(57) Abrégé/Abstract:
The invention relates to processes for the separation, in particular filtration of liquids and solids from liquid-solid-mixtures, in particular from a mineral solid-liquid-suspension, preferably ore or coal suspension and sludge, respectively, of contaminated earth, the process space being submitted to overpressure, as well as to an installation for carrying out the process, consisting of a collector container for liquid-solid-mixture, in particular suspension, a pressure filter, a discharge system and container for condensate and solid matter. The invention is characterised primarily in that the separation, in particular filtration takes place in addition to the application of overpressure at elevated temperature, preferably 40°C to 300°C, conveniently 60°C to 200°C, preferably about 150°C, and in that the pressure filter (2) communicates with a source for heated medium, respectively.
Abstract

The invention relates to processes for the separation, in particular filtration of liquids and solids from liquid-solid-mixtures, in particular from a mineral solid-liquid-suspension, preferably ore or coal suspension and sludge, respectively, of contaminated earth, the process space being submitted to overpressure, as well as to an installation for carrying out the process, consisting of a collector container for liquid-solid-mixture, in particular suspension, a pressure filter, a discharge system and container for condensate and solid matter. The invention is characterised primarily in that the separation, in particular filtration takes place in addition to the application of overpressure at elevated temperature, preferably 40°C to 300°C, conveniently 60°C to 200°C, preferably about 150°C, and in that the pressure filter (2) communicates with a source for heated medium, respectively.
Process and Installation for the Separation of Solid-Liquid-Mixtures

The present invention relates to processes for the separation, preferably filtration, of liquids and solids from liquid-solid-mixtures, in particular from a mineral solid-liquid-suspension, preferably an ore or coal suspension or sludge of contaminated earth, the process space being submitted to overpressure, as well as to an installation for carrying out the process, consisting of a collector container for liquid-solid-mixture, in particular liquid-solid-suspension, a pressure filter, a discharge system and container for condensate and solid matter.

Such processes and installations have already successfully been employed in the field of mineral processing for the treatment of ore and coal concentrates. A special variant of a pressure filter suitable therefor is described in German Patent Publication No. DE-2,947,329 (Stahl) published on May 27, 1981. This does, however, not satisfy the requirements for dehumidification of ore or coal concentrates and for an application for the decontamination of contaminated earth, respectively.

Thus the present invention proposes that the separation, in particular filtration, of solids and liquids from solid-liquid-mixtures, in particular from mineral solid-liquid-suspensions takes place, in addition to the application of overpressure, under elevated temperature, for instance 40°C to 300°C, conveniently 60°C to 200°C, preferably about 150°C. The elevated temperature primarily reduces the viscosity of the liquid to be expelled, which makes it easier to expel the liquid in particular in case of pressure filtration, resulting from very low residual
moisture values. According to the invention the elevated temperature may be generated by means of vapour, in particular water vapour, for instance at 110°C to 200°C, advantageously about 150°C. For this purpose, according to the invention the pressure filter communicates with a vapour source.

By using vapour, in particular water vapour, it is possible to obtain very low contents of residual moisture in ore and coal concentrates, which are not obtainable with air as the filtration medium. Furthermore it is also possible to thereby separate dangerous substances, as for instance trinitrotoluene (TNT) from contaminated earths, which furthermore dissolve
in vapour and condensate, respectively.

In an embodiment of the process according to the invention the temperature for the separation or filtration is generated in the whole process space by means of vapour, in particular water vapour. Thus the known pressure filters may practically be employed.

A further advantageous modification of the process according to the present invention is characterised in that the overpressure for the separation or filtration is generated by means of vapour, in particular water vapour, in a space separated from the rest of the process space. Although it is true that separation of the filtration space is additionally necessary here, on the other hand, there is considerable saving of vapour, and the supplementary aggregates housed in the pressure filter container are easier to handle. With a type of process like this only the filter has to be adapted to the elevated temperatures.

Further embodiments of the invention are characterised in that the vapour is saturated vapour and in that the vapour is overheated vapour, respectively. A choice of the suitable type of process has to be made in accordance with the respective requirements as to the separation or filtration of the mixture, in particular depending on the material to be filtered.

According to an advantageous development of the invention the condensed vapour is discharged together with the liquid to be expelled, for instance water, TNT. Separation of the condensed vapour from the liquid to be expelled may be avoided by appropriate choice of the vapour pressure medium, which is how further elaborate separation steps may be dispensed with.

In a further preferable embodiment of the invention, the solid matter heated by the vapour and separated from the liquid, for instance the ore or coal concentrate and decontaminated earth, respectively, is separately submitted to further processing.

A further embodiment of the process according to the invention is
characterised in that the temperature for filtration is generated by compressed air heated to, for instance 40°C to 300°C, conveniently 60°C to 200°C, preferably about 150°C. The compressed air necessary for generating pressure or compressed air being available from another process, in particular during operation, may for instance be employed in a simple way here.

According to the present invention the elevated temperature in the whole process space may be generated by heated compressed air. Thus the known pressure filters may practically be taken over. According to a further embodiment of the invention the elevated temperature may also be generated by heated compressed air in a space separated from the rest of the process space. By direct impingement on the filter cake the energy losses in the pressure chamber may largely be reduced.

A further embodiment according to the invention is characterised in that the solid-liquid-mixture or solid-liquid-suspension is supplied to the filter at an elevated temperature, for instance 40°C to 300°C, conveniently 60°C to 200°C, preferably about 80°C, it being possible to additionally heat the mixture or suspension before it enters the filter. By this type of process, a considerably more favourable separation or filtration and thus considerably lower residual moisture values may be obtained without substantially modifying the pressure filter.

According to the invention economical operation may be achieved in particular if the air pressure in the container or chamber space of the filter is controlled in dependance on the vapour pressure. It may, however, possibly be more favourable for the vapour pressure to be controlled in dependance on the air pressure in the container and chamber space of the filter, respectively. According to the invention the effect of separation or filtration may be particularly raised if, apart from the application of overpressure at elevated temperature, the solid-liquid-mixture, in particular solid-liquid-suspension, to be separated, in particular to be filtrated, is subjected to a movement in addition to the usual movement of separation, in particular filtration in the filter, in particular in the filter trough or the like. Then undesired sedimentation and too rapid obstruction of the filter elements or filter or sieve openings,
respectively, is prevented. This effect in combination with higher working pressure and elevated working temperature results in particularly progressive separation or filtration effects and high separation or filtration performance, respectively, at favourably low expenditure of energy.

An installation according to the invention for carrying out the process according to the invention is characterised in that the pressure filter communicates with a source for heated medium. According to an embodiment of the invention, this source is a vapour source.

If, according to a further modification of the invention, the container, for instance the chamber, of the pressure filter communicates with the vapour source, the whole process space may be filled with vapour in a particularly easy way.

However, according to the invention the vapour source may communicate with a separate vapour dome at the interior of the container of the pressure filter. Thus a special space for vapour pressure filtration may deliberately be separated from the rest of the process space. Thus no special type of the materials for the other aggregates situated in the container of the pressure filter (control head, snap-blow valve, drive, controlling equipment, measuring probes, electric lines) is necessary.

A favourable development of the invention is characterised in that the vapour dome communicates with the filter trough of the rotary filter (rotary disk or drum filter). In this way the vapour required for filtration may be fed to the region of the filter surface, in particular to the so-called dehumidification region, in a targeted way, thus minimizing the loss of vapour and energy.

If subsequently, according to the invention, the vapour dome is tightly connected to the discharge opening of the pressure filter container, the dome including the material discharge and the conveyance system, further loss of vapour and energy and consequently heating up of the rest of the process space may be avoided. When using dangerous or toxic substances, these may also be separated from the rest of the process space and
discharged (disposed of) in a controlled manner.

According to a further favourable embodiment of the invention the source of heated medium is a source of heated compressed air. According to the invention this may either communicate with the chamber of the pressure filter or with a separate dome connected to the filter trough of the rotary filter, in the interior of the container of the pressure filter.

According to a further embodiment of the invention the source for heated medium is a supply of hot solid-liquid-mixture or solid-liquid-suspension.

An advantageous embodiment of the invention is characterised in that the vapour dome is provided with outlets on both sides of the filter disk for the vapour and the heated compressed air, respectively. By this construction, the vapour and the heated compressed air, respectively, may be directly applied to the filter cake on the filter disk.

According to a further favourable modification of the invention, the vapour dome communicates with the pressure space via at least one valve flap.

Here the flap may be opened towards the pressure space or the vapour space, it also being possible to provide a combination of two flaps.

Particularly advantageously the at least one flap opens at a pressure difference of about 0,05 bar. Thus the vapour dome must not be provided with reinforcement.

According to the invention economical operation is ensured by providing a means for controlling the air pressure in the container or chamber space of the filter independance on the vapour pressure. On the contrary, it may however also be favourable to have a means for controlling the vapour pressure in dependance on the air pressure in the container or chamber space of the filter in the system. A particularly advanced separation or filtration may be achieved by providing, at the elevated temperature according to the invention and the overpressure applied, a means, for instance an agitator for the purpose of movement of the and in the mixture, in particular suspension, respectively -- in addition to the usual movement
of separation, in particular filtration of the solid-liquid-mixture, in particular solid-liquid-suspension -- in the filter trough or the like.

Therefore, in accordance with the present invention there is provided a process for the continuous separation of solids and liquids from solid/liquid mixtures, said process comprising filtering said mixture, by means of a moving filter, under pressure applied by a pressure medium, said pressure medium comprising compressed air and/or steam; wherein the filtration takes place at a temperature of between 40°C and 300°C, the section of said filter which is not immersed in said mixture is screened off against the remaining process areas, and the screened off section of said filter being pressurized by a pressure medium differing from the pressure medium to which the unscreened section of the process area is subjected.

In accordance with the present invention, there is provided a pressure filter device for the continuous separation of solids and liquids from solid/liquid mixtures comprising a receptacle for said mixture, a rotary filter whose surface is in contact with said mixture, a pressurized vessel adapted to accommodate said receptacle and said rotary filter, discharge means for separate discharge of the filtrate and the solids from the mixture, a pressure medium source adapted to feed the pressurized vessel with a pressure medium, a pressure hood provided inside the pressurized vessel and above the immersed area of the filter, said hood being adapted for selected feeding of the non-immersed filter areas with
said pressure medium, and a heating generating device adapted to heat said pressure medium.

Also in accordance with the present invention, there is provided a process for filtration of solids and liquids from a solid-liquid mixture comprising:
filtering said mixture through a filtration means to produce a filter cake, said means having a moving filter and a means for receiving said mixture and being in fluid communication with said filter; said filter and said means for receiving said mixture being in an enclosure means defining a pressure space;
providing said filtration means with a dome for enclosing said moving filter and being connected to said means for receiving said mixture, and for defining a second space within said pressure space and being separate from said pressure space;
introducing a heated gas into said second space defined by said dome and means for receiving said mixture to heat said mixture;
subjecting said pressure space to a pressure greater than atmospheric pressure; and
filtering said mixture at a temperature of about 40° C. to 300° C.

Still in accordance with the present invention, there is provided a process for filtering solids and liquids from a solid-liquid mixture comprising the steps of:
feeding a solid-liquid mixture into a filtration means, said filtration means being disposed in an enclosure defining a pressure space, said filtration
means comprising a rotatable filter disk and a trough containing said solid-liquid mixture, and a dome enclosing said filter disk to define a second space, said second space being in fluid communication with said pressure space, introducing a heated gas into said dome; subjecting said pressure space to a pressure greater than atmospheric pressure, and maintaining said mixture at a temperature of about 40° C. to about 300° C.; and rotating said filter disk wherein a first portion of said filter disk passes through said solid-liquid mixture to form a filter cake and a second portion passes through said second space to force liquid through said filter cake on said filter, and thereafter removing said filter cake from said filter.

Still further in accordance with the present invention, there is provided an apparatus for filtering solid-liquid mixtures comprising:
means for defining a first pressure space;
a collector container having an inlet for the solid-liquid mixture, said container being positioned within said first pressure space;
pressure filter means disposed in said container for filtering said mixture and separating solids from said mixture;
a liquid discharge from said container;
a condensate and solids collection means connected to said container;
a pressure chamber coupled to said collector container and enclosing said filter means and solid-
liquid mixture and defining a second pressure space contained within said first pressure space; and
a source of heated fluid medium connected to said container to heat said second pressure space and said mixture while being filtered.

Still further in accordance with the present invention, there is provided an apparatus for filtering a solid-liquid mixture, comprising:
a filter trough having an inlet for receiving said solid-liquid mixture;
a pressure filter means for filtering said solid-liquid mixture and separating solids from said mixture;
a liquid discharge means coupled to said trough;
a solid discharge means connected to said filter means;
means for defining a first pressure space enclosing said filter means and trough;
a dome coupled to said trough for completely enclosing said filter means and solid-liquid mixture and defining a second pressure space within said first pressure space and in fluid communication with said first pressure space;
a pressure medium source in fluid communication with said first pressure space for maintaining said first and second pressure spaces at an elevated pressure;
a pressure operated valve coupled to said dome providing said fluid communication between said first and second pressure spaces; and
means for supplying a heated fluid to said second pressure space.
Examples of the invention will be described with reference to the drawings.

Fig. 1 being a process scheme according to the invention, Fig. 2 showing a modification of the process according to the invention, Fig. 3 showing a further modification of the process according to the invention, and Fig. 4 showing the core of an installation or arrangement according to the invention for carrying out the process.

The process according to the invention will now be described briefly with reference to Fig. 1. The mineral suspension or sludge of an ore or coal preparation and contaminated earth, respectively, is sucked from a collector container 20 with agitator 32' at an appropriate hydrostatic admission pressure by means of pump 21 and pumped into the filter trough 3 via a filtrate feeding device 30 from the above. The filter trough 3 is installed in the pressure chamber 1. In order to avoid concentrating-on of solid matter, the trough 3 is provided with continuous overflow 12 and discharge 13. Flow of the sludge through the filter trough 3 and homogenization of the sludge is supported by means of an agitator 18 (also see Fig. 4). The conveyance flow of the sludge supply pump 21 is brought about automatically by the electric motor controlled via a frequency transformer in dependance on the amount of overflow of sludge. The amount of overflow of sludge is registered by a flow-rate measurement station 37. The overflow stream 12 and the discharge stream 13 flow into a suspension collecting container 31 with agitator 32 in the form of a pressure agitation container by gravimetric fall. From the pressure container 31 the sludge may be conveyed back
into the collector container via a level-controlled pump (not shown) having an immersed suction pipe or only by way of pressure gradient. The filter 2 is supplied with compressed air from a station for compressed air, for instance an air compressor 23, or vapor from the vapor network of the installation (not shown) as a working medium. The air and the vapor, respectively, may also be brought to the required temperature by means of a heater 24 before entering the pressure space. The cake forming filtrate 14 having as little air content as possible flows into a filtrate separator 25 into which the dehumidification filtrate is also introduced after cooling in the air/gas cooler 27 wherein the condensate is precipitated. The stream of exhaust air escapes from the top of the filtrate separator 25 at 26. The filtrate-condensate-mixture separated off may accordingly be disposed of. The dewatered solid matter (ore concentrate, coal concentrate) and the decontaminated earth 10 is discharged through a gate sluice 7,8,8',9. In this, the filter cake removed from the filter disk 2 (also see Fig. 4) for instance by means of snap-blow valve 28 and compressed air from the snap-blow compressor 29 falls through fall shafts 5 (also see Fig. 4) mounted on both sides of the filter disk 2 into a funnel 6 for the material removed. From there it gets into the sluice collector container 7. Now a gate sluice 8,8' is alternatively opened and closed, which is how the filter cake first gets into the intermediate sluice chamber 9 and subsequently to the filter cake discharge 10. The gate sluice 8,8' is operated by an hydraulic aggregate 34. The discharged filter cake 19' is transported away for instance by means of a conveyor belt 35. The amounts of air, vapour, suspension supply, overflow, discharge as
well as the amount of filtrate may be controlled by control valves and the appropriate conduits also be completely blocked, respectively.

Fig. 2 now shows a modification of the process according to the invention, the vapour and the heated air, respectively, in this case being guided into a vapour dome 4 mounted above the filter disk 2, which dome is positioned above the filter trough 3 and temperature-isolated. The compressed air required for generating the pressure in the pressure chamber 1 streams into the chamber space 17 (not preheated, but out of a compressor without cooling system) positioned outside the vapour dome 4 as warm air at equal pressure. When using vapour in order to achieve filtration at elevated temperature, the air pressure is adjusted to for instance 4,0 bar in absolute figures. This corresponds to a temperature of the saturated vapour of 143,6°C (when using water vapour). The air pressure is measured and constitutes the control input for the vapour pressure to be adjusted in the chamber space 17. This is realjusted to the air pressure to delta-p approx. < =0,05 bar. The regulation of pressure difference between air space 17 and vapour dome 4 is done in such a way that vapour preferably escapes into the air space. The vapour dome 4 does not pressure-sealedly rest on the filter trough 3.
Controlled pressure compensation between vapour dome 4 and air space 17 in the filter chamber 1 (gap, bore, valve) is provided for.

Moderate transfer of air into the vapour space of the vapour dome 4, which is also possible, does not constitute any problem. If the air is cooler than the vapour, it is rapidly heated up thereby. The temperature of the gas mixture will decrease only little.

Fig. 3 illustrates a further modification of the invention wherein the suspension is brought to filtration in a heated state. In some cases the suspension to be filtered is introduced into the suspension collector container at high temperature already. This is the case, for example, with waste liquor from the aluminum process and red mud, wherein the suspension has temperatures over 200°C and to this day has to be cooled down before filtration. In most cases, however, the suspension must be additionally heated up in a heater 38 before being supplied to the filter trough 3. By the hot suspension in particular the viscosity of the liquid is reduced, and in this way the latter may more easily be separated from the solid matter. By analogy this also applies to the use of heated compressed air and vapour, respectively, wherein the reduction of viscosity of the liquid to be expelled also considerably contributes to better filtration.

Fig. 4 illustrates a single-disk filter with filter disk 2 and filter trough 3 to be employed for the processes according to the present invention as a practical example. In the filter trough 3 mounted on stand 45 an agitator 18 is furthermore installed, which serves to homogenize the suspension and sludge, respectively. A vapour dome 4 provided with openings 39,39' for pressure holding flaps is mounted above the filter trough 3. These flaps open in dependance on the pressure difference between vapour dome 4 and pressure space 17 (Figs. 1 to 3!) in which the filter is positioned. They may be adjusted to a specific limiting value for opening for instance by means of elastic force or counter weights. The vapour and the heated compressed air, respectively, is guided into a vapour chamber 41 via a muff 40, from where the vapour and the heated compressed air, respectively, is guided directly onto the filter cake 19 already filtered on via openings 42 provided on both sides of the filter disk 2, for instance in the form of a perforated plate. The temperature and/or the
pressure under the vapour dome 4 is measured via measuring probes 43 and regulated according to the requirements. For special applications, for instance for the filtration of readily sedimenting substances, further installations, for instance guiding plates, special suspension feeding and discharge means, may be provided for homogenizing sludge. The filter cake is then thrown down into the fall shafts 5 and removed with scrapers, respectively, and falls into the funnel 6 for the material removed (not shown here, but indicated in Figs. 1 to 3), the fall shaft 5 and funnel 6 possibly being tightly connected with each other.

The examples only serve to illustrate the invention, other applications, for instance with rotary filters having several disks, drum filters or also band filters in the pressure chamber, also being conceivable. The application of the invention generally to the separation and filtration, respectively, of liquid-solid-mixtures may be of considerable advantage under certain circumstances, in particular in view of carrying out the process economically.
The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A process for the continuous separation of solids and liquids from solid/liquid mixtures, said process comprising:
   filtering said mixture, by means of a moving filter, under pressure applied by a pressure medium, said pressure medium comprising compressed air and/or steam; wherein
   the filtration takes place at a temperature of between 40 °C and 300 °C;
   the section of said filter which is not immersed in said mixture is screened off against the remaining process areas; and
   the screened off section of said filter being pressurised by a pressure medium differing from the pressure medium to which the unscreened section of the process area is subjected.

2. The process according to claim 1, wherein said mixture is heated before filtration.

3. The process according to claim 1, wherein said mixture is a mineral solid/liquid suspension.

4. The process according to claim 1, wherein said mixture is an ore or coal suspension.

5. The process according to claim 1, wherein said mixture is a suspension from contaminated earth.

6. The process according to claim 1, wherein said pressure mediums are heated.

7. The process according to claim 1, wherein the pressures of said pressure mediums are controlled independently.

8. The process according to claim 1, wherein said filter is a rotary filter.

9. The process according to claim 8, wherein said filter is a disk filter.
10. The process according to claim 1, wherein said mixture in said filter area is homogenised by being stirred or agitated.

11. A pressure filter device for the continuous separation of solids and liquids from solid/liquid mixtures, said filter device adapted to carry out the process defined in any one of claims 1, 3 to 6 and 8, said filter device comprising:

   a receptacle for said mixture;
   a rotary filter whose surface is in contact with said mixture;
   a pressurised vessel adapted to accommodate said receptacle and said rotary filter;
   discharge means for separate discharge of the filtrate and the solids from the mixture;
   a pressure medium source adapted to feed the pressurised vessel with a pressure medium;
   a pressure hood provided inside the pressurised vessel and above the immersed area of the filter, said hood being adapted for selected feeding of the non-immersed filter areas with said pressure medium; and
   a heating generating device adapted to heat said pressure medium.

12. The pressure filter device according to claim 11, wherein said receptacle is a filter vat.
13. The pressure filter device according to claim 11, wherein said receptacle is provided with an overflow.

14. The pressure filter device according to claim 11, wherein said rotary filter is a disk filter.

15. The pressure filter device according to claim 11, wherein said pressure medium comprises gas and/or steam.

16. The pressure filter device according to claim 11, wherein said pressure hood is mounted to said receptacle.

17. The pressure filter device according to claim 11, further comprising an agitator or stirrer adapted for homogenisation of said mixture in said receptacle.

18. The pressure filter device according to claim 11, further comprising at least one differential-pressure controlled connecting element adapted to allow said pressure medium to spill between the pressure hood and the pressurised vessel.

19. The pressure filter device according to claim 18, wherein said at least one connecting element comprises valve flaps arranged on both sides of said filter disk, said valve flaps adapted to open at a differential pressure of 0.05 bar.

20. The pressure filter device according to claim 11, comprising separate sources of pressure medium for feeding the pressure hood and the pressurised vessel.

21. The pressure filter device according to claim 20, wherein said separate sources of pressure medium produce different pressure media.

22. The pressure filter device according to claim 21, wherein said pressure medium source for feeding said pressure hood is adapted to produce heated compressed air and/or steam, and wherein the pressure medium source for feeding the pressurised vessel is adapted to produce compressed air.
23. The pressure filter device according to claim 11, further comprising a heating device adapted to heat the solid/liquid mixture.

24. The pressure filter device according to claim 11, wherein said pressure hood is connected to said receptacle, such that the lower edge of said pressure hood, when mounted in an approximately vertical position, is connected with the upper edge of said receptacle when said receptacle is mounted in an approximately vertical position.

25. The pressure filter device according to claim 11, wherein the filter area in said pressurised vessel is substantially enclosed by said receptacle, and the pressure hood connected to said receptacle is mounted as a separate unit inside said pressurised vessel.

26. The pressure filter device according to claim 11, wherein said pressure hood is equipped with outlets for the steam or the heated compressed air, said outlets provided on both sides of the filter disk, directing the steam or the heated compressed air to the surface of the filter disk.
27. A process for filtration of solids and liquids from a solid-liquid mixture comprising:
   filtering said mixture through a filtration means to produce a filter cake, said means having a moving filter and a means for receiving said mixture and being in fluid communication with said filter;
   said filter and said means for receiving said mixture being in an enclosure means defining a pressure space;
   providing said filtration means with a dome for enclosing said moving filter and being connected to said means for receiving said mixture, and for defining a second space within said pressure space and being separate from said pressure space;
   introducing a heated gas into said second space defined by said dome and means for receiving said mixture to heat said mixture;
   subjecting said pressure space to a pressure greater than atmospheric pressure; and
   filtering said mixture at a temperature of about 40° C. to 300° C.

28. The process of claim 27, wherein a solid component of said solid-liquid mixture is selected from the group consisting of mineral, ore, coal and soil suspensions.

29. The process of claim 27, comprising filtering said mixture at a temperature of about 60° C. to 200° C.

30. The process of claim 27, comprising filtering said mixture at a temperature of about 150° C.
31. The process of claim 27, comprising introducing a heated vapor to heat said mixture to about 100° C. to 200° C.

32. The process of claim 31, comprising introducing said vapor to heat said mixture to about 150° C.

33. The process of claim 31, comprising introducing heated steam into said pressure space to heat said mixture.

34. The process of claim 33, comprising condensing said steam in said filtration means and discharging condensed vapor with liquid separated from said mixture.

35. The process of claim 31, wherein said vapor is saturated steam.

36. The process of claim 31, wherein said vapor is superheated steam.

37. The process of claim 31, comprising removing and discharging said filter cake from said filtration means.

38. The process of claim 27, comprising introducing compressed heated air at a temperature of about 40° to 300° C. into said pressure space.

39. The process of claim 38, comprising heating said compressed air to about 60° C. to 200° C.

40. The process of claim 38, comprising heating said air to about 150° C.
41. The process of claim 38, comprising introducing heated compressed air to filtration means to heat said mixture.

42. The process of claim 38, comprising heating compressed air at a location remote from said pressure space to produce said heated compressed air prior to introducing to said pressure space.

43. The process of claim 27, comprising introducing said solid-liquid mixture to said filtration means at an elevated temperature of about 40° C. to 300° C.

44. The process of claim 43, comprising introducing said mixture at a temperature of about 60° C. to 200° C.

45. The process of claim 43, comprising introducing said mixture at about 80° C.

46. The process of claim 43, comprising heating said mixture at a location remote from said pressure space before introducing to said filtration means.

47. The process of claim 27, comprising controlling air pressure in the pressure space in response to vapor pressure in said second space defined by said housing and means for receiving said mixture.

48. The process of claim 27, comprising controlling vapor pressure in said second space defined by said housing and means for receiving said mixture in response to air pressure in said pressure space.
49. The process of claim 27, said mixture having a normal flow movement in said filtration means, said process comprising inducing an additional movement of said mixture in said filtration means to prevent settlement of solids in said filtration means.

50. A process according to claim 27, wherein the mixture is a sludge suspension of contaminated earth.

51. The process of claim 27, wherein said heated gas is selected from the group consisting of heated compressed air, saturated steam, and superheated steam.

52. A process for filtering solids and liquids from a solid-liquid mixture comprising the steps of:

feeding a solid-liquid mixture into a filtration means, said filtration means being disposed in an enclosure defining a pressure space, said filtration means comprising a rotatable filter disk and a trough containing said solid-liquid mixture, and a dome enclosing said filter disk to define a second space, said second space being in fluid communication with said pressure space, introducing a heated gas into said dome; subjecting said pressure space to a pressure greater than atmospheric pressure, and maintaining said mixture at a temperature of about 40° C. to about 300° C.; and rotating said filter disk wherein a first portion of said filter disk passes through said solid-liquid mixture to form a filter cake and a second portion passes through said second space to force liquid
through said filter cake on said filter, and thereafter removing said filter cake from said filter.

53. The process of claim 52, comprising feeding a heated gas under pressure into said pressure space to force liquid through said filter disk.

54. The process of claim 52, further comprising introducing heated air or steam to said dome.

55. The process of claim 52, further comprising introducing compressed air into said pressure space at a pressure substantially equal to the pressure in said dome.

56. The process of claim 52, said process comprising providing said dome with pressure operated valves for communicating the interior of said dome with said pressure space, and introducing steam or heated compressed air into said dome.

57. The process of claim 56, comprising providing said dome with a vapor chamber coupled to said dome and having openings for communicating with the interior space of said dome, and introducing said steam or heated compressed air into said vapor chamber and directing said steam or heated compressed air directly onto said filter.

58. The process of claim 57, comprising directing said steam or heated compressed air directly onto said filter cake on opposite sides of said filter disk.
59. An apparatus for filtering solid-liquid mixtures comprising:
   means for defining a first pressure space;
   a collector container having an inlet for the solid-
   liquid mixture, said container being positioned
   within said first pressure space;
   pressure filter means disposed in said container for
   filtering said mixture and separating solids from
   said mixture;
   a liquid discharge from said container;
   a condensate and solids collection means connected
   to said container;
   a pressure chamber coupled to said collector
   container and enclosing said filter means and solid-
   liquid mixture and defining a second pressure space
   contained within said first pressure space; and
   a source of heated fluid medium connected to said
   container to heat said second pressure space and
   said mixture while being filtered.

60. An apparatus according to claim 59, wherein said
    fluid medium source is a source of heated vapor.

61. An apparatus according to claim 60, wherein said
    vapor source is in fluid communication with said pressure
    chamber in said container.

62. An apparatus according to claim 59, comprising a
    separate vapor dome in an interior portion of said
    container defining said pressure chamber, said dome being
    in fluid communication with said heated fluid medium.
63. An apparatus according to claim 62, said filter means comprising a rotary filter and a filter trough, said vapor dome being connected to said trough.

64. An apparatus according to claim 62, said vapor dome comprising a material discharge and a conveyance system tightly connected to a discharge opening.

65. An apparatus according to claim 62, said vapor dome comprising outlets for said heated fluid medium on each side of the filter means.

66. An apparatus according to claim 65, said vapor dome being in fluid communication with the first pressure space and said outlets including at least one valve flap.

67. An apparatus according to claim 66, wherein said at least one valve flap opens towards said first pressure space.

68. An apparatus according to claim 66, wherein said at least one valve flap opens towards said vapor dome.

69. An apparatus according to claim 66, said at least one flap valve opening at a pressure difference of about 0.05 bar.

70. An apparatus according to claim 59, wherein said source of heated fluid is a heated compressed air source.

71. An apparatus according to claim 70, said filter means comprising a rotary filter, a filter trough and a vapor dome connected to said filter trough.
72. An apparatus according to claim 70, comprising means for controlling air pressure in said container or second pressure space in relation to vapor pressure in said first pressure space.

73. An apparatus according to claim 70, comprising means for controlling vapor pressure in said container or second pressure space in relation to air pressure in said first pressure space.

74. An apparatus according to claim 59, comprising means for heating said solid-liquid mixture at a remote location from said filter means.

75. An apparatus according to claim 59, comprising agitator means in said container to induce movement of said mixture in addition to a usual movement of said mixture through said apparatus for preventing settlement of solids in said container.

76. An apparatus according to claim 59, wherein the mixture is a mineral, ore, coal or sludge suspension of contaminated earth.

77. An apparatus for filtering a solid-liquid mixture, comprising:
   a filter trough having an inlet for receiving said solid-liquid mixture;
   a pressure filter means for filtering said solid-liquid mixture and separating solids from said mixture;
   a liquid discharge means coupled to said trough;
a solid discharge means connected to said filter means;
means for defining a first pressure space enclosing said filter means and trough;
a dome coupled to said trough for completely enclosing said filter means and solid-liquid mixture and defining a second pressure space within said first pressure space and in fluid communication with said first pressure space;
a pressure medium source in fluid communication with said first pressure space for maintaining said first and second pressure spaces at an elevated pressure;
a pressure operated valve coupled to said dome providing said fluid communication between said first and second pressure spaces; and
means for supplying a heated fluid to said second pressure space.

78. The apparatus of claim 77, wherein said filter means comprises rotary disk filter.

79. The apparatus of claim 77, wherein said pressure operated valve is a flap valve.

80. The apparatus of claim 77, wherein said dome substantially maintains said heated fluid in said second pressure space.

81. The apparatus of claim 77, wherein said fluid communication between said first and second pressure spaces maintains said second pressure space at substantially the same pressure as said first pressure space.
82. The apparatus of claim 77, wherein said means for supplying heated fluid comprises means for supplying steam or heated compressed air.

83. The apparatus of claim 77 wherein said filter means is a rotary filter.