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(54) PROCESS FOR BIOLOGICALLY DEGRADING PETROLEUM-CONTAINING WASTE

(71) We, BANQUE POUR L'EXPANSION INDUSTRIELLE "BANEXI", of 1 Boulevard Haussmann, Paris 9eme, France, a French Body Corporate, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to the biological degradation of petroleum waste material. It is known that organic waste matters in suspension in water are, when the oxygenation of the water is sufficient, subjected to natural biodegradation under the influence of aerobic micro-organisms, but this biodegradation is slow because the aqueous milieu in which the waste matters are in suspension is often unsuitable or at the very least is not the best for the development of these micro-organisms.

In order to develop the micro-organisms need air, which requirement is generally met in a known manner by means of mixing and aerating. But they equally need carbon, nitrogen, phosphorus and trace elements in well defined proportions. The micro-organisms which are specific for the degradation of certain substances show maximum development when they are located in a specific pH medium. The technique of biological purification by the activated sludge method involves artificial aeration of an aqueous suspension of the waste material, which aeration makes it possible to meet the biochemical oxygen requirement but to provide for nutritive requirements of the micro-organisms which degrade the organic substances it is necessary to recycle the activated sludge which is enriched in micro-organisms but this recycling leads to an increase in the volume which has to be treated.

It is moreover necessary when it is desired to degrade such waste matters which *per se* constitute a source in certain of the nutritive elements which are necessary to the micro-organisms not to add to the medium large quantities of sources of the same

nutritive elements which are more easily consumed by the said micro-organisms.

In addition the waste materials must be dispersed in stable suspension and it is impossible to subject to biological degradation petroleum-waste materials unless they are likewise emulsified.

According to the invention there is provided a process for biologically degrading a petroleum waste material in which the said waste material is emulsified in water using a biodegradable glue or gum, nitrogen- and phosphorus-containing materials being incorporated in the emulsion to give a nitrogen content of from 6 to 8% by weight and a phosphorus content of from 1 to 3% by weight based on the weight of the said waste material; the emulsion then being subjected to aerobic conditions.

In order to emulsify in the water petroleum waste materials such as crude petroleum, petroleum-containing residual sludge, oils and grease, use is made of a biodegradable glue or gum such as glues derived from bones, skins or fish and natural gums (e.g. tragacanth, or arabic).

In the process of the present invention there may be used compositions which are constituted principally by vinasses and which also comprise ammonium nitrate, dicalcium phosphate and calcium carbonate.

Vinasses are in fact cheap sources of nitrogen and trace elements as they themselves constitute distillation residues. They are moreover, unlike molasses, lacking in sugar and alcohol which are the sources of carbon most easily consumed by micro-organisms. Thus their presence does not interfere with the biological degradation of the carbonaceous part of the waste matters.

These may be used in present processes the biological degradation of petroleum waste material a composition (A) constituted in its active part by 40 to 60% by weight of vinasse, 0 to 12% by weight of ammonium nitrate, 3 to 8% by weight of dicalcium phosphate, 25 to 40%

by weight of calcium carbonate and 1 to 3% by weight of glue.

Ammonium nitrate can often be suppressed when the vinasses are very rich in nitrogen.

Active part is taken in the above to mean the part which intervenes in the process of biological degradation of petroleum waste material, and it is quite clear that the composition can contain water or additional mineral or organic substances.

In one embodiment of the invention, to 100 parts by weight of petroleum waste material there are added 70 to 200 parts by weight of a composition (A) as above described the mixture being stirred with 10 to 30 times its weight of water, and the resultant emulsion being aerated.

There follows a description of examples of use of the invention. In the Examples the nitrogen and phosphorus contents of the emulsions produced were within the ranges 6 to 8% by weight and 1 to 3% by weight, based on the weight of the petroleum waste respectively.

EXAMPLE 1

In order to degrade a petroleum waste material constituted by residual sludge a paste was prepared constituted by:

Vinasse	39% by weight
Ammonium nitrate	7% " "
Dicalcium phosphate	4% " "
Calcium carbonate	29% " "
Glue (skins glue)	1% " "
Water	20% " "

This paste was mixed in equal parts to the petroleum waste material and the mixture was stirred with 20 times its own weight of water and then the emulsion which was obtained was stored in a tank with forced aeration. After 25 days chromatography showed total degradation of the hydrocarbons.

EXAMPLE 2

In order to degrade petroleum waste materials constituted by greasing oils a paste was prepared constituted by:

Potassium vinasse	15% by weight	
Magnesium vinasse	30% " "	
Dicalcium phosphate	6% " "	
Calcium carbonate	30% " "	55
Glue (arabic gum)	1% " "	
Water	18% " "	

This paste compound was added weight for weight to greasing oils and to the mixture was added 30 times its own weight of water. The emulsion was poured out over a soil constituted by a mixture of sand and gravel. After 60 days under aerobic conditions no trace of hydrocarbon was detected in the soil.

WHAT WE CLAIM IS:—

1. A process for biologically degrading a petroleum waste material in which the said waste material is emulsified in water using a biodegradable glue or gum, nitrogen-and phosphorus-containing materials being incorporated in the emulsion to give a nitrogen content of from 6 to 8% by weight and a phosphorus content of from 1 to 3% by weight based on the weight of the said waste material; the emulsion then being subjected to aerobic conditions.

2. A process as claimed in claim 1 in which to 100 parts by weight of the petroleum waste material there are added 70 to 200 parts by weight of a composition constituted in its active part (as herein defined) by 40 to 60% by weight of vinasse, 0 to 12% by weight of ammonium nitrate, 3 to 8% by weight of dicalcium phosphate, 25 to 40% by weight of calcium carbonate and 1 to 3% by weight of glue, the mixture being stirred with 10 to 30 times its own weight of water, and the resultant emulsion being aerated.

3. A process as in any one of claims 1 and 2 in which the glue or gum is chosen amongst glues derived from bones, skins and fish, and natural gums.

4. A process as claimed in claim 1 substantially as hereinbefore described with reference to the Examples.

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