

Description

The present invention relates to a process for producing a detergent.

US 3971726 describes a method of producing alkali metal carbonate beads having a low bulk density and which may be treated with a nonionic detergent to produce a heavy duty detergent composition. The beads are produced by admixing a small percentage of alkali metal soap of a higher fatty acid with an aqueous crutcher mix having a solids content of 40—75% and comprising the alkali metal carbonate and up to about 2% by weight of nonionic detergent. The mixture is heated and spray dried to yield the beads, which may then be further treated with nonionic detergent.

US 4028262 describes phosphate-free detergent compositions using a combination of sodium citrate and sodium carbonate as builders. The combination may be used with nonionic surfactants and anionic surfactants. Processes for preparing the detergent compositions are not particularly described.

We have now devised a process which:—

a) reduces the enormous investment in plant and equipment for compounding and drying starting materials compared to known techniques for manufacturing powdered detergents;

b) avoids pollution caused by existing manufacturing processes, namely, from i) dispersal of detergent powder material into air during an atomizing process, and ii) the emission of soot and smoke from fuels used in the drying process;

c) prevents the wastage of enormous amounts of the fuel required for drying (which amounts to approximately 10% of the production amount);

d) substantially shortens manufacturing times; and

e) enhances the usefulness of natural oil fat powdered detergents which have hitherto been difficult to dry due to their molecular structures.

The present inventor has devised a process for the high-speed formulation of detergents with a low energy consumption.

The present invention provides a process for producing a detergent which comprises the step of preparing a mixture of soda ash (sodium carbonate) as builder, and a nonionic surfactant or a surfactant composition comprising an anionic surfactant and at least 40% of a nonionic surfactant, characterised in that the mixture is prepared in a generally cylindrical reaction vessel, the bottom of which is provided with an agitating blade rotating in a substantially horizontal plane and turning on a substantially vertical axis, the side wall of which is provided with crosswheels turning on a substantially horizontal axis, and the upper part of which is of generally circular conical form having a curvature of 5 to 30°; and vigorous agitation of the mixture by means of the blade and the crosswheels which rotate at different speeds.

Embodiments of the invention are described below by way of example with reference to the accompanying drawings in which:—

Figure 1 is a perspective view showing apparatus wherein the process of the present invention may be carried out;

Figure 2 shows a vertical sectional view of apparatus wherein the process of the present invention may be carried out; and

Figure 3 shows the flow of particles in the apparatus of Figure 2.

The components forming a detergent of the present invention comprises soda ash as a builder, and a nonionic surfactant or a mixed surfactant consisting of nonionic and anionic surfactants, the soda ash amounting conveniently to 50% or more, preferably from 70 to 85% of the whole detergent. The detergent of the invention exhibits a washing effect higher than that of conventional detergents. Tables 1 and 2, below, illustrate clearly how unique such a composition is, compared with conventional synthetic detergents.

TABLE 1
Conventional synthetic detergent
("Knowledge of Synthetic Detergents" by Keizoh Ogino)

Component	Content (%)
o Active component	15—30%
Phosphate	10—35%
Glauber's salt	30—50%
Sodium silicate	0—15%
o Sodium carbonate	0—20%
CMC	0.5—2.0%
Fluorescent dyestuff	0.1—0.4%
Moisture	1—15%

TABLE 2
An example of a detergent of the invention

	Component	Content (%) 4% nonionic
5	o Surfactant	7.8%
		3.8% anionic
10	Soda ash	79.0%
	Sodium silicate	5.0%
15	CMC	0.1%
	Sequestering agent	0.1%
	Enzyme	0.1%
20	Moisture	the rest

The soda ash used as the builder in the present invention has a detergency in aqueous solution which approximates, in ionic action, to that of salts such as alkylbenzene sulfonates, linear alkylbenzene sulfonates, and sulfonates of coconut oil alcohol.

Nonionic surfactants are superior to anionic ones in permeability, solubility, etc., so the present invention aims at reducing the amount of anionic surfactant used as well as attaining a synergistic detergency effect by the use of soda ash and a nonionic surfactant, by employing nonionic surfactant or substituting soda ash for a part of the anionic surfactant. Soda ash reacts with moisture in the active component, and the exothermic reaction on hydration (which may produce temperatures up to approximately 80°C) promotes drying of the reaction product and has the effect of preventing a fall in pH caused by oxidation of oils. In the present invention, accordingly, it is possible to omit phosphates which have sometimes been employed in the past for the above effect.

In addition to the above-mentioned components, other conventional additives such as thickeners, enzymes, sequestering agents and the like may be added as desired.

The accompanying drawing illustrates an embodiment of apparatus wherein the process of the present invention may be carried out. It is a cylindrical reaction vessel 1, approximately 1/3 of the upper part of which forms a circular cone with a curvature of 5 to 30°, and the inner part is equipped at the vertical axis 2 at the center of the bottom with a horizontally agitating blade 3 rotating on said axis; and the side wall is provided at the horizontal axis 4 with a plurality of crosswheels (choppers) 5 fixed perpendicularly to the said axis, and rotating on the axis.

The blade 3 comprises a plurality of flat blades having faces with elevation angles of 5 to 45°, the peripheral speed of which is conveniently 0.6 to 6.0 m.s.⁻¹.

When the crude particles of detergent containing soda ash as the builder are added to the reaction vessel 1, and the blade 3 and the crosswheels 5 are rotated, the crude particles are scattered outwards by the centrifugal force caused by the rotation of the bottom blades and at the same time upperwards by the elevation angle of the blade faces. The downward curvature at the rim of the vessel avoids dead points on the upper surface of the particle mass and enables the cyclic movement shown by the arrows in Figure 3, and consequently the particles become uniform.

The crude particles are thereby ground by the rotation of the blade, and at the same time, the crude particles themselves make a kind of spiral movement in a radial and upperwards manner. The crosswheels (chopper) mounted on the horizontal axis interfere with the scattering of the particles to complete mixing, and at the same time, grind clods and prevent subsequent cohesion (blocking) of the builder. In addition, the crosswheels help to regulate particle size and to obtain the detergent in a highly dried state. The crosswheels preferably rotate with a peripheral speed of 6 to 12 m.s.⁻¹.

In the process of the present invention, since drying is effected in the reaction vessel with the heat of hydration of the soda ash and the heat caused by the mutual friction of the particles, the energy consumption which has hitherto been regarded as inevitable for producing synthetic detergents is greatly reduced. Detergency may also be improved by the synergistic effect of soda ash as the builder and the nonionic portion. In particular, it enables the manufacture of powdered detergents from natural vegetable oils as the starting materials, which have previously exhibited problems in profitability due to their difficulty in drying.

Example

The materials in the following composition were added to a reaction vessel of the type illustrated on Figure 2 to produce the detergent.

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15 **Reaction vessel: capacity: 25 liter**
 blade: 1, elevation angle: 30°,
 rotation: 150 rpm
 crosswheels: 3, rotation: 1500 rpm
 Period from preparing the product to taking out: 6 minutes.

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Sulfate of natural coconut oil alcohol	3.6%
Fatty acid amide of natural coconut oil alcohol	3.4%
Sequestering agent	0.2%
CMC	0.1%
Soda ash	82.0%
Sodium metasilicate	5.0%
Moisture	the rest

Reaction vessel: capacity: 25 liter
blade: 1, elevation angle: 30°,
rotation: 150 rpm
crosswheels: 3, rotation: 1500 rpm
Period from preparing the product to taking out: 6 minutes.

Particle size distribution:

Particle size		Weight		Aggregate %	
Mesh	Micron	Gram	%	Above screen	Under screen
+14	+1190	3.04	2.1	2.1	97.9
+20	+840	4.11	2.8	4.9	95.1
+28	+590	3.31	2.3	7.2	92.8
+35	+420	3.01	2.1	9.3	90.7
+48	+297	5.62	3.9	13.2	86.8
+65	+210	11.83	8.2	21.4	78.6
+100	+149	50.60	35.1	56.5	43.5
+150	+105	23.23	16.1	72.6	27.4
+200	+74	29.03	20.0	92.6	7.4
+270	+53	8.44	5.9	98.5	1.5
+325	+44	2.04	1.4	99.9	0.1
-325	-44	0.12	0.1	—	—
Total		144.38	100.0	—	—

Claims

1. A process for producing a detergent which comprises the step of preparing a mixture of soda ash as builder, and a nonionic surfactant or a mixed surfactant comprising an anionic surfactant and at least 40% of a nonionic surfactant, characterised in that the mixture is prepared in a generally cylindrical reaction vessel, the bottom of which is provided with an agitating blade rotating in a substantially horizontal plane and turning on a substantially vertical axis, the side wall of which is provided with crosswheels turning on a substantially horizontal axis, and the upper part of which is of generally circular conical form having a curvature of 5 to 30°; and with vigorous agitation of the mixture by means of the blade and the crosswheels which rotate at different speeds.

2. A process according to claim 1 in which the blade has an elevation angle of 5 to 45°.



3. A process according to either of claims 1 and 2 in which the crosswheels have a vertical surface.
4. A process according to any one of the preceding claims in which the peripheral speed of the blade is from 0.6 to 6.0 m.s⁻¹, and the peripheral speed of the crosswheels is from 6 to 12 m.s⁻¹.

5 Patentansprüche

1. Verfahren zur Herstellung eines Detergens mit der Stufe der Herstellung eines Gemisches von wasserfreier Soda als Gerüststoff und eines nichtionischen oberflächenaktiven Mittels oder eines gemischten oberflächenaktiven Mittels aus einem anionischen oberflächenaktiven Mittel und wenigstens 40 % eines nichtionischen oberflächenaktiven Mittels, dadurch gekennzeichnet, daß das Gemisch in einem allgemein zylindrischen Reaktionsbehälter, dessen Boden mit einem in einer im wesentlichen horizontalen Ebene rotierenden und auf einer im wesentlichen vertikalen Achse sich drehenden Rührblatt versehen ist, dessen Seitenwand mit auf einer im wesentlichen horizontalen Achse sich drehenden Malteserkreuzen versehen ist und dessen oberer Teil allgemein runde Kegelform mit einer Rundung von 5 bis 30° hat, und mit heftigem Rühren des Gemisches mit Hilfe des Blattes und der Malteserkreuze, die mit unterschiedlichen Geschwindigkeiten rotieren, hergestellt wird.
2. Verfahren nach Anspruch 1, bei dem das Blatt einen Höhenwinkel von 5 bis 45° hat.
3. Verfahren nach einem der Ansprüche 1 und 2, bei dem die Malteserkreuze eine vertikale Oberfläche haben.
4. Verfahren nach einem der vorausgehenden Ansprüche, bei dem die Umfangsgeschwindigkeit des Blattes 0,6 bis 6,0 m.s⁻¹ und die Umfangsgeschwindigkeit der Malteserkreuze 6 bis 12 m.s⁻¹ beträgt.

Revendications

1. Procédé pour produire un détergent qui comprend l'étape de préparation d'un mélange de carbonate de sodium comme adjuvant pour détergent et d'un agent tensio-actif non ionique ou d'un agent tensio-actif mixte comprenant un agent tensio-actif anionique et au moins 40 % d'un agent tensio-actif non ionique, caractérisé en ce que le mélange est préparé dans un réacteur de forme générale cylindrique dont le fond est muni d'une pale d'agitation tournant dans un plan sensiblement horizontal autour d'un axe sensiblement vertical, dont la paroi latérale est munie de roues croisées tournant selon un axe sensiblement horizontal et dont la partie supérieure à une forme générale conique circulaire ayant une courbure de 5 à 30°; et avec une agitation énergique du mélange à l'aide de la pale et des roues croisées qui tournent à des vitesses différentes.
2. Procédé selon la revendication 1, dans lequel la pale a un angle d'élévation de 5 à 45°.
3. Procédé selon l'une des revendications 1 et 2, dans lequel les roues croisées ont une surface verticale.
4. Procédé selon l'une quelconque des revendications précédentes, dans lequel la vitesse périphérique de la pale est de 0,6 à 6,0 m.s⁻¹ et la vitesse périphérique des roues croisées est de 6 à 12 m.s⁻¹.

