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**WO 03/018504 A1**

(54) Title: PROCESS FOR PRODUCING A BUILDING COMPONENT OR AN ABSORBENT PRODUCT FROM WASTE IN PAPERMAKING

(57) Abstract: The invention relates to a process for producing a recycle product comprising at least rest fibres obtained from the recycle process for wasted paper material comprising at least a) from about 40 to about 85 % dry content of fibres, b) from about 10 to about 85 % dry content of calcium and from about 0.1 to about 20 % dry content of pigment and /or ink and producing a recycle product, such as building component products or absorbent products. The invention also relates to recycle products obtained by the process.

Process for producing a building component or an absorbent product from waste in papermaking.

## FIELD OF INVENTION

The invention relates to a process for the production of a recycle product, such as a building component product or an absorbent product. The recycle product comprising at least rest fibres obtained from the recycle process for wasted paper material. The invention also relates to the recycle products obtained by the process, such as building component products and absorbing products and their use.

## 10 BACKGROUND OF THE INVENTION

There is an increased demand all over the world to reuse materials as much as possible. The optimal case is when components of a product or waste from a process line may be recycled/reused into other products again and again. However, still there are plenty of waste materials, which are stored due to that no reuse is invented and/or it is too expensive to reuse the wasted materials. However, the decrease in space and the increasing environmental awareness force the human being to find new applications for wasted materials.

One example is the recycling of paper material such as wasted newspapers, magazines, catalogues, advertising handouts, paper boxes etc. The paper material may be reused within the paper industry for the production of different kinds of papers. However, to enable the reuse of wasted paper material there is a first step of preparing the wasted paper material prior to entering the wasted paper material into the production line of new paper. The wasted paper material contains several unwanted components, which are necessary to be removed. Examples of such components are adhesives, colours and printing inks.

However, removal of the above mentioned components present on the wasted paper material has been performed by a subset of companies which have developed recycled process lines using several steps in which the wasted paper material is modified into paper pulp, which is suitable for the production of new paper. The process includes steps such as sieving, flotation, filtering, whirling purification, dilutions, addition of needed additives, dispersion etc. However, while the recycled process produce paper pulp a waste product is also produced, often called rest fibres.

The rest fibres, comprises except for fibres, calcium and additives, such as lime, talc, colours and printing inks. Today, the rest fibres are mainly burned, which most often result in huge amounts of ashes, approximately 40-50% of the total amount of the rest fibres, due to the presence of high amount of minerals within the rest fibres. Beyond burning, the rest fibres have also been used in several processes to produce new products such as paper sheets, absorbent materials and building

materials. However, the processes which has been used so far either comprises addition of water or other components, such as the environmentally dangerous polyacrylamide to obtain a rest fibre mixture which is suitable to form new rest fibre products prior to drying the produced rest fibre.

5           There is a need for new processes to reuse fibre waste obtained during the recycling process of wasted paper material. A process, which enables reuse of the rest fibres again and again to full-fill the future requirements to reuse materials from nature and also use materials, which are harmless to human beings.

          We hereby provide a process, which enables the production of recycle  
10 products, where the materials are harmless to human beings. Furthermore, the process saves our environment resources, such as the reuse of the rest fibres and minimal use of water and furthermore is a low cost process. The process may be used for the production of absorbing and building component products and the products may be reused again.

15

#### BRIEF DISCLOSURE OF THE INVENTION

          The invention relates to a process for producing a recycle product, such as a building component product or a absorbent product. The recycle products, comprises rest fibres obtained as a waste product during the recycle process of  
20 wasted paper material, such as recycling of wasted newspapers, magazines, catalogues, advertising handouts and paper boxes. The recycle products being produced during the recycling of wasted paper material when new paper pulp is produced for the production new recycled paper materials.

          According to one aspect the invention relates to a process for producing a  
25 building component product comprising the steps of providing rest fibres obtained as a waste during the recycling process of wasted paper material comprising at least a) from about 40 to about 85 % dry content of fibres, b) from about 10 to about 85 % dry content of calcium and from about 0.1 to about 20 % dry content of pigment and/or ink and moulding the building component product.

30           According to another aspect the invention relates to a process for producing an absorbent product comprising providing rest fibres obtained as a waste during the recycling process of wasted paper material comprising at least a) from about 40 to about 85 % dry content of fibres, b) from about 10 to about 85 % dry content of calcium and from about 0.1 to about 20 % dry content of pigment and/or ink and  
35 shaping the recycle product.

          The invention also relates to products produced by the above mentioned processes, such as building and absorbing products and use of the processes or products.

          The invention provides completely new processes for the production of

recycle products wherein the recycle products comprises rest fibres obtained as a waste product during the recycle process of wasted paper material. Furthermore, the process saves our environment resources, such as the reuse of the rest fibres and minimal use of water and furthermore is a low cost process. The process may be used for the production of absorbing and building component products and the produced products may be reused again and again without any need of purification to remove compound which are dangerous such as being cancerogenic for human beings or environmentally unfavourable.

## 10 DETAILED DESCRIPTION OF THE INVENTION

### Definitions

In the context of the present application and invention the following definitions apply:

15 The term "rest fibres" is intended to mean rest fibres which are discarded during the recycle process of wasted paper material wherein the recycle process is done to obtain new paper pulp. The rest fibres comprise components such as fibres, calcium pigment and/or ink and one or more components used during the process for the production of paper pulp. The paper pulp may further be used for the production of new paper.

20 The term "wasted paper material" is intended to mean paper material such a papers, magazines, catalogues, advertising handout, paper boxes etc, i.e., paper which has been treated with different components such as pigments, ink, adhesives, plastic layers etc. Paper material, which have been discarded.

25 The term "pigment" is intended to mean any pigment used to colour a paper or pigments of pictures.

The term "ink" is intended to mean any kind of ink, such as printing ink used in the paper industry.

### 30 Process for production of a recycle product

According to a first aspect the invention relates to a process for the production of recycled products, such as building- or absorbing products.

35 The process uses rest fibres, which has been discarded during the recycling of wasted paper material, which means the rest fibres are obtained when new paper pulp are produced from wasted paper material. The paper pulp may be used for the production of new recycled papers. The rest fibres, which are obtained as waste are often discarded and result in huge heaps, which uses a lot of space.

The rest fibres comprise different components, such as fibres, minerals, pigment and inks. Examples of minerals are potassium and calcium. The

components present in the rest fibres are components from the wasted paper material or components, additives, added during a known recycling process. However, the components within the rest fibres are environmentally friendly or present in acceptable amounts. Acceptable amounts being amounts, which are  
5 accepted as being non-harmful for human being and environmentally friendly to the environment.

According to one aspect the rest fibres used in the process comprises a) from about 40 to about 85 % dry content of fibres, b) from about 10 to about 85 % dry content of calcium and from about 0.1 to about 20 % (dry content) of pigment  
10 and/or ink, preferably at least a) from about 50 to about 60 % dry content of fibres, b) from about 15 to about 85 % dry content of calcium and from about 0.1 to about 20 % dry content of pigment and/or ink.

However, the calcium content may vary and be within the range of from about 10-85 % dry content or from about 20-85 % dry content, e.g., 30-85 % dry  
15 content or 40-85 % dry content, e.g., 50-85 % dry content. The rest fibres may furthermore contain potassium in an amount ranging from about 0.1-10 % dry content and also minor amounts of other components which are of no importance for the recycle product of the invention.

The dry content of the rest fibres in the recycle product is of importance  
20 since if the dry content is too high the recycle product may be attacked by microorganisms, such as fungus. Microorganisms which may be present within the rest fibres or which may come in contact with the recycle product upon use of the rest fibres. The dry content may be at least 60 %, preferably at least 80 %, 80-100 % such as 85 %. Therefore a step of drying may be needed if the rest fibres are not dry  
25 enough, i.e., has a dry content of at least 60 %. If such a step is avoided there is a high probability that microorganisms either present in the rest fibres or which comes into contact with the recycle product upon use, start to multiply and degrades the recycled product. Examples of microorganisms are bacteria, algae and fungus. Microorganisms which may be present within the rest fibres or which come  
30 in contact with the recycle product upon use of the rest fibres. Therefore, the process may comprise a step of drying the rest fibres to a dry content to at least 60 %, such as from about 80 % to about 100%, e.g., from about 85 % to about 100% prior to producing (moulding or shaping) the recycle product. However, the way the drying is performed is of no importance and a person skilled in the art may be able  
35 to select the optimal drying process. Under certain circumstances there may be a need of adding additives to the rest fibres prior to drying, such as adjusting the pH. According to one aspect the invention relates to a process for producing a building component product comprising providing rest fibres obtained as a waste during the recycling process of wasted paper material comprising at least a) from about 40 to

about 85 % dry content of fibres, b) from about 10 to about 85 % dry content of calcium and from about 0.1 to about 20 % dry content of pigment and/or ink and moulding the building component product.

The moulding may be performed by several methods and examples of  
5 methods are injection-moulding, compression-moulding, press-moulding and cast-moulding.

Additionally a step of drying the rest fibres to a dry content to at least 60 %, such as from about 80 % to about 100%, e.g., from about 85 % to about 100% may be added prior to moulding the recycle product.

10 Additionally, a step of sieving may be performed prior to moulding under certain circumstances. The sieving is performed to distribute the particles of the rest fibres into different groups upon their size, such as from < 2mm to > 8mm, e.g., < 2mm, 2-4 mm, 4-6.3 mm, > 6.3 mm or > 8 mm. The sieved rest fibres particles are then subjected to a further step of moulding or die-casting to produce a recycle  
15 product. Drying may be performed either prior to sieving or after sieving.

Furthermore, if necessary an additional component, such as a binding agent may be added to the rest fibres prior to the rest fibres being exposed to any treatment, such as drying, sieving or being moulding. Examples of components are calcium lignosulphonate (WAFEX), polypropylene, polyvinylalcohol (HDPE) or  
20 ureaformaldehyde. Calcium lignosulphonate, polypropylene, polyvinylalcohol and ureaformaldehyde are binding agents, which aid in binding the rest fibres into a building component product, such as plastic composites or plastic granulates used for the production of plastic products. Ureaformaldehyde may be added to an amount of between 0.1 % -15 %. Examples of moulded products comprising  
25 additional components are found in example 2,4 and 5.

Examples of products, which may be produced by the process are different kind of building materials such as ceiling panels, facade panels, roof tiles, isolating material, sheets, such as floor sheets furniture and furniture parts, acoustic panels, panels for sound and heat insulation, sound elimination, pallets, transportation  
30 boxes, floors for containers, toys, consumer items and production of different kinds of fibres concrete and fibre cement. Other examples are moulded parts for the car industry and different kind of packages including disposable cat boxes.

Another example is the production of moulded sheets comprising foamed concrete in which between 20-30 % of concrete is mixed with 70-80 % of rest fibres  
35 using a method well-known for a person skilled in the art. The foamed concrete sheets may have a thickness of approximately 25 mm, a format of about 600 x 600 mm and a weight being from about 5 to about 6 kg/m<sup>2</sup>.

According to another aspect of the invention relates to a process for producing an absorbent product comprising: providing rest fibres obtained as a

waste during the recycling process of wasted paper material comprising at least a) from about 40 to about 85 % dry content of fibres, b) from about 10 to about 85 % dry content of calcium and from about 0.1 to about 20 % dry content of pigment and/or ink and shaping the absorbent product.

- 5            Additionally a step of drying the rest fibres to a dry content to at least 60 %, such as from about 80 % to about 100%, e.g., from about 85 % to about 100% may be added prior to shaping the recycle product.

                 Additionally, a step of sieving may be performed prior to shaping under certain circumstances. A step of sieving fibres from calcium. Thereby, the process  
10 enables the shaping of an absorbing product which comprising calcium as a core and fibres as a coat (example 1). By such a process an excellent absorbent material may be obtained, which can absorb excretion from animals, such as cats, cows, horses and pigs. The recycle product may further absorb chemical compounds such as N, S, Cl, P and also different kinds of leakage products such as oil and other non  
15 environmental friendly chemical solutions. The rest fibres of the absorbent product first absorb the excretion or chemical compound, which after being absorbed diffuse into the core comprising of calcium. The calcium absorbs, neutralises and maintains the excretion or chemical compound within the core, which is coated with the fibres. Thereby, the excretion or chemical compound remains within the core of the  
20 absorbent product and wont diffuse back out from the absorbent product. Additionally the absorbent product has an efficient possibility to absorb NH<sub>4</sub>, thereby it may be used in stables, in the horse boxes to absorb the excretion from horses. Another advantage is that the absorbent product is light and easy for young people to carry around and thereby suitable for use in stables. The absorbent  
25 product may also be used in horse training areas. The absorption recycle product may comprise certain additives such as antioxidants, pigments, perfumes, binding agents or mixtures thereof.

## EXAMPLES

30

### EXAMPLE 1

#### Production of an absorbent product

500 kg of rest fibres were air dried to a dry content of 75-80 % (dry content). The rest fibres, was mixed by stirring and the fibres separated from calcium carbonate  
35 (CaCO<sub>3</sub>) by sieving. 100 kg of calcium carbonate was then stirred in a spinning drum and 100 kg of fibres was added to the drum and an absorbent product consisting of calcium carbonate as a core and fibres as a coat was produced. 30 % of the absorbent product was then treated with vapour to increase the humidity to approximately 35 – 40 %.

## EXAMPLE 2

Production of moulded recycle product

Moulded recycle products were produced using rest fibres using following moulding parameters;

- 5           moulding former diameter - 140 mm  
              compression moulding pressure – 300 bar  
              moulding time – 90 sec,  
              Materials – 80 g of rest fibres

- 10           The final moulding products containing binding agents were dried in a hot  
blast furnace at 60° C for at least 12 hours.

The rest fibres were either directly moulded or mixed with a binding agent prior to moulding. 80 g of rest fibres was mixed with the binding agent to a homogenous mixture and moulded using the above mentioned parameters.

- 15   The binding agents including the used amounts are shown in table 1.  
The binding agent were mixed with appropriate amount of water and homogenised under stirring prior to mixing with the rest fibres.  
The binding agent polyvinylalcohol was mixed and heated to 75 ° C.  
The binding agent WAFEX was obtained from BORREGAARD Ligno Tech. and  
20   polyvinylalcohol 72 000 obtained from MERCH Schuchardt.

TABLE 1

Sample	Rest fibres (size of the particles)	Binding agent	Amount of binding agent
1	< 8 mm	No	-
2	< 8 mm	WAFEX	1 g
3	< 8 mm	WAFEX	2 g
4	< 8 mm	WAFEX	10 g in 50 ml H <sub>2</sub> O
5	< 8 mm	WAFEX	20 g in 50 ml H <sub>2</sub> O
6	2-4 mm	WAFEX	10 g in 50 ml H <sub>2</sub> O
7	4-6.3 mm	WAFEX	10 g in 50 ml H <sub>2</sub> O
8	< 8 mm	Polyvinylalcohol	10 g in 350 ml H <sub>2</sub> O
9	< 8 mm	Polyvinylalcohol	20 g in 300 ml H <sub>2</sub> O
10	< 8 mm	Polyvinylalcohol	20 g in 300 ml H <sub>2</sub> O
11	< 8 mm	Polyvinylalcohol	20 g in 300 ml H <sub>2</sub> O
12	< 8 mm	Polyvinylalcohol	20 g in 300 ml H <sub>2</sub> O
13	4-6.3 mm	Polyvinylalcohol	20 g in 300 ml H <sub>2</sub> O
14	2-4 mm	Polyvinylalcohol	20 g in 300 ml H <sub>2</sub> O
15	0-2 mm	Polyvinylalcohol	20 g in 300 ml H <sub>2</sub> O
16	< 8 mm	HDPE	-

## EXAMPLE 3

5 Production of a sieved recycle products

1000 kg of wasted rest fibres was obtained from the recycled process from wasted paper material. The rest fibres was air dried to a dry content of 90 % dry content and sieved into a size of > 8 mm.

## 10 EXAMPLE 4

Production of moulded recycle product using Portland cement

Moulded recycle products were produced using rest fibres using following moulding parameters;

moulding former diameter - 140 mm

15 compression moulding pressure – 50 bar

moulding time – 15 min,

Materials – rest fibres and Portland cement (binding agent)

The final moulding products dried at room temperature.

20 The rest fibres were mixed with a binding agent and water prior to moulding. 300 g

of rest fibres was mixed with 450 g of binding agent and 350 g water was added and mixed to a homogenous mixture and moulded using the above mentioned parameters. 150 g of water was emitted during the moulding (see table 2).

5 TABLE 2

Sample	Rest fibres (size of the particles)	Composition
1	< 8 mm	300 g rest fibre 450 g Portland cement 350 g water
2	2.0-4.0 mm	300 g rest fibre 450 g Portland cement 350 g water
3	4.0-6.3 mm	300 g rest fibre 450 g Portland cement 350 g water

## EXAMPLE 5

Production of moulded recycle product using ureaformaldehyde

10 Moulded recycle products were produced using rest fibres using following moulding parameters;

moulding former diameter - 140 mm heating the moulder to 150 °C prior to moulding

compression moulding pressure – 100 bar

15 moulding time – 4 min, including aeration for 2 sec every 30 second

Materials – rest fibres and ureaformaldehyde (binding agent)

The final moulding products dried at room temperature.

20 The rest fibres were mixed with the binding agent prior to moulding. 850 g of rest fibres was mixed with 150 g of binding and mixed to a homogenous mixture and moulded using the above mentioned parameters. The moulded recycle product may be used as a plastic composite.

## CLAIMS

1. A process for producing a building component product comprising:
  - 5 i) providing rest fibres obtained as waste during the recycling process of wasted paper material comprising at least a) from about 40 to about 85 % dry content of fibres, b) from about 10 to about 85 % dry content of calcium and from about 0.1 to about 20 % dry content of pigment and/or ink and
  - ii) moulding the building component product.
- 10 2. The process according to claim 1, wherein an additional step of drying the rest fibres to a dry content of at least 60 % is added between step i) and ii).
3. The process according to claim 2, wherein the rest fibres are dried to a dry content of from about 80 % to about 100%.
4. The process according any of preceding claims, wherein an additional step of sieving is added prior to step ii).
- 15 5. The process according to any of preceding claims, wherein the moulding step is selected from the group consisting of injection-moulding, compression-moulding, press-moulding and mould-casting.
6. The process according to any of preceding claims, wherein an additional component is added in step i), the component being selected from the group
- 20 consisting of polyvinylalcohol, polypropene, calcium lignosulphonate and ureaformaldehyde.
7. A building component product obtainable by the process of any of claims 1-6.
8. The building component product according to claim 7, wherein the building component product is a plastic composite.
- 25 9. A process for producing an absorbent product comprising:
  - i) providing rest fibres obtained as a waste during the recycling process of wasted paper material comprising at least a) from about 40 to about 85 % dry content of fibres, b) from about 10 to about 85 % dry content of calcium and from about 0.1 to about 20 % dry content of pigment and/or
  - 30 ink and
  - ii) shaping the absorbent product.
10. The process according to claim 9, wherein an additional step of drying the rest fibres to a dry content of at least 60 % is added between i) and ii).
11. The process according to claim 10, wherein the rest fibres are dried to a dry
- 35 content of from about 80 % to about 100%.
12. The process according to any of the preceding claims, wherein an additional step of sieving is performed prior to step ii) to separate calcium from the fibres.
13. The process according to any of claims 9-12, wherein the shaping step forms a absorbent product comprising calcium as a core coated with the rest fibres.

14. An absorbent product obtainable by the process of any of claims 9-13.

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 02/01474

## A. CLASSIFICATION OF SUBJECT MATTER

IPC7: C04B 18/24, A01K 1/015, B01J 20/24, C09K 3/32, D21C 5/02  
 According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: C04B, A01K, B01J, C09K, D21C, D21F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6146498 A (JAY C. HSU ET AL), 14 November 2000 (14.11.00), figures 1,2, column 1, line 40 - column 2, line 37, column 3, line 19 - line 44, column 6, line 9 - line 44, column 7, line 22 - line 46	1-7
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X	WO 9011978 A1 (FOSSE LIMITED), 18 October 1990 (18.10.90), page 2, line 19 - line 30, page 3, line 12 - line 29, page 4, line 24 - line 30, page 5, line 1 - line 36	1-7,9-11,14
A	--	12,13

Further documents are listed in the continuation of Box C.  See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E" earlier application or patent but published on or after the international filing date	"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

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## INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 02/01474

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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INTERNATIONAL SEARCH REPORT

International application No.  
**PCT/SE02/01474**

**Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)**

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

- 1.  Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
  
- 2.  Claims Nos.:  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
  
- 3.  Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

**Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)**

This International Searching Authority found multiple inventions in this international application, as follows:

**I. Claims 1-8 directed to a process for producing a building component and a building component product.**

**II. Claims 9-14 directed to a process for producing an absorbent product and an absorbent product.**

- 1.  As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
- 2.  As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
- 3.  As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
  
- 4.  No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

**Remark on Protest**

- The additional search fees were accompanied by the applicant's protest.
- No protest accompanied the payment of additional search fees.

**INTERNATIONAL SEARCH REPORT**

Information on patent family members

01/12/02

International application No.

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Patent document cited in search report			Publication date	Patent family member(s)		Publication date
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