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(71) Applicant: **BillerudKorsnäs AB**
169 27 Solna (SE)

(72) Inventors:
- **NORDSTRÖM, Fredrik**
652 26 Karlstad (SE)
- **KULLANDER, Johan**
653 50 Karlstad (SE)
- **KARPATHAKIS, Mikael**
664 93 Edsvalla (SE)

(74) Representative: **Kransell & Wennborg KB**
P.O. Box 27834
115 93 Stockholm (SE)

Remarks:
Amended claims in accordance with Rule 137(2) EPC.

(54) EFFICIENT PRODUCTION OF A CONTAINERBOARD TO BE USED AS FLUTING

(57) There is provided a method of producing a containerboard having a geometric SCT index of 37.0-42.0 Nm/g when measured according to ISO 9895:2008, comprising the steps of:
- providing a pulp having a Schopper-Riegler (SR) value of 15-19 when measured according to ISO 5267-1:1999, wherein at least 70% by dry weight of the pulp is NSSC pulp;
- forming a web from the pulp;
- pressing the web in a press section comprising a shoe press, wherein the shoe press comprises a shoe press belt having discontinuous grooves and the line load in the shoe press is in the range of 1400-2000 kN/m;
- drying the web from the press section in a drying section to obtain said containerboard.

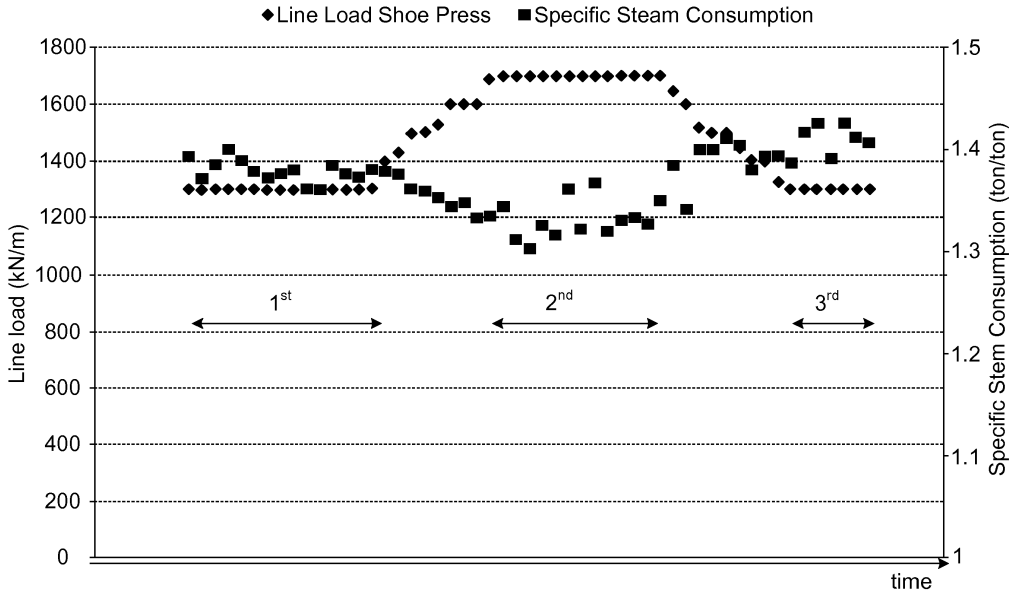

Fig. 1

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Description

TECHNICAL FIELD

[0001] The invention relates to a method of producing a containerboard to be used as fluting.

BACKGROUND

[0002] Neutral Sulfite Semi-Chemical (NSSC) pulping is an old process that it is well known in the field of paper pulping and in use in many pulp mills around the world. One of the reasons for using NSSC pulping is the high yield.

[0003] In NSSC pulping, the cooking liquor comprises sulfite, such as Na_2SO_3 or $(NH_4)_2SO_3$ and a base, such as NaOH or Na_2CO_3. "Neutral" means that the pH of the NSSC cooking liquor is generally between 6 and 10. Normally, the cooking time is between 0.5 and 3 hours and the cooking temperature is 160-185 °C. The NSSC pulp comprises comparatively high amounts of residual lignin, such as 15-20 %, which make the NSSC pulp stiff. The NSSC pulping is "semi-chemical" in the sense that it comprises mechanical treatment/grinding (after the chemical (cooking step)).

[0004] The NSSC pulp is for example used to produce containerboard that is subsequently corrugated to form the fluting of corrugated board.

[0005] Examples of mills using the NSSC pulping method are: BillerudKorsnäs' mills in Gruvön (PM 6) and Skärblacka (PM4), Sweden; Mondi Swiecie S.A.'s mill in Swiecie (PM4), Poland; Mondi's (Powerflute's) mill in Koupio, Finland; Stora Enso Oyj's mill in Heinola, Finland (Heinola Fluting Mill); S.C. Celrom S.A.'s mill in Drobeta, Romania; Packaging Corp. of America's mills in Filer City (PM1, PM2 & PM3), Tomahawk (PM2 & PM4) and Wallula (PM2), United States; Ilim Group's mills (PM1 and PM3) in Korjazma, Russia; Permsky Karton's mill (PM2) in Perm, Russia; WestRock's mills in Longview (PM10) and Stevenson (PM1 & PM2), United States; International Paper's mills in Mansfield (PM2) and Pine Hill (PM2), United States; Georgia-Pacific LLC's mills in Big Island (PM1 & PM3) and Cedar Springs, United States; Cascades Containerboard Packaging's mill in Trenton, Canada; Sappi's Tugela mill (PM2) in South Africa; Lake Utopia Paper's mill in St. George, Canada; Graphic Packaging International's mill in West Monroe, United States; Greif Bros Corp's mill in Riverville, United States; Hood Container Corp's mill in New Johnsonville, United States; and Sonoco's mill in Hartsville (PM10), United States.

[0006] EP3026173 discloses a method of producing a containerboard (to be used as fluting) of increased SCT strength from pulp comprising NSSC pulp. According to the method, a web formed from the pulp comprising NSSC pulp is pressed in a shoe press, in which the line load is at least 1200 kN/m.

[0007] Further, it is generally acknowledged in the prior art that the SCT strength of NSSC-based containerboard to be used as fluting is increased when the NSSC pulp is subjected to more refining. As an example, the rebuild of PM4 in Swiecie in 2015 involved a rebuild of the refining system to allow for more refining of the NSSC pulp in order to increase SCT strength. For the same purpose, Billerud AB (now BillerudKorsnäs AB) increased the refining capacity in the NSSC mill in Gruvön, Sweden back in 2005. Powerflute's NSSC mill improved its refining capacity in 2010.

SUMMARY

[0008] The object of the present disclosure is to increase the efficiency of the method disclosed in EP3026173 while maintaining the SCT strength of the product at a high level.

[0009] In the context of the present disclosure, the increased efficiency may be an increased energy efficiency (i.e. a reduced amount of energy consumed for producing one tonne of paper) and/or a higher productivity (i.e. that a higher amount of paper can be produced by the paper machine used for the method).

[0010] To meet the above-mentioned objects, there is provided a method of producing of a containerboard having a geometric SCT index of 37.0-42.0 Nm/g when measured according to ISO 9895:2008, comprising the steps of:

- providing a pulp having a Schopper-Riegler (SR) value of 15-19 when measured according to ISO 5267-1:1999, wherein at least 70% by dry weight of the pulp is NSSC pulp;
- forming a web from the pulp;
- pressing the web in a press section comprising a shoe press, wherein the shoe press comprises a shoe press belt having discontinuous grooves and the line load in the shoe press is in the range of 1400-2000 kN/m;
- drying the web from the press section in a drying section to obtain said containerboard.

[0011] The above range for the Schopper-Riegler value of the pulp (15-19) reflects a very low degree of refining, which means low energy consumption in that stage of the papermaking process. The inventor has also shown that a reduction of the refining energy results in that less energy (i.e. less steam) is needed for drying the paper web formed from the pulp in the drying section. Surprisingly, the inventors have found that the low degree of refining is not associated with

an impaired SCT strength when the production is carried out according to the present disclosure.

[0012] Regarding the pressing of the web in the shoe press, the inventors have found that increasing the line load to 1400 kN/m or more generally does not increase dewatering of the web unless the right type of shoe press belt is selected. When the right belt is selected, however, such an increase of the line load effectively reduces the amount of steam needed to dry the paper web in the downstream drying section.

[0013] The present disclosure can thus make the production of NSSC-based containerboard more energy efficient, which is of particular interest since the yield of the NSSC pulping process is so high that the remaining biofuel (that is combusted in the recovery boiler) is insufficient for the papermaking process. Consequently, NSSC mills are dependent on external energy. If the NSSC mill is not integrated with an adjacent sulphate mill that produces a surplus of biofuel, it may be necessary to use fossil fuel as the external energy. Examples of such non-integrated NSSC mills are the Heinola Fluting Mill and the Powerflute Mill. Further, the speed of many papermaking processes is limited by the drying capacity of the drying section. This limitation is a particular problem when containerboard of higher grammages is produced. By providing a web that requires less drying energy in the drying section, the present disclosure allows for higher speed and thus higher productivity in the making of NSSC-based containerboard.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] Figure 1 is a graph showing the shoe press line load and the resulting specific steam consumption (medium pressure steam at about 8 bar) in the drying section during the inventive trial described below. The shoe press line load was 1300 kN/m during a first period ("1st") and a third period ("3rd"), During a second period ("2nd"), the shoe press line load was 1700 kN/m.

DETAILED DESCRIPTION

[0015] There is thus provided a method of producing a containerboard having a geometric SCT index of 37.0-42.0 Nm/g. The containerboard is intended for use as fluting (i.e. corrugated medium) in corrugated board. As understood by the skilled person, the method is intended to be used on a full-scale paper machine, i.e. a machine adapted to produce at least 50,000 tons of containerboard per year, normally at least 100,000 tons of containerboard per year. The grammage of the containerboard may be in the range of 120-240 g/m^2, such as 120-200 g/m^2 or 140-230 g/m^2, such as 150-230 g/m^2. Grammage is measured according to ISO 536:2012.

[0016] Preferably, the geometric SCT index of the containerboard is 38.0-42.0 Nm/g, such as 38.0-41.0 Nm/g.

[0017] To obtain the geometric SCT index, the compressive strength in the machine direction (MD) and the cross direction (CD) of the containerboard is first measured using a short-span compressive tester (SCT) measured according to ISO 9895:2008. To calculate the compressive strength index, the compressive strength (N/m) is divided by the grammage. The unit of the SCT index is thus Nm/g. The geometric SCT index is calculated as the square root of the product of the SCT index in MD and CD:

$$\text{geometric SCT index} = \sqrt{(\text{SCT index (MD)} * \text{SCT index (CD)})}.$$

[0018] The compressive strength is considered to be more important in CD than in MD. The SCT index in the CD of the containerboard may for example be above 28 Nm/g, such as at least 29 Nm/g. An upper limit for the SCT index index may for example be 32 Nm/g.

[0019] The method comprises the step of:

- providing a pulp having a Schopper-Riegler (SR) value of 15-19 when measured according to ISO 5267-1:1999, wherein at least 70% by dry weight of the pulp is NSSC pulp.

[0020] In one embodiment, the SR value is 16-19. In another embodiment, the SR value is 15-18.

[0021] The SR value referred to above (and in the claims) is the SR value that the pulp has in the head box (i.e. the chamber from which the pulp is caused to flow onto the wire of the wire section). To obtain this SR value, the pulp of the present disclosure may be subjected to refining, such as LC refining, between the NSSC pulping process and the head box.

[0022] Preferably, at least 80% by dry weight of the pulp is NSSC pulp. In one example, at least 85% or 88% by dry weight of the pulp is NSSC pulp.

[0023] The NSSC pulp may comprise hardwood NSSC pulp. Preferably, at least 70% by dry weight of the NSSC pulp is hardwood NSSC pulp, such as birch NSSC pulp. In one example, at least 80% by dry weight of the NSSC pulp is

hardwood NSSC pulp, such as birch NSSC pulp.

[0024] It has been reported in the prior art that a relatively low yield of the NSSC pulp is needed to obtain a large increase in strength. The results presented in the Examples section are however obtained using a NSSC pulp of a relatively high yield, more precisely about 82 %. The yield of the NSSC pulp of the present disclosure may thus be 75%-85%, preferably 79%-85 %, such as 80-84%.

[0025] In addition to the NSSC pulp, the pulp may comprise recycled fibers, reject pulp and/or clippings.

[0026] "NSSC pulp" is obtained from "NSSC pulping", which in turn is defined in the background section. The NSSC pulp of the present disclosure may for example be sodium-based NSSC pulp, which means that the cooking liquor of the NSSC cook comprised Na_2SO_3.

[0027] The method further comprises the step of:

- forming a web from the pulp (that has a SR value of 15-19), typically in a wire section (as conventional in paper making).

[0028] In the method, the head box consistency may for example be 0.50%-1.20%, such as 0.80%-1.20%, such as 0.90%-1.15%. The higher consistencies are particularly relevant when a large proportion (e.g. at least 80%) of the NSSC pulp is derived from hardwood.

[0029] In one embodiment, the head box consistency is 1.05%-1.20% and the grammage of the containerboard is 140-240 g/m^2, such as 140-240 g/m^2.

[0030] The method further comprises the step of:

- pressing the web in a press section comprising a shoe press.

[0031] The nip length in the shoe press may for example be 200-330 mm, such as 250-300 mm. The shoe press is typically a double felted shoe press.

[0032] The shoe press comprises a shoe press belt having discontinuous grooves. Such a shoe press belt is commercially available. One example is the BlackBelt G DG marketed by Valmet. The hardness of the elastomer in the shoe press belt may for example be 93-95 Shore A.

[0033] The line load in the shoe press is in the range of 1400-2000 kN/m, preferably 1500-2000 kN/m, such as 1600-2000 kN/m, such as 1600-1800 kN/m.

[0034] In the shoe press, the web may be subjected to a press impulse of 105-280 kPa*s, such as 105-190 kPa*s, such as 105-135 kPa*s. The highest press impulses are obtained when the line load is relatively high and the web speed is relatively low (because of a high grammage of the produced containerboard).

[0035] The press section may comprise another press arranged upstream the shoe press. The other press is typically double felted and may for example be a jumbo press or a shoe press. The line load of the other press may be 100-300 kN/m, such as 150-250 kN/m, in particular in case of a jumbo press.

[0036] Finally, the method further comprises the step of:

- drying the web from the press section in a drying section to obtain said containerboard. As explained above, the method of the present disclosure facilitates a reduced steam consumption in the drying section and/or production at a relatively high speed, such as 700-850 m/min or even 750-850 m/min. When the method of the present disclosure is carried out, the steam consumption in the drying section may be as low as 1.20-1.35 tonne steam per tonne paper. This steam is normally "medium pressure steam", which refers to steam having a pressure of 6-11 bar, such as 6-10 bar, typically about 8 bar.

EXAMPLES

First reference trial

[0037] Over a first period of about three months, NSSC containerboard (intended for fluting) of various grammages was produced in the Gruvön mill, Sweden. Data from the production is presented in table 1. The pulp was a mixture of about 90% NSSC pulp from birch and about 10% kraft pulp. The pulp was refined. The resulting SR numbers are presented in table 1. The press section had two double felted nips; first a jumbo press and then a shoe press with a shoe press belt having blind drilled holes. The line load of the jumbo press was 180 kN/m.

[0038] Over a second period of about three months, NSSC containerboard (intended for fluting) of the same grammages was produced in the Gruvön mill, Sweden. Data from the production is presented in table 2. Again, the pulp was a mixture of about 90% NSSC pulp from birch and about 10% kraft pulp and it was refined. The resulting SR numbers are presented in table 2. The press section was the same as during the first period except that another shoe press belt was used. This new shoe press belt had discontinuous grooves. The characteristics of the grooves were:

width: 1.30 mm;

land: 1.80 mm;

depth: 1.30 mm;

open area: 38 %;

void volume: 460 ml/m^2.

[0039] From the data of tables 1 and 2, the change of shoe press belt does not appear to have had any particular effect. It is notable that the specific steam consumption was not reduced during the second period despite that the average SR number was slightly lower than during the first period. It is also notable that the average geometric SCT index was almost the same during the second period as during the first period.

Table 1. First reference trial, first period (shoe press belt having blind drilled holes). "SSC" means specific steam consumption. The SR numbers were measured online.

Grammage (kg/m^2)	SR number	Head box slice lip (mm)	Head box consistency (%)	Line load shoe press (kN/m)	SSC (ton/ton)	SCT Geo	SCT Geo index
0.110	17.9	15.7	0.92	1300	1.44	4.3	39.1
0.120	18.6	16	1.01	1300	1.46	4.7	39.2
0.130	19.2	16.2	1.03	1300	1.5	5.1	39.2
0.140	19.9	16.7	1.07	1300	1.53	5.4	38.6
0.150	19.4	17.3	1.08	1296	1.53	5.8	38.7
0.160	19.4	17.9	1.11	1300	1.53	6.1	38.1
0.175	19.2	20.4	1.06	1300	1.54	6.9	39.4
Average	19.1			1299	1.504		38.9

Table 2. First reference trial, second period (shoe press belt having discontinuous grooves). "SSC" means specific steam consumption. The SR numbers were measured online.

Grammage (kg/m^2)	SR number	Head box slice lip (mm)	Head box consistency (%)	Line load shoe press (kN/m)	SSC (ton/ton)	SCT Geo	SCT Geo index
0.110	19	15.8	0.92	1300	1.5	4.3	39.1
0.120	18.8	16.1	1.00	1275	1.49	4.7	39.2
0.130	19	16.4	1.02	1289	1.49	5	38.5
0.140	18.3	16.6	1.08	1341	1.53	5.4	38.6
0.150	18	17.1	1.09	1309	1.56	5.7	38.0
0.160	18	17.9	1.11	1325	1.54	6.2	38.8
0.175	16.8	19.5	1.11	1300	1.48	6.9	39.4
Average	18.3			1306	1.513		38.8

Second reference trial

[0040] NSSC containerboard (intended for fluting) having a grammage of 140 g/m^2 was produced in the Gruvön mill, Sweden. The pulp was a mixture of about 90% NSSC pulp from birch and about 10% kraft pulp. The pulp was refined. The resulting SR numbers are presented in table 3 along with other data from the production. The press section had

two double felted nips; first a jumbo press (line load = 180 kN/m) and then a shoe press with a shoe press belt having blind drilled holes. During a first period of about 28 hours, the shoe press line load was 1500 kN/m. During a second period of about 34 hours, the shoe press line load was again 1300 kN/m. Data from the production in presented in table 3.

[0041] The data in table 3 show that the increased line load of 1500 kN/m did not reduce the specific steam consumption.

Table 3. Second reference trial (grammage = 140 g/m^2, shoe press belt having blind drilled holes). "SSC" means specific steam consumption. The SR numbers were measured online.

Period	Average SR number	Head box slice lip (mm)	Head box consistency (%)	Line load shoe press (kN/m)	Average SSC (ton/ton)
First	15.9	17.0	1.05	1500	1.54
Second	16.1	17.1	1.05	1300	1.52

Inventive trial

[0042] NSSC containerboard (intended for fluting) having a grammage of 160 g/m^2 was produced in the Gruvön mill, Sweden. The pulp was a mixture of about 90% NSSC pulp from birch and about 10% kraft pulp. The pulp was refined. The resulting SR numbers are presented in table 4 along with other data from the production. The press section had two double felted nips; first a jumbo press (line load = 180 kN/m) and then a shoe press having a shoe press belt having discontinuous grooves with the characteristics described above under the first reference trial. During a first period of about 2.5 hours, the shoe press line load was 1300 kN/m. The shoe press line load was then gradually increased and during a second period of about two hours, the shoe press line load was 1700 kN/m. The shoe press line load was then gradually decreased and during a third period of about one hour, the shoe press line load was again 1300 kN/m. Data from the production is presented in table 4 (see also figure 1).

[0043] The data in table 4 and figure 1 show that in case of a shoe press belt having discontinuous grooves, increasing the line load above 1300 kN/m (e.g. to 1700 kN/m) reduced the specific steam consumption considerably. On average, the specific steam consumption was 5 % lower at 1700 kN/m than at 1300 kN/m.

[0044] Further, the average geometric SCT index of the containerboard produced during the second period was 38.3 Nm/g. During the same period, the SCT index in the cross direction was 29.4 Nm/g.

Table 4. Inventive trial (grammage = 160 g/m^2, shoe press belt having discontinuous grooves). "SSC" means specific steam consumption. The SR numbers were measured online.

Period	Average SR number	Head box slice lip (mm)	Head box consistency (%)	Line load shoe press (kN/m)	Average SSC (ton/ton)
First	17.2	18.1	1.10	1300	1.38
Second	17.3	18.0	1.11	1700	1.33
Third	17.3	18.1	1.10	1300	1.41

Claims

1. A method of producing a containerboard having a geometric SCT index of 37.0-42.0 Nm/g when measured according to ISO 9895:2008, comprising the steps of:

   - providing a pulp having a Schopper-Riegler (SR) value of 15-19 when measured according to ISO 5267-1:1999, wherein at least 70% by dry weight of the pulp is NSSC pulp;
   - forming a web from the pulp;
   - pressing the web in a press section comprising a shoe press, wherein the shoe press comprises a shoe press belt having discontinuous grooves and the line load in the shoe press is in the range of 1400-2000 kN/m;
   - drying the web from the press section in a drying section to obtain said containerboard.

2. The method according to claim 1, wherein the web is subjected to a press impulse of 105-190 kPa*s in the shoe press.

3. The method according to claim 1 or 2, wherein the speed of the web is in the range of 700-850 m/min, such as 750-850 m/min.

4. The method according to any one of the preceding claims, wherein grammage of the containerboard is in the range of 120-240 g/m^2, such as 140-230 g/m^2, such as 150-230 g/m^2, when measured according to ISO 536:2012.

5. The method according to any one of the preceding claims, wherein line load in the shoe press is in the range of 1500-2000 kN/m, such as 1600-2000 kN/m, such as 1600-1800 kN/m.

6. The method according to any one of the preceding claims, wherein at least 80% by dry weight of the pulp is NSSC pulp.

7. The method according to any one of the preceding claims, wherein at least 88% by dry weight of the pulp is NSSC pulp.

8. The method according to any one of the preceding claims, wherein the yield of the NSSC pulp is 75-85 %, such as 79-85 %.

9. The method according to any one of the preceding claims, wherein the containerboard has a geometric SCT index of 38.0-42.0 Nm/g, such as 38.5-42.0 Nm/g, such as 39.0-42.0.

10. The method according to any one of the preceding claims, wherein at least 70% by dry weight of the NSSC pulp is hardwood NSSC pulp, such as birch NSSC pulp.

11. The method according to any one of the preceding claims, wherein at least 80% by dry weight of the NSSC pulp is hardwood NSSC pulp, such as birch NSSC pulp.

12. The method according to any one of the preceding claims, wherein the steam consumption in the drying section is in the range of 1.20-1.35 tonne steam per tonne paper.

13. The method according to any one of the preceding claims, wherein the press section comprises another press, such as a jumbo press or a shoe press, arranged upstream the shoe press.

14. The method according to any one of the preceding claims, wherein the consistency of the pulp in a head box used for forming the web is 0.50%-1.20%.

15. The method according to claim 10 or 11, wherein the consistency of the pulp in a head box used for forming the web is 0.80%-1.20%, 0.90%-1.20%, such as 0.90%-1.15%.

Amended claims in accordance with Rule 137(2) EPC.

1. A method of producing a containerboard having a geometric SCT index of 37.0-42.0 Nm/g when measured according to ISO 9895:2008, comprising the steps of:

    - providing a pulp having, in the head box, a Schopper-Riegler (SR) value of 15-19 when measured according to ISO 5267-1:1999, wherein at least 70% by dry weight of the pulp is NSSC pulp and the pulp is subjected to refining between the NSSC pulping process and the head box to obtain the SR value;
    - forming a web from the pulp;
    - pressing the web in a press section comprising a shoe press, wherein the shoe press comprises a shoe press belt having discontinuous grooves and the line load in the shoe press is in the range of 1400-2000 kN/m;
    - drying the web from the press section in a drying section to obtain said con tainerboard.

2. The method according to claim 1, wherein the web is subjected to a press impulse of 105-190 kPa*s in the shoe press.

3. The method according to claim 1 or 2, wherein the speed of the web is in the range of 700-850 m/min, such as 750-850 m/min.

4. The method according to any one of the preceding claims, wherein grammage of the containerboard is in the range of 120-240 g/m^2, such as 140-230 g/m^2, such as 150-230 g/m^2, when measured according to ISO 536:2012.

5. The method according to any one of the preceding claims, wherein line load in the shoe press is in the range of 1500-2000 kN/m, such as 1600-2000 kN/m, such as 1600-1800 kN/m.

6. The method according to any one of the preceding claims, wherein at least 80% by dry weight of the pulp is NSSC pulp.

7. The method according to any one of the preceding claims, wherein at least 88% by dry weight of the pulp is NSSC pulp.

8. The method according to any one of the preceding claims, wherein the yield of the NSSC pulp is 75-85 %, such as 79-85 %.

9. The method according to any one of the preceding claims, wherein the containerboard has a geometric SCT index of 38.0-42.0 Nm/g, such as 38.5-42.0 Nm/g, such as 39.0-42.0.

10. The method according to any one of the preceding claims, wherein at least 70% by dry weight of the NSSC pulp is hardwood NSSC pulp, such as birch NSSC pulp.

11. The method according to any one of the preceding claims, wherein at least 80% by dry weight of the NSSC pulp is hardwood NSSC pulp, such as birch NSSC pulp.

12. The method according to any one of the preceding claims, wherein the steam consumption in the drying section is in the range of 1.20-1.35 tonne steam per tonne paper.

13. The method according to any one of the preceding claims, wherein the press section comprises another press, such as a jumbo press or a shoe press, arranged upstream the shoe press.

14. The method according to any one of the preceding claims, wherein the consistency of the pulp in a head box used for forming the web is 0.50%-1.20%.

15. The method according to claim 10 or 11, wherein the consistency of the pulp in a head box used for forming the web is 0.80%-1.20%, 0.90%-1.20%, such as 0.90%-1.15%.

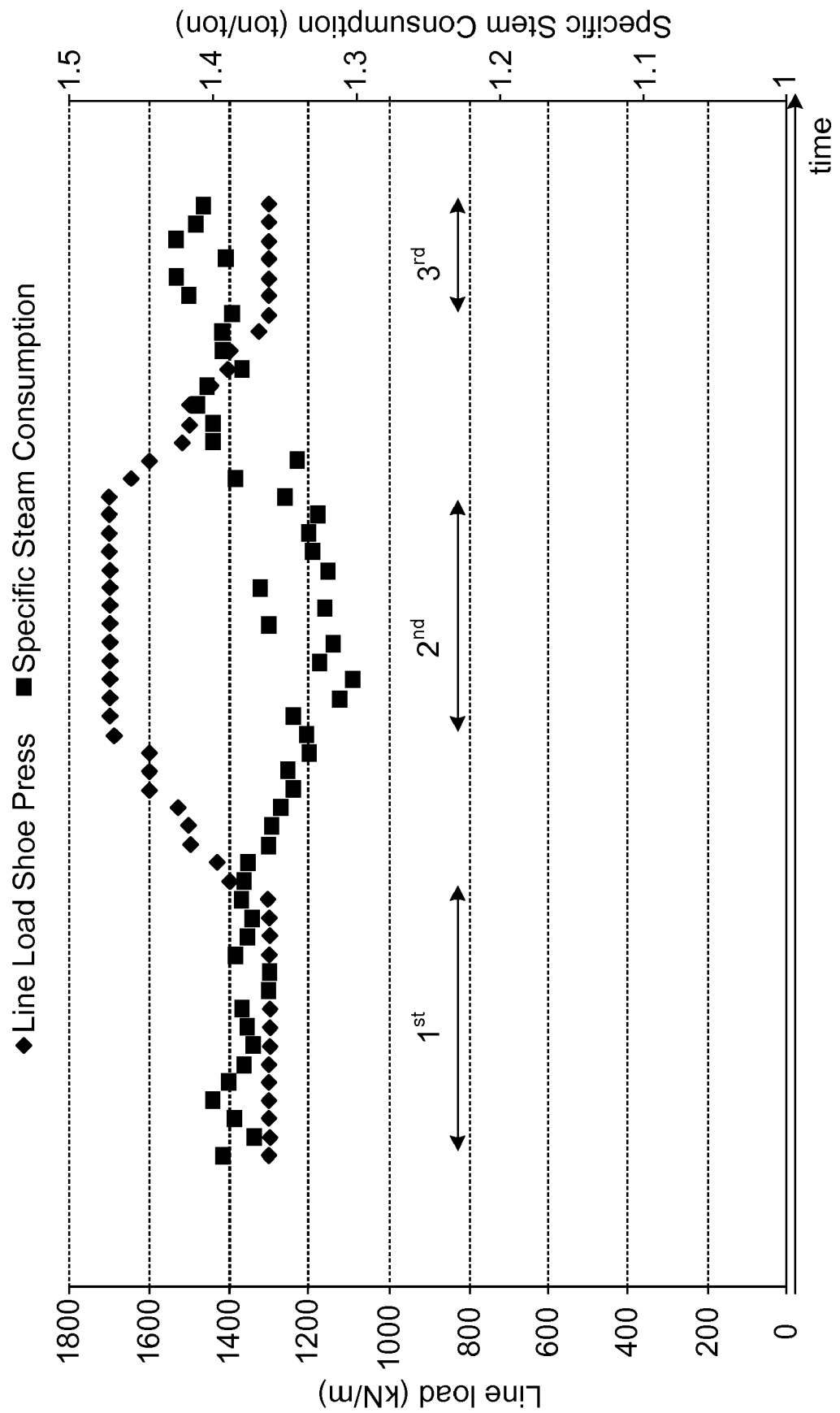
Line Load Shoe Press
Specific Steam Consumption
Line load (kN/m)
Specific Stem Consumption (ton/ton)
time
1st
2nd
3rd
0
200
400
600
800
1000
1200
1400
1600
1800
1
1.1
1.2
1.3
1.4
1.5

Fig. 1

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EUROPEAN SEARCH REPORT

Application Number
EP 19 17 4469

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A,D	EP 3 026 173 A1 (BILLERUDKORSNÄS AB [SE]) 1 June 2016 (2016-06-01) * paragraphs [0019] - [0026] * -----	1-15	INV. D21F3/02 D21F11/00 D21H11/02
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D21F
D21H
B65D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	15 October 2019	Pregetter, Mario

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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