

DESCRIPTION

Device for Sludge Dewatering

Technical Field

The present invention relates generally to the field of the dewatering treatment technology, in particular to a sludge dewatering device.

Background Art

Along with the development of social economy and urbanization, the output and the quantity of municipal wastewater are increasing continuously. According to incomplete statistic, the discharge amount of the wastewater in the whole country was about 53.7 billion tons in 2006. Along with the increment of wastewater treatment rate, the municipal wastewater will be largely increased in treatment amount in the further 20 years in China and accompanied by a large amount of excess sludge. It is forecasted that the output of municipal dry sludge in China will reach about 8.4 million tons per year (equal to the wet sludge of 42 million tons with 80 percent of moisture content), which accounts for 3.2 percent of total discharge amount of countrywide solid wastes, and furthermore, the annual growth rate is more than 10 percent.

The sludge has complicate components, is an aggregate including zooglea formed by a plurality of microorganisms, as well as organic matters and inorganic matters absorbed by the microorganisms, and not only contains a large amount of water (Be up to above 80 percent after the water is mechanically extruded and dewatered), but also contains organic groups, heavy metals and salt which are difficult to be degraded, as well as pathogenic microorganisms and parasitic ovum, etc. If being piled and discharged at random, a large amount of sludge which is not processed will result in new environment pollution, in particular to several cities and areas with higher urbanization level, and therefore, the sludge disposal problem is outstanding and urgent.

At present, the final treatment technology mainly includes incomplete sanitary landfill, incineration and compost.

Sanitary landfill is mainly shown as follows:

Firstly, the sludge has bad soil-mechanical property. Presently, the sludge which is sent to a landfill yard for landfill has 20 percent of solid content ratio; and a marshy area can be easily formed by the

independent landfill, as well as landslide, collapse and other phenomenon in rainy season in the south of China, which can reduce the service life of the landfill yard.

Secondly, because the filtrating liquid of the sludge may result in pollution to the underground water source, the article of "The sludge with the moisture content larger than 60 percent is forbidden to enter the landfill yard from Oct. 1, 2007" is regulated in the "CJ/T249-2007 The Disposal of Sludge from Municipal Wastewater Treatment Plant-Sludge Quality for Co-landfilling" issued by the Department of Construction P.R.China in 2007.

A plurality of problems also exists in the incineration. The sludge which is not dried is hard to be incinerated and is not economic in energy consumption; and a plurality of auxiliary fuels are required to be added due to more water, thereby causing more cost.

The sludge in the compost is also required to be dried or added with saw dust, tree leaves and so on to improve the solid scale of the sludge.

At present, the common device in the domestic and overseas wastewater treatment plants mainly comprises belt filter presses, centrifugal dehydrators, plate and frame filter presses and other devices. The moisture content of the sludge processed by the devices mentioned above only can reach about 80 percent, and a certain difficulty still exists in the dewater of the sludge processed by the devices no matter what final processing technologies are adopted. Therefore, the sludge drying technology is an issue required to be solved without delay at home. At present, the heat drying technology is mainly adopted to carry out further drying treatment to the wastewater with the moisture content of about 80 percent, which is difficult to be popularized in aspects of investment, floor area, running cost and so on.

The sludge electro osmosis dewatering technology is a novel sludge treatment technology, which mainly is used for dewatering the cake-shaped sludge under the double action of electric field and mechanical extruding force and dewatering the sludge under the action of electro osmosis, thus enabling the sludge processed to reach higher dewatering rate. The prior art provides a sludge electro osmosis dewatering device uses the drum as the anode; and the metal wire mesh as the cathode, the anode drum is partially enwrapped by the metal wire mesh; a layer of filtering cloth is added on the surface of the anode drum to prevent the cathode metal wire mesh from being in contact with the anode drum. The cathode metal wire mesh has the disadvantages that the elasticity is bad in use, the plastic fatigue is easy to deform, and the service life is short; because the water gathers towards the cathode, the water adjacent to one side of the cathode is less; the filtering cloth between the anode and the cathode can result in large resistance between the cathode and the anode, so that the dewatering speed is more slowly. The prior art further provides an electro osmosis dewatering device which uses a metal flat as the anode and a metal perforating plate as the

cathode; the cathode plate is fixed; the anode plate adopts hydraulic drive to extrude the sludge cake between the cathode and the anode; a nonmetal weaving mesh is adopted between the cathode and the anode, so as to ensure that the cathode is not contact with the anode and the conveying and the filtering effects are simultaneously played. The nonmetal weaving mesh stops traveling while the extrusion and the dewater are carried out; and after the extrusion is finished, the anode plate lifts and the nonmetal weaving mesh travels to carry the sludge which is dewatered away and enable the sludge which is not dewatered to be dewatered. However, the art has the disadvantages of uncontinuous working manner, low working efficiency and low dewatering efficiency due to less water filtering area of the metal perforating plate as the cathode.

Contents

Based on the problem existing in the prior art, the embodiment of present invention provides a sludge dewatering device, which can solve the problems of the prior electro osmosis dewatering device such as short service life of the cathode, less water filtering area and low dewatering efficiency of the dewatering device.

The embodiment is achieved through the following technical solutions:

The embodiment relates to a sludge dewatering device, which is characterized by comprising:

A frame, an anode drum, a cathode filter screen, a guide roller and a drive roller;

The said anode drum is the metal drum, is arranged in the frame, and is electrically connected with the anode of a power source;

The said cathode filter screen is the nonmetal spiral mesh; a plurality of metal wires arranged in the spiral drum of the nonmetal spiral mesh are used as the conductive bodies, each metal wire crosses through the nonmetal spiral mesh and both ends thereof extend out of the nonmetal spiral mesh; and each metal wire is electrically connected with the cathode of the power source;

The said drive roller and the guide roller are arranged on the frame; the cathode filter screen driven by the drive roller is arranged on the drive roller and the guide roller; and one part of the cathode filter screen is surrounded outside the anode drum, thus forming the clearance with the anode drum to extrude the sludge.

As shown in the technical solution provided by the execution manner of the invention, the sludge between

the anode drum and the cathode filter screen can be dewatered under the double action of compression and electro osmosis in a continuous manner through partially cladding the cathode filter screen outside the anode drum and driving the cathode filter screen by using the drive roller and the guide roller to operate, so as to achieve higher dewatering efficiency. In addition, because each metal wire is arranged inside the nonmetal spiral mesh in the cathode filter screen and connected into the integral conductive bodies at both ends of the metal wire through a metal plate, not only the water filtering area of the cathode is ensured and the dewatering efficiency is improved, but also the service life of the cathode is increased.

Description of the Drawings

The structural schematic diagram of the dewatering device provided by the embodiment is shown in FIG. 1.

The structural schematic diagram of the cathode filter screen of the dewatering device provided by the embodiment is shown in FIG. 2.

The A-A profile of FIG. 2 is shown in FIG. 3.

All the reference signs in the Figures refer to: 1-filter screen tightening device; 2-cathode filter screen; 3-sludge extruding device; 4-drive roller; 5-sludge scraping device; 6-filter screen correcting device; 7-anode drum; 8-current collecting device; 9-auxiliary extruding roller; 10-filter screen washing device; and 11-guide roller.

21-metal wire and 22-nonmetal spiral mesh.

Specific Execution Manner

In order to understand, the invention is further described in combination with the drawings and the specific embodiment.

Embodiment

The embodiment provides a sludge dewatering device, which is used for dewatering the sludge, as shown in FIG 1 and FIG 2. The dewatering device comprises:

A frame, an anode drum 7, a cathode filter screen 2, a guide roller 11 and a drive roller 4; the anode drum 7 is metal, which is arranged in the frame and electrically connected with the anode of the power source; the metal surface of the anode drum 7 can be covered with the special metal coating layer; the metal coating layer can be made of coatings which are sintered on the surface of a titanium plate at high temperature and contain iridium; the special metal coating layer can carry out the electrical corrosion protection to the surface of the anode drum; and compared with the anode protection art, the anode drum has good dimension stability and high electric energy utilization.

The cathode filter screen 2 is the nonmetal spiral mesh; a plurality of metal wires 21 arranged in the spiral drum of the nonmetal spiral mesh 22 are used as the conductive bodies (refer to FIG. 2); each metal wire 21 crosses through the nonmetal spiral mesh 22, and both ends thereof extend out of the nonmetal spiral mesh 22; each metal wire 21 is electrically connected with the cathode of the power source; the drive roller 4 and the guide roller 11 are arranged on the frame; the cathode filter screen 2 is arranged on the drive roller 11 and the guide roller 4; one part of the cathode filter screen 2 is surrounded outside the anode drum 7; the guide of the cathode filter screen 2 is achieved through driving the drive roller 4 and the guide roller 11; and the clearance for extruding the sludge is formed between the cathode filter screen 2 and the anode drum 7. In fact, the diameter of the metal wire in the spiral drum of the nonmetal spiral mesh of the cathode filter screen 2 is 0.6 mm, and the threading diameter is 0.8 mm.

In the dewatering device with the above structure, an arc-shaped electric field can be formed between the anode drum 7 and the cathode filter screen 2, so as to ensure the continuous operation; and the dewatering efficiency of the sludge is improved greatly compared with the horizontal component of the electric field.

The current collecting device 8 is also included in the dewatering device; the anode drum 7 is electrically connected with the anode of the power source through the current collecting device 8; and each metal wire 21 of the cathode filter screen 2 is also electrically connected with the cathode of the power source through the current collecting device 8. The current collecting device 8 comprises the anode conducting ring, the cathode conducting ring, the anode electrical brush, the cathode electrical brush and the two groups of metal cathode contact rings. The anode conducting ring and the cathode conducting ring are fixed on the main shaft of the anode drum 7; the anode conducting ring is connected with the anode of the power source; the cathode conducting ring is connected with the cathode of the power source; the anode electric brush is arranged on and is electrically connected with the anode drum 7, and is connected with the anode conducting ring in a sliding manner; the anode drum 7 is connected with the anode of the power source through the anode electrical brush and the anode conducting ring; The cathode electrical brush is also arranged on the anode drum 7; the insulating body is arranged between the cathode electrical brush and the anode drum 7; the cathode electrical brush is connected with the cathode conducting ring in a sliding

manner; the two groups of mental cathode contact rings are respectively arranged at both ends of the anode drum 7; the insulating layer is arranged between the two groups of mental cathode contact rings and the anode drum 7; the two groups of mental cathode contact rings are electrically connected with the cathode electrical brush; the metal edge of each metal wire 21 surrounding on two sides of the cathode filter screen 2 outside the anode drum 7 is respectively in contact with the cathode contact ring to ensure that the cathode filter screen 2 is connected with the cathode of the power source.

The sludge extruding device 3 is also included in the dewatering device; the sludge extruding device 3 is arranged at the sludge inlet at the top part of the frame and is flat fan-shaped wholly, the inlet thereof is round, and the outlet thereof is a slit with the width of 8 mm; and the cross-section area from the inlet to the outlet is equal, thereby ensuring that the material is continuous and uniform when being discharged from the outlet through being extruded.

The sludge scraping device 5 and the filter screen washing device 10 are also arranged in the dewatering device, wherein the sludge scraping device 5 is arranged at the sludge outlet on the frame; the sludge cake after being dewatered is scraped away from the cathode filter screen 2 through the sludge scraping device 5; the sludge scraping device 5 comprises the scraping plate and the compacting cylinder; the compacting cylinder is connected with the scraping plate; and the scraping plate is compacted on the surface of the cathode filter screen 2 at the sludge outlet. The scraping plate can scrape a large amount of fibers, hairs and impurities containing in the sludge cake away; and the fibers, the hairs and the impurities attached on the scraping edge of the scraping plate can be conveniently cleared through lifting the compacting cylinder.

The filter screen washing device 10 is arranged on the frame and is positioned on the inner side of the frame and behind the sludge scraping device 5; the filter screen washing device 10 is corresponding to the cathode filter screen 2 arranged on the drive roller 4 of the frame and can wash the cathode filter screen 2, so as to ensure that the meshes of the cathode filter screen 2 are not blocked by the sludge processed and ensure the water filtering area of the cathode filter screen 2 and the dewatering efficiency.

In order to adjust the position of the cathode filter screen 2, the filter screen correcting device 6 and the filter screen tightening device 1 also can be arranged in the dewatering device, wherein the filter screen correcting device 6 is arranged on the frame; the correcting roller is arranged on the filter screen correcting device 6; the cathode filter screen 2 is arranged on the correcting roller; the filter screen tightening device 1 is also arranged on the frame; the adjusting roller is arranged on the filter screen tightening device 1; and the cathode filter screen 2 is arranged on the adjusting roller. In fact, the filter screen correcting device 6 can adopt the pneumatic correcting roller; the filter screen tightening device can adopt the pneumatic

tightening roll; the cathode filter screen 2 is driven by the drive roller 4 and diverted by the guide roller 11 during the running process of the dewatering device; the cathode filter screen 2 is tightly supported by the pneumatic tightening roll as the filter screen tightening device 1, so as to serve the function of adjusting the tightness of the cathode filter screen 2; and when deviating the central position during the running process, the cathode filter screen 2 is adjusted to the central position through the pneumatic tightening roll as the filter screen tightening device 1. Thus, the cathode filter screen 2 can be prevented from deviating during the running process through the restriction function of the filter screen correcting device 6, thereby ensuring the treatment effect on the sludge.

A plurality of auxiliary extruding roller 9 can also be arranged in the dewatering device, are uniformly distributed on the frame and outside the circumference of the anode drum 7, and pressed on the outer side of the cathode filter screen 2; the cathode filter screen 2 can be pressed on the anode drum 7 through the auxiliary extruding roller 9, thereby adjusting the clearance between the cathode filter screen 2 and the anode drum 7, so as to serve the function of improving the dewatering efficiency of the dewatering device.

According to the principle that the surface of ion in the material is wrapped by opposite charge based on the electric double layer theory and the polar liquid wrapped by positive charge is convenient to flow to the cathode under the action of the extra electric field, the dewatering device can dewater the cake-shaped sludge under the double action of the electric field and the mechanical extrusion force; however, under the dewatering process of the material extruded mechanically, the water in the material is difficult to be extruded out along with the smaller and smaller porosity of the material, therefore, the moisture content of the sludge after being extruded mechanically in the water treatment technology only can achieve about 80 percent generally; when the dewatering device is used for dewater the sludge under the double action of the extra electric field and the mechanical extrusion force; and the moisture content of the sludge after being dewatered can achieve below 60 percent and the outflow speed is also greatly improved.

In conclusion, the dewatering device in the embodiment can enable the sludge processed to achieve higher dewatering rate through matching the cathode filter screen and the anode drum; and particularly, the service life of the cathode is prolonged greatly by adopting the cathode filter screen with a special structure, the water filtering area is ensured, and the dewatering efficiency of the dewatering device is improved.

The above only is the better execution manner of the invention, but, the protection scope of the invention is not limited to the above; and the change or the replacement which can be easily thought by any technicians who are familiar with the technical field should be included in the protection scope of the invention. Therefore, the protection scope in the claims should prevail.

CLAIMS

1. Sludge dewatering device, characterized by comprising:

A frame, an anode drum, a cathode filter screen, a guide roller and a drive roller;

Said anode drum, which is metal, is arranged in the frame and electrically connected with the anode of a power source;

Said cathode filter screen is a nonmetal spiral mesh; a plurality of metal wires arranged in the spiral drum of the nonmetal spiral mesh are used as the conductive bodies; each metal wire crosses through the nonmetal spiral mesh and both ends thereof extend out of the nonmetal spiral mesh; and each metal wire is electrically connected with the cathode of the power source;

Said drive roller and the guide roller are arranged on the frame; the cathode filter screen driven by the drive roller is arranged on the drive roller and the guide roller; and one part of the cathode filter screen is surrounded outside the anode drum, thus forming the clearance with the anode drum to extrude the sludge.

2. Said sludge dewatering device according to claim 1, characterized in that said sludge dewatering device further comprises a current collecting device; the anode drum is electrically connected with the anode of the power source through the current collecting device; and the metal wire of the cathode filter screen is also electrically connected with the cathode of the power source through the current collecting device.

3. Said sludge dewatering device according to claim 2, characterized in that the current collecting device comprising:

An anode conducting ring, a cathode conducting ring, an anode electrical brush, a cathode electrical brush and two groups of metal cathode contact rings;

The anode conducting ring and the cathode conducting ring are fixed on the main shaft of the anode drum; the anode conducting ring is connected with the anode of the power source; the cathode conducting ring is connected with the cathode of the power source; the anode electrical brush, which is arranged on the anode drum, is electrically connected with the anode drum and connected with the anode conducting ring in a sliding manner; the cathode electrical brush is arranged on the anode drum; an insulating body is arranged between the cathode electrical brush and the anode drum; the cathode electrical brush is connected with the cathode conducting ring in a sliding manner; the two groups of metal cathode contract rings are

respectively arranged at both ends of the anode drum; an insulating layer is arranged between the two groups of metal cathode contract rings and the anode drum; the two groups of metal cathode contract rings are electrically connected with the cathode electrical brush; and the metal edge of the cathode filter screen surrounded outside the anode drum is in contact with the cathode contract ring.

4. Said sludge dewatering device according to any one of claims 1 to 3, characterized in that said sludge dewatering device further comprises a sludge extruding device;

said sludge extruding device is flat fan-shaped and positioned at a sludge inlet at the top part of the frame, the inlet thereof is round, and the outlet thereof is a slit with the width of 8 mm; and the cross-sectional area from the inlet to the outlet is equal.

5. Said sludge dewatering device according to any one of claims 1 to 4, characterized by said sludge dewatering device further comprising a sludge scraping device and a filter screen washing device;

Said sludge scraping device is arranged at a sludge outlet on the frame, and the sludge scraping plate thereof is corresponding to the cathode filter screen on the drive roller;

Said filter screen washing device, which is arranged on the frame, is corresponding to the cathode filter screen on the drive roller arranged on the frame.

6. Said sludge dewatering device according to claim 5, characterized in that said sludge scraping device includes a scraping plate and a compacting cylinder; and the compacting cylinder is connected with the scraping plate to compact the scraping plate on the surface of the cathode filter screen at the sludge outlet.

7. Said sludge dewatering device according to any one of claims 1 to 6, characterized by said sludge dewatering device further comprising a filter screen correcting device and a filter screen tightening device;

Said filter screen correcting device is arranged on the frame; a correcting roller is arranged on the filter screen correcting device; and the cathode filter screen is arranged on the correcting roller;

Said filter screen tightening device is arranged on the frame; an adjusting roller is arranged on the filter screen tightening device; and the cathode filter screen is arranged on the adjusting roller.

8. Said sludge dewatering device according to any one of claims 1 to 7, characterized by said sludge dewatering device further comprising a plurality of auxiliary extruding rollers which distributed on the circumference of the anode drum and pressed on the outer side of the cathode filter screen.

9. Said sludge dewatering device according to any one of claims 1 to 8, characterized in that the diameter

of the metal wire in the spiral drum of said nonmetal spiral mesh is 0.6 mm, and the threading diameter is 0.8 mm.

10. Said sludge dewatering device according to any one of claims 1 to 9, characterized in that the surface of the anode drum is covered with an anticorrosive layer formed by anticorrosive materials.