



US 20110011546A1

(19) **United States**(12) **Patent Application Publication**
Rintala et al.(10) **Pub. No.: US 2011/0011546 A1**(43) **Pub. Date: Jan. 20, 2011**(54) **METHOD FOR CONTROLLING DEPOSIT
FORMATION**(76) Inventors: **Juha Rintala**, Vaasa (FI); **Lars-Ola
Berts**, Malax (FI); **Reetta
Strengell**, Vaasa (FI); **Thorbjorn
Ahlskog**, Vaasa (FI); **Jonni
Ahlgren**, Espoo (FI)Correspondence Address:
CANTOR COLBURN LLP
20 Church Street, 22nd Floor
Hartford, CT 06103 (US)(21) Appl. No.: **12/680,788**(22) PCT Filed: **Sep. 30, 2008**(86) PCT No.: **PCT/FI08/50544**§ 371 (c)(1),
(2), (4) Date: **Oct. 8, 2010**(30) **Foreign Application Priority Data**

Oct. 1, 2007 (FI) 20070746

Publication Classification(51) **Int. Cl.**
D21H 21/02 (2006.01)(52) **U.S. Cl.** **162/135**(57) **ABSTRACT**

The invention relates to a method for controlling deposit formation on paper machine rolls, said method comprising applying at the dry end of a paper machine an aqueous solution of an anionic or non-ionic polymer on the surface of the paper for preventing the rolls from being contaminated by stickies and/or other depositable material from the paper.

METHOD FOR CONTROLLING DEPOSIT FORMATION

FIELD OF THE INVENTION

[0001] The invention relates to a method for controlling deposit formation on paper machine rolls, especially calender rolls.

BACKGROUND OF THE INVENTION

[0002] A papermaking process starts with stock preparation where cellulosic fibers are mixed with water and mineral filler (usually clay or calcium carbonate). The obtained slurry is delivered by means of a head box on a forming fabric or press fabric or wire to form a fibrous web of cellulosic fibers at the forming section of the paper machine. Then water is drained in the draining section and the formed web is conducted to the press section including a series of roll presses where additional water is removed. The web is then conducted to the drying section of the paper machine where most of the remaining water is evaporated typically by means of steam-heated dryer drums. Post drying operations include calendering where the dry paper product passes between rolls under pressure, thereby improving the surface smoothness and gloss and making the caliper/thickness profile more uniform. There are various calenders such as machine calenders where the rolls usually are steel rolls and include a heated roll (thermo roll), and supercalenders that use alternate hard and soft, heated rolls.

[0003] It is well known that pitch can accumulate in papermaking causing problems. "Pitch" is a term originally used to describe sticky materials which appear in paper making and originate from the wood raw material. However, nowadays the term "pitch" also includes for example ink and adhesive present in recycled paper. The term "stickies" is also used for such substances. The pitch can deposit at various points in the paper making system. It can block fabrics and thus prevent drainage of the web. It can also adhere to the wires and/or dryer drums causing holes in the paper. Additionally it can deposit on press rolls or other rolls which come into direct or indirect contact with the paper material.

[0004] A number of chemicals have been used or proposed to be used for eliminating the above described problems, especially at the wet end of the papermaking system.

[0005] EP 0 493 066 A discloses a method for the control of pitch in pulp or paper making which method comprises applying to the pulp or paper making equipment which is not in continuous contact with water a water soluble cationic polymer and a water soluble anionic polymer. These two polymers are applied separately. It is claimed that by using this combination of cationic and anionic polymers it is possible to obtain a coating on the pick up felt, paper forming wire, press roll and dandy roll which prevents pitch from adhering to them. The cationic polymer can be polyethylene imine or a protonated or quaternary ammonium polymer. Preferably the cationic polymer is derived from an amine and an epihalohydrin or a dicyandiamide formaldehyde condensate. The anionic polymer can be a sulphonate or carboxylate. A preferred anionic polymer is lignin sulphonate or polynaphthalene sulphonate.

[0006] WO 2005/094403 A discloses a paper machine belt conditioning apparatus and method. In this method, typically in the press section, a continuously rotating belt on which a fibrous web travels is sprayed with a conditioning chemical.

A number of conditioning chemicals is proposed including various surfactants, solvents, acid-based cleaners and alkaline cleaners. The apparatus may also include a doctor blade.

[0007] WO 97/15646 A discloses a release agent for rolls, such as press rolls in papermaking. The release agent prevents the formation of deposits on the surface of the rolls. The release agent is in the form of a microemulsion which preferably comprises a deposit preventing component. This component is preferably a dicyandiamide formaldehyde condensate.

[0008] The paper M. Pohjolainen et al., Paperi ja Puu, Vol. 89, No. 2, 2007, pages 92-94, reports some pilot trials where PCC filled SC paper were treated on a pilot multi-nip supercalender. Various chemical solutions were sprayed onto each side of the sheet prior to calendering. According to this report the spraying of a starch-based polymer having a concentration of from 3 to 4% in the spray water, onto the paper can result in minimal deposition of material on the roll surface.

[0009] Deposit formation on modern calenders, especially on the thermo rolls is a serious problem. This problem has previously been solved by mechanical cleaning during production by doctor blades or by chemical washings during stoppages normally with strong alkaline solutions. This problem may also appear on other paper machine rolls, such as heated dryer rolls or drums.

BRIEF DESCRIPTION OF THE INVENTION

[0010] The invention relates to controlling deposit formation on paper machine rolls by spraying a chemical onto the surface of the paper. The chemical moves with the paper to the rolls protecting the same from collecting sticky material from the paper.

DETAILED DESCRIPTION OF THE INVENTION

[0011] According to the invention it has surprisingly been found that anionic polymers, when sprayed in a small amount in the form of a diluted aqueous solution on the surface of the paper, worked perfectly well preventing deposit formation on the rolls. At the same time paper dusting and linting were significantly reduced. Also non-ionic polymers work similarly and are useful for this purpose.

[0012] Thus, according to the invention there is provided a method for controlling deposit formation on paper machine rolls, said method comprising applying at the dry end of a paper machine an aqueous solution of an anionic or non-ionic polymer on the surface of the paper for preventing the rolls from being contaminated by stickies and/or other depositable material from the paper.

[0013] "Paper machine" is in this specification meant to include paper machines having an on-line calender or an off-line calender. In the latter case the calender is separate from the actual paper machine. The paper machines also include board machines.

[0014] Said paper machine rolls include calender rolls and dryer rolls. The paper machine rolls are preferably calender rolls, and more preferable thermo rolls of calenders, especially of supercalenders. The surface temperature of thermo rolls is typically at least 100° C.

[0015] The anionic or non-ionic polymer used in the present invention is preferably not derived from natural products such as starch, cellulose or saccharides.

[0016] The anionic and non-ionic polymers should be soluble in water. Suitable anionic polymers useful in the present invention, include:

[0017] Lignosulphonates such as sodium lignosulphonate.

[0018] Condensation products of aromatic sulphonic acids with formalin such as condensed naphthalene sulphonates.

[0019] Dispersing anionic polymers and copolymers polymerized from anionic monomers, or charged to give an anionic form after polymerization. Said polymers comprise repeating units with anionic charges such as carboxylic acids, salts of carboxylic acids, sulphonic acids, salts of sulphonic acids, and/or mixtures thereof. Anionic copolymers may be produced by copolymerizing an anionic monomer with another anionic comonomer, an uncharged comonomer and/or a cationic comonomer. Anionic monomers may typically include acrylic acid, methacrylic acid, vinyl sulphonate, 2-acrylamide-2-methylpropanesulphonic acid, styrenesulphonic acid, or salts thereof and other corresponding monomers. Polymers charged to give an anionic form only after polymerization include hydrolyzed polyacrylamides and polymers produced from maleic anhydride.

[0020] Anionic polymers may also contain different types of charged repeating units such as phosphates, like ethyleneglycol methacrylatephosphate, or phosphonic acids or salts thereof, like vinylphosphonic acid.

[0021] As examples of the anionic polymers described above following may be mentioned:

poly(meth)acrylates, polyacrylate-maleate, polymaleate, poly- α -hydroxyacrylic acid, polyvinylsulphonate, polystyrenesulphonate, 2-acrylamide-2-methylpropane sulphonate and polyvinyl phosphonate.

[0022] Suitable non-ionic polymers useful in the present invention include polyvinyl alcohol, polyvinyl pyrrolidone, polyalkoxy silanes and polyethoxy alcohols.

[0023] The above mentioned salts of the polymers or monomers are preferably alkali metal salts, such as sodium or potassium, or alkaline earth metal salts, such as calcium or magnesium.

[0024] A preferred anionic polymer comprises a condensation product of an aromatic sulphonic acid with formaldehyde such as naphthalenesulphonate formaldehyde condensate.

[0025] The aqueous solution of the anionic or non-ionic polymer is applied in an amount preferably ranging from 0.001 to 0.5 gram per m² of the surface of the paper per side of the paper calculated as active substance. A more preferred amount ranges from 0.001 to 0.3 gram per m², and a still more preferred amount ranges from 0.01 to 0.03 gram per m² of the surface of the paper calculated as active substance.

[0026] The concentration of the aqueous solution of the anionic or non-ionic polymer is preferably from 0.01 to 20% by weight, more preferably from 0.1 to 5% by weight.

[0027] The aqueous solution of the anionic or non-ionic polymer can be applied on one or both sides of the paper.

[0028] The applying is preferably made by spraying.

[0029] The paper to be calendered is normally moistured and some paper machines are equipped with a moisturing shower or showers downstreams of the calender rolls.

[0030] According to a preferred embodiment of the invention the aqueous solution of the anionic or non-ionic polymer is sprayed by means of said moisturing shower or showers.

[0031] In respect of dryer rolls the aqueous solution of the anionic or non-ionic polymer can be applied on the web to be dried by per se known means, such as by spraying.

[0032] The invention is now described in more detail by means of examples. In this specification the percentages are % by weight unless otherwise specified.

Example 1

[0033] Pilot trials were made by using a multi-nip super-calender.

[0034] The base paper was of mixture of peroxide-bleached thermo-mechanical pulp and bleached chemical pulp, the base paper having 51 g/m². The filler was kaolin and ground calcium carbonate and the content thereof was 33-34%.

[0035] The deposit formation on the first thermo roll was inspected.

[0036] The run parameters of the calender were as follows: Surface temperature of the first thermo roll: 190° C.

Load: 1st stack 550 kN/m

Steaming in 1st box: 2 g/m²

Water amount from moisturing shower before the 1st nip: 6.5 g/m²

Speed: 530 m/min

[0037] In the trials following chemicals were tested:

Example 2

Pure Water (Reference)

[0038] In the trial runs precipitation appeared as a yellowish mat surface/film on the first thermo roll. The deposit was not formed as bands on the roll but was smooth in the cross direction. Some loose dusting appeared.

Example 3

A Dicarboxylic Ester in the Form of an Emulsion (Reference)

[0039] This is a commercial product which is used in paper machines for deposit control, stickies control and wire purification. This product was diluted to a 2% solution of the commercial product and on the surface of the paper. As compared to Example 2, this product resulted in a clearly thinner yellowish, mat layer which was just detectable. The deposit was not formed as bands on the roll but was smooth in the cross direction. This product did not have any effect on dusting.

Example 4

Sodium Naphthalenesulphonate Formaldehyde Condensate (Invention)

[0040] This anionic polymer (CAS 36290-04-7) is a chemical which is typically used at the wet end of paper machines for pitch control.

[0041] An aqueous 30% solution of this anionic polymer was diluted to give a 0.3% aqueous solution (as active substance). This solution was sprayed on the surface of the paper as described above in the amount of 6.5 g/m². Thus, the amount of the anionic polymer on the paper surface was about 0.02 g/m² calculated as active substance.

[0042] This anionic polymer resulted in that no deposition at all was formed on the roll. The surface of the roll remained clear and glossy. Also the dusting was clearly reduced.

Example 5

Dicyandiamide Formaldehyde Condensate (Reference)

[0043] This is a cationic polymer which is a conventional deposit preventing chemical which is applied directly to the rolls. An aqueous 30% solution of this cationic polymer was diluted to give a 0.6% aqueous solution (as active substance), and sprayed on the surface of the paper. This cationic polymer resulted in a thin smooth, mat layer over the whole thermo roll. Additionally, the precipitation was accumulated as one narrow (<1.0 cm) yellowish white band. The band was thin and could be removed by the doctor blade. As compared to Examples 2, 3 and 4, the dusting was clearly stronger.

[0044] The above test results from pilot trials show the Example 4 representing the present invention worked perfectly well, whereas Examples 2, 3 and 5 were not satisfactory.

1. A method for controlling deposit formation on paper machine rolls, said method comprising applying at the dry end of a paper machine an aqueous solution of an anionic or non-ionic polymer on the surface of the paper for preventing the rolls from being contaminated by stickies and/or other depositable material from the paper.

2. The method of claim 1 wherein the paper machine rolls are calender rolls.

3. The method of claim 2 wherein the calender rolls include thermo rolls.

4. The method of claim 3 wherein the surface temperature of the thermo rolls is at least 100° C.

5. The method of claim 1 wherein the anionic polymer comprises a condensation product of an aromatic sulphonic acid with formaldehyde.

6. The method of claim 1 wherein the aqueous solution of the anionic or non-ionic polymer is applied in an amount ranging from 0.001 to 0.5 gram per m² of the surface of the paper per side of the paper calculated as active substance.

7. The method of claim 6 wherein the aqueous solution of the anionic or non-ionic polymer is applied in an amount ranging from 0.01 to 0.03 gram per m² of the surface of the paper calculated as active substance.

8. The method of claim 1 wherein the aqueous solution of the anionic or non-ionic polymer is applied on both sides of the paper.

9. The method of claim 1 wherein the applying is made by spraying.

10. The method of claim 2 wherein the paper machine is equipped with a moistening shower or showers downstream of the calender rolls, said aqueous solution of the anionic or non-ionic polymer being sprayed by means of said moistening shower(s).

11. The method of claim 5, wherein the condensation product of an aromatic sulphonic acid with formaldehyde comprises naphthalenesulphonate formaldehyde condensate.

* * * * *