(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 200 074**
A2

(12) # EUROPEAN PATENT APPLICATION

(21) Application number: **86105103.5**

(51) Int. Cl.[4]: **C10L 1/32**

(22) Date of filing: **14.04.86**

(30) Priority: **23.04.85 IT 2045685**

(43) Date of publication of application:
10.12.86 Bulletin 86/45

(84) Designated Contracting States:
DE FR GB NL SE

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(54) **Stabilizer for aqueous suspensions.**

(57) Aqueous suspensions of pet-coke are stabilized by means of the addition of bentonite in a percentage comprised within the range of from 0.2% to 3% by weight relatively to the weight of the suspension.

EP 0 200 074 A2

"STABILIZER FOR AQUEOUS SUSPENSIONS"

The present Invention relates to a stabilizer for aqueous suspensions.

More particularly, the present invention relates to a stabilizer for aqueous suspensions of pet-coke.

In the present disclosure, reference shall be made to this latter case, which is the most interesting to the Applicant, it being intended that the stabilizer according to the present invention can be used in a wide range of suspensions of solids in water.

Pet-coke is a high heat value product with low content of ashes, and a great interest exists hence in converting said pet-coke into a fluid product by dispersing it in liquids, in particular in water.

The problem to be faced with pet-coke is that it gives rise to completely unstable suspensions in water.

After a short rest time indeed an aqueous suspension of pet-coke gives rise to a lower layer of highly packed pet-coke, and to an upper layer of water.

Homogenizing again the two phases results very difficult.

The use of traditional stabilizers of polysaccharide type (xanthan gums) results not much efficacious from the view point of stability, and on the other hand induces considerable increases in viscosity.

It has been surprisingly found, and this is the object of the present invention, that the aqueous suspensions of pet-coke can be stabilized by adding to them bentonite in amounts comprised within the range of from 0.2 to 3% by weight relatively to the weight of the suspension.

As for the concentration of pet-coke in water, it is usually comprised within the range of from 50% to 80% by weight.

The suspension contains moreover normal fluidifiers, in particular those obtained by the sulphonation and salifying of coal tar, and possible condensation with formaldehyde, or the non-surfactant anionic polyelectrolytes, in particular those having alkyl-substituted polynuclear aromatic groups and having a molecular weight higher than 300 and preferably comprised within the range of from 500 to 3000.

Among these latter, mentioning is worth while the salts of monovalent cations of polymerized alkyl naphthalene-sulphonic acids, and among these the compounds known under the trade names DAXAD 15 (W.R. Grace), DAXAD 19 (W.R. Grace) and Reoplast 203 (Fratelli Lamberti).

As for the granulometry of pet-coke in the aqueous suspension, it is such as to have particles of size lower than 300 μm, and preferably the suspension is formed by two groups of particles of different average size, the first group of particles having an average size between 210 μm and 60 μm, whilst the particles of the second group have an average size comprised between 1/6 and 1/20 of the average size of the particles of the first group.

The particles of the first group are at least 50% and up to 80% by weight of the total of the particles.

As for the preparation of the suspension of pet coke containing the stabilizer according to the present invention two routes can be followed: dry process and wet process.

In the dry process, the bentonite is added to the fluidifier-containing pet-coke in the step of pet coke grinding, or in the step of mixing with water and additives.

In the wet process, in case of a continuous type granulometry of the particles of pet-coke, the process is carried out as described above, with the exception of the fact that the grinding is carried out under wet and not dry conditions.

On the contrary, in case mixtures of pet-coke with two different granulometric fractions are used as preferable, the bentonite can be added either during the wet grinding step in which the coarse fractions are produced, or, preferably, during the wet grinding during which the finer (micronized fraction is produced.

In order to obtain the coarser fraction, a rod mill is generally used, whilst to obtain the finer fraction a ball micronizer is used.

The end particle sizes of the two pet-coke fractions are those as above mentioned.

The two fractions mixed with each other give rise to the aqueous suspensions of pet-coke.

The wet milling to obtain the coarser fraction is preferably carried out by mixing the raw pet-coke to be ground with the wet-micronized fraction, continuining the grinding, until the size desired for the coarse fraction is reached. This is the grinding process adopted in Examples 2 and 3.

Some Examples having the purpose of better illustrating the invention shall be now given, it being intended that the same invention is not limited by them or to them.

Example 1

Dry Process: Addition of bentonite in the mixing step

The pet-coke having the following characteristics has been used:

volatile matter	12.6%	by weight
sulphur	4.63%	by weight
ashes	0.4 : 0.5%	by weight
gross heat value, referred to dry pet-coke	8520	kcal/kg
grindability index	22.3	Hardgrove

A slurry has been prepared with the coarse fraction and the micronized fraction, in the weight ratio of 65/35 at a concentration of pet-coke of 72.0% by weight, and with an amount of DAXAD 15 of 0.5%.

Bentonite has been metered into it in the amounts of respectively 0%, 1.0%, 1.5%, 2.0%, 2.5%.

The samples stored inside closed containers have shown a good stability already at the bentonite concentration of 1%, but the optimum concentration value has resulted to be 1.5%.

Larger amounts of bentonite confer a too pseudoplastic character to the product.

The values of stability, as % after 48 hours, for the five cases, are respectively

91.0; 96.0; 98.5; 99; 99.5.

The rheological characteristics obtained are the following:

	ADDED BENTONITE %				
	0	1.0	1.5	2.0	2.5
η (P)	5.52	5.62	4.57	5.27	6.28
K (P)	5.65	25.93	51.16	75.21	103.61
n	0.99	0.69	0.54	0.50	0.51

wherein η (P) is the viscosity in Poises computated as the shear stress / shear rate regression line between 70 and 130 s^{-1} of shear rate, K and n are related with each other by the relationship

$$\tau = K \dot{\gamma}^{n}$$

wherein τ is the shear stress, $\dot{\gamma}$ is the shear rate, K is the consistency index and n is the index describing the newtonian character of the suspension.

Determination of the Static Stability

The determination of the static stability is carried out by pouring the coal suspension into a 170 x 24 mm plexiglas cylinder and keeping it resting for a determined time at constant temperature.

After such time, the cylinder is introduced in a freezer to cause the suspension to solidify.

The 150-mm high core is thex extracted from the cylinder and from its ends two samples of about 15 mm of height are drawn.

The two samples are then analyzed for the determination of the content of solids.

The % ratio of the solids content found in the top sample to that of the bottom sample allows to calculate the stability.

The static stability is expressed by a number comprised between 0 and 100.

Example 2

Wet Process: Addition of bentonite during the end rod milling step

The pet-coke used was that of Example 1.

The wet-micronization has been carried out a a concentration of 50% of solids, with an amount o DAXAD 15 corresponding to the concentration o 0.5%, as referred to the end rod milling.

The coarse/fine ratio in the end rod milling ha been 65/35.

At the beginning of the wet rod milling, th following amounts of bentonite have been respec tively added:

0%, 0.2%, 0.4%, 0.5%, 0.6%.

The end concentration of pet-coke has been c 71% by weight.

The results obtained are reported in the follow ing Table.

	BENTONITE %				
	0	0.2	0.4	0.5	0.6
η (P)	5.31	(6.37)	5.75	6.39	7.10
k (P)	2.96	6.85	17.20	25.60	37.96
n	1.13	0.98	0.77	0.71	0.65
Stability % after 48 hrs	90.2	95.7	96.6	96.7	96.4

Example 3

Wet Process: Addition of bentonite during the micronization step

The pet-coke used was that of Example 1.

Wet-micronizations have been carried out at a concentration of 50% of solids, with the addition of 0, 0.1%, 0.2%, 0.3%, 0.5%, 0.7%, 0.9% of bentonite, referred to the overall micronized matter.

The whole amount of fluidifier additive DAXAI 15 has been added in the micronization step, so a to obtain in the end rod milling a concentration c 0.5%.

Using a coarse/fine ratio of 65/35 in the en rod milling, the bentonite amounts above liste correspond to 0%, 0.05%, 0,10%, 0.15%, 0.25% 0.35%, 0.45% in the end product.

The concentration of pet-coke in the end prod uct has resulted around 71%.

In the following Tables, the rheological char acterizations are reported of the product from th micronization step, and of the product from th rod-milling step, and the stability thereof.

MICRONIZATION

BENTONITE %

	0	0.1	0.2	0.3	0.5	0.7	0.9
n (P)	0.41	0.41	0.43	0.48	0.48	0.54	0.53
K (P)	0.15	0.21	0.51	0.72	2.13	9.33	13.05
n	1.18	1.11	0.96	0.91	0.69	0.45	0.40

END ROD MILLING

Bentonite % in end slurry

(added in the micronization step)

	0	0.05	0.10	0.15	0.25	0.35	0.45
n (P)	5.51	5.14	(6.16)	5.25	5.99	6.82	7.94
k (P)	2.96	3.51	5.49	5.41	11.61	40.00	62.16
n	1.13	1.09	1.03	1.00	0.86	0.86	0.57
Stability %							
after 48 hrs	90.2	89.3	93.3	96.1	97.0	98.8	98.6

From the results obtained, it can be observed how, to the purpose of minimizing the concentration to be added, the use of bentonite in the micronization step is more convenient. The optimum concentration of bentonite to be added is of 0.2 to 0.4%, referred to the end rod milling.

In the Figure the stability (ordinate, as %) obtained by adding bentonite (abscissae, as %) in the rod-milling step (white circles) and in the micronization step (black circles) is comparatively shown.

It can be observed that better stabilities and with lower concentrations are obtained by adding bentonite in the micronization step.

Claims

1. Stabilizer for aqueous suspensions of pet-coke, characterized in that it is bentonite.

2. Stabilizer according to claim 1, wherein the bentonite is in a percentage comprised within the range of from 0.2% to 3% by weight relatively to the weight of the suspension.

3. Stabilizer according to the above claims, characterized in that it is added to the pet-coke during its dry or wet milling.

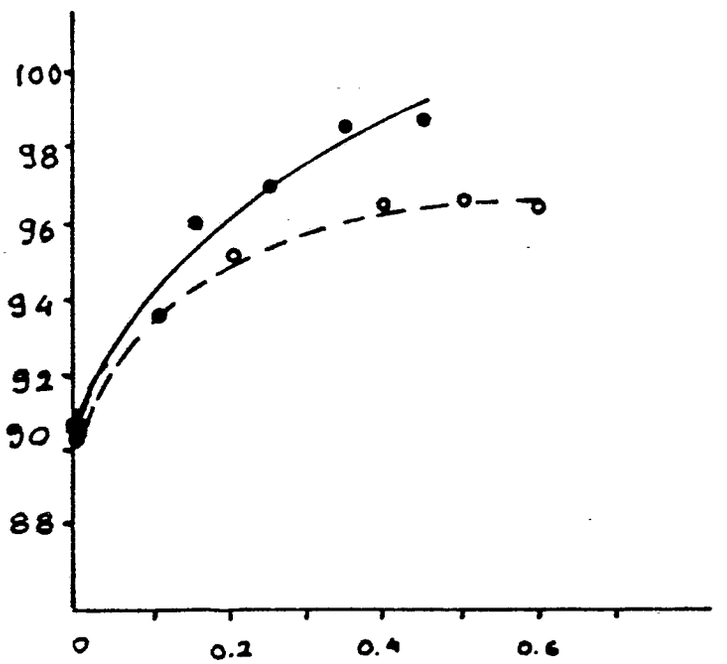

FIG. 1