethylAmine Oxide - LDMAO) by producing the corresponding amine (LaurylDimethylAmine), insoluble in water and then which can be eliminated with the oily portion of the waste water. On the contrary, the enzymes are not eliminated, by providing a residual COD impossible to be avoided.

Definitely, there is on the market a product which is considered the leader in the field (Zyme-Flow line), which even it has a series of advantages:

- it is an effective cleaner
- it produces a foam very useful for cleaning in the high portions of the plants, difficult to be reached
- it is capable of oxidising the sulphides and especially the pyrophoric iron sulphide
- once discharged, it allows an easy separation of the oily phase,

it does not meet fully the use requirements.

The market, especially the European one, is currently directing towards *green* products and technologies with low environmental impact even in procedures such as reclamation and decontamination of plants. Studies performed by Total and CNR demonstrated the toxicological and biocidal effect of the amine oxide contained in the product Zymeflow 657 (in includes Lauryl Dimethyl Amine Oxide - LDMAO) by ULI.

This active product contained in the product line already mentioned, and thus belonging to the state of art, at certain concentrations can strongly invalidate the activity of the biological plant with a biocidal effect downstream of the decontamination treatment. This effect appears in a very evident way in the petrochemical field wherein the poor quantity of sulphides increases the quantity of not reacted amine oxide and consequently it increases the concentration thereof upon discharging.

The disadvantages connected to the use of the product of the state of art (Zymeflow 657) are wholly solved with the present invention, without any loss in effectiveness or the positive features which brought this technology to be leader on the market.

Summary

In one aspect, there is provided a composition comprising a trialkylamine oxide wherein the alkyl radical may be linear or branched and have a number of carbon atoms comprised between 1 and 6 and a surfactant selected from the class consisting of Alkyl polyglucosides.

In another aspect, there is provided use of the composition described herein for the cleaning of refinery plants, petrochemical plants and storage tanks for crude oil.

In another aspect, there is provided use of a trialkylamine oxide wherein the alkyl radical may be linear or branched and show a number of carbon atoms comprised between 1 and 6 for the cleaning of refinery plants, petrochemical plants and storage tanks for crude oil.

Description of the invention

The advantages, features and use modes of the present invention will result evident from the following detailed description of some embodiments, shown by way of example and not for limitative purpose.

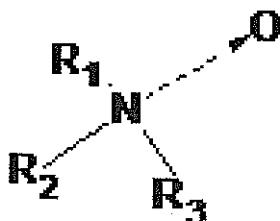
The present invention relates to a composition comprising an Amine - Oxide which is different from those claimed in the above described patents which is not a surfactant, but only an oxidant and a wholly biodegradable surfactant, with low COD, effective in cleaning but with no toxicity with respect to the disposal biological plant.

Used Amine-Oxide: Tri Methyl Amine Oxide (TMAO). The advantages of the composition according to the invention are

- no surface-active property and then no biocidal power; classified as not dangerous in handling
- good oxidizing force (higher than LDMAO)
- much higher oxygen content than LDMAO and then it reaches the parity of oxidizing force at much lower concentrations
- once reacted with the sulphides it forms Tri Methyl Amine which is a gas and then it does not remain in the waste water and it does not increase the COD.

Usually it is conveyed in the gas discharge in burning torch, as all hydrocarbon vapours during the decontamination phase.

The Amine Oxide to be inserted in the composition of the present invention is a TriAlkyl Amine Oxide of formula



wherein R1, R2, and R3 are alkyl chains with number of carbons from 1 to 6.

In particular, The preferred Amine Oxide is the Tri Methyl Amine Oxide

(Trimethylamine, N-oxide , CAS-No. : 62637-93-8 - Formula : $C_3H_9NO \cdot 2H_2O$ -

5 Molecular Weight : 111.14 g/mol).

The surfactants which can be used in the composition of the present invention are those selected from the class of high-biodegradable nonionic surfactants thereamong:

- Surfactants derived from oxyethylated vegetable oils
- 10 - Oxyethylated sorbitan esters
- Betaines and oxyethylated betaines
- Surfactants derived from oxyethylated castor oil
- Oxyethylated alcohols
- Surfactants derived from esterified and oxyethylated carboxylic acids
- 15 - Surfactants derived from oxyethylated or esterified glycerin

can be mentioned.

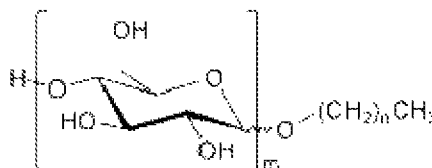
In a preferred embodiment the surfactants which can be used in the composition of the present invention belong to the general class of Alkyl polyglucosides. In particular, in the most interesting molecules, the alkyl chain is long C8 – C10 or C10 – C16 and the glucoside units are repeated from 0 to 3 times (CAS nr. 68515 – 73 – 1 or CAS nr. 110615-47-9; CE nr. 500-220-1 or CE nr. 600-975-8)

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The Alkyl Poly Glucoside can be represented by the following formula I

25

(I)



30

wherein

n is comprised between 8 and 16

m is an integer from 0 to 3

This family of products has the following properties

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- polysaccharide derivative, with natural provenience
- perfectly biodegradable
- powerful foaming compound
- optimum cleaner

- it forms a little stable emulsions, with the easily removable oily phases, better than LDMAO
- its aqueous solutions have low COD
- no biocidal power, on the contrary, as it is a sugar derivative, it is easily metabolized by the bacteria of the plants for disposal of waste water.

Advantageously in the composition of the present invention The Amine Oxide and the surfactant are present in a weight/weight ratio comprised between 100:1 and 1:100. The increase and the decrease of the components allow a more targeted use of the composition: by way of example, in the refinery plants, wherein the presence of sulphides is higher than in the petrochemical plants, a higher quantity of oxidizing amine will be favoured.

Advantageously additives usual for the technical field can be added to the composition of the present invention and even this forms a subject of the present invention. Such additives belong to the class formed by: corrosion inhibitors, odorants, colorants, peroxides, terpenes and biodiesel.

A subject of the present invention is also the use of the compositions of the invention for the cleaning of refinery plants, petrochemical plants and storage tanks for crude oil and the use of a trialkylamine oxide wherein the alkyl radical may be linear or branched and it may have a number of carbon atoms comprised between 1 and 6 for the cleaning of refinery plants, petrochemical plants and storage tanks for crude oil.

Brief description of the figures

A figure is enclosed to the present description, showing the test results of the emulsifying capability. Figure 1 shows that the aqueous solution separating in the container of the first test (sequence at the top, photos A, B, C e D – from 40 minutes to 4 hours – Product A) is clearly cleaner, wholly transparent (the transparency is evident, as it is possible to see the magnetic small anchor very clearly). In the second test, show in the sequence at the bottom (photos E, F, G e H - Product B), the water is very dirty, even after 4 hours it is not possible to see the magnetic small anchor.

Examples

Hereinafter embodiment examples of the invention are reported compared to known products. It is demonstrated that the composition claimed in this invention obtains performances comparable to the best reference products in the cleaning and unloading (foam formation) tests, but is obtains clearly higher performances as far as the H₂S oxidation, the COD test and the test of the emulsifying capability is concerned.

But above all, the Respirometer test demonstrates that the reference products of known art including LDMAO cannot be absolutely discharged into the biological plant for treating the waste water of a refinery, without the risk of wholly deactivating the activated sludge, with very serious consequences on the capability of purifying the plant itself. Even more so, the solutions including LDMAO absolutely could not be discharged into the outer environment without an adequate treatment.

On the contrary, the water including even high concentrations of the mixture claimed in this invention can outflow safely into the plant for the disposal of waste water, without running any risk of off-specification or malfunction of the plant itself.

Example 1: CLEANING TEST

The test to verify the cleaning power was developed by taking as reference the "Evaluation of Household or Industrial Cleaning Products for Remediation of Chemical Agents" document drawn up by US EPA.

A homogeneous viscous paste was created, by using a deposit coming from a CDU plant of a refinery, mixed to heavy diesel fuel and paraffin (weight ratio 4:1:0,2). This ratio allowed us to have a very homogeneous paste, without the presence of lumps, so liquid as it could be easily applied on a metallic test piece, but quite viscous so as to remain well fixed to the above-mentioned one. Standard corrosion test pieces made of steel C1018, (provider Metal Samples, P/N CO100, sizes 1/2" X 3" X 1/16" , hole of 3/16", total area 3.38 sq.inch) were used.

The previously weighed test piece was dipped into the paste, getting dirty on both sides up to the wished level: with a jet of hot air the excess liquid was removed and the adhesion of the paste onto the test piece itself was facilitated. In this way a fixed quantity of the fouling paste (about 0.3 grams) was applied onto the test piece.

Once the dirty test piece was weighed, it was dipped into half-litre of demineralised water, under stirring of medium intensity, at room temperature and at 40°C. The tests were repeated by using at first only water and then the solutions of the products under examination, at various concentrations.

At the end of the test, the test piece was put in stove at 40°C for half an hour, to make the water residues to evaporate, which would influence the final weight, and then weighed.

RESULTS

1 - Product A: 12% active solution of Alkyl Poly Glucoside in water

2 - Product B: 12% active solution of LDMAO in water

3 - Zymeflow 657 (assumed content of LDMAO of 12%)

We tested the products with concentrations equal to 0.2%, 0.5% and 2%.

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Room temperature

White (no product): 12% of removal

Product A (0.2%): 19.5%

5 Product A (0.5%): 79.0%

Product A (2.0%): 72.0%

Product B (0.2%): 26.5%

Product B (0.5%): 79.0%

10 Product B (2.0%): 82.0%

Zymeflow 657 (0.2%): 24.0%

Zymeflow 657 (0.5%): 79.5%

Zymeflow 657 (2.0%): 80.0%

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Temperature 40°C

White (no product): 42% of removal

Product A (0.2%): 88.0%

20 Product A (0.5%): 85.0%

Product A (2.0%): 85.5%

Product B (0.2%): 76.5%

Product B (0.5%): 84.0%

25 Product B (2.0%): 91.0%

Zymeflow 657 (0.2%): 77.0%

Zymeflow 657 (0.5%): 84.5%

Zymeflow 657 (2.0 %): 89.0%

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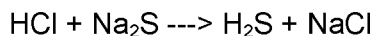
The Product A, based upon a green surfactant, gave results comparable to LDMAO and Zymeflow 657, showing an even more effective behaviour at low concentrations and high concentrations (conditions of higher interest).

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Example 2 H₂S OXIDATION TEST

The Amine – Oxides have a contained oxidizing power towards H_2S , by using only a catalyst it is possible observing a reaction at not too high temperatures. In a bottle made of boron-silicate glass at $80^\circ C$ we made to react 100 ppm of sulphides in aqueous solution (added as Sodium Sulphide) with the Amine - Oxides, by using as catalyst cobalt and metallic copper.

The mixture is heated at $80^\circ C$ and left under stirring at constant temperature for 5 hours, thereafter one proceeds with the measurement of the residual (not oxidized) hydrogen sulphide, by adding hydrochloric acid to the solution. H_2S is released from the strongly acid environment, after the following reaction:



The analysis was performed after the H_2S stripping by means of nitrogen and measurement with a Draeger vial.

Test in white (without additives): the whole H_2S is developed and the Draeger vial is coloured completely.

Test with 2400 ppm of LDMAO: as for white, the vial is coloured completely.

Test with 1000 ppm of TMAO: the vial is coloured by 40% less compared to white and LDMAO.

Then, it is confirmed that TMAO is a more effective oxidant than LDMAO.

Example 3 UNLOADING TEST

In order to test the foaming capabilities of the surfactants, tests were performed on a column made of glass, wherein a constant flow of air is made to gurggle, to develop abundant foam.

When the surfactants are very effective, the foam will reach the high portion of the column and it will overflow onto another container: the water so transferred due to the foam, measured in weight, provides a measurement of "unloading".

PROCEDURE

The test was performed the surfactant concentration being equal, in a volume of 100 mL of water, with constant flow of air (7 L/min) and at room temperature.

RESULTS

1 - Product A: 12% active solution of Alkyl Poly Glucoside in water

2 - Product B: 12% active solution of LDMAO in water

3 - Zymeflow 657 (assumed content of LDMAO of 12%)

Product A (3000 mg/l): 67.8%
Product A (3500 mg/l): 75.0%
Product B (3000 mg/l): 74.8%
Zymeflow 657 (3000 mg/l): 73%

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The unloading capability of the green surfactant approaches very much to that of LDMAO and of Zymeflow 657; the use of PolyAlkyl Glucoside at a slightly higher concentration than LDMAO leads to a substantial performance parity.

10 Example 4 COD TEST

Such test represents a first evaluation of the environmental impact of the products including LDMAO (Zymeflow 657) and the mixture Alkyl Poly Glucoside - TMAO.

PROCEDURE

The test was performed by using aqueous solutions at known concentrations, by
15 using the Hach kit for measuring the COD in the range 0-1500 ppm of O₂.

RESULTS

Product A: 0.06% Alkyl Poly Glucoside + 0.02% TMAO (total conc. 0.08 %) in water
Product B: 0.5% Zymeflow 657 (corresponding to an assumed content of LDMAO of
20 0.06 % in water)

RESULTS

Product A : 954 ppm O₂
Product B : 4660 ppm O₂

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The product based upon Alkyl Poly Glucoside + TMAO, even with higher overall concentration of active elements, has a much lower COD than the solution of LDMAO. Then, waste water including the product based upon Alkyl Poly Glucoside + TMAO, will have a certainly lower impact on a biological purification plant than the
30 same water including LDMAO.

Example 5 EMULSIFYING CAPABILITY TEST

The emulsifying capability of Alkyl Poly Glucoside was evaluated, compared to that of LDMAO.

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PROCEDURE

The test was performed by using for each product 98 mL of water, 2 mL of 12% solution of the two active principles and 50 mL of an oily solution, constituted by a CDU plant deposit + heavy diesel fuel, in ratio 1:10. Everything was homogenised under magnetic stirring for 10 minutes and left to rest for 4 hours, to evaluate the emulsion rupture speed in time.

RESULTS

See FIGURE 1

Comments

Figure 1 shows that the aqueous solution which separates in the container of the first test (sequence at the top, photos A, B, C e D – from 40 minutes to 4 hours – Product A) is clearly cleaner, wholly transparent (the transparency is evident as it is possible to see the magnetic small anchor very clearly). In the second test, shown in the sequence at the bottom (photos E, F, G e H - Product B), the water is very dirty, even after 4 hours it is not possible to see the magnetic small anchor.

It is clear that the solution including Alkyl Poly Glucoside as surfactant separates more easily and quicker than the one including the same concentration of LDMAO.

Example 6 RESPIROMETER TEST

It is a test which is performed to verify the biocidal power of a substance with respect to the bacteria existing in the active sludge of a plant for the disposal of waste water.

Method Principle.

The tests consist in measuring the quantity of dissolved oxygen consumed in a certain time interval by a sludge incubated in presence and in absence of the substance under examination, potentially capable of exerting inhibiting effect on the oxidative activity of the biomass with respect to biodegradable carbonaceous substrate (end peptone 60 mg/L). The oxygen consumption, as it is known, is a quantitative index of the overall oxidative (mainly bacterial) activity of the sludge (normal oxidative values: 10-50 mg O₂ g⁻¹ VSS h⁻¹); the inhibiting effect of the substance is highlighted by means of a decrease in the kinetics of the oxygen consumption, in case up to a complete zeroing in case of strong product toxicity.

Purpose of the tests. It is that of evaluating a possible inhibiting effect on the active sludge of a biological plant for the treatment of discharge water, after inletting into the tank with active sludge the products to be tested which in a continuous or discontinuous way may arrive at the plant upon discharging.

Used Analytical Methods. The tests are performed according to the Standard Method 2710B and the Method IRSA on the sludge Request of oxygen Quad. IRSA n64 (1983). The test consists in determining the "Oxygen uptake rate", expressed as O_2 g-1 VSS h-1 on an active sludge of a plant for the biological treatment, in presence of carbonaceous substrate (peptone) and the product to be tested; the products were added to the active sludge in concentrations similar to those which may arrive at the plant for the treatment of waste water during a decontamination.

Product A: 12% Alkyl Poly Glucoside + 6% TMAO in water

Product B: 12%LDMAO in water

The tests performed with the Product A do not show effects visible on the respiratory activity of the active sludge up to the concentration of 20,000 mg/l. Tests with even higher concentrations were not performed.

On the contrary, the Product B starts to have negative effects already at a concentration of 2000 mg/l, by causing a partial reversible inhibition of the respiratory activity of the active sludge. At the concentration of 4000 mg/l the effect becomes lethal, by wholly inhibiting the respiratory capability in irreversible way. The test performed with 10000 mg/l of Product B causes the total destruction of the bacterial colony and it confirms that above 4000 mg/l this solution is toxic for the active sludge and it exerts a strong biocidal action on this bacterial substrate.

In other words, the solution including this concentration of LDMAO cannot be discharged in any way into the biological plant for the treatment of waste water of a refinery plant, without running the risk of the complete deactivation of the active sludge, with very serious consequences on the purification capability of the plant itself. In absence of an operating disposal plant, the refinery would be not able to discharge the waste water according to law and it should stop the activities thereof with relevant economical damages. Even more so, an aqueous solution including this concentration of LDMAO could not be discharged in any way into the outer environment without an adequate treatment.

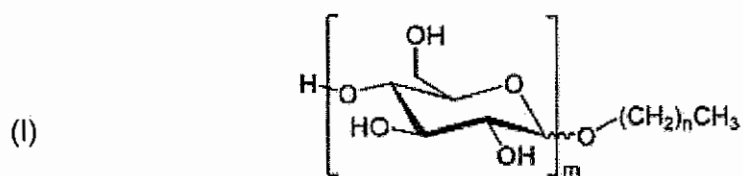
Therefore what the actual art provides, in case of high concentrations of the currently used product, is a temporary storage of the decontamination water, in order to be able to dispose it in small quantities (thus low concentrations) and in very long time: however, this involves relevant costs, the immobilization of a tank and however a series of risks in case of managing badly such water.

The washing water including instead even high concentrations of Product A not only guarantee the same effectiveness in the removal of deposits, in the oxidation of the

sulphides and in all critical operating steps of a decontamination, but they can outflow safely into the plant for the disposal of waste water, without running any risk of off-specification or malfunction of the plant itself.

CLAIMS

1. A composition comprising
a trialkylamine oxide wherein the alkyl radical may be linear or branched and
have a number of carbon atoms comprised between 1 and 6 and
a surfactant selected from the class consisting of Alkyl polyglucosides.
2. The composition according to claim 1, wherein said alkyl radical is trimethyl.
3. The composition according to claim 1 or 2, wherein said trialkylamine oxide
and said surfactant are contained in a weight/weight ratio between 100:1 and
1:100.
4. The composition according to at least one of the preceding claims, wherein
said surfactant is selected from the class consisting of alkyl-polyglucosides
of following formula I



wherein

n is comprised between 8 and 16

m is an integer from 1 to 3

for use in the cleaning of refinery plants, petrochemical plants and storage
tanks for crude oil.

5. The composition according to at least one of the preceding claims further
containing further additives usual in the technical field
6. The composition according to claim 5, wherein said additives belong to the
class formed by corrosion inhibitors, odorants, colorants, peroxides, terpenes
and biodiesel.

- 5
7. The use of the composition according to at least one of the preceding claims for the cleaning of refinery plants, petrochemical plants and storage tanks for crude oil.
 8. The use of a trialkylamine oxide wherein the alkyl radical may be linear or branched and show a number of carbon atoms comprised between 1 and 6 for the cleaning of refinery plants, petrochemical plants and storage tanks for crude oil.
 9. The use according to claim 8 wherein said alkyl radical is trimethyl.