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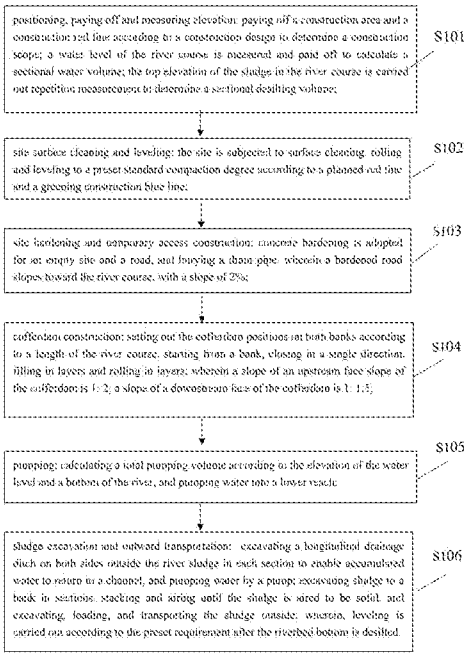
(54) **METHOD OF DRY-TYPE DESILTING FOR RIVER COURSE.**

(57) The present application provides a method of dry type desilting for a river course, the river course needs to be set off partially during construction, which is suitable for the river course desilting with a certain space on both banks and convenient for set off construction; furthermore, the river bank is thoroughly desilted, it is easy to control the desilting depth, coupled with high sludge concentration and low transportation cost, so the engineering cost is relatively low. In the whole process, the river desilting is carried out in sections, the preliminary preparation and later construction are carried out at the same time, the construction process is efficient and fast, which not only ensures the smoothness of the river desilting engineering, but also ensures the minimal impact on the surrounding area.



LU503303

METHOD OF DRY-TYPE DESILTING FOR RIVER COURSE

BACKGROUND

Field of Invention

The present application relates to the technical field of river course desilting treatment, in particular relates to a method of dry-type desilting for a river course.

Background of the Invention

As a carrier of water resources transportation, river course sedimentation is caused by soil migration and sedimentation due to the erosion of water in the long-term transportation process, as well as the deposition of algae and other impurities contained in the water. The continuous accumulation of sludge will not only lead to the rise of the riverbed, resulting in the transport difficulty of water resource, but also influencing the normal performance of each item function such as flood control, drainage, irrigation, water supply, navigation, and the continuous increase of pollutant in the river course, influencing quality of water blacking and becoming smelly. In order to restore the normal functions of the river course and promote the rapid development of the economic society, the sludge deposited on the river bottom needs to be desilted.

Therefore, it is necessary to provide an improved technical solution

for the above-mentioned shortcomings of the prior art.

SUMMARY

The purpose of the present application is to provide a method of dry-type desilting for a river course, in order to solve or alleviate the problems existing in the prior art.

In order to achieve the above purpose, the present application provides the following technical solutions:

the present application provides a method of dry-type desilting for a river course, comprising: step S101, positioning, paying off and measuring elevation: paying off a construction area and a construction red line according to construction design to determine a construction scope; a water level of the river course is measured and paid off to calculate a sectional water volume, the top elevation of the sludge in the river course is carried out repetition measurement to determine a sectional desilting volume; step S102, site surface cleaning and leveling: the site is subjected to surface cleaning, rolling and leveling to a preset standard compaction degree according to a planned red line and a greening construction blue line; step S103,site hardening and temporary access road construction: concrete hardening is adopted for an empty site and a road and burying a drainage pipe; step 104, cofferdam construction:

setting out the cofferdam positions on both banks according to a length of the river course, starting from a bank, closing in a single direction, filling in layers and rolling in layers; step 105, pumping: calculating a total pumping volume according to the elevation of the water level and a bottom of the river, and pumping water into a lower reach; step S106, sludge excavation and outward transportation: excavating a longitudinal drainage ditch on both sides outside the river sludge in each section to enable accumulated water to return to a channel, and pumping water by a pump; excavating sludge to a bank in sections, stacking and airing until the sludge is aired to be solid, and excavating, loading, and transporting the sludge outside;.

Beneficial effects

In the method of dry-type desilting for a river course provided in the present application, before construction, firstly, paying off the construction area and the construction red line according to the construction design to determine the construction scope; the water level of the river course is measured and paid off to calculate the sectional water volume; the top elevation of the sludge in the river course is carried out repetition measurement to determine the sectional desilting volume, so as to realize the preparation work of positioning and paying off and measuring the elevation before construction; during construction, the site is subjected to surface cleaning, rolling and leveling to the preset

standard compaction degree according to the planned red line and the greening construction blue line, concrete hardening is used for the empty site and the road to realize surface cleaning, leveling and hardening of site, so as to prepare for cofferdam construction and desilting; then, setting out the cofferdam positions on both banks according to the length of the river course, starting from a bank, closing in a single direction, filling in layers and rolling in layers to complete the cofferdam construction; furthermore, pumping water for blocking water on the upstream surface of the cofferdam, and pumping water into a downstream river reach so as to desilt the bottom of the river bed; finally, excavating sludge to a bank in sections, stacking and airing until the sludge is aired to be solid, and excavating, loading, and transporting the sludge outside to complete desilting work of the river course. In the whole process, the river desilting is carried out in sections, and the preliminary preparation and later construction are carried out at the same time, the construction process is efficient and fast, which not only ensures the smoothness of the river desilting engineering, but also ensures the minimal impact on the surrounding area.

The method of dry-type desilting for a river course comprises the steps of segmenting the river course and building a cofferdam during construction, the accumulated water in the river bank within the cofferdam is drained by a pump, desilting construction is carried out after

draining, which is generally carried out along both banks of the river course by using a long-arm excavator excavation or manual excavation according to the site conditions of the construction site.

By adopting the dry-type desilting method for a river course, on one hand, the river course needs to be set off partially during construction, which is suitable for the river course desilting with a certain space on both banks and convenient for set off construction; on the other hand, the river bank is thoroughly desilted, it is easy to control the desilting depth, coupled with high sludge concentration and low transportation cost, so the engineering cost is relatively low.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a flow diagram of a method of dry-type desilting for a river course;

Fig. 2 is a schematic diagram of cofferdam section.

DETAILED DESCRIPTION OF THE PREFERRED EMBODYMENTS

Fig. 1 is a flow diagram of a method of dry-type desilting for a river course according to some examples of the present application; as shown in fig. 1, the method of dry-type desilting for a river course comprises the following steps:

step 101, positioning, paying off and measuring elevation: paying off a construction area and a construction red line according to construction design to determine a construction scope; a water level of the river course is measured and paid off to calculate the sectional water volume, the top elevation of the sludge in the river course is carried out repetition measurement to determine the sectional desilting volume;

establishing site network points according to a predetermined coordinates and elevations to ensure accuracy of the elevation and positions. Specifically, establishing a site control network point by using GPS, RTK according to the coordinates and the elevation provided by the construction design, in order to ensure the accuracy of the elevation and positions, furthermore, establishing a horizonal and a vertical control system on site to carry out measurement control during the whole construction period.

Wherein the plane control system is established by adapting a traverse survey method in the plane control system, measuring and paying off is performed by GPS, RTK and a steel tape, a liner control pile is arranged. Hereon, the position of the control pile is stable and reliable, and the control pile is convenient to protect and apply during construction period. In the elevation control system, a measurement instrument adopts GPS and RTK, the elevation will be led to the temporary bench mark according to the bench mark provided by users, the temporary bench

mark must be firm and stable, the distance shall not be more than 200 m, and they are visible from front to the back, and the temporary bench mark and the design bench mark are carried out repetition measurement and closed reduction.

Step S102, site surface cleaning and leveling: the site is subjected to surface cleaning, rolling and leveling to a preset standard compaction degree according to a planned red line and a greening construction blue line; specifically, the preset standard compaction degree is not less than 90%.

In an example of the present application, according to the planned red line and the greening construction blue line, in order not to affect later- stage greening construction, the site is cleared to the red line as the temporary construction access road and enclosure installation site; for the section without slop protection structure and with shrubs and construction wastes, the surface is directly excavated and cleaned through excavation equipment(for example: an excavator), the green plants are transplanted or felled to improve the construction efficiency. The surface cleaning waste shall be piled up at the dumping site, and then transported to the soil bank by a muck truck. The stone masonry of the destroyed slope protection structure and construction garbage are piled up for the construction of access roads.

Step S103, site hardening and temporary access road construction:

concrete hardening is adopted for an empty site and a road, and burying a drainage pipe, wherein a hardened road slopes toward the river course, with a slope of 2%; specifically, an empty site and a road are hardened with concrete C15, a thickness of the road is 25 cm, and a PC drainage pipe with a diameter of 150 mm is buried every 20 m.

A construction access road is built and hardened 1 m outside a greenbelt of the river course, wherein the hardened road is 4.5 m wide and 240 m long, part of the hardened access is selected as a safety experience area, and a drainage ditch is arranged outside the safety experience area to connect with the river course.

Step S104, cofferdam construction: setting out the cofferdam positions on both banks according to a length of the river course, starting from a bank, closing in a single direction, filling in layers and rolling in layers; wherein a slope of an upstream face slope of the cofferdam is 1: 2; a slope of a downstream face slope of the cofferdam is 1: 1.5;

fig. 2 is a schematic diagram of cofferdam section provided in the present application; as shown in fig. 2, a filling material of the cofferdam is cohesive soil, a top width of the cofferdam is 3 m, and a top surface of the cofferdam is 50 cm higher than the water surface of the river course. The slop of the front surface of the cofferdam is less than that of the downstream of the cofferdam, so that the water blocking effect of the cofferdam can be better realized. In the process of cofferdam filling, the

water outlet surface follows the principles of layered filling and layered rolling, and the compaction degree is not less than 90%. Therefore, the effect of the cofferdam construction is fully ensured and the safety of the cofferdam construction is improved.

Step S105, pumping: calculating a total pumping volume according to the elevation of the water level and a bottom of the river, and pumping water into a lower reach; specifically, determining the number and model of the water pump according to the calculated water pumping volume.

The water surface and river bottom elevation are measured for each section, and the total pumping volume is calculated. Because each section elevation is different, the calculation is carried out by combining the vertical section, the cross-section and the plane diagram. Selecting the number and the model of the pump (for example: 150m^3/h, 1500w) according to the volume of the river, and carrying out temporary power distribution of generator according to the selected model of the pump.

Due to the small power consumption of on-site construction, short period of large amount of power consumption (large power consumption for pumping) and the long construction line, so temporary generator is used for power supply. Moreover, due to less water consumption in the early stage of the site, and the water consumption is mostly for the restoration and greening of the bank of the river course in the later stage, so municipal water does not need to be introduced into the desilting

section of the river course.

Step S106, sludge excavation and outward transportation: excavating a longitudinal drainage ditch on both sides outside the river sludge in each section to enable accumulated water to return to a channel, and pumping water by a pump; excavating sludge to a bank in sections, stacking and airing until the sludge is aired to be solid, and excavating, loading, and transporting the sludge outside; wherein, leveling is carried out according to the preset requirement after the riverbed bottom is desilted.

The width and the depth of the drainage ditch excavated on both sides outside the river sludge in each section are 1 m and 0.5 m, which is convenient for the accumulated water in the river course to return to the groove, and all accumulated water is pumped by a pump.

Sectional excavation is adopted when the sludge is excavated, an upper channel and a lower channel of excavation equipment are built along the bank of the river course, the slop of the channels is not more than 1:3, a steel plate bottom is adopted for mechanical construction on the sludge to prevent the excavation machinery from sinking into the sludge, and a road is paved in advance when the excavation machinery advances by one section. And leveling the river bed bottom according to requirements after desilting is finished.

The sludge is excavated to the river bank for stacking and airing, and

the stacking height of sludge on the bank is not more than 1.5 m, so that the sludge is prevented from flowing into the river course again. And when the sludge is aired to be solid, excavating, loading and transporting the sludge outside. During the transportation, measures are taken to prevent the phenomena such as dripping, scattering, and leakage; the carrier runs according to a designated route in the process of internal and external transportation.

The river course is coffered and the construction is carried out in sections, the accumulated water in the river course in the cofferdam section is completely drained, then the sludge at the bottom of the river course is removed by an excavator, the sludge is temporarily stacked to the bank, and the muck truck is used for external transportation to a spoil ground after being aired for 5-7 days. During the whole process, the river course desilting is carried out in sections, and the preliminary preparation and later construction are carried out at the same time, and the construction progress is efficient and fast.

Before construction, firstly, paying off the construction area and the construction red line according to the construction design to determine the construction scope; the water level of the river course is measured and paid off to calculate the sectional water volume; the top elevation of the sludge in the river course is carried out repletion measurement to determine the sectional desilting volume, so as to realize the preparation

work of positioning and paying off and measuring the elevation before construction; the site is subjected to surface cleaning, rolling and leveling to a preset standard compaction degree, concrete hardening is adopted for the empty site and the road to realize surface cleaning, leveling and hardening of site, so as to prepare for cofferdam construction and desilting; then, setting out the cofferdam positions on both banks according to the length of the river course, starting from a bank, closing in a single direction, filling in layers and rolling in layers to complete the cofferdam construction; furthermore, pumping water for blocking water on the front surface of the cofferdam, and pumping water into the lower reach so as to desilt the bottom of the river bed; finally, excavating sludge to a bank in sections, stacking and airing until the sludge is aired to be solid, and excavating, loading, and transporting the sludge outside to complete desilting work of the river course. In the whole process, the river desilting is carried out in sections, and the preliminary preparation and later construction are carried out at the same time, the construction process is efficient and fast, which not only ensures the smoothness of the river desilting engineering, but also ensures the minimal impact on the surrounding area.

The method of dry type desilting for a river course comprises the steps of segmenting the river course and building a cofferdam during construction, the accumulated water in the river bank within the

cofferdam is drained by a pump, desilting construction is carried out after draining, wherein desilting is often carried out along both banks of the river course by using a long-arm excavator excavation or manual excavation according to the site conditions of the construction site.

By adopting the dry-type dredging method for a river course, on one hand, the river course needs to be set off partially during construction, which is suitable for the river course desilting with a certain space on both banks and convenient for set off construction; on the other hand, the river bank is thoroughly desilted, it is easy to control the desilting depth, coupled with high sludge concentration and low transportation cost, so the engineering cost is relatively low.

CLAIMS

1. A method of dry type desilting for a river course, characterized by comprising:

step S101, positioning, paying off and measuring elevation: paying off a construction area and a construction red line according to construction design to determine a construction scope; a water level of the river course is measured and paid off to calculate a sectional water volume; the top elevation of the sludge in the river course is carried out repetition measurement to determine a sectional desilting volume;

step S102, site surface cleaning and leveling: the site is subjected to surface cleaning, rolling and leveling to a preset standard compaction degree according to a planned red line and a greening construction blue line;

step S103, site hardening and temporary access road construction: concrete hardening is adopted for an empty site and a road, and burying a drainage pipe, wherein a hardened road slopes toward the river course, with a slope of 2%;

step 104, cofferdam construction: setting out the cofferdam positions on both banks according to a length of the river course, starting from a bank, closing in a single direction, filling in layers and rolling in layers; wherein a slope of a front upstream slope of the cofferdam is 1: 2; a slope of a downstream surface slope of the cofferdam is 1: 1.5;

step 105, pumping: calculating a total pumping volume according to the elevation of the water level and a bottom of the river, and pumping water into a lower reach;

step S106, sludge excavation and outward transportation: excavating a longitudinal drainage ditch on both sides outside the river sludge in each section to enable accumulated water to return to a channel, and pumping water by a pump; excavating sludge to a bank in sections, stacking and airing until the sludge is aired to be solid, and excavating, loading, and transporting the sludge outside; wherein leveling is carried out according to the preset requirement after the riverbed bottom is desilted.

2. The method of dry type desilting for a river course according to claim 1, characterized in that in step S101, establishing site points according to a predetermined coordinates and elevations to ensure accuracy of the elevation and positions.

3. The method of dry type desilting for a river course according to claim 1, characterized in that in step S101, a plane control system is established by adopting a traverse survey method, measuring and paying off is performed by GPS, RTK and a steel tape.

4. The method of dry type desilting for a river course according to claim 1, characterized in that in step S102, the preset standard compaction degree is not less than 90%.

5. The method of dry type desilting for a river course according to claim 1, characterized in that in step S103, an empty site and a road are hardened with concrete C15, a thickness of the road is 25 cm, and a PC drainage pipe with a diameter of 150 mm is buried every 30 m.

6.The method of dry type desilting for a river course according to claim 1, characterized in that in step S104, a filling material of the cofferdam is cohesive soil, a top width of the cofferdam is 3 m, and a top surface of the cofferdam is 50 cm higher than the water surface of the river course.

7. The method of dry type desilting for a river course according to claim 1, characterized in that in step S105, determining the number and model of the water pump according to the calculated water pumping volume.

8. The method of dry type desilting for a river course according to claim 1, characterized in that in step S106, a width of the drainage ditch is

1 m and a depth is 0.5 m.

9. The method of dry type desilting for a river course according to claim 1, characterized in that in step S106, an excavation equipment channel with a slop not more than 1:3 is built along the bank of the river course before excavating the sludge in sections, and a steel plate is used for protecting the bottom.

10. The method of dry type desilting for a river course according to any one of claims 1-9, characterized in that in step S106, a stacking height of sludge on the bank is not more than 1.5 m.

Ansprüche

1. Trockenbaggerverfahren für Fluss, das umfasst:

Schritt S101: Positionieren, Abstecken und Messen der Höhe: Abstecken des Baubereichs und der roten Baulinie gemäß dem Bauplan und Bestimmen des Bauumfangs; Messen und Abstecken der Wasseroberflächenhöhe des Flusses und Berechnen des Wasservolumens abschnittsweise, Wiederholen der Messerung der Höhe der Schlickoberseite im Fluss, und Bestimmen der abschnittsweisen Baggermenge;

Schritt S102: Räumen und Einebnen des Geländes: Räumen und Einebnen des Geländes gemäß der roten Planungslinie und der blauen Linie für den Begrünungsbau bis auf einen voreingestellten Standardverdichtungsgrad;

Schritt S103: Härten des Geländes und Bauen einer temporären Zugangsstraße: Härten von leerem Gelände und Straße mit Beton, Vergraben von Entwässerungsrohr und Härten von Flussufer der Sträße mit einer Neigung 2 %;

Schritt S104: Bauen des Kofferdamms: Abstecken der Position des Kofferdamms an beiden Ufern entsprechend der Länge des Flusses, Beginnen von Ufern, Schließen in einer Richtung, Füllen in Schichten und Walzen in Schichten, wobei die Neigung des dem Wasser zugewandten Fläche des Kofferdamms 1 : 2 und die Neigung der dem Wasser abgewandten Fläche des Kofferdamms 1 : 1,5 beträgt;

Schritt S105: Pumpen von Wasser: Berechnen des Gesamtpumpvolumens gemäß der Wasseroberfläche und der Höhe des Flussbodens und Pumpen des Wassers in die stromabwärtigen Abschnitte; und

Schritt S106: Schlickaushub und Abtransport: Ausheben eines Längsentwässerungsgrabens an den beiden Seiten des Schlicks in jedem

Flussabschnitt, Führen des angesammelten Wassers in den Tank und Pumpen des Wassers; Stapeln und Trocknen des ausgehobenen Schlicks, Abtransport des getrockneten Schlicks; Einebenen des Flussbodens nach der Entfernung des Schlicks gemäß den vorgegebenen Anforderungen.

2. Trockenbaggerverfahren für Fluss nach Anspruch 1, dadurch gekennzeichnet, dass in Schritt S101 ein Netzpunkt vor Ort gemäß vorbestimmten Koordinaten und Höhen festgelegt wird, um eine genaue Höhe und Position sicherzustellen.

3. Trockenbaggerverfahren für Fluss nach Anspruch 1, dadurch gekennzeichnet, dass in Schritt S101 ein Quermessverfahren verwendet wird, um ein Ebenensteuerungssystem einzurichten, und GPS, RTK und ein Stahllineal verwendet werden, um das Messen und Abstecken durchzuführen.

4. Trockenbaggerverfahren für Fluss nach Anspruch 1, dadurch gekennzeichnet, dass in Schritt S102 der voreingestellte Standardverdichtungsgrad nicht niedriger als 90 % beträgt.

5. Trockenbaggerverfahren für Fluss nach Anspruch 1, dadurch gekennzeichnet, dass in Schritt S103 C15-Beton verwendet wird, um das leere Gelände und die Straße zu härten, wobei die Straßendicke 25 Zentimeter beträgt, und alle 30 Meter ein PC-Entwässerungsrohr mit 150 Millimeter eingegraben wird.

6. Trockenbaggerverfahren für Fluss nach Anspruch 1, dadurch gekennzeichnet, dass in Schritt S104 das Kofferdamm-Füllmaterial bindiges Erdreich ist, wobei die Breite der Oberseite des Kofferdamms 3 Meter beträgt und die Oberseite des Kofferdamms 50 Zentimeter höher ist als die Wasseroberfläche des Flusses.

7. Trockenbaggerverfahren für Fluss nach Anspruch 1, dadurch gekennzeichnet, dass in Schritt S105 die Menge und der Typ der Wasserpumpe gemäß dem berechneten Pumpvolumen bestimmt werden.

8. Trockenbaggerverfahren für Fluss nach Anspruch 1, dadurch gekennzeichnet, dass in Schritt S106 die Breite des Entwässerungsgrabens 1 Meter und die Tiefe 0,5 Meter beträgt.

9. Trockenbaggerverfahren für Fluss nach einem der Ansprüche 1 bis 8, dadurch gekennzeichnet, dass in Schritt S106 vor dem abschnittsweisen Ausheben des Schlicks entlang des Flussufers ein Kanal mit einer Neigung von höchstens 1 : 3 errichtet wird und der Boden mit Stahlblechen geschützt wird.

10. Trockenbaggerverfahren für Fluss nach einem der Ansprüche 1 bis 9, dadurch gekennzeichnet, dass in Schritt S106 die Stapelhöhe von Schlick auf dem Flussufer nicht größer als 1,5 Meter ist.

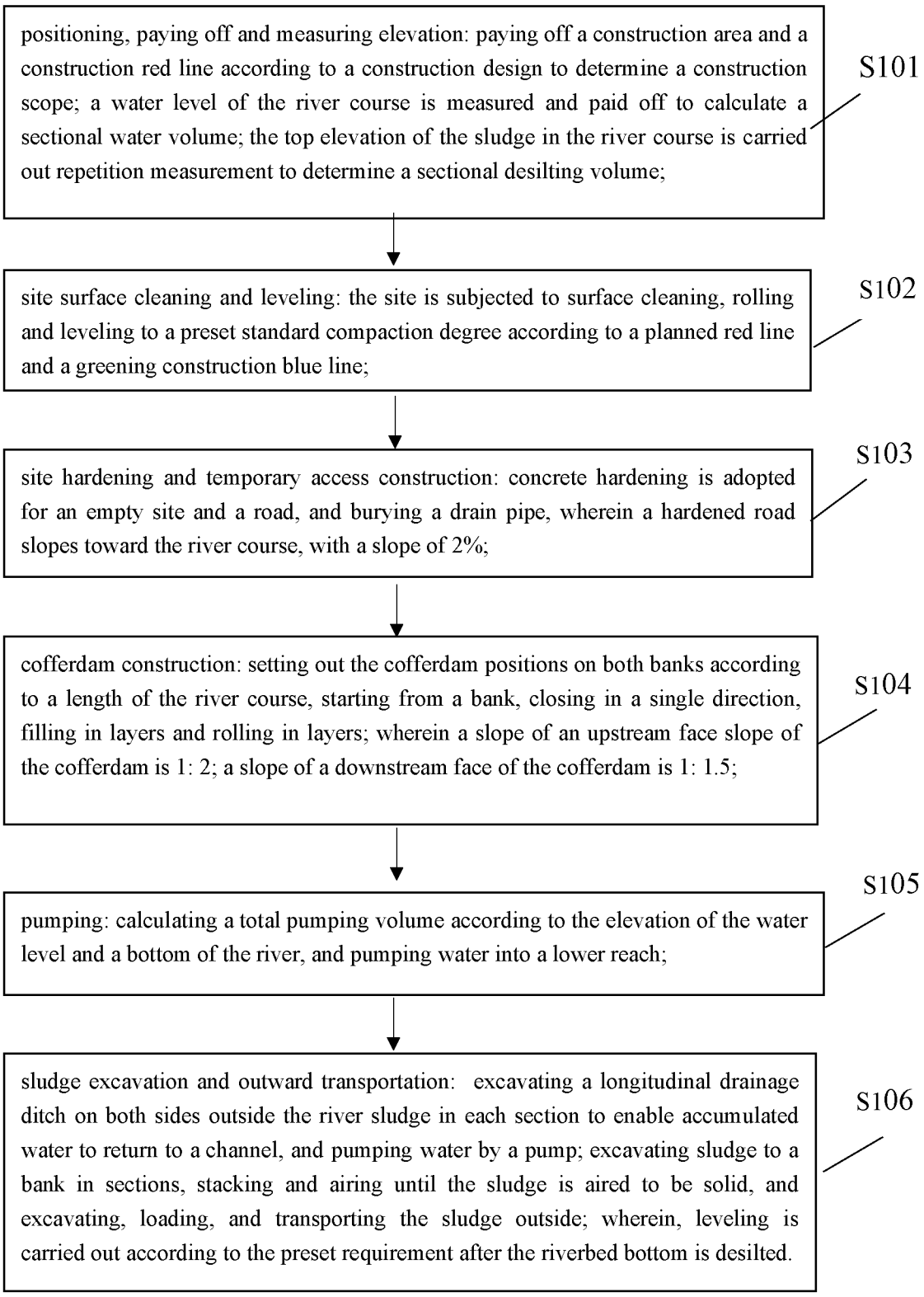

positioning, paying off and measuring elevation: paying off a construction area and a construction red line according to a construction design to determine a construction scope; a water level of the river course is measured and paid off to calculate a sectional water volume; the top elevation of the sludge in the river course is carried out repetition measurement to determine a sectional desilting volume;
S101
site surface cleaning and leveling: the site is subjected to surface cleaning, rolling and leveling to a preset standard compaction degree according to a planned red line and a greening construction blue line;
S102
site hardening and temporary access construction: concrete hardening is adopted for an empty site and a road, and burying a drain pipe, wherein a hardened road slopes toward the river course, with a slope of 2%;
S103
cofferdam construction: setting out the cofferdam positions on both banks according to a length of the river course, starting from a bank, closing in a single direction, filling in layers and rolling in layers; wherein a slope of an upstream face slope of the cofferdam is 1: 2; a slope of a downstream face of the cofferdam is 1: 1.5;
S104
pumping: calculating a total pumping volume according to the elevation of the water level and a bottom of the river, and pumping water into a lower reach;
S105
sludge excavation and outward transportation: excavating a longitudinal drainage ditch on both sides outside the river sludge in each section to enable accumulated water to return to a channel, and pumping water by a pump; excavating sludge to a bank in sections, stacking and airing until the sludge is aired to be solid, and excavating, loading, and transporting the sludge outside; wherein, leveling is carried out according to the preset requirement after the riverbed bottom is desilted.
S106

Fig. 1

Downstream face Upstream face

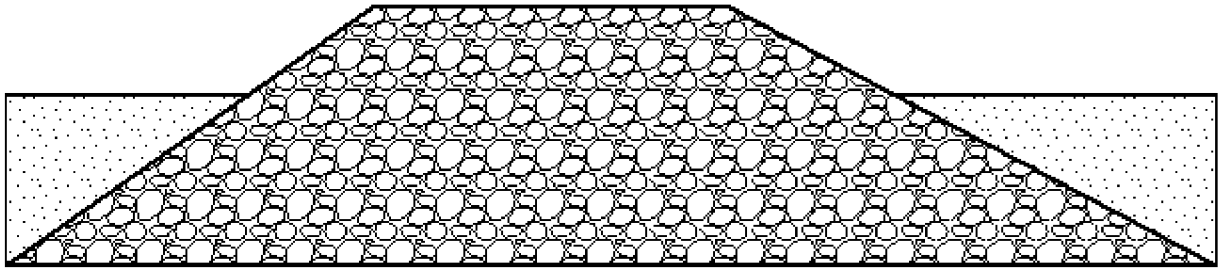


Fig. 2

专 利 合 作 条 约

PCT

国际检索报告

(PCT 第 18 条和细则 43 和 44)

申请人或代理人的档案号 M8ZZWR210804	**关于后续行为**	见 PCT/ISA/220 表和 适用时，见下面第 5 项
国际申请号 PCT/CN2021/104828	国际申请日 *(日/月/年)* 06.7 月 2021(06.07.2021)	(最早的)优先权日 *(日/月/年)* 18.6 月 2021(18.06.2021)
申请人 中铁四局集团有限公司		

按照条约第 18 条，本国际检索报告由本国际检索单位做出并送交申请人。报告副本送交国际局。

本国际检索报告总计 5 页。

☐ 它还附有本报告所引用的各现有技术文件的副本。

1. **报告的基础**

a.关于语言，进行国际检索基于：

☒ 国际申请提交时使用的语言。

☐ 该国际申请的_____语言译文，为了国际检索的目的提供该种语言的译文(细则 12.3(a)和 23.1(b))。

b.☐ 本国际检索报告考虑了本单位许可或被通知的根据细则91所做出的明显错误更正。(细则43.6之二(a))。

c.☐ 关于国际申请中公开的任何核苷酸和/或氨基酸序列(见第 I 栏)。

2. ☐ 某些权利要求被认为是不能检索的(见第 II 栏)。

3. ☐ 缺乏发明的单一性(见第 III 栏)。

4. 关于**发明名称，**

☒ 同意申请人提出的发明名称。

☐ 发明名称由本单位确定如下：

5. 关于**摘要，**

☐ 同意申请人提出的摘要。

☒ 根据细则 38.2(b)，摘要由本单位制定，如第 IV 栏中所示。自本国际检索报告发文日起一个月内，申请人可以向本单位提出意见。

6. 关于附图，

a.随摘要一起公布的**附图**是：图 1

☒ 按照申请人建议的。

☐ 由本单位选择的，因为申请人没有建议一幅图。

☐ 由本单位选择的，因为该图能更好地表示发明的特征。

b. ☐ 没有与摘要一起公布的附图。

国际检索报告

第 IV 栏 摘要正文(续第 1 页第 5 项)

一种河道干式清淤方法，在施工过程中，需要对河道进行局部断流，适合两岸具有一定空间且便于断流施工的河道清淤；再者河道清淤彻底，易于控制清淤深度，污泥浓度高，运输成本低，因而工程成本相对较低。整个过程，河道清淤分段进行，前期准备与后期施工同时进行，施工过程高效快速，既保证了河道清淤工程的顺畅，又保证了对周边的影响降至最小。

国际检索报告

A. 主题的分类

E02F 5/28(2006.01)i；E02D 19/04(2006.01)i；C02F 11/00(2006.01)i

按照国际专利分类（IPC）或者同时按照国家分类和 IPC 两种分类

B. 检索领域

检索的最低限度文献(标明分类系统和分类号)

IPC：E02F E02D C02F

包含在检索领域中的除最低限度文献以外的检索文献

在国际检索时查阅的电子数据库(数据库的名称，和使用的检索词（如使用）)

CNABS, CNTXT, VEN, WPABSC, ENTXT, ENTXTC, DWPI, PATENTICS：中铁四局，朱成武，周江，付立宏，王婧馨，李备，刘千孺，陈守伟，赵德岁，许磊，干挖，干式，排干，清淤，定位，放线，高程，标高，分段，清表，碾压，平整，压实，硬化，便道，埋设，埋管，围堰，合拢，填筑，抽水，开挖，挖，外运，晾晒， dug, dry, drain, declog, payoff, elevat+, section, roller compact+, level+, harden+, weir, close, fill, air+

C. 相关文件

类　型*	引用文件，必要时，指明相关段落	相关的权利要求
X	CN 109056761A (上海宝冶集团有限公司) 21.12 月 2018(21.12.2018) 实施例 2	1-10
A	CN 103422466A (张家港市绿岩生态技术有限公司) 04.12 月 2013(04.12.2013) 具体实施方式	1-10
A	CN 108611932A (中铁第六勘察设计院集团有限公司) 02.10 月 2018(02.10.2018) 具体实施方式	1-10
A	CN 106380042A (浙江水利水电学院) 08.2 月 2017(08.02.2017) 具体实施方式	1-10
A	WO 2017159692A1 (KONDO， Tadayosi 等) 21.9 月 2017(21.09.2017) 具体实施方式	1-10
A	CN 110804993A (深圳市东深工程有限公司) 18.2 月 2020(18.02.2020) 具体实施方式	1-10
A	CN 111908748A (中建水务环保有限公司) 10.11 月 2020(10.11.2020) 具体实施方式	1-10
A	WO 2005005736A2 (SAIPEM S.P.A.) 20.1 月 2005(20.01.2005) 具体实施方式	1-10
A	CN 111997157A (深圳市利源水务设计咨询有限公司) 27.11 月 2020(27.11.2020) 具体实施方式	1-10

国际申请号
PCT/CN2021/104828

国际检索报告

☐其余文件在 C 栏的续页中列出。　　☒见同族专利附件。

* 引用文件的具体类型：

"A" 认为不特别相关的表示了现有技术一般状态的文件

"E" 在国际申请日的当天或之后公布的在先申请或专利

"L" 可能对优先权要求构成怀疑的文件，或为确定另一篇引用文件的公布日而引用的或者因其他特殊理由而引用的文件（如具体说明的）

"O" 涉及口头公开、使用、展览或其他方式公开的文件

"P" 公布日先于国际申请日但迟于所要求的优先权日的文件

"T" 在申请日或优先权日之后公布，与申请不相抵触，但为了理解发明之理论或原理的在后文件

"X" 特别相关的文件，单独考虑该文件，认定要求保护的发明不是新颖的或不具有创造性

"Y" 特别相关的文件，当该文件与另一篇或者多篇该类文件结合并且这种结合对于本领域技术人员为显而易见时，要求保护的发明不具有创造性

"&" 同族专利的文件

国际检索实际完成的日期	国际检索报告邮寄日期
25. 2 月 2022(25. 02. 2022)	16. 3 月 2022(16. 03. 2022)
ISA/CN 的名称和邮寄地址： 中国国家知识产权局(ISA/CN) 北京市海淀区蓟门桥西土城路 6 号 100088 传真号：(86-10)62019451	受权官员： 温媚 电话号码： 86-(10)-53962785

国际检索报告

检索报告中引用的专利文件	公布日期	同族专利	公布日期
CN109056761A	21.12.2018	无	
CN103422466A	04.12.2013	CN103422466B	03.02.2016
CN108611932A	02.10.2018	无	
CN106380042A	08.02.2017	无	
WO2017159692A1	21.09.2017	JPWO2017159692A1	13.09.2018
		JP6582361B2	02.10.2019
CN110804993A	18.02.2020	无	
CN111908748A	10.11.2020	无	
WO2005005736A2	20.01.2005	EP1641983A2	05.04.2006
		EP1641983B1	19.05.2021
		GB0413601D0	21.07.2004
		EA200600185A1	30.06.2006
		EA007692B1	29.12.2006
CN111997157A	27.11.2020	无	

TRANSLATION

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2021/104828

LU503303

A. CLASSIFICATION OF SUBJECT MATTER

E02F 5/28(2006.01)i; E02D 19/04(2006.01)i; C02F 11/00(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

E02F; E02D; C02F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNABS, CNTXT, VEN, WPABSC, ENTXT, ENTXTC, DWPI, PATENTICS: 中铁四局, 朱成武, 周江, 付立宏, 王婧馨, 李备, 刘千孺, 陈守伟, 赵德安, 许磊, 干挖, 干式, 排干, 清淤, 定位, 放线, 高程, 标高, 分段, 清表, 碾压, 平整, 压实, 硬化, 便道, 埋设, 埋管, 围堰, 合拢, 填筑, 抽水, 开挖, 挖, 外运, 晾晒, dug, dry, drain, declog, payoff, elevat+, section, roller compact+, level+, harden+, weir, close, fill, air+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 109056761 A (SHANGHAI BAOYE GROUP CORP., LTD.) 21 December 2018 (2018-12-21) embodiment 2	1-10
A	CN 103422466 A (ZHANGJIAGANG LVYAN ECOLOGY TECHNOLOGY CO., LTD.) 04 December 2013 (2013-12-04) specific embodiments	1-10
A	CN 108611932 A (CHINA RAILWAY LIUYUAN GROUP CO., LTD.) 02 October 2018 (2018-10-02) specific embodiments	1-10
A	CN 106380042 A (ZHEJIANG UNIVERSITY OF WATER RESOURCES AND ELECTRIC POWER) 08 February 2017 (2017-02-08) specific embodiments	1-10
A	WO 2017159692 A1 (KONDO, Tadayosi et al.) 21 September 2017 (2017-09-21) specific embodiments	1-10

☑ Further documents are listed in the continuation of Box C. ☑ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
25 February 2022	**16 March 2022**
Name and mailing address of the ISA/CN **China National Intellectual Property Administration (ISA/CN)** **No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088, China** Facsimile No. **(86-10)62019451**	Authorized officer Telephone No.

TRANSLATION

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2021/104828

LU503303

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 110804993 A (SHENZHEN DONGSHEN ENGINEERING CO., LTD.) 18 February 2020 (2020-02-18) specific embodiments	1-10
A	CN 111908748 A (CHINA CONSTRUCTION WATER AND ENVIRONMENT CO., LTD.) 10 November 2020 (2020-11-10) specific embodiments	1-10
A	WO 2005005736 A2 (SAIPEM S.P.A.) 20 January 2005 (2005-01-20) specific embodiments	1-10
A	CN 111997157 A (SHENZHEN LIYUAN WATER DESIGN & CONSULTATION CO., LTD.) 27 November 2020 (2020-11-27) specific embodiments	1-10

TRANSLATION

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2021/104828

LU503303

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
CN	109056761	A	21 December 2018	None			
CN	103422466	A	04 December 2013	CN	103422466	B	03 February 2016
CN	108611932	A	02 October 2018	None			
CN	106380042	A	08 February 2017	None			
WO	2017159692	A1	21 September 2017	JP	WO2017159692	A1	13 September 2018
				JP	6582361	B2	02 October 2019
CN	110804993	A	18 February 2020	None			
CN	111908748	A	10 November 2020	None			
WO	2005005736	A2	20 January 2005	EP	1641983	A2	05 April 2006
				EP	1641983	B1	19 May 2021
				GB	0413601	D0	21 July 2004
				EA	200600185	A1	30 June 2006
				EA	007692	B1	29 December 2006
CN	111997157	A	27 November 2020	None			