HORIZONTAL PRESSURE TYPE PULP SCREEN

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This invention relates to pulp screens of the horizontal pressure type and particularly to a screen in which the rejects and that portion of acceptable fibres carried with the rejects are passed into a secondary compartment where the acceptable fibres and the rejects are separated from each other with the fibres being passed through the screen and the rejects are discharged through the reject discharge opening.

In the conventional pressure or "drowned" type of screen, the reject material remains on the inside of the screen plate and a current must be induced along the face of the plate to move the rejects positively to the discharge point. As the feed stock is the only fluid available to move the rejects in this manner, a large amount of good fibre must be rejected, together with the true rejects, in order to discharge the rejects from the screen. In the present invention, in order to avoid the rejecting of a fairly large quantity of fibre with the true rejects, the medium carrying the rejects i.e. the mixture of pulp and liquor, is displaced by a clear liquor. The pulp is washed out through the screen plate and the rejects continue to the discharge in a medium of clear liquor only with no good fibre included.

The invention consists essentially in the provision of a rotary impeller which is provided with a conical core having its apex pointed in the direction of the stock inlet of the screen and having a transverse baffle forming the base of the conical core and defining a secondary reject washing compartment at the discharge end of the screen. The impeller is provided with a series of longitudinal blades radiating outwardly at right angles to the axis of the impeller and extending along the surface of the conical core and projecting beyond the transverse baffle to form a series of wings within the secondary reject washing compartment. The secondary reject washing compartment is provided with inlets connected to a source of dilution liquor, usually white water, from the pulp mill and the reject discharge is also directly connected with this secondary compartment.

The conical section of the impeller, with the large end of the cone towards the reject discharge, provides a continually decreasing area of flow axially toward the reject end of the screen and maintains the axial velocity of flow of the rejects along the inside of the screen plate toward the reject discharge. At the periphery of the baffle forming the large end of the cone the mixture of good stock and rejects is discharged over the baffle into the secondary or reject compartment. This rear compartment is completely filled with liquid and this is picked up and driven outwards under centrifugal force by the wings or paddles forming extensions of the blades of the rotor. Thus, in the area of the screen plate forming the peripheral surface of the secondary compartment, the dilution liquor is used to wash away the acceptable fibre through the screen plate and the rejects are then discharged through the reject outlets, in the medium of dilution liquor only. The amount of washing applied in the secondary compartment is governed by the area of the screen plate forming the peripheral surface of this compartment and is designed to allow fibre free rejects to be discharged from the screen.

The object of the invention is to provide a pulp screen in which approximately all of the pulp fibres are screened from the reject material.

A further object of the invention is to provide a pulp screen in which, in the final stage, the mixture of pulp fibres and reject material is washed and separated by liquor other than that carrying the pulp into the screen.

A further object of the invention is to provide a pulp screen in which the impeller includes a conical member effecting a continually decreasing area of flow of pulp stock axially towards the reject end of the machine.

A further object of the invention is to provide a conical member which will maintain the axial velocity of flow of the rejects along the inside of the screen plate towards the reject end of the machine.

A further object of the invention is to provide an impeller having a transverse baffle at the large end of an axially aligned conical member and providing a restricted peripheral passage between the main body of the pulp screen and a secondary reject washing compartment. These and other objects of the invention will be apparent from the following detailed description and the accompanying drawings showing a preferred embodiment of the invention, in which:

FIG. 1 is a longitudinal vertical section of the pulp screen showing a pair of blades in the vertical plane passing through the axis of the rotor.

FIG. 2 is a vertical end elevation looking in the direction of the arrows 2—2 in FIG. 1.

FIG. 3 is a partial vertical section taken on the line 3—3 of FIG. 1.

FIG. 4 is a partial vertical section taken on the line 4—4 of FIG. 1.

FIG. 5 is a vertical section taken on the line 5—5 of FIG. 1.

FIG. 6 is a longitudinal side elevation of the impeller. FIG. 7 is a vertical end section looking on the inlet end of the impeller.

Referring to the drawings, the pulp screen 5 is of the horizontal type adapted to operate under pressure and consists of an outer annular casing 6 having a main discharge outlet 7. A pair of end walls 8 and 9 support between them a circular perforated screen 10 held in place by the rings 10a. The end wall 8 is provided with a pulp stock inlet 11 which provides a bearing support 12 for one end of the rotor shaft 13 while the end wall 9 provides a bearing support 14 for the opposite end of the rotor shaft 13. The rotor shaft 13 may be of one piece throughout its length or may be provided with a hollow sleeve 15 on which the impeller proper is mounted.

The elements of the impeller are here shown as being mounted on the hollow sleeve 15 and comprise a circular transverse baffle plate 16, a hollow core member 17 in the form of a frustum of a cone having its large end secured to the forward facing surface 16a of the baffle plate 16 while its small end is secured to the forward portion of the sleeve 15 at 18. A series of longitudinal blades 19 radiate outwards at equally spaced angular distances from each other and are secured at their inner edges 20 to the surface of the core member 17. Each of the blades 19 extend forwardly of the transverse baffle 16 to within a short distance of the forward end plate 8 and have their forward portion undercut at 21 to provide an unrestricted entry portion of the impeller for the pulp stock entering the screen from the stock inlet 11 and to allow for even distribution of the stock into the area between each of the blades 19.

The blades 19 are held in their angular spaced relationship by the baffle 16, the forward end ring 22 and the intermediate ring 23.

In FIG. 5 the surface of the core member 17 is shown made up of a series of triangular shaped plates 17a set between the longitudinal blades 19.
Each of the blades 19 are extended rearwardly of the transverse baffle 16 to within a short distance of the end wall 9 to form a series of washers 24 located within the secondary washing compartment 25 of the screen. Each of these washers 24 project radially inwards to approximately in line with the peripheral edge of the large end of the core member 17.

Perfused water is introduced into the secondary washing compartment 25 through the inlet pipe 26 and the branches 27 and 28 connected to the openings 29 and 30 in the end wall 9 of the screen.

A reject outlet 31 is also located in the end wall 9 on the vertical axis of the screen and adjacent the outer periphery of the secondary washing compartment 25.

The tailings from the compartment are carried away through the pipe 32 and the rejects are carried away through the branch 33.

The screened pulp fibres are discharged from the area 34 surrounding the screen plate 10 through the discharge outlet 7.

In the operation of this invention the screen is designed to operate under pressure, i.e. with the interior of the screen being completely filled with pulp stock. The pulp stock is delivered to the interior of the screen from the stock inlet and is directed between the blades 19 and through the core member 17 in the direction of the arrows, shown in FIG. 1, towards the interior surface of the perforated screen plate 10. In the area between the end wall 8 and the transverse baffle 16, a large portion of the pulp fibres are washed through the screen plate 10 and are discharged from the screen through the discharge outlet 7.

Because of the conical core member 17 there is provided a continually decreasing area of flow axially towards the transverse baffle 16 and therefore there is maintained an axial velocity of flow of the reject material along the inside of the screen plate 10. As the transverse baffle 16 extends radially beyond the periphery of the large end of the cone shaped core 17, there is provided a restricted passage, indicated by the arrows A in FIG. 1 between the main body of the screen and the secondary washing compartment 25, through which the rejects and such pulp fibres attached to the rejects, pass through into the secondary washing compartment 25. Here, the rejects are subjected to a washing operation with liquor fed into the compartment through the openings 29 and 30. The liquor fed into the compartment 25 is picked up and driven outwards under centrifugal force by the wings 24 which are extensions of the rotor blades 19. This action thoroughly washes any pulp fibres from the reject material and causes them to be washed through that portion of the screen plate 10 which extends around the secondary washing compartment 25. The reject material and tailings are discharged through the opening 31 and are carried away through pipes 32 or 33 whichever is more suitable for the installation.

Suitable valves at the inlet and outlets of the screen (not shown) ensure that the screen is kept filled at all times.

By the use of the above described invention the axial flow of the heavier reject material is maintained along the interior of the screen and over the transverse baffle into the secondary washing compartment, and by the use of a separate source of washing liquor and not pulp stock, the reject material is thoroughly washed to the extent that in actual operation less than 1% of the good fibre in the feed of the screen may be discharged from the rejects, whereas this may be as high as 20% with conventional pressure type screens hitherto in use. The basic principle behind the design of this screen is the use, in a screen under pressure, of an external liquid to displace the pulp medium used to carry the tailings through the screen and thereby carry the tailings from the screen in a medium free from acceptable material. This gives a complete separation of acceptable and unacceptable material in a single screen which is kept under pressure.

This result can be achieved presently to open type conventional screens, but cannot be achieved by any pressure type of screen now in use.

The open type of screen cannot be used in certain applications where exposure to air will cause entrainment of air bubbles in the liquid medium with consequent production of foam and ill effects on the pulp or paper making process. This screen combines all the advantages of a conventional open screen with perfect separation and a closed screen with no air entrainment.

What I claim is:

1. A pulp screening machine having an inlet end and a discharge end and a circular perforated screen extending from the inlet end to discharge end, a rotary impeller, a pulp stock supply inlet located at the inlet end axially with respect to said impeller, a relatively large area within the screen adjacent the said inlet, a core member on said impeller, the said core member effecting a progressive reduction in the area within the screen from the said relatively large area to a relatively small area spaced inwardly from the discharge end of the machine, the progressive reduction in area between screen and core effecting a relatively high velocity to the flow of pulp stock through the secondary washing compartment, and the said core member being located remote from the said supply inlet, a baffle set transversely of the axis of the impeller and located at

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the large end of said conical core and spaced inwardly from the discharge end of the machine to form a reject washing compartment, the said baffle having its peripheral edge spaced radially outwardly of the adjacent surface of the conical core member to form a restricted annular passage connecting said washing compartment with the area between the said conical core member and screen, and a series of blades set longitudinally of the length of the impeller and radiating from the axis thereof, the said blades extending beyond the said baffle into said reject washing compartment, means to feed wash liquid into said reject washing compartment and a reject material discharge outlet from the said washing compartment.

9. In a pulp screening machine as set forth in claim 8 in which the small end of the said conical core member is secured about the said shaft at a point intermediate the inlet end of the machine and the said baffle, and the said blades are secured to the surface of the said conical core member and to the said baffle.

10. In a pulp screening machine as set forth in claim 9 in which that portion of the blades between the inlet end of the machine and the small end of the said conical core member are cut out coincident with the diameter of the stock supply inlet.

11. In a pulp screening machine as set forth in claim 8 in which the said conical core member is made up of a series of flat triangular plates secured to said baffle and to said blades.

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