EUROPEAN PATENT SPECIFICATION

ARCHIMEDES SCREW SEPARATION PLANT FOR TREATING SLURRY
SCHNECKENFÖRDERER-TRENNUNGSANLAGE ZUR SCHLAMMVERARBEITUNG
INSTALLATION DE SÉPARATION À VIS D’ARCHIMÈDE POUR TRAITEMENT DE SUSPENSION

DEsigned Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

Priority: 05.07.2010 IT BO20100430

Date of publication of application:
15.05.2013 Bulletin 2013/20

Proprietor: WAM Industriale S.p.A.
Modena (IT)

Inventors:
• MARCHESINI, Vainer
I-41030 San Prospero (IT)

• PASSERINI, Massimo
I-44043 Mirabello (IT)
• GADDI, Marco
41030 San Prospero (IT)

Representative: Boggio, Luigi et al
Studio Torta S.p.A.
Via Viotti, 9
10121 Torino (IT)

References cited:
EP-A1- 1 066 953
EP-A2- 0 156 206
DE-A1- 19 619 147
WO-A1-2008/096381
DE-U1-202007 007 606
DE-U1-202008 011 369
GB-A- 1 200 842
JP-A- 51 038 778

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).
The present invention relates to an Archimedes screw separation plant for treating slurry as per the preamble of claim 1.

The present invention finds advantageous, but not exclusive, application in the treatment of livestock effluents to which the following description will make explicit reference without loss of generality.

The purpose of said process is to have at the end, starting from a slurry, a first substantially liquid product, and a second substantially solid product.

Background Art

Both horizontal and vertical axis Archimedes screw plants for separating slurry are well known, for example, in the treatment of livestock effluents.

Regarding a traditional vertical axis Archimedes screw separation plant, it comprises the following elements:

- a slurry feeding device towards a tubular sifting device;
- a vertical axis slurry feeding device inside which are housed advancing and pushing means, adapted to move and compress the slurry, and means adapted for filtering the slurry in transit;
- an evacuating device for the liquid slurry fraction after its separation from the solid fraction, separation substantially occurring inside the tubular sieve as a result of flattening the slurry against the sifting wall and the filtering action of the holes on the sieve.

However, the vertical axis Archimedes screw separation plants on the market today present the following drawbacks:

- efficient separation between the liquid and the solid phase of the slurry cannot be obtained;
- sorts of "bridges" are formed between the filter wall and the slurry pushing means consisting of solid material clogging the sieve resulting in a loss of filtering surface; due to the abovementioned "bridges" and agglomerations formed within the sieve the plant must be frequently stopped causing significant economic losses to the manager and/or owner thereof, and
- there is not a regular and consistent supply of the slurry towards the tubular sifting device.

Disclosure of Invention

The present Archimedes screw separation plant was conceived, so as to overcome the abovementioned drawbacks.

Therefore, according to the present invention an Archimedes screw separation plant is provided as stated in claim 1 or in any of the claims depending directly or indirectly by claim 1.

Brief Description of the Drawings

For a better understanding of the present invention certain preferred embodiments will now be described, purely by way of non-limitative examples and with reference to the attached figures, wherein:

- Figure 1 illustrates a three-dimensional rear view of an Archimedes screw separation plant object of the present invention;
- Figure 2 represents a front view of the plant of figure 1;
- Figure 3 shows a section A-A (according to a plan \( \Phi \)) executed on the three-dimensional rear view of Figure 1, also represented in this figure is a first configuration of a siphon device also object of the present invention;
- Figure 4 illustrates the same section A-A (according to the plan \( \Phi \))as in Figure 3, however, in this figure a second configuration of the siphon apparatus is represented;
- Figure 5 represents a plan view of two counter pressure elements being part of a contrast element comprised in the plant illustrated in Figures 1, 2, 3, 4;
- Figure 6 shows an isometric view of a counter pressure device of a first type being part of the contrast element shown in Figure 5, and
- Figure 7 illustrates an isometric view of a counter pressure device of a second type being part of the contrast element as in Figure 5.

Best Mode for Carrying Out the Invention

In the attached figures, with 10 is indicated as a whole, a separation plant object of the present invention.

The plant 10 is used to filter slurry so as to isolate in one part the liquid phase, and, in the other, the dry separated solid agglomerate, being almost completely devoid of liquid particles.

Said plant 10 comprises a tubular sifting device 11 having a vertical axis (X) inside which are housed,
advantageously but not necessarily, two advancing and pushing elements 12, 13 substantially conformed to an Archimedes screw (auger), which interpenetrate one in the other.

[0015] In this context the term "tubular sieve" must be meant as any tubular sieve having any cross-section, whether circular or polygonal, equal to any height.

[0016] In addition, each advancing and pushing element 12, 13 provides a respective shaft 12A, 13A (Figure 3).

[0017] In particular, the shaft 12A presents a respective vertical axis (Y1), while the shaft 13A foresees a respective vertical axis (Y2) (Figures 2, 3).

[0018] The vertical axes (X), (Y1) (Y2) are parallel to each other and all lie on the same vertical plane.

[0019] In the plant 10 object of the present invention the two Archimedes screws (augers), forming the two advancing and pushing elements 12, 13, can be interpenetrated by a near-tangency position of the coil ridges, to a position wherein each ridge scrapes the shaft of the contiguous Archimedes screw. In other words, depending on the needs, the rate of penetration between the two Archimedes screws can be varied by changing the distance between the vertical axes (Y1) (Y2).

[0020] As shown particularly in Figure 1 the device 11 is contained in a supporting structure (STR) in metal carpentry which will be described in greater detail hereinafter.

[0021] The shafts 12A, 13B are placed in counter-rotation, or in equi-rotation, with respect to one another by a motor assembly (GM), which, in the particular embodiment shown in the attached figures, is located above the device 11. In the embodiment shown in the attached figures the shafts 12A, 13B rotate in counter-rotation, i.e., respectively, in clockwise direction according to arrow (R1), and anti-clockwise direction according to arrow (R2).

[0022] The motor assembly (GM) comprises an electric motor (MM) mechanically coupled with a reducer (RDT), in turn coupled with a gearbox (STR) containing a chain and a gear train so as to achieve the desired type of rotation of the two shafts 12A, 13A respectively around the axes (Y1), (Y2) arrows (R1), (R2). Each generic coil 12* and 13*, respectively, of advancing and pushing element 12 and of advancing and pushing element 13, is coupled with the other coil 13*, 12*, so that each of which can execute the tasks of crushing, homogenization and flattening of the slurry in transit, but also of cleaning the opposite coil and of respective shafts 12A, 13A.

[0023] In other words, the plant consisting in the assembly of the two coils 12* and 13* is a self-cleaning plant.

[0024] The supporting structure (STR) comprises a lower end flange 14, an upper end flange 15 and two intermediate flanges 16, 17.

[0025] Note that the intermediate flange 16 is inclined with respect to the axis (X) for the purposes that will be later indicated in more detail.

[0026] In addition, the flanges 14, 15, 16, 17 are mechanically connected together by a plurality of vertical metal ribs (NRV) (Figure 1).

[0027] It can be seen by entering in more detail that the tubular sifting device 11 comprises a filtering punched wall 18 (Figure 3) which, in a known way, serves to filter the slurry in transit upwardly from below according to an arrow (F1) under the action of the coils 12*, 13* of the advancing and pushing elements 12, 13.

[0028] In the upper part of the filtering punched wall 18 continues with a compaction chamber 19, which starts from a surface (SS1), which substantially coincides with the end of the coils 12*, 13*, and ends with the cited upper end flange 15.

[0029] As shown particularly in Figure 3, coaxially to the filtering punched wall 18 is an outer sleeve 21 provided with an opening (OPN) to which a device is applied (not shown) to evacuate the liquid fraction after the separation from the solid fraction.

[0030] The intermediate flange 16 is attached to the lower end of the outer sleeve 21 to allow more drainage of the liquid and its conveyance towards the exit.

[0031] Fixed on the bottom plate 14 are two centering pins (PN1) and (PN2) of a respective shaft 12A, 13A. More specifically, since the shafts 12A, 13A are at least partially hollow at their ends, each pin (PN1), (PN2) is inserted into a corresponding seat of a corresponding shaft 12A, 13A allowing the centering of the same (as has already been said), and its rotation around that axis (Y1), (Y2) and according to the respective arrow (R1), (R2).

[0032] The assembly consisting in the filtering punched wall 18 and in the compaction chamber 19 ends with an opening 22 made in the upper flange 15. The width of the opening 22 is equal to that of any cross section (ST) of the device 11.

[0033] Vertically discharged from the upper opening 22 towards the outside is the dry separated solid (according to arrow (F2); Figure 3).

[0034] The compaction of the separated solid is substantially within the compaction chamber 19, wherein the compaction of the separated solid can be achieved, at least partially, due to the force of gravity on the separated solid itself.

[0035] More in detail, the compaction chamber 19 comprises a lower portion 19A, presenting a sifting-wall and which, therefore, is adapted for further evacuating the liquid in the usual way, and a solid wall upper portion 19B (i.e. without sieve) wherein the actual pressing of the separated solid occurs. Note that both portions 19A, 19B of the compaction chamber 19 are free of coils 12*, 13*.

[0036] By changing the height (H1) (Figure 3) of the compaction chamber 19 the degree of dehydration of the separated solid may be varied.

[0037] In other words, if the height (H1) of the compaction chamber 19 is increased the product amount present within will consequently increase. Therefore by the increasing of (H1) the force effected by the column of semi-
solid material will be greater, and therefore the greater the degree of dehydration of the separated solid in the column itself.

[0038] Therefore, the height (H1) can be chosen depending on the material to be dehydrated, i.e. with very liquid slurry the height (H1) will have to be increased in order to reach the desired degree of dehydration and the formation of the so-called "solid plug".

[0039] In this context the term "solid plug" indicates the solid fraction contained in the dehydrated effluents and having a residual moisture of about 70%. In other words, the "solid plug" is the final solid product that is formed during the path (transportation, emergence, compaction) that vertically occurs in the tubular sifting device 11. Therefore, the "solid plug" is the final result of the solid-liquid separation process and is the product solid fraction, which entering was just effluents, and is formed as a result of pressure against the sifting walls, the vertical transport of the product and the weight of product itself that accumulates in the upper end of the device 11.

[0040] For the foregoing reasons, the plant 10 can be provided with a compaction chamber 19 whose height (H1) can be varied depending on the value of the amount of liquid in the slurry.

[0041] In addition, the desired pressing effect can also be achieved by properly adjusting the relative heights of the portion 19A (by height (H2)) and of the portion 19B (by height (H3)) and of the compaction chamber 19 (by overall height (H1)), in order to balance an area of only effective pressing free of sifting (portion 19B) with a pressing and evacuation area of fluids (portion 19A) provided, instead, of sifting.

[0042] In a further embodiment not shown the height (H1) of the compaction chamber 19 is telescopically adjustable by an operator by way of manual means.

[0043] A contrast element 40, shown schematically in Figures 1, 2, 3, and in more detail in Figures 5, 6, 7 is adopted.

[0044] As shown in Figure 5 in particular the contrast element 40 comprises two identical counter pressure devices 41, 42 facing each other.

[0045] The contrast element 40 acts simultaneously upon all the material in transit from the opening 22, whose amplitude, as we have said, is substantially equal to that of any cross section (ST) of the device 11.

[0046] The contrast element 40 comprises a plurality of segments 41A, 41B, 41C, 41D, 41E, 41F adjacent to each other. Foreseen in correspondence to the free ends of the segments 41A, 41B, 41C is a cavity 41G adapted to embrace, in use, one half of the perimeter of the shaft 12A. Similarly in correspondence to the free ends of the segments 41D, 41E, 41F is provided a cavity 41H adapted to embrace, in use, one half of the perimeter of the shaft 13. All segments 41A, 41B, 41C, 41D, 41E, 41F are projecting from a common edge 51 provided with a plurality of seats (SD), each of which is adapted to receive, in use, a respective screw for fastening the counter pressure device 41 to the upper end flange 15. As again shown in Figure 5 each segment 41A, 41B, 41C, 41D, 41E, 41F is separated from each adjacent segment by a space (SP). This space (SP) allows each segment 41A, 41B, 41C, 41D, 41E, 41F to flex, independently from the other segments, around the edge 51, which functions as a hinge when subjected to the action of thrust of the solid material exiting the compaction chamber 19.

[0047] Since the counter pressure device 42 is identical to the counter pressure device 41, to the counter pressure device 42 can be applied the same observation made earlier to counter pressure device 41. In particular, the segments 42A, 42B, 42C, 42D, 42E, 42F (this time projecting from an edge 52), the cavities 42G, 42H, the seats (SD) and the spaces (SP) have the same characteristics described above in relation to the corresponding elements belonging to the counter pressure device 41.

[0048] Obviously, in use, the counter pressure devices 41, 42 are mounted side by side to each other (Figure 1) so that each pair of cavities 41G, 42G and, respectively, 41H, 42H each embrace, a corresponding shaft 12A, 13A.

[0049] As shown in more detail in Figure 6, each counter pressure device 41, 42 comprises, advantageously but not necessarily, a deformable plastic sheet (PD), properly shaped and cut, containing within it a respective elastic layer (LM) (made, for example, in spring steel, or any plastic material suitable for use) which shape substantially reproduces the shape of the group of segments 41A, 41B, 41C, 41D, 41E, 41F and the edge 51, respectively, segments 42A, 42B, 42C, 42D, 42E, 42F and the edge 52. Said elastic layer (LM) lies substantially in a plane parallel to the plane where the deformable plastic sheet (PD) lies and has been represented in hatched lines also in Figure 5.

[0050] In Figure 7 another embodiment is shown where instead of a single layer (LM) two layers (LM*) and (LM**) are provided which may be equal or different from each other as in material as in thickness. In addition, each layer (LM*), (LM**) can be composed of equal or different sections, from each other, so that each segment 41A, 41B, 41C, 41D, 41E, 41F, 42A, 42B, 42C, 42D, 42E, 42F is able to better respond to various stress factors of the material exiting from the opening 22 (Figure 3). In other words, there may be cases in which the segment 41F must carry a greater share of compression on the output material with respect, for example, to the output material between segments 41C and 41D. In this case, the manufacturer may provide the user with a specially conceived contrast element 40 wherein the segment 41F is provided with two layers (LM*), (LM**), while each segment 41C, 41D internally comprises only one layer (LM*). The same effect could clearly be obtained by choosing a layer with a non uniform thickness, or a layer having different resistance properties passing from segment to segment.

[0051] Upon buyer request this plant 10 can be provided, therefore, with a set comprising a plurality of contrast elements having different response capacity according to the material to be treated.
In other words, if the user should realize that to dehydrate a certain very watery product a higher counter pressure is required, a replacement can be made of the first contrast element having, for example, a single layer (Figure 6), with a second contrast element which instead provides the use of two layers (figure 7). Obviously, it is possible to conceive contrast elements having more than two layers.

As shown particularly in Figure 1, the tubular sifting device 11 presents a cross-sectional section to axis (X) of a substantially elongated elliptical shape, while each advancing and pushing element 12, 13 is housed in a respective seat 23, 24 (Figure 3) having a substantially circular cross-section.

The two seats 23, 24 are portions of the filtering punched wall 18 being substantially circular in shape and intersecting each other in a cusp 25.

It is obvious to underline that, since in Figure 3 a longitudinal section of the plant 10 is shown, there is also a second elongated cusp element (opposite to the elongated cusp element 25) which is not visible in Figure 3.

The seats 23, 24 advantageously must present a substantially circular shape so that the filtering punched wall 18 is touched by the edges of the coils 12*, 13* during the rotation of the advancing and pushing elements 12, 13.

Moreover, at least a portion of the filtering punched wall 18 is surrounded by outer sleeve 21 whose inner wall, along with the perforated filter wall 18, defines an annular discharge channel 26 through the opening (OPN), of only the liquid fraction after its separation from the separated solid thanks to the action affected by the holes present on the perforated filter wall 18 itself and on the portion 19A.

The lower portion of the filtering punched wall 18 is provided with an opening 27 connected, both mechanically and hydraulically, with a siphon apparatus 30 (Figure 3).

Said siphon apparatus 30 comprises, in turn, a connecting duct 31, preferably but not necessarily, elbow shaped, whose upper end 31A terminates in a compensation chamber 32. The compensation chamber 32 is provided, in a known way, with a degassing tube (DSG) (Figures 3, 4) adapted for bringing the same compensation chamber 32 to the atmospheric pressure.

Fastened to the compensation chamber 32 is one end of a primary feeding duct 33 of slurry (according to arrow (F3)), and one end of an additional overflow duct 34, whose entrance mouth in the compensation chamber 32 has been designated with the number 35. Therefore, the amount of any excess slurry will be evacuated through the mouth 35 and the overflow duct 34 (according to a horizontal arrow (F4) (Figure 1)).

As shown in Figure 3, the compensation chamber 32 is box-shaped open at the upper 32A, and lower 32B ends, each of which is provided with a respective flange 36A, 36B.

As again shown in Figure 3, to the free end 33A of primary feeding duct 33 is associated a corresponding flange 33B; equally to the free end 31A of the connecting duct 31 provided with a respective flange 31B.

Note also that on the flange 33B is fixed the degassing tube (DSG) perpendicular to it and also ends up inside the compensation chamber 32 constantly maintaining the same compensation chamber 32 at atmospheric pressure.

In use, the flange 33B is supported upon the flange 36A and fixed to it by means of bolts (BL1) provided with respective nuts. Similarly the flange 32B is supported on the flange 36B. The fixing of the two flanges 32B, 36B one to the other is secured by means of bolts (BL2) provided with respective nuts.

The function performed by the siphon apparatus 30 is of particular importance.

In fact, the presence of the siphon apparatus 30 prevents an overflowing supply of slurry towards the device 11, and acting as such, provides a regular supply of the slurry itself. It goes without saying that a constant feeding of slurry towards the device 11 favors obtaining an effective filtering of slurry during the crossing of the device 11 itself (according to the arrow (F1)).

Another unique characteristic of the siphon apparatus 30 is that by properly adjusting the height (H4*) (Figure 3) of the center (C1) of the overflow duct 34 with respect to the ground (GR) the height (H5*) may also be controlled of the free surface (PL) of slurry present in the compensation chamber 32 itself.

Therefore, for the known "principle of communicating vessels" the height (H5*) (Figure 3) of the free surface (PL) is also the maximum height of a free surface (SS2*) of slurry within the filtering punched wall 18 and of the liquid alone within the annular discharge channel 26.

In turn, the two surfaces (SS1) (SS2*) define a dripping chamber 190, of height (H6*) (Figure 3), wherein the slurry undergoes pre-dehydration before entering the compaction chamber 19.

In this way the siphon apparatus 30, apart from serving as a security feature of the device 11 from possible flooding and draining of fluids from the opening 22, for example, it is also utilized for adjusting the height (H6) of the dripping chamber 190.

Summarizing the advantages of the siphon apparatus 30 are the following:

(A) an optimal draining of the product, and
(B) a level of ensurence that the plug formed in section 19 will not be allowed to get wet, wherein the principle of communicating vessels are used in order to define a level above which the effluents cannot go.

In other words, as shown in Figure 4, if the height (H6) increases, allowing it to assume a value (H6**), of the dripping chamber 190, for example, lowering the center (C1) (which now has a height (H4**) less
Also note that while crossing the dripping chamber 190 when the material loses fluid through the filtering punched wall 18 and is in the meantime shaken by the coils 12*, 13*, inside the compaction chamber 19 on the material in transit only an upwardly push is performed without it being shaken. This allows to create the ideal conditions for the formation of the abovementioned solid plug in the compaction chamber 19 itself.

Also note that it is very easy to change the height (H4) of the center (C1) of the overflow duct 34 with respect to the ground (GR) by simply unscrewing, while the plant is stationary, the nuts from respective bolts (BL1), (BL2), horizontally pulling the compensation chamber 32 (arrow (FF)) from the space comprised between the two flanges 33B, 31B, and overturning the compensation chamber 32 causing (obviously after the reinsertion of the compensation chamber 32 in the space comprised between the flanges 33B and 31B) the flange 33B to rest this time on the flange 36B and the flange 32B being pressed against the flange 36A. The two pairs of flanges 33B, 36B, respectively, 32B, 36A, are held together, respectively, by bolts VT1, and bolts VT2 (with respective nuts).

With the present invention, therefore, by way of a single compensation chamber 32 it is possible to achieved with a simple overturning, at least two values of (H5) (i.e.: (H5*), respectively (H5**)) for determining, therefore, the value of the height (H6) (i.e.: (H6*), respectively (H6**)) of the dripping chamber 190. Said height (H6), as we have said is fixed by the plant technician before the plant 10 starts working, depending on the type of slurry to be processed. If the slurry itself is fairly dry then the height (H6) may have low values, as was shown in Figure 3, while if the mixture is quite liquid the height (H6) should be increased accordingly (Figure 4).

Also note that, for the same overall dimensions of the compensation chamber 32, a certain role is played by the eccentricity (ECC) of the abovementioned center (C1) with respect to the center (C2) of the compensation chamber 32 itself. In other words, even if the distance between the flanges 31B and 33B remains the same it is possible to vary the height (H4) by choosing a new compensation chamber 32 having a different eccentricity (ECC).

While remaining within the scope of the present invention an alternative version of a siphon apparatus (not shown) can be utilized in which upon a wall of the compensation chamber, there are, for example, three openable hatches placed at different heights. Opening a hatch and hooking to it the overflow duct (obviously while keeping closed the other two hatches), the height of the free surface with respect to the ground can be varied.

In use, the slurry coming from the duct 33 (according to arrow (F3)) enters from above into the compensation chamber 32. Any possible portion of excess slurry is evacuated through the overflow duct 34 (according to horizontal arrow (F4)), while the remaining part flows towards the opening 27 and inside of the filtering punched wall 18 (Figure 3).

The portion of the slurry in excess evacuated through the duct 34 is recirculated (by non illustrated means) and sent back to the feeding duct 33.

We can say conclusively that the siphon apparatus 30 has a product path that follows at least one vertical segment in the compensation chamber 32 and uses the principle of "U" shaped communicating vessels having a horizontal overflow duct 34; allowing that the level of product in the tubular sifting device 11 cannot go beyond the compaction chamber 19.

The main advantages of the Archimedes screw separation plant for slurry object of the present invention are summarized in the following points:

- a better separation between the liquid and solid phases of slurry due to the presence of at least a pair of pushing elements;
- the two coils are coupled to each other so that each of them performs crushing, homogenization and flattening actions of slurry in transit, but also, possibly, of cleaning the other coil and the other shaft; in other words, by adopting the teachings of the present invention, there is an optimal "self-cleaning" of coils and shafts thus avoiding having to stop the plant for the removal of any "bridge" of solid materials that could be formed for example, between the coils and the punched wall or inside the steps of the coils themselves;
- adjusting the height of the compaction chamber there is a variation of the self-compacting weight force of the material in transit; and
- there is a regular and constant supply to the tubular sifting device thanks to the siphon apparatus through which the exceeding portion of slurry is expelled thus avoiding overflow of the product.

Claims

1. An Archimedes screw plant (10) for separating slurry...
The plant (10), as claimed in any of the preceding claims, characterized in that said contrast element (40) comprises at least one counter pressure device (41, 42) comprises a deformable sheet (PD), which internally houses at least one respective elastic layer (LM, LM*, LM**).

5. The plant (10), as claimed in claim 4, characterized in that the shape of said at least one respective elastic layer (LM, LM*, LM**) substantially reproduces the shape of said at least one counter pressure device (41, 42).

6. The plant (10), as claimed in any of claims 3-5, characterized in that said contrast element (40) comprises at least two counter pressure devices (41, 42) side by side to each other.

The plant (10), as claimed in any of claims 3-6, characterized in that said at least one respective elastic layer (LM, LM*, LM**) equal to or different from each other both in material and thickness.

8. The plant (10), as claimed in any of claims 3-7, characterized in that each layer (LM, LM*, LM**) is composed of equal or different segments, to or from each other; so that each segment (41A, 41B, 41C, 41D, 41E, 41F, 42A, 42B, 42C, 42D, 42E, 42F) can best respond to the different stress factors of the material exiting from said upper opening (22).

Patentansprüche

1. Schneckenförder-Anlage (10) zur Schlammabtrennung, wobei die Anlage (10) aufweist:

- eine röhrenförmige Siebeinrichtung (11), die über eine vertikale Achse (X) verfügt, ausgestattet mit einer gelochten Filterwand (18), die innen vertikale Vortriebsmittel (12, 13) beherbergt, versehen mit Wendeln (12*, 13*), wobei die vertikalen Vortriebsmittel (12, 13) in der Lage sind, Schlamm vertikal zu bewegen und zu komprimieren; wobei die vertikalen Vortriebsmittel (12, 13) wenigstens zwei Vortriebssegmente (12, 13) aufweisen, die im Wesentlichen einer archimedischen Schraube (Förderschnecke) entsprechen, die sich im Wesentlichen gegenseitig durchdringen;
- eine Schlammeinspeiseeinrichtung (31);
- eine Austragseinrichtung (21) für die Flüssigfraktion nach ihrer Abtrennung von der Feststofffraktion, wobei die Abtrennung im Wesentlichen innerhalb der Einrichtung (11) geschieht;
- eine Austragseinrichtung (19, 22) für den im Wesentlichen trocknen, abgetrennten Feststoff nach seiner Abtrennung von der Flüssigfraktion,
wobei die Trennung im Wesentlichen innerhalb der röhrenförmigen Siebeinrichtung (11) geschieht; wobei das kompaktierte Produkt vertikal abgelassen wird (F2);
- Anlage (10), wobei die röhrenförmige Siebeinrichtung (11) im Inneren eine obere Kompaktierungskammer (19) des abgetrennten Feststoffes aufweist, wo ein Feststoffpropfen aus Produkt gebildet wird; wenigstens ein erster Abschnitt (19B) der Kompaktierungskammer (19) keines der Vortriebselemente (12, 13) aufweist und keine der gelochten Filterwände (18); und
- die röhrenförmige Siebeinrichtung (11) eine obere Auslassöffnung (22) für den abgetrennten Feststoff darstellt, wobei die obere Öffnung (22) mit einem ersten Hilfsgegenelement (40) zur Bildung des Feststoffpropfens aus Produkt versehen ist;

wobei Anlage (10) dadurch gekennzeichnet ist, dass die Größe der oberen Öffnung (22) im Wesentlichen der eines Querschnitts (ST) der Einrichtung (11) entspricht; und das Hilfsgegenelement (40) zugleich auf das gesamte Material einwirkt, welches sich im Übergang von der oberen Öffnung (22) befindet.

2. Anlage (10) wie in Anspruch 1 beansprucht, dadurch gekennzeichnet, dass die gesamte Kompaktierungskammer (19) keine Vortriebselemente (12, 13) aufweist, wobei wenigstens ein zweiter Abschnitt (19A) der Kompaktierungskammer (19) mit einer gelochten Filterwand (19) versehen ist.

3. Anlage (10), wie in einem der vorhergehenden Ansprüche beansprucht, dadurch gekennzeichnet, dass das Gegenelement (40) wenigstens eine Gegendruckeintrichtung (41, 42) aufweist, welche eine Mehrzahl von benachbarten Segmenten (41A, 41B, 41C, 41D, 41E, 41F, 42A, 42B, 42C, 42D, 42E, 42F) darstellt, die an einer gemeinsamen Kante (51, 52) befestigt sind, und die sich unabhängig voneinander beugen können, wenn sie der Vortriebswirkung des festen Materials ausgesetzt werden, welches die Kompaktierungskammer (19) verlässt.

4. Anlage (10) wie in Anspruch 3 beansprucht, dadurch gekennzeichnet, dass die wenigstens eine Gegendruckeintrichtung (41, 42) ein verformbares Blatt (PD) aufweist, welches intern wenigstens eine entsprechend elastische Schicht (LM, LM*, LM**) beherbergt.

5. Anlage (10) wie in Anspruch 4 beansprucht, dadurch gekennzeichnet, dass die Gestalt der wenigstens einen entsprechenden elastischen Schicht (LM, LM*, LM**) im Wesentlichen die Gestalt der wenigsten einen Gegendruckeintrichtung (41, 42) reproduziert.

6. Anlage (10), wie in einem der Ansprüche 3 bis 5 beansprucht, dadurch gekennzeichnet, dass das Gegenelement (40) wenigstens zwei Gegendruckeintrichtungen (41, 42) Seite an Seite zueinander aufweist.

7. Anlage (10), wie in einem der Ansprüche 3 bis 6 beansprucht, dadurch gekennzeichnet, dass die wenigstens eine Gegendruckeintrichtung (41, 42) wenigstens zwei Schichten (LM*, LM**) aufweist, die sowohl in Bezug auf Material als auch Dicke voneinander gleich oder verschieden sind.

8. Anlage (10), wie in einem der Ansprüche 3 bis 7 beansprucht, dadurch gekennzeichnet, dass jede Schicht (LM, LM*, LM**) aus zueinander oder voneinander gleicher oder unterschiedlicher Segmenten zusammengesetzt ist, so dass jedes Segment (41A, 41B, 41C, 41D, 41E, 41F, 42A, 42B, 42C, 42D, 42E, 42F) am besten auf verschiedene Beanspruchungsfaktoren des Materials reagieren kann, welche aus der oberen Öffnung (22) austritt.

Revendications

1. Installation à vis d’Archimède (10) pour séparer de la boue, l’installation (10) comprenant :
- un dispositif de tamisage tubulaire (11), ayant un axe vertical (X), pourvu d’une paroi perforée de filtration (18) logeant à l’intérieur des moyens de poussée verticaux (12, 13) pourvus de bobines (12*, 13*), lesdits moyens de poussée verticaux (12, 13) étant capables de déplacer verticalement et de comprimer de la boue ; lesdits moyens de poussée verticaux (12, 13) comprenant au moins deux éléments de poussée (12, 13) sensiblement conformés en une vis d’Archimède (vis sans fin) qui s’interpénètrent sensiblement ;
- un dispositif d’alimentation en boue (31) ;
- un dispositif d’évacuation (21) pour la fraction liquide après sa séparation d’avec la fraction solide, la séparation se produisant sensiblement à l’intérieur dudit dispositif (11) ;
- un dispositif d’évacuation (19, 22) pour le solide séparé sensiblement sec après sa séparation d’avec la fraction liquide, la séparation se produisant sensiblement à l’intérieur dudit dispositif de tamisage tubulaire (11) ; le produit compacté étant libéré verticalement (F2) ;
- l’installation (10) dans laquelle le dit dispositif de tamisage tubulaire (11) comprend à l’intérieur une chambre de compactage supérieure
(19) du solide séparé où un bouchon de produit solide est formé ; au moins une première portion (19B) de ladite chambre de compactage (19) étant dépourvue desdits éléments de poussée (12, 13) et de ladite paroi perforée de filtration (18) ; et dans laquelle - ledit dispositif de tamisage tubulaire (11) présente une ouverture d'échappement supérieure (22) pour le solide séparé, ladite ouverture supérieure (22) étant pourvue d'un élément de contraste auxiliaire (40) pour former ledit bouchon de produit solide ;

l'installation (10) étant caractérisée par le fait que la taille de ladite ouverture supérieure (22) est sensiblement égale à celle de toute section (ST) du dispositif (11) ; et ledit élément de contraste auxiliaire (40) agissant simultanément sur toute la matière en transit provenant de ladite ouverture supérieure (22).

2. Installation (10) selon la revendication 1, caractérisée en ce que la totalité de la chambre de compactage (19) est dépourvue desdits éléments de poussée (12, 13), au moins une seconde portion (19A) de ladite chambre de compactage (19) étant pourvue de ladite ouverture supérieure (22).