REDUCING FOAMING IN PAPER MANUFACTURE.

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Description

The present invention is concerned with reducing the problems caused by foam formation during the production of paper produced under alkaline or neutral conditions using cyclic acid anhydrides, especially alkyl or alkenyl succinic anhydrides (ASA) as sizes.

Sizing paper with alkenyl succinic anhydrides (ASA) at or about a neutral pH, using paper stock containing calcium carbonate as a neutral whitening filler is a well known process, but it is known to produce an unacceptable amount of foam in the paper machine white water recycle. The foam, accumulates as white pitches in the white water recycle and is transported with the paper stock to the paper machine head box. Although silicones and other anti-foam additives are sometimes added they do not give adequate foam reduction.

Shutting down the process and cleaning up the equipment is the technique used to alleviate the above mentioned problems. The resulting cost, due to the lower productivity, represents an unrecoverable process loss.

Typically the sizing is carried out by metering ASA as an emulsion into the paper stock in the wet end of the paper machine just before feeding the diluted paper stock to the Fourdriner table. The paper stock contains 20-30% (on dry cellulose) calcium carbonate as an inert filler. More recently it has been proposed in EP-A-0348127 that the ASA may be applied neat or as a solution.

Suitable technologies have been developed to produce emulsion involving both dynamic and static mixing (US-E-29960), ancillary materials, classified as activators, promoters and stabilizers, to optimise ASA emulsions with respect to sizing, retention and paper machine runnability.

Although the place to introduce the ASA emulsion in the paper machine can be chosen according to various plant needs, it is customary to select a position to minimize hold time and where the fluid is turbulent to facilitate ASA mixing with the paper stock.

ASA are easily hydrolysable compounds which produce alkenyl succinic acid on reaction with water. The acid is not active in sizing paper (TAPPI Journal 70, 12, pages 117-121, 1987). Moreover, it builds up in the white water recycle to a point when the production of foam and of white pitches occurs with the appearance of dark spots in the paper. Plating out of the white pitches also occurs on several critical places of the paper machine (such as the Fourdriner net, the drying section’s felts, the head box and in the piping system) with a consequent productivity decrease mainly due to press picking, felt soilage and lowered drainage.

Shutting down the process and cleaning up the paper machine is the only known technique used to prevent paper quality problems due to foaming and white pitches formation see the (TAPPI Papermakers Conference 1986 Publication pages 311-314) and to eliminate runnability problems.

ASA’s hydrolysis kinetics indicate a rapid reaction whose rate increases with temperature and pH and it is a function of the emulsion’s particle size (TAPPI Alkaline Papermaking 1985, pages 17-20). The ASA emulsion in water is therefore generally produced on site just before its introduction in the paper machine to minimize hydrolysis.

Unless the ASA's first pass retention is high (i.e. 80-85% and higher), hydrolysis of the unretained ASA and foaming occur quite rapidly due to the high pH prevalent in the white water recycle and its temperature being between 30 to 40 °C.

A number of formulations are available to the paper industry to prepare ASA emulsions see (TAPPI Alkaline Papermaking 1985, pages 113-133, TAPPI Sizing short course 1987, pages 89-91). They are based on an emulsifier compound (such as sulfosuccinates, nonylphenol adducts with ethylene and propylene oxides and the like) and natural and synthetic organic compounds bearing positive charges (such as cationized starch, polyamines and the like).

An improved sizing process, which maximizes ASA first pass retention, involves metering ASA neat or in solution, as a fine spray, directly into the paper stock through a nozzle as described in EP-A-0348127. The improved retention obtainable with the spray-mixing technique depends on several parameters including: ASA particle diameter distribution, presence of ASA-soluble, inert compounds, absence of emulsifiers, a 2-3 orders of magnitude lower contact time with water compared with the emulsion process, etc.


The main purpose of the present invention is to eliminate the technical and cost problems, as previously described, encountered due to foam formation in the ASA-based paper sizing technology.

It has been observed that in papermaking operations involving ASA sizing foam formation depends on the presence of ASA, calcium carbonate and air microbubbles. The absence of one of these components
from the paper stock drastically reduces or eliminates foam. Thus, ASA hydrolysis alone cannot account for foam production.

We have found that the foam is composed of calcium carbonate mixed with small amounts of fines and traces of calcium succinate, an ionic surfactant. It includes also moderate to large amounts of air. We have also found that air microbubbles, when brought into contact with a calcium carbonate surface, do not spontaneously adhere thereto. However, if a hydrophobic material, such as an alkyl succinic moiety, coats the surface of the calcium carbonate particle the air microbubbles may attach readily to it floating the calcium carbon particles typically of diameter 0.2-0.5 micrometers to the surface so that they accumulate as a frothy foam on top of the process liquid.

ASA hydrolysates are essentially alkyl or alkenyl succinic acid dissolved in or dissolving unhydrolysed ASA. They produce a hydrophobic material adhering by chemisorption to calcium carbonate and in part reacting with the production of calcium succinate.

It has been found that foam in the paper making process may be depressed by addition to the paper stock of water soluble salts of a polybasic acid such as sodium hydroxide-treated polymerised silica of the general formula Na$_2$O$_m$SiO$_2$nH$_2$O where m and n are the number of SiO$_2$ and H$_2$O moles relative to one mole of Na$_2$O. We have found that the addition of such depressants reduces or prevents foaming and thus both reduces the paper process runnability problems and improves paper quality. We prefer to use from 0.02 to 2 wt % based on weight of dry cellulose of the salt of the polybasic acid.

It is believed that the effect of the addition of these salts of polybasic acids is to block the calcium carbonate surface and prevent the formation of the foam creating calcium succinate. Other salts which may be used as foam depressants include sodium derivatives of polyacids such as polyphosphoric acids, polyphosphonic acids, ethylene tetracetic acid, polyacrylic acids, hydrocolloids, polysaccharides, etc.

The present invention therefore provides the use of a water soluble or dispersible salt of a polybasic acid or a water colloidal dispersion of said salt as a foam suppressant in alkaline or neutral paper making employing an alkyl or alkenyl succinic acid anhydride sizing agent and calcium carbonate filler.

The invention also provides a process for making paper under alkaline or neutral conditions employing an alkyl or alkenyl succinic acid anhydride sizing agent and calcium carbonate filler, characterized in that the formation of foam is depressed by addition to the stock of a water soluble or dispersible salt of a polybasic acid or a water colloidal dispersion of said salt.

The treatment of the calcium carbonate with the foam depressant is carried out either batchwise or preferably on-line when the pigment slurry is added to the paper stock. While the foam suppressant and calcium carbonate introduction points could be different, we prefer they are the same and are preferably positioned downstream of the position at which the size is added to the paper stock.

It is believed that foam depression by surface blocking occurs because the depressants preferably bind themselves to the calcium carbonate surface thus preventing air microbubbles from adhering to calcium carbonate particles and floating them upward (A.T. Taggart, Elements of ore dressing, John Wiley & Sons Inc., New York 1951 pages 263 to 281).

As a consequence of a substantially foamless operation, white pitches accumulation in the paper is drastically depressed or eliminated. Thus, it is no longer necessary to frequently shut down the paper-making process to carry out cleaning operations to eliminate white pitches deposited on the paper machines. As a consequence, there is an improvement of the machine runnability and of the production costs.

This invention may be applied to the production of paper or similar products, such as board, cardboard etc., based on cellulose or synthetic fibres.

Paper, board, cardboard and other similar products are produced by first dispersing the cellulose or synthetic fibres in large quantities of water and the dispersion passed to a paper making machine where the water is removed to form the continuous paper web.

According to the nature of the fibres, the type of paper or board to be produced etc., the product is treated with various chemicals which may be injected into the aqueous dispersion of the fibres. One particular treatment common to most paper making processes is sizing.

Sizing of paper is well known, two typical sizing materials are alkyl-ketene dimers and alkenyl succinic anhydrides. These products are generally used in emulsion form as described in, for example, JP-A 62-231099; 61-146898; 61-160495; 52-25102; 60-20905. Whilst the present invention is concerned with sizing in general it is particularly concerned with sizing with alkenyl succinic anhydrides, and alkyl ketene dimers.

GB-A-1492104 describes the use of polyoxyalkylene alkyl or arylalkyl ethers, or the corresponding mono- and di-esters derivatives to produce emulsions of cyclic acid anhydrides with a low input of shear energy. Such emulsions are used to disperse intimately the anhydrides into the cellulose stock to produce sized paper. The sizing emulsion can be produced in-situ, within the cellulose stock, or prior to introduction
into the cellulose stock. The emulsions are preferably prepared in the presence of cationized stabilisers such as cationized starches, polyaminoethyl acrylate resins, polyamide resins having free amino groups, reacted or not with epichlorohydrin etc.

The main function of these cationic stabilizers is to charge positively the emulsion's particles favouring their absorption by Coulombic attraction on the negatively charged surface of the cellulose fibres.

Whilst the present invention may be used with processes in which size emulsions are used it is particularly suited for use in combination with the technology described in our EP-A-0348127 in which paper, board, cardboard, etc are produced with a sizing process comprised of the following steps:
- production of a cellulose stock water slurry.
- cationization of such slurry.
- dispersing the synthetic size, neat or in solution with non active compounds such as gas or solvents, in form of fine droplets into the cellulose stock before, during or after the paperweb formation whether or not said paperweb is dry or wet.
- drying the paperweb.

It is also applicable to the process in which the size is introduced in admixture with water. Here the water generally at 30 to 50 °C is used as the vehicle to transport the synthetic size in subdivided form.

0.2 to 4.0 cubic metres of water per ton of dry cellulose, preferably 0.35 to 3.0 cubic metres are used.

According to these preferred procedures, the reactive synthetic sizing compound is continuously dispersed in the form of fine droplets into the wet-end of the paper machine, preferably in places where the cellulose stock water slurry is under high turbulence, to obtain rapid and complete contact of the sizing compound with the paper stock. If necessary turbulence can be controlled by the provision of baffles and stirrers in the flow of the slurry.

The absorption of the sizing compound droplets on the cellulose fibres is aided by a cationizing treatment either the fibres may have undergone such treatment either on-line or in the paper stock preparation tubs alternatively the size may be cationised by for example, addition together with a cationising compound. Such cationization is a standard technique in paper production to favour the retention of wet-strength resins, of mineral charges, etc, which otherwise would be in large part lost. The cationization is generally carried out with long chain fatty amines, synthetic polymers containing amines, cationic modified starches, polyamide-amine resins and other cationized products. Typically 0.02 to 3.50 wt% of cationizing agent based on the weight of dry fibre is used.

In these processes the contact time with the process water of the reactive synthetic sizing compound in dispersed droplet form is very small, depending on the turbulence of the machine wet-end and on the cationizing treatment of the cellulose fibre. These factors can be varied at will until high deposition rates of the size droplets on the fibres are achieved.

The combined action of the extremely low contact time with the process water and the natural hydrophobicity of the sizing compound prevent its hydrolytic degradation and the resulting waste. Moreover, by lowering the droplets diameter to very low values, the interactions with the cellulose fibres and the sizing compound absorption can be improved thus increasing the sizing yield to a level beyond that which can be achieved with the current emulsion technology.

In another procedure, the solutions of certain gases, such as methane, propane, butane, chlorofluoro hydrocarbons, carbon dioxide, etc., in the synthetic sizing compound are sprayed in form of fine droplets directly into the wet-end of the paper machine or onto the formed paper web before the machine drying section, or in the size press.

A range of gas-sizing compound compositions may be used. A preferred composition could be experimentally determined because it may depend from the type of paper produced in a given machine and from the process parameters. In general, the dissolved gas concentration may be in the range 20 to 50% on the sizing compound although for economic reasons it is preferable that gas concentrations be kept in the range 1 to 19% if the cost factor is very important. The sizing compound gas solutions could also be obtained by previously mixing gas types with low and high solubility into the sizing compound, such as nitrogen and carbon dioxide, nitrogen and methane.

In another procedure, the reactive synthetic sizing compound is first dissolved in an anhydrous, aprotic, water-soluble, inert solvent. The solution, is sprayed with one or more nozzles as fine droplets directly into the water-cellulose slurry at the paper machine wet-end. In this case, the inert solvent is dissolved by the process water thus protecting the reactive sizing compound droplets from water's hydrolytic action and generating in-situ a fresh surface in the presence of cellulose.

The presence of inert gases dissolved in the aprotic solvent, as previously specified (for example carbon dioxide), is claimed also for this type of procedure.
Examples of useful aprotic compounds include ketones, esters, ethers, aromatic and aliphatic hydrocarbons, (for example acetone, methyl ethyl ketone, acetylacetone, methyl acetate, ethylene glycol diacetate, dioxane, etc). A range of solvent concentrations in the solutions with the sizing compound can be considered. The preferred composition will be determined by experiment depending on the process parameters. Cost considerations would indicate that solvent concentrations in the range 1 to 19% may be preferred to concentrations in the range 20 to 50% or higher, also to avoid the solvents accumulation in the water recycle system.

In another preferred procedure, the reactive sizing compound is dissolved in an anhydrous, protic, water soluble compound immediately before being sprayed and transformed into fine droplets.

Preferred concentrations of the protic anhydrous solvent with the reactive sizing compound are as previously disclosed in the case of the aprotic solvents. Classes of such solvents include alcohols, etheralcohols, esteralcohols (e.g. methyl alcohol, ethyl alcohol, 2-butoxyethanol, ethylene glycol monoacetate, 2-(2-butoxyethanol), etc.

Subsequent to the addition of the sizing compound to the paper stock into the paper machine wet-end in the concentration range of 0.005 to 2.0% weight on dry fibres, the paper web is dried by heating to temperatures in the range 90 to 120 °C thus favouring the reaction between the reactive sizing compound and the hydroxyl groups of the cellulose. This may be performed by the heated cylinders which provide also the pressure needed to impregnate the paper web surface and thicken the reactive sizing compound.

The preferred synthetic reactive sizing compounds are cyclic acid anhydrides of the general formula

\[ R_1 - C - C = O \]

\[ \quad | \quad \backslash \]

\[ \quad | \quad O \]

\[ \quad | \quad / \]

\[ C - C = O \]

where \( R_1 \) is an organic hydrophobic group. More preferred are the liquid cyclic acid anhydrides in which \( R_1 \) is a branched chain \( C_{9-15} \) alkenyl group.

Typical examples of cellulose that may be treated with the sizing compounds are derived from hardwoods and softwoods, bleached or not bleached, semi-chemical, groundwood and combinations thereof. Synthetic rayon or regenerated cellulose fibres may also be used as well as waste paper and cardboard.

The following examples illustrate the present invention in which the content of all materials reported in the Examples refers to weights on dry cellulose and the following materials are used:

A) Bleached sulphate cellulose (60% hardwood, 40% softwood) of freeness 35 °SR and concentration 40 g per litre in tap water (hardness 17 French degrees) is treated with 0.25 to 0.50% hydrated aluminium sulphate (alum) as a 100 g per litre solution in tap water.

B) Cationized potato starch (Roquette Fr. HICAT (RTM) 180 brand), of concentration around 5% in demineralized water, is cooked at 85-90 °C for 30 minutes and subsequently diluted about 5 times. Limited amounts of starch are cooked and normally used within 12-24 hours from cooking to prevent ageing effects.

C) Calcium carbonate (Craie Micronic (RTM) O brand) is pre-slurried in tap water at the concentration 350 g per litre.

D) Alkenyl succinic anhydride (Exxon Chemical Co. brand), having a \( C_{12} \) branched side chain, and FIBRAN 76 (Roquette (RTM) Fr. brand), having a \( C_{16-18} \) side chain, are used as sizing agents.

E) Alkyl Ketene dimer (AKD) of melting point 39 °C as measured by differential scanning calorimetry.

F) Polyacrylamide (Schimmer & Schwartz FO4550BPM brand), dissolved in water at the concentration 0.038 %, is used as flocculating retention aid.

G) Sodium polysilicate \( Na_{2}SiO_{3}, 3H_2O \) as a 42% wt water solution is added without modifications. Colloidal polymerized silica containing 0.3% \( Na_{2}O \) as a 15% water dispersion (EKA-KEMI (RTM) Compozil BMA Brand) is added without modification.

H) Diethylene triaminopentamethylene phosphonic acid (Monsanto Dequest 2060 S) containing 0.1 % wt \( Na_{2}O \) as a 20 wt % water solution. The acid is believed to be of the formula
In the Examples all concentrations refer to dry cellulose unless otherwise stated.

**COMPARATIVE EXAMPLE 1**

An amount of the paper stock A previously treated with 0.25% alum is fed to a 5 m³ feed tub and it is treated with 0.5% cooked cationic potato starch B. The paper stock amount is limited to about 1 hour of machine feed to prevent unwanted ageing effects.

A piston metering pump connected to a spraying nozzle is used to spray-mix neat FIBRAN (RTM) 76 D into a stream of tap water at 40-50 °C and the mixture is fed at the rate of 0.5m³ Ton⁻¹ dry cellulose to the suction side of the pump feeding the alum-treated paper stock to the paper machine. FIBRAN (RTM) 76 is fed at the rate of 0.35% to maximize foaming effects, if any.

The paper machine is constructed by SICMA, Terni, Italy. It is fitted with a Fourdrinier net width 0.56m and a series of 22 steam-heated drying cylinders, running at the speed of 40m.min⁻¹ and producing about 100 kg paper per hour. The grammage is kept at about 80-85 g.m².

25% calcium carbonate slurried in water is metered on-line into the paper stock on the suction side of the fan pump. The paper stock pH after calcium carbonate addition is in the range 7.2-7.6.

0.038% polyacrylamide F is finally added to the paper stock just before it enters the head box.

The paper web is dried in the machine drying section, whose steam-heated cylinders are programmed to reach temperatures in the range 50-110 °C, before being wound up.

The following paper machine parameters are observed at equilibrium.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head box paper stock concentration g.1⁻¹</td>
<td>3.5</td>
</tr>
<tr>
<td>First pass retention all solids %</td>
<td>94.3</td>
</tr>
<tr>
<td>First pass retention calcium carbonate %</td>
<td>80.5</td>
</tr>
<tr>
<td>Ashes at 425 °C %</td>
<td>19.7</td>
</tr>
<tr>
<td>Zeta potential white waters mV</td>
<td>1.1</td>
</tr>
<tr>
<td>Felt + wire/2 Cobb 60 + 2.54 cm (60°, 50% RH, 23 °C)</td>
<td>19</td>
</tr>
<tr>
<td>Grammage g.m²</td>
<td>80</td>
</tr>
</tbody>
</table>

Severe foaming is observed in the white waters recycle and white pitches formation. An average 830 dark spots per m² is counted in the paper produced making it totally unsuitable for sale.

**COMPARATIVE EXAMPLE 2**

Comparative Example 1 is repeated by using a branched chain C₁₂ alkenyl succinic anhydride D (EXXON CHEMICAL CO) as the sizing agent.

The following paper machine parameters are observed at equilibrium.
Severe foaming is also observed and formation of white pitches. An average 950 dark spots per m² is counted in the paper produced making it totally unsuitable for sale.

**EXAMPLE 1**

Comparative Example 2 is repeated in runs 1, 2, 3 and 4. Sodium polysilicate G is metered on-line into the paper stock on the suction side of the fan pump together with calcium carbonate slurried in water. The paper stock pH after addition is in the range 7.2 to 7.6.

Runs 3 and 4 were carried out with a paper stock pretreated with 0.5% alum and Run 4 with 0.3% of the size to maximize foaming and white pitches, if any.

The following paper machine parameters are observed when equilibrium is attained.

<table>
<thead>
<tr>
<th>Run No.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium polysilicate %</td>
<td>0.08</td>
<td>0.16</td>
<td>0.08</td>
<td>0.08</td>
</tr>
<tr>
<td>Size %</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
<td>0.30</td>
</tr>
<tr>
<td>Head box paper stock concentration g.1⁻¹</td>
<td>3.6</td>
<td>3.6</td>
<td>3.6</td>
<td>3.6</td>
</tr>
<tr>
<td>First pass retention all solids %</td>
<td>-</td>
<td>95.0</td>
<td>-</td>
<td>96.6</td>
</tr>
<tr>
<td>First pass retention calcium carbonate %</td>
<td>-</td>
<td>91.1</td>
<td>-</td>
<td>93.8</td>
</tr>
<tr>
<td>Ashes at 425 °C %</td>
<td>22.4</td>
<td>21.6</td>
<td>22.5</td>
<td>22.0</td>
</tr>
<tr>
<td>Zeta potential white waters mV</td>
<td></td>
<td>+4.4</td>
<td></td>
<td>+5.3</td>
</tr>
<tr>
<td>Felt + Wire/2 Cobb 60•2,54 cm (60°; 50% RH, 23 °C)</td>
<td>21</td>
<td>21</td>
<td>19</td>
<td>20</td>
</tr>
<tr>
<td>Grammage g.m²</td>
<td>80</td>
<td>80</td>
<td>80</td>
<td>80</td>
</tr>
</tbody>
</table>

Small amounts or no foam is produced and absence of white pitches are observed in all runs. The presence of dark spots in the paper produced averaged about 30-35 units per m² indicated that the treatment with sodium polysilicate has drastically decreased white pitches formation.

**EXAMPLE 2**

Comparative Example 2 is repeated in Runs 5, 6, 7, 8 and 10. Run 9 is carried out with FIBRAN RTM 76 as sizing agent for comparison. In all cases, the size concentration is 0.25%. Sodium Polysilicate G or polyphosphonic acid H are metered on-line into the paper stock on the suction side of the fan pump together with calcium carbonate slurried in water. The paper stock pH after addition is in the range 7.2 to 7.6. Runs 6, 7, 8, 9 and 10 are carried out with decreasing amount of polyacrylamide (from 0.038% as in Comparative Example 1 to 0.019 and 0.0%).

The following paper machine parameters are observed when equilibrium is attained.
Small amounts or no foam is produced and absence of white pitches are observed in all runs. The presence of dark spots in the paper produced average about 25-30 units per m² indicating that the treatment with COMPOZIL or Dequest 2060 S has drastically decreased white pitches formation. It is worth mentioning that COMPOZIL alone without any polyacrylamide added has shown a good flocculating action.

**EXAMPLE 3**

Example 2 is repeated in runs 11 and 12 by using respectively branched chain C₁₂ alkenyl succinic anhydride D (EXXON Chemical Company) and mixture of 92.7% wt of the same with 7.3% wt alkyl ketene dimer E as sizing agents both at the concentration of 0.15%.

In both runs, paper stock A is not previously treated with alum and cationized potato starch B. A piston metering pump, connected to a spraying nozzle, is used to spray-mix neat C₁₂ alkenyl anhydride D or its mixture with alkyl ketene dimer E into a stream of cationized potato starch in demineralized water at the concentration of 1.3% at the rate of 0.38 m³·Ton⁻¹ dry cellulose.

Sodium polysilicate G (COMPOZIL (RTM)) is metered on-line into the paper stock at the rate of 0.33 parts of commercial material per 100 parts of cellulose on the suction side of the fan pump together with calcium carbonate slurried in water.

Finally, 0.25 parts of alum are metered into the paper stock just before the head box and no polyacrylamide is added.

The following paper machine parameters are observed when equilibrium is attained.

<table>
<thead>
<tr>
<th>Run No.</th>
<th>11</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head box paper stock conc. g.1⁻¹</td>
<td>3.6</td>
<td>3.6</td>
</tr>
<tr>
<td>First pass retention all solids %</td>
<td>96.5</td>
<td>97.1</td>
</tr>
<tr>
<td>First pass retention Ca carbonate %</td>
<td>83.8</td>
<td>88.3</td>
</tr>
<tr>
<td>Ashes at 425°C %</td>
<td>21.5</td>
<td>22.8</td>
</tr>
<tr>
<td>Zeta potential white waters mV</td>
<td>+1.9</td>
<td>+2.8</td>
</tr>
<tr>
<td>Felt+W/2 Cobb 60•2,54 cm (60°; 50% RH, 23 °C)</td>
<td>19</td>
<td>17</td>
</tr>
<tr>
<td>Hercules Sizing Test</td>
<td>287</td>
<td>350</td>
</tr>
<tr>
<td>Grammage g.m²</td>
<td>80</td>
<td>80</td>
</tr>
</tbody>
</table>

No foam is produced and no white pitches are observed in both runs. Moreover, the presence of dark spots in the paper produced is drastically reduced to 1-5 per 10m².

**Claims**

1. The use of a water soluble or dispersible salt of a polybasic acid or a water colloidal dispersion of said salt as a foam suppressant in alkaline or neutral paper making employing an alkyl or alkenyl succinic acid anhydride sizing agent and calcium carbonate filler.

2. The use according to claim 1 of from 0.2 to 2 wt % based on weight of dry cellulose of the salt of the poly basic acid.
3. The use according to claim 1 in which the paper is additionally sized by the addition during paper making of alkyl ketene dimer.

4. A process for making paper under alkaline or neutral conditions employing an alkyl or alkenyl succinic acid anhydride sizing agent and calcium carbonate filler, characterized in that the formation of foam is depressed by addition to the stock of a water soluble or dispersible salt of a polybasic acid or a water colloidal dispersion of said salt.

5. A process according to claim 4 in which from 0.2 to 2 wt % based on the weight of dry cellulose of the salt of the polybasic acid is added.

6. A process according to claim 4 or claim 5 in which the paper is additionally sized by the addition of an alkyl ketene dimer to the aqueous paper making stock.

**Patentansprüche**


2. Verwendung nach Anspruch 1 von 0,2 bis 2 Gew.% des Salzes der mehrbasigen Säure, bezogen auf das Gewicht der getrockneten Cellulose.

3. Verwendung nach Anspruch 1, bei dem das Papier zusätzlich durch die Zugabe von Alkylketen-Dimer während der Papierherstellung geleimt wird.


5. Verfahren nach Anspruch 4, bei dem 0,2 bis 2 Gew.% des Salzes der mehrbasigen Säure, bezogen auf das Gewicht der getrockneten Cellulose, zugesetzt werden.

6. Verfahren nach Anspruch 4 oder Anspruch 5, bei dem das Papier zusätzlich durch die Zugabe von Alkylketen-Dimer zu dem wäßrigen Papierherstellungsrohstoff geleimt wird.

**Revendications**

1. Utilisation d'un sel hydrolysable ou dispersable dans l'eau d'un polyacide ou d'une dispersion aqueuse colloïdale dudit sel comme suppresseur de moussage dans la production de papier en milieu alcalin ou neutre en utilisant un agent d'encollage consistant en un anhydride d'acide alkyl- ou alcényl-succinique et une charge consistant en carbonate de calcium.

2. Utilisation suivant la revendication 1 de 0,2 à 2 % en poids, sur la base du poids de la cellulose sèche, du sel du polyacide.

3. Utilisation suivant la revendication 1, dans laquelle la papier est encollé en outre par addition, au cours de la production du papier, d'un dimère d'alkylcéthène.

4. Procédé de production de papier en milieu alcalin ou neutre au moyen d'un agent d'encollage consistant en un anhydride d'acide alkyl- ou alcényl-succinique et d'une charge consistant en carbonate de calcium, caractérisé en ce que la formation de la mousse est réduite par addition à la pâte à papier d'un sel hydrosoluble ou dispersable dans l'eau d'un polyacide ou d'une dispersion aqueuse colloïdale dudit sel.
5. Procédé suivant la revendication 4, dans lequel une quantité de 0,2 à 2 % en poids, sur la base du poids de la cellulose sèche, du sel du polyacide est ajoutée.

6. Procédé suivant la revendication 4 ou la revendication 5, dans lequel le papier est collé en outre par addition d’un dimère d’alkylcéthène à la pâte aqueuse de production de papier.