SLURRY TRUCK TRANSPORT BINS

Applicant: Santa Clara Waste Water Company, Oxnard, CA (US)

Inventors: Douglas Brian Edwards, Oxnard, CA (US); Matthew Shawn Rosecn, Ventura, CA (US); Carl Robert Edwards, Carpinteria, CA (US); Edward Bruce Wilson, Nampa, ID (US)

Filed: Jul. 14, 2014

Publication Classification

B65D 88/12 (2006.01)
B65D 90/00 (2006.01)
B65D 90/02 (2006.01)

ABSTRACT

A slurry truck transport bin includes a double-walled bin tub of molded resin and a double-walled lid of molded resin. The bin tub has an inner wall bounding a cavity for containing unsolidified waste slurry, a lip bounding an opening of the cavity, an outer wall defining channels extending across a bottom of the bin tub opposite the cavity opening and sized to accept forklift tines, and structural ribs connecting the inner and outer walls and arranged to support a floor of the cavity under weight of over a metric ton of unsolidified waste as the bin tub is lifted by forklift. The lid is configured to span the cavity opening and defines an underside perimeter channel sized to receive the lip of the bin tub. The inner wall of the bin tub at the lip and an inner wall surface of the lid bounding the perimeter channel are of complementary tapers.
SLURRY TRUCK TRANSPORT BINS

TECHNICAL FIELD

[0001] This invention relates to bins or containers, and more particularly to truck transport bins for liquid or slurry bulk materials.

BACKGROUND

[0002] In oil or gas drilling process, drilling cuttings from drilling rig shakers, e.g., mud/dirt waste from the drilling process, can be captured in a truck transport bin. The drilling cuttings can be wet or in a slurry condition. Alternatively, in solidification methods, a powder drying agent is mixed to the captured drilling cuttings to cause the wet cuttings to dry, and the dried cuttings are then loaded onto a truck and sent for off-site disposal. However, the solidification methods can increase disposal and trucking costs and can have negative environment impacts, such as from airborne drying agents.

SUMMARY

[0003] One aspect of the invention features a slurry truck transport bin for oil or gas drilling waste. The slurry truck transport bin includes a double-walled bin tub of molded resin that has an inner wall bounding a cavity for containing unsolidified waste slurry, a lip bounding an opening of the cavity, an outer wall defining channels extending across a bottom of the bin tub opposite the cavity opening and sized to accept forklift tines, and structural ribs connecting the inner and outer walls and arranged to support a floor of the cavity under weight of over a metric ton of unsolidified waste as the bin tub is lifted by forklift. The slurry truck transport bin also includes a double-walled lid of molded resin configured to span the cavity opening, the lid defining an underside perimeter channel sized to receive the lip of the bin tub. The inner wall of the bin tub at the lip and an inner wall surface of the lid bounding the perimeter channel are of complementary tapers. The relative sizes of the bin tub lip and the inner wall surface of the lid are such that when the lid is placed on the bin tub with the lip in the channel, the inner wall of the bin tub is positioned to engage the tapered inner wall surface of the lid with the lip of the bin lid spaced from a bottom of the lid channel. The bin tub is of such flexibility that pinching the lid to the bin tub with a force sufficient to cause the tapered inner wall surface to slide along the inner tub surface until the bin tub lip contacts the bottom of the lid channel, flexes the bin tub lip outward without cracking, thereby forming a barrier to slurry flow along two sets of contacting surfaces between the bin tub and the lid.

[0004] The double-walled bin tub of molded resin can include a sealed void space defined between the inner wall and the outer wall. The double-walled bin tub of molded resin and the double-walled lid of molded resin can each be in the form of a unitarily molded structure. In some cases, the bin tub and the lid are each rotationally molded high density polyethylene (HDPE) structures.

[0005] In some implementations, the lid includes an upper wall, a bottom wall, and a side wall connecting the upper wall and the bottom wall, and the upper wall, the bottom wall, and the side wall define therebetween a sealed void space. The upper wall can define upperside channels sized to accept forklift tines, and the lid can include one or more metal plates attached to the upper wall and spanning the upperside channels so as to confine forklift tines within the upperside channels. In some examples, the upperside channels include a first set of channels and a second set of channels intersecting channels of the first set, and the metal plates span intersections between channels of the first and second sets. The bottom wall of the lid can also define one or more recesses extending horizontally along a length of the lid.

[0006] When the bin tub lip contacts the bottom of the lid channel, an outer surface of the outer wall can be in contact with an inner surface of a side wall of the lid, thereby forming a third set of contacting surfaces between the bin tub and the lid to secure the slurry flow within the bin tub.

[0007] In some implementations, the slurry truck transport bin includes a rubber bulb seal positioned in contact with the tapered inner wall surface of the lid within the underside perimeter channel and sized to be compressed and flex outward when the tapered inner wall surface slides along the inner tub surface of the inner wall.

[0008] In some implementations, the slurry truck transport bin includes a rubber bulb seal positioned in contact with an inner surface of a side wall of the lid within the underside perimeter channel and sized to be in contact with both an outer surface of the outer wall and the inner surface of the side wall when the lid is placed on the bin tub with the lip in the channel.

[0009] The slurry truck transport bin can include one or more metal plates spanning the channels at the bottom of the bin tub and configured to confine forklift tines within the channels. In some cases, the bin includes one or more releasable ratchet strips surrounding the lid and secured to the outer wall of the bin tub.

[0010] In some examples, the tapered inner wall surface of the lid has a vertical height of between about 3 inches and 5 inches, measured perpendicular to the bottom of the lid channel. The cavity for containing unsolidified waste slurry can define a volume of at least 3.5 cubic yards, and the slurry truck transport bin has an empty weight of less than about 1000 pounds.

[0011] The details of one or more embodiments of the invention are set forth in the accompanying drawings and the description below. Other features, objects, and advantages of the invention will be apparent from the description and drawings, and from the claims.

DESCRIPTION OF DRAWINGS

[0012] FIG. 1A is a perspective view of an example slurry truck transport bin according to the present disclosure.

[0013] FIG. 1B is a perspective view of the bin of FIG. 1A with straps.

[0014] FIG. 1C is an exploded top perspective view of the bin of FIG. 1A.

[0015] FIG. 1D is an exploded bottom perspective view of the bin of FIG. 1A.

[0016] FIG. 1E is a side cross-sectional view of the bin of FIG. 1A.

[0017] FIG. 2A is a side cross-sectional view of an example double-walled bin tub of the bin of FIG. 1A.

[0018] FIG. 2B is a top perspective view of the bin tub of FIG. 2A.

[0019] FIG. 2C is a bottom perspective view of the bin tub of FIG. 2A.

[0020] FIG. 3A is a side cross-sectional view of an example double-walled lid of the bin of FIG. 1A.

[0021] FIG. 3B is a top perspective view of the lid of FIG. 3A.
FIG. 3C is a bottom perspective view of the lid of FIG. 3A.

Like reference symbols in the various drawings indicate like elements.

**DETAILED DESCRIPTION**

The present disclosure describes a slurry truck transport bin which may be used to capture and contain liquid or slurry bulk materials, e.g., oil or gas drilling waste, for transportation. In one aspect, a slurry truck transport bin includes a double-walled bin tub of molded resin and a double-walled lid of molded resin, which provides tight and secure seals for unsolidified waste slurry contained in the bin tub. The bin tub includes channels on the bottom of the bin tub that are sized to accept forklift tires. An operator can operate a forklift to place the double-walled bin tub directly under drilling rig shakers to capture wet drill cuttings. When the captured wet drill cuttings reach a predetermined holding capacity, e.g., 90% of a volume capacity of the bin tub, the forklift operator can move the bin tub from under the drilling rig shakers and set the bin tub in a staging area. Another empty double-walled bin tub can be placed under the drilling rig shakers to continue capturing the wet drill cuttings. The forklift operator then places the double-walled lid on the bin tub containing the captured wet drill cuttings and secures the lid on the bin tub, e.g., by exerting a force on the lid and/or using releasable ratchet straps. After securing the lid to the bin tub, the secured slurry truck transport bin is ready to be trucked off for disposal.

With reference to FIGS. 1A-1E, an example implementation of a slurry truck transport bin 100 is shown in various views and various configurations. As illustrated, the slurry truck transport bin 100 includes a double-walled bin tub 102 and a double-walled lid 104. The bin tub 102 is configured to capture and hold waste, particularly unsolidified waste slurry, e.g., water waste or wet drill cuttings in oil/gas drilling processes. The lid 104 is configured to cover the bin tub 102 on the top and secure the waste within the bin tub 102. FIGS. 1C and 1D show exploded configurations for the bin tub 102 and the lid 104. FIGS. 1A, 1B, and 1E show closed configurations for the bin tub 102 and the lid 104.

FIGS. 2A-2C illustrate various views of the double-walled bin tub 102 of the slurry truck transport bin 100 of FIGS. 1A-1E. The double-walled bin tub 102 includes an inner wall 122 and an outer wall 124. The inner wall 122 bounds a cavity 121 for containing the waste. The bin tub 102 includes a lip 126 that connects the inner wall 122 and the outer wall 124. The lip 126 includes an inner lip edge 125 and an outer lip edge 127. The inner lip edge 125 bounds an opening of the cavity 121. The outer lip 127 defines an outer circumference of the bin tub 102 at the opening of the cavity 121.

The bin tub 102 can be in a form of a unitary molded structure, and/or without welds and without openings. The bin tub 102 can be fabricated by rotational molding using plastic, e.g., molten resin such as polyethylene or any suitable molding material. In a particular example, the plastic includes high density polyethylene (HDPE). The bin tub 102 is a rotationally molded HDPE structure.

The inner wall 122, the outer wall 124, and the lip 126 define therebetween a sealed inner space 123. The bin tub 102 can include one or more structure ribs 128 in the inner space 123. The structure ribs 128 are placed between the inner wall 122 and the outer wall 124, e.g., on the bottom of the inner wall 122 and on the top of the outer wall 124. The structure ribs 128 can connect the inner and outer walls and be arranged to support a floor of the cavity 121 under a weight of waste, e.g., over a metric ton of unsolidified waste, as the bin tub 102 is lifted by a forklift. In some examples, the structure ribs 128 are made of metal such as steel.

In some implementations, the inner space 123 is a sealed void space, which can decrease the empty weight of the bin tub 102. The voice space can also provide flexibility for the inner wall 122. When the inner wall 122 is pressed under a pressure or a force, the inner wall 122 can flex outward without cracking. In some implementations, the inner space 123 is filled with foam materials. The foam materials can include heat insulating foam such as urethane foam, such that the waste in the cavity 121 can be protected against hot and/or cold temperatures outside the bin tub 102. The foam materials can be configured to support the cavity 121 and/or have flexibility to be compressed under pressure.

One or more mark lines 121 can be marked at one or more positions on an inner surface of the inner wall 122. The mark lines 121 can be used to indicate different levels of the cavity 121 for holding waste, e.g., 50%, 60%, 90%, or a maximum allowable capacity. The mark lines 121 can be marked using different colors to indicate the different levels, e.g., green for 60%, or red for 90%.

The inner wall 122 can be a taper. For example, as illustrated in FIG. 2A, the inner wall 122 has a larger circumference at the opening of the cavity 121 and a smaller circumference at the bottom of the cavity 121. The circumference of the inner wall 122 can gradually decrease from the opening to the bottom of the cavity 121, e.g., with an inclined angle. In some examples, the inner wall 122 can have round corners at the bottom and at the opening of the cavity 121.

The outer wall 124 can have round corners at the bottom of the outer wall 124 and/or at the top of the outer wall 124. The outer wall 124 can extend vertically from the top of the outer wall 124 or the lip 126 to a turning position “T” at a top corner extending horizontally for a distance, and then extend as a taper or slop to the bottom of the bin tub 102.

In some implementations, the bin tub 102 includes a supporter 130 extending from the turning position “T” to the bottom of the bin tub 124. The supporter 130 can have a complementary shape to an outer surface of the outer wall 124 to support the bin tub 102.

As illustrated, the double-walled bin tub 102 can have a cuboid shape. In some implementations, the bin tub 102 includes one or more support recesses 132 along Y direction (in width) and one or more support recesses 134 along X direction (in length). The support recesses 132 and 134 can extend from the outer wall 124 to the inner wall 122, e.g., for strengthening the bin tub 102 and/or providing support for the cavity 121.

The bottom of the bin tub 102 defines a first set of channels 133 along X direction and a second set of channels 135 along Y direction. Channels 133 and 135 of the first and second sets extend across with each other on the bottom of the bin tub 102. The channels 133 and 135 are sized to accept forklift tires, e.g., with a size of about 4.75 inch in height and about 10 inch in width. As illustrated, the channels 133 and 135 can be wider at the bottom of the bin tub 102 than at the bottom of the channels, which provides easy access for the forklift times.

The bin tub 102 can include metal plates 136 attached to the bottom of the bin tub 102, particularly at the
bottom of the channels 133 and/or 135. The metal plates 136 can be attached to the outer wall 124 by fasteners, e.g., screws and/or bolts, or by welding. The metal plates 136 can confine the forklift lines within the channels 133 and/or 135 during operating the bin tub 102. The metal plates 136 can also strengthen the bottom of the bin tub 102 and/or keep the bottom of the bin tub 102 in shape, e.g., in a flat shape. In some cases, the metal plates 136 are made of stainless steel, e.g., Grade 316 steel.

[0038] FIGS. 3A-3C illustrate various views of the double-walled lid 104 of the slurry truck transport bin 100 of FIGS. 1A-1F. The double-walled lid 104 is configured to cover and seal the double-walled bin tub 102.

[0039] The lid 104 includes a bottom wall 142, a top wall 144, and a side wall 146 for connecting the bottom wall 142 and the top wall 144. The lid 104 defines a sealed inner space 143. The inner space 143 can be a sealed void space that reduces a weight of the lid 104 and increases flexibility of the lid 104.

[0040] The lid 104 can be in the form of a unitarily molded structure, including the bottom wall 142, the top wall 144, and the side wall 146. Similar to fabricating the bin tub 102, the lid 104 can be fabricated by rotational molding using plastic, e.g., high density polyethylene (HDPE).

[0041] The lid 104 can span the opening of the cavity 121, e.g., around the lip 126 of the bin tub 102. In some implementations, the lid 104 defines an underside perimeter channel 145 to receive the lip 126. The channel 145 can be defined by an inner surface 146 of the side wall 146, the bottom wall 142 of the lid 104, and the inner wall surface 142 of the lid 104. The inner wall surface 142 of the lid 104 bounding the perimeter channel 145 can be a complementary taper to the inner wall 122 of the bin tub 102.

[0042] Referring back to FIG. 1E, relative sizes of the lip 126 and the inner wall surface 142 of the lid 104 are such that, when the lid 104 is placed on the bin tub 102 with the lip 126 in the channel 145, the inner wall 124 of the bin tub 102 is positioned to engage the tapered inner wall surface 142 of the lid 104 with the lip 126 spaced from a bottom of the lip channel 145.

[0043] As noted above, the bin tub 102 can be made of molten resin. The bin tub 102 can have such flexibility that cinching the lid 104 to the bin tub 102 with a force sufficient to cause the tapered inner wall surface 142 to slide along an inner tub surface of the inner wall 122 until the bin tub lip 126 contacts the bottom of the lip channel 145 and flexes the bin tub lip 126 outward without cracking, thereby forming a barrier to slurry flow along sets of contacting surfaces between the bin tub 102 and the lid 104. The sets of contacting surfaces can include a first set of contacting surfaces of the tapered inner wall surface 142' and the inner tub surface of the inner wall 122, and a second set of contacting surfaces of the lip 126 and the bottom of the lip channel 145.

[0044] In some implementations, the bin 100, e.g., the lip 104, includes a flexible seal 108 placed in contact with the tapered inner wall surface 142' within the lip channel. When the tapered inner wall surface 142' slides along the inner tub surface of the inner wall 122, the flexible seal 108 can be pressed to increase the sealing between the tapered inner wall surface 142' and the inner tub surface of the inner wall 122.

[0045] The flexible seal 108 can be a rubber bulb seal made of, for example, EPDM, silicone, viton® fluorocelastomer, or vinylite. The rubber bulb seal can be cut to a suitable length with a scissors or a knife. The rubber bulb seal can be placed in the lip channel 145 with staples, tacks, screws, or adhesive. In a particular example, the seal 108 is Style 1 rubber bulb seal from McMaster-Carr, Inc. The seal 108 can have a width of about ½ inch, a height of about ¼ inch, and a bulb diameter of about ¼ inch.

[0046] When the lip 126 contacts the bottom of the lip channel 145, the vertical portion of the outer wall 124 can be in contact with the inner surface 146 of the side wall 146 of the lip 104. The inner surface of the side wall 146 can flex the bin tub lip 126 inward without cracking, thereby forming another barrier to the slurry flow along a third set of contacting surface between the bin tub 102 and the lid 104 to further secure the slurry flow within the bin tub 102.

[0047] In some implementations, a second flexible seal, e.g., a rubber bulb seal, is placed in contact with the inner surface 146' within the channel 145. When the lip 126 contacts the bottom of the lip channel 145, the second flexible seal is pressed to create a tight seal between the vertical portion of the outer wall 124 and the inner surface 146'.

[0048] Referring back to FIGS. 3A-3C, the bottom wall 142 defines one or more recesses 150 extending horizontally along a length of the lid 104, e.g., in X direction. The recesses 150 can provide flexibility for the lid 104. For example, when the tapered inner wall surface 142' slides along the inner tub surface of the inner wall 122 by a force, the inner wall 122 can flex the inner wall surface 142' inward without cracking, which increases the seal against the bin tub 102 and the lid 104. Each recess 150 can have a same depth as the channel 145. The recess 150 is configured to have a wider width on the bottom than the top of the recess 150. Having the recesses 150 in the bottom wall 142 also reduces a weight of the lid 104.

[0049] The top wall 144 of the lid 104 can define a first set of channels 147 along X direction and a second set of channels 149 along Y direction. The first and second sets of channels 147 and 149 are sized to accept forklift lines. The lid 104 can include metal plates 148 placed on top of the channels, particularly spanning on intersections between the channels 147 and 149.

[0050] The metal plates 148 can be secured to the top wall 144 by fasteners, e.g., screws and/or bolts, or by welding. The metal plates 148 can confine the forklift lines within the channels 147 and/or 149 when the lid 104 is placed onto the bin tub 102 or taken away from the bin tub 102. The metal plates 148 also strengthens the top wall 144 and/or keep the top wall 144 in shape, e.g., in a flat shape. The metal plates 148 can be made of stainless steel, e.g., Grade 316 steel. In some examples, the lid 104 includes a ring 152 in a center of the top wall 144. A rope can be tied through the ring 152 for operating lid 104.

[0051] In a particular example, an outer surface of the bin tub 102 has a length of about 96 inch (in X direction), a width of about 66 inch (in Y direction), and a height of about 40 inch (in Z direction). The supporter 130 has a height h, of about 27.5 inch, and a bottom width w, of about 4.4 inch. Each channel 133 or 135 can have a height of about 4.75 inch and a width of about 10 inch at the top. Two adjacent channels 133 or 135 along a direction can have a distance of about 34 inch from center to center. Two adjacent support recesses 132 or 134 along X or Y direction can have a distance of about 24 inch from center to center. The lip 126 has a width of about 2.5 inch from the inner lip edge 125 to the outer lip edge 127.

[0052] The lid 104 has a length of about 98.5 inch (in X direction) and a width of about 68.5 inch (in Y direction). The channel 145 can have a depth h, of between about 3 inch and...
by the scope of the appended claims. There are and will be other examples and modifications within the scope of the following claims.

What is claimed is:

1. A slurry truck transport bin, comprising:
   a double-walled bin tub of molded resin, the tub having:
   an inner wall bounding a cavity for containing unsolidified waste slurry, the bin tub having a lip bounding an opening of the cavity;
   an outer wall defining channels extending across a bottom of the bin tub opposite the cavity opening, the channels sized to accept forklift times; and
   structural ribs connecting the inner and outer walls and arranged to support a floor of the cavity under weight of over a metric ton of unsolidified waste as the bin tub is lifted by forklift; and
   a double-walled lid of molded resin configured to span the cavity opening, the lid defining an underside perimeter channel sized to receive the lip of the bin tub,
   wherein the inner wall of the bin tub at the lip, and an inner wall surface of the lid bounding the perimeter channel, are of complementary tapers, and wherein the relative sizes of the bin tub lip and the inner wall surface of the lid are such that when the lid is placed on the bin tub with the lip in the channel, the inner wall of the bin tub is positioned to engage the tapered inner wall surface of the lid with the lip of the bin lid spaced from a bottom of the lid channel, and
   wherein the bin tub is of such flexibility that cinching the lid to the bin tub with a force sufficient to cause the tapered inner wall surface to slide along an inner tub surface until the bin tub lip contacts the bottom of the lid channel, flexes the bin tub lip outward without cracking, thereby forming a barrier to slurry flow along two sets of contacting surfaces between the bin tub and the lid.

2. The slurry truck transport bin of claim 1, wherein the double-walled bin tub of molded resin includes a sealed void space defined between the inner wall and the outer wall.

3. The slurry truck transport bin of claim 1, wherein the double-walled bin tub of molded resin and the double-walled lid of molded resin are each in the form of a unitarily molded structure.

4. The slurry truck transport bin of claim 3, wherein the bin tub and the lid are each rotationally molded high density polyethylene (HDPE) structures.

5. The slurry truck transport bin of claim 1, wherein the lid includes an upper wall, a bottom wall, and a side wall connecting the upper wall and the bottom wall, and wherein the upper wall, the bottom wall, and the side wall define therebetween a sealed void space.

6. The slurry truck transport bin of claim 5, wherein the upper wall defines uppermost channels sized to accept forklift times, and wherein the lid further comprises one or more metal plates attached to the upper wall and spanning the uppermost channels so as to confine forklift times within the uppermost channels.

7. The slurry truck transport bin of claim 6, wherein the uppermost channels include a first set of channels and a second set of channels intersecting channels of the first set, and wherein the metal plates span intersections between channels of the first and second sets.

8. The slurry truck transport bin of claim 5, wherein the bottom wall defines one or more recesses extending horizontally along a length of the lid.
9. The slurry truck transport bin of claim 1, further comprising a rubber bulb seal positioned in contact with the tapered inner wall surface of the lid within the underside perimeter channel and sized to be compressed and flex outward when the tapered inner wall surface slides along the inner tub surface of the inner wall.

10. The slurry truck transport bin of claim 1, wherein, when the bin tub lip contacts the bottom of the lid channel, an outer surface of the outer wall is in contact with an inner surface of a side wall of the lid, thereby forming a third set of contacting surfaces between the bin tub and the lid to secure the slurry flow within the bin tub.

11. The slurry truck transport bin of claim 1, further comprising a rubber bulb seal positioned in contact with an inner surface of a side wall of the lid within the underside perimeter channel and sized to be in contact with both an outer surface of the outer wall and the inner surface of the side wall when the lid is placed on the bin tub with the lip in the channel.

12. The slurry truck transport bin of claim 1, further comprising one or more metal plates spanning the channels on the bottom of the bin tub and configured to confine forklift tires within the channels.

13. The slurry truck transport bin of claim 1, further comprising one or more releasable ratchet strips surrounding the lid and secured to the outer wall of the bin tub.

14. The slurry truck transport bin of claim 1, wherein the tapered inner wall surface of the lid has a vertical height of between about 3 inches and 5 inches, measured perpendicular to the bottom of the lid channel.

15. The slurry truck transport bin of claim 1, wherein the cavity defines a volume of at least 3.5 cubic yards, and wherein the slurry truck transport bin has an empty weight of less than about 1000 pounds.

* * * * *