Abstract:
The invention relates to a suction roll comprising a cellulosic fiber layer and an outer cellulosic fiber layer. The outer cellulosic fiber layer has a thickness of at least 50% of the thickness of the suction roll. The rolling dewatering of the pulp is increased when the suction roll is used in a dewatering process of pulp.

Title: PROCESS FOR THE DRYING OF PULP AND A SUCTION ROLL USED FOR THE DRYING OF PULP
FIELD OF INVENTION

The present invention relates to a process for the drying of pulp and a suction roll for the drying of pulp.

BACKGROUND

Pulp comprisingcellulosic fibers is used for the production of paper or paperboard. The pulp can be produced in many different ways and many different cellulosic fibers may be used.

The produced pulp is conducted to a wire in order to form a fibrous web which eventually will form a paper or paperboard. When the pulp and the paper or paperboard is manufactured at the same location it is easy to transport the pulp, in a wet state, to the paper or paperboard machine. However, the production of the pulp and the production of the paper or paperboard can also be done at different locations and it is then necessary to transport the pulp to the paper or paperboard manufacturing location. It is thus desirable to dry the pulp before transportation in order to avoid expensive transports due to unnecessary transport of water.

There are two major different type of pulp drying machines, i.e. fourdrinier and cylinder machines. The fourdrinier machine is most commonly used and the pulp is deposited from a headbox to a continuous wire. The water in the pulp drains through the wire forming a pulp mat. After the initial free drainage through the wire, the pulp mat is further dewatered, as it is carried on the wire, by the application of increased vacuum. The vacuum is applied to the underside of the pulp mat by vacuum boxes and/or a couch roll located prior to the removal of the mat from the wire. The pulp mat is then conducted to the press section and the drying section in which further water is removed.

There is a desire to maximize the dewatering of the pulp in order to decrease transportation costs of the pulp. It is also advantageous to remove
as much water as possible in an early stage of the dewatering or drying process of the pulp since it becomes more expensive to remove water in the drying section since it is a more energy demanding process compared to the use of free drainage or vacuum.

Dewatering can be maximized in many different ways. By optimizing the performance of the vacuum section, press section and dryer section of a pulp drying machine, it is possible to increase the dewatering in an as efficient way as possible. It is also advantageous to keep the pulp temperature as high as possible in order to improve water removal since the viscosity of the water is decreased at higher temperatures. Furthermore, it is preferred to keep the pH of the pulp low, preferably around 4-5, since the fibers are not as swollen at lower pH and thus facilitates drainage of the water.

Another possibility is to add chemicals to the pulp which improves drainage. One example is described in WO021 8704.

However, there is still a need for an improved process for the drying of pulp in an efficient way.

Summary of the invention

It is an object of the present invention to provide a process for the drying of pulp in an improved and energy efficient way.

Another object of the invention is to provide a suction roll for improved drying of pulp.

These objects and other advantages are achieved by the process according to claim 1. The present invention relates a process for the drying of pulp which process comprises the steps of, providing a pulp comprising cellulosic fibers, conducting the pulp to a wire, dewatering the pulp by the aid of a suction roll wherein the suction roll has a open surface area of above 60%. By increasing the open surface area of the suction roll the dewatering of the pulp is increased.

The suction roll has a shell thickness of above 50 mm. It is preferred to increase the shell thickness of the roll shell since the open surface area is
increased. In this way the strength of the roll is still good and it is possible to still have high negative pressure (vacuum) or suction in the roll.

The suction roll preferably comprises a doctor blade. It is preferred that the doctor blade is an air knife. The doctor blade is used in order to clean the open surface area of the suction roll.

The dry content of the pulp is preferably between 15-30% by weight after passing the suction roll. It is thus possible to increase the dry content of the pulp by the use of the suction roll with increased open surface area.

The present invention further relates to a suction roll for the drying of pulp wherein the suction roll has an open surface area of above 60%. By increasing the open surface area of a suction roll it is possible to increase the dewatering of a pulp.

The shell of the suction roll has a thickness of above 50 mm. Increased shell thickness will increase the strength of the roll and thus make it possible to further increase the open surface area of the roll and/or the negative pressure of the roll, i.e. increased suction.

The suction roll preferably comprises a doctor blade. It is preferred that the doctor blade is an air knife. The doctor blade is used in order to clean and remove the water from the open surface areas of the roll.

**Brief description of the drawings**

In the following, the invention will be described with reference to the appended drawings, in which

Fig. 1 shows a schematic figure of the suction roll,

Fig. 2 shows a schematic figure of the open area surfaces of the suction roll.

**Detailed description of the invention**

The present invention relates to process for the drying of pulp and a suction roll used for the drying of pulp.
It has been shown that by increasing the open surface area of the roll, i.e. increase the number and/or size of the holes of the shell of the roll, it is possible to improve the dewatering of the pulp in a very energy efficient way. The amount of water drained from the pulp can in this way be increased but without increasing the energy needed, i.e. by using the same negative pressure, i.e. suction, of the roll. The increased amount open surface area will allow higher negative pressure and it is thus possible to increase the negative pressure and increase the amount of water being dewatered from the pulp.

The amount of open surface area of the suction roll shell is above 60% of the total area of the roll shell, preferably above 70%. The open surface area is preferably in the form of several holes being evenly distributed over the whole surface of the roll shell. It is possible that the open surface area is bigger in the outer part of the shell and smaller in the inner part of the shell, i.e. the holes forming the open surface area are in a tapered form. The amount open area surface of the suction roll according to the invention shall preferably constitute of more than 60% of the total area of the surface roll, seeing both to the inner side or the outer side of the roll.

By increasing the size of the holes forming the open surface area of the roll shell, marking might occur on the pulp mat. These suction roll vacuum markings may be beneficial in the subsequent drying steps of the pulp mat. The use of air drying is the most commonly used drying technique in pulp drying machines and it is then beneficial to have as large surface area as possible and the vacuum roll markings will increase the surface area of the pulp mat and thus improve the drying.

The thickness of the roll shell is increased compared to drying rolls used in prior art. Due to the increased amount of open surface area of the roll it might be necessary or at least advantageous to increase the thickness of the roll shell in order to provide the roll with sufficient strength. It is also possible to increase the negative pressure of the suction roll since the thickness of the roll shell is increased. The thickness of the roll shell is preferably above 50 mm, even more preferred above 60 mm. There is an optimal ratio between the amount of open surface area and thickness of the shell. If the amount of open surface area is high, the thickness of the roll shell
is increased in order to be able to run the suction roll in the best way, i.e. in
the most efficient way.

The negative pressure (vacuum) inside the roll is preferably between
10-1 00 kPa.

The suction roll is preferably provided with at least one doctor blade. The
main purpose of the doctor blade is to remove the water from the open
surface area, i.e. from the holes. Since the centrifugal force of the roll is low, it
is not possible for the drained water to be removed from the roll. The doctor
blade will thus remove the water from the holes making sure that the
efficiency of the suction roll is not decreased. The doctor blade may also
remove impurities, such as deposits, from the suction roll.

The doctor blade is preferably an air knife. The air knife comprises an
air nozzle which directs pressurized air at the surface of the roll. The air knife
may comprise more than one air nozzles. It is preferred that the width of the
air knife covers the entire width of the shell surface. The width of the at least
one nozzle is preferably wide enough to allow the formation of an air knife
capable of removing water from the open surface areas of the roll, but narrow
enough to minimize the amount of air required. The at least one air nozzle is
preferably located far enough from the surface of the roll shell in order to
avoid deposit of the removed water and/or deposits on the nozzle itself, but
close enough to remove the water and/or deposits from the open surface area
of the roll. The air of the air knife should preferably be pressured to the point
where the air knife will be able to remove water and/or deposits.

By the process according to the invention it is possible to increase the
dry content of the pulp already at the wet end of the pulp drying machine. It is
preferred that the dry content of the pulp after passing the suction roll of the
invention is preferably between 15-30 % by weight. By increasing the dry
content of the pulp at an early stage in the pulp drying machine it is possible
to use higher pressure in the subsequent press section.

The suction roll according to the invention can be of any conventional
type used for the drying of pulp and/or production of paper or paperboard,
with the difference that the amount of open surface area is increased. Other
components, such as type of shell, vacuum system or water removal system, etc can be of any conventional type.

The suction roll according to the invention can be used in any conventional pulp drying machine or process. It is preferred to use it instead of a couch roll in a fourdrinier machine.

It may also be advantageous to use a lumpbreaker roll in combination with the suction roll. The lumpbreaker roll preferably comprises a felt, i.e. a felted lumpbreaker roll. The lumpbreaker roll preferably forms a nip together with the suction roll. The nip pressure between the lumpbreaker roll and the suction roll is preferably between 25-40 kN/m. It is advantageous to use the lumpbreaker roll since it can increase the drying of the pulp since the drained water tends to go to the open surface area of the suction roll to a greater extent.

Figure 1 and figure 2 shows a suction roll (1) according to the invention. A wire (2) is conducting a pulp mat or web. The wire (2) is partly wrapped round the suction roll (1). The suction roll (1) comprises a roll shell (3) which rotates around a non rotating central roll core. The roll shell (3) comprises a number of holes forming an open surface area. As can be seen from figure 2, the open area surface (9) is in the form of holes that have been formed by drilling of the roll shell (3). The open surface area (9) constitutes at least 60% of the total surface of the roll shell (3). The holes makes sure that the pulp mat on the wire (2) will be exposed to the lower pressure (vacuum) inside the roll (1). The roll shell (3) is made of metal and the thickness of the roll shell (3) is above 50 mm.

The roll (1) further comprises vacuum seals (4) which make sure that it is possible to create a negative pressure inside the roll. The roll (1) further comprises a non-rotating suction quadrant (5). The quadrant (5) creates the negative pressure or vacuum inside the roll. The water withdrawn from the pulp is removed by a white water removal system (6) which removes water from inside the roll (1). The withdrawn water is also removed by the aid of an air knife (7). The air knife (7) removes water from the open surface areas (9) of the roll shell (3). The roll (1) also comprises an end plate (8).
The pulp may be of any conventional type. It can be mechanical, chemimechanical, chemithermomechnical and/or chemical pulp. The cellulosic fibers of the pulp may be of any conventional kind wood cellulose fibers, such as hardwood fibers, softwood fibers or agricultural raw materials or waste products.

In view of the above detailed description of the present invention, other modifications and variations will become apparent to those skilled in the art. However, it should be apparent that such other modifications and variations may be effected without departing from the spirit and scope of the invention.
Claims

1. A process for the drying of pulp which process comprises the steps of:
   - providing a pulp comprising cellulosic fibers,
   - conducting the pulp to a wire,
   - dewatering the pulp by the aid of a suction roll wherein the suction roll has an open surface area of above 60% and a shell thickness of above 50 mm.

2. The process according to any of the preceding claims wherein the suction roll comprises a doctor blade.

3. The process according to claim 2 wherein the doctor blade is an air knife.

4. The process according to any of the preceding claims wherein the dry content of the pulp is 15-30 % by weight after passing the suction roll.

5. A suction roll for the drying of pulp wherein the suction roll has an open surface area of above 60% and a shell thickness of above 50 mm.

6. The suction roll according to any of claim 5 wherein the suction roll comprises a doctor blade.

7. The suction roll according to claim 6 wherein the doctor blade is an air knife.
## INTERNATIONAL SEARCH REPORT

**A. CLASSIFICATION OF SUBJECT MATTER**

**IPC:** see extra sheet

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)

**IPC:** D21 C, D21 F, F26B

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 database consulted during the international search (name of database and, where practicable, search terms used)

EPO-Internal, PAJ, WPI data

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

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* Further documents are listed in the continuation of Box C.

See patent family annex.

- **“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
- **“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
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International Patent Classification (IPC)

D21C 9/18 (2006.01)
D21F3/10 (2006.01)
F26B 13/16 (2006.01)

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Paper copies can be ordered at a cost of 50 SEK per copy from PRV InterPat (telephone number 08-782 28 85).

Cited literature, if any, will be enclosed in paper form.
## INTERNATIONAL SEARCH REPORT

**Information on patent family members**

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