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Mechanical Industry Standards of the People's Republic of China

JB/T XXXXX—XXXX

Multi-disc Screw Press Sludge Dewatering Machine

叠螺式污泥脱水机

(English Translation)

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Contents

Foreword

CMIF/TC 7 is in charge of this English translation. In case of any doubt about the contents of this English translation, the Chinese original shall be considered authoritative.

This standard is drafted according to the rules dictated in GB / T 1.1-2020.

This standard was proposed by China Machinery Industry Federation.

This standard was prepared by CMIF/TC7 on the Machinery Industry Environmental Protection Machinery Standardization Technical Committee.

This standard was issued as the first edition.

Multi-Disc Screw press sludge dewatering machine

1 Scope

This standard specifies the terms and definitions, types and naming, technical requirements, testing methods, inspection rules, marking, packaging, transportation and storage of multi-disc screw press sludge dewatering machine (hereafter referred to as dewatering machine).

This standard is applicable to dewatering machine for sludge dewatering in sewage treatment process.

2 Normative References

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

GB/T 191 *Packaging-pictorial marking for handling of Goods*

GB/T 879.4 *Spring-type straight pins-Coiled，Standard duty*

GB/T 893.1 *Cirlclips for holes-Type A*

GB/T894.1 *Cirlclips for shaft-Type A*

GB/T 1096 *Square and rectangular keys*

GB/T 1184 *Geometrical tolerancing-geometrical tolerance for features without individual tolerance indications*

GB/T 2100 *Corrosion-resistant steel castings for general applications*

GB/T 3098.6 *Mechanical properties of fasteners-Stainless steel Bolts, screws and studs*

GB/T 3098.15 *Mechanical properties of fasteners-Stainless steel nuts*

GB/T 3280 *Cold rolled stainless steel plate, sheet and strip*

GB/T 4237 *Hot rolled stainless steel plate, sheet and strips*

GB/T 4942.1 *Degrees of protection provided by the integral design of rotating electrical machines (IP code) - Classification*

GB/T 5226.1 *Electrical safety of machinery —Electrical equipment of machines —Part 1:General requirements*

GB/T 6060.2 *Roughness comparison specimens —Ground, turned, bored, milled, shaped and planed*

GB/T 6388 *Transport package shipping mark*

GB/T 8196 *Safety of machinery —Guards —General requirements for the design and construction of fixed and movable guards*

GB/T 9969 *General principles for preparation of instructions for use of industrial products*

GB/T 10002.1 *Unplasticized poly(vinyl chloride) (PVC-U) pipe for water supply*

GB/T 10002.2 *Unplasticized polyvinyl chloride (PVC-U) pipe fittings for water supply*

GB/T 10002.3 *Unplasticized polyvinyl chloride (PVC-U) pipes for buried drainage and sewerage systems*

GB/T 10894 *Determination method of noise emitted by separating machine*

GB/T 13306 *Plates*

GB/T 13384 *General specifications for packing of mechanical and electrical product*

GB/T 14976 *Seamless stainless steel pipes for fluid transport*

GB/T 16938 *Fasteners—General requirements for bolts, screws, studs and nuts*

GB/T 20878 Stainless and heat-resisting steels-Designation and chemical composition

GB/T 21707 *Insulation specification for variable frequency adjustable speed definite purpose converter-fed three-phase induction motors*

JB/T 5943 *Construction machinery-General specifications for welding parts*

JB/T 7118 *Specification for YVF2 series (IP52) variable frequency adjustable speed definite purpose converter-fed three-phase induction motors (Frame size 80~355)*

JB/T 7217 *The painting specification for separating machines*

JB/T 9218 *Non-destructive testing-Test method for penetrant testing*

CJ/T 221 *Determination method of municipal sludge in wastewater treatment plant*

3 Terms and Definitions

For the purposes of this document, the following terms and definitions apply.

3.1

Multi-Disc screw press sludge dewatering machine

A sludge dewatering machine, which is a general name of multi-screw pressure dewatering machine.

Note: It is composed of main engine, sludge supply system, flocculation and mixing system, control system, etc. The dewatering main engine consists of several discs and screw extrusion shaft. Stacking screw means discover lapping and driving by screw extrusion shaft.

3.2

Extrusion shaft

The component for concentrating, dewatering and transferring sludge.

3.3

Fixed plate

Immovable disc.

3.4

Movable plate

A disc is moving with the extrusion shaft.

3.5

Input part

The component for receiving sludge.

3.6

Output part

The component for discharge sludge.

3.7

Extrusion plate

The component for pressing dewatered sludge.

3.8

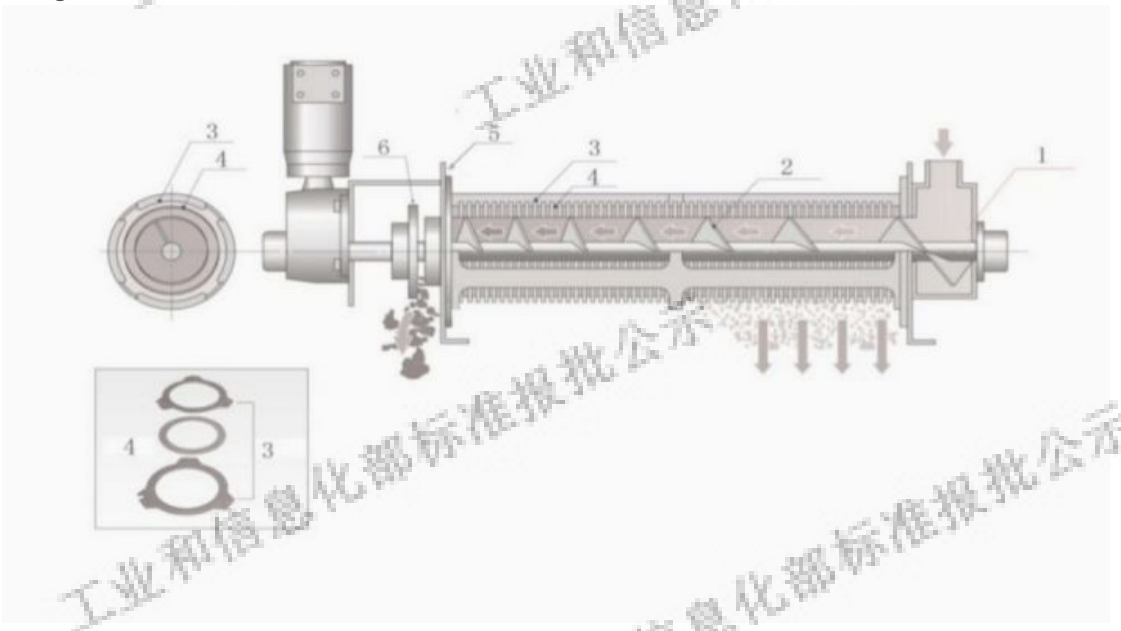
Main engine

The main device for receiving sludge and completing sludge dewatering, consisting of screw extrusion shaft, fixing plate, movable plate, input part, discharge part, extrusion plate, speed reducer, etc.

4 Types and Naming

4.1 Basic structural type of dewatering machine

The dewatering machine is divided into horizontal type and tilting type according to the installation modes of main engine. The schematic diagram of the main engine structure is shown in Fig. 1.



Key:

1--- input part； 2--- extrusion shaft； 3--- fixed plate；

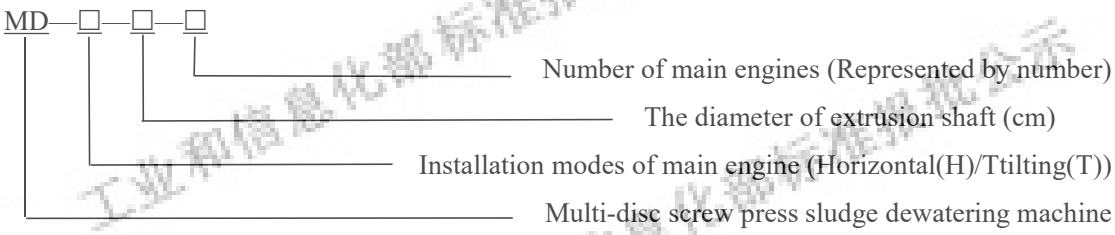
4--- movable plate； 5--- extrusion plate； 6--- output part.

Fig. 1. the structural diagram of the main engine structure

4.2 Naming

4.2.1 Identification

The types of dewatering machine is composing of the English first letters and Arabic numbers, which is identified according to the following rules.



4.2.2 Specifications

The specifications of dewatering machine are selected by the diameter of extrusion shaft, the number of main machines and the absolute dry sludge treatment capacity of a single main engine in unit time, as shown in Table 1.

Table 1. The specifications of the dewatering machine

Specifications	The diameters of extrusion shaft（mm）	The absolute dry sludge treatment capacity of a single main engine in unit time（kg/h）	Remarks
MD-H(T)-10-N	75-125	≥3.0	The treatment capacity of main machines is calculated as follows: the number of main machines×the treatment capacity of a single main engine
MD-H(T)-15-N	126-175	≥4.5	
MD-H(T)-20-N	176-225	≥9.0	
MD-H(T)-25-N	226-275	≥13.5	
MD-H(T)-30-N	276-325	≥27.0	
MD-H(T)-35-N	326-375	≥40.0	
MD-H(T)-40-N	376-425	≥80.0	

5 Technical Requirements

5.1 Basic Requirements

5.1.1 The design and manufacture of the dewatering machine shall comply with the provisions of this standard. The dewatering machines shall be manufactured according to the drawings and technical documents approved by the specified procedures. When the user has special requirements, it can be manufactured according to the agreement signed by both parties.

5.1.2 The selected materials and purchased parts shall comply with the requirements given in GB/T 879.4, GB/T 893.1, GB/T 894.1, GB/T 1096, GB/T 2100, GB/T 3280, GB/T 4237, GB/T 893.1, GB/T 894.1, GB/T 10002.1, GB/T 10002.2, GB/T 10002.3, GB/T 14976 and GB/T 20878. It also shall be provided the qualification certificate of the supplier. If not, it shall not be used without a qualifying check.

5.1.3 The performance grades of the used stainless steel fasteners shall not be lower than A2-70,

and as specified in GB/T 3098.6, GB/T 3098.15 and GB/T 16938.

5.1.4 The motor of the used speed reducer shall be the variable frequency motor, which shall be as specified in JB/T 7118. The motor with protection grade of "IP54" or above shall comply with the provisions given in GB/T 4942.1. The motor with insulation grade of "E" or above shall comply with the provisions given in GB/21707.

5.1.5 Castings shall comply with the requirements given in GB/T 2100.

5.1.6 The working speed of extrusion shaft shall be frequency controlled, which is ranging from 0.5r/min to 5.0r/min.

5.1.7 The electrical control devices shall comply with the requirements given in GB/T 5226.1.

5.1.8 The cleaning device shall be set to keep the filter of the main engine clean.

5.1.9 The mechanical accuracy requirements of main parts and components shall comply with the requirements of Table 2.

Table 2. The technical requirements for main parts and components

Name of parts	Materials	Accuracy requirements	Appearance requirements	Test methods
movable plate	06Cr19Ni10	parallelism error≤0.07mm	Bright surface, without scratches, edges without burrs	GB/T 1184 GB/T 6060.2
fixed plate	06Cr19Ni10	parallelism error≤0.07mm	Bright surface, without scratches, edges without burrs	GB/T 1184 GB/T 6060.2
input part	06Cr19Ni10	verticality error≤0.3mm	The surface is free of scratches, edges and burrs, and the machined surface roughness Ra is ≤3.2um.	GB/T 1184 GB/T 6060.2
output put	06Cr19Ni10	verticality error≤0.3mm	The surface is free of scratches, edges and burrs, and the machined surface roughness Ra is ≤3.2um.	GB/T 1184 GB/T 6060.2
extrusion shaft	06Cr19Ni10 (matrix)	Coaxial error ≤0.3mm, thickness of wear-resistant layer ≥1.0mm, hardness of wear-resistant layer ≥50HRC	Smooth surface connection, polishing, surface roughness Ra < 6.3um.	GB/T 1184 GB/T 6060.2

5.1.10 The welding method shall be used by argon arc. And the weldment shall comply with the

requirements given in JB/T 5943.

5.1.11 The dye penetrant inspection shall be carried out on the stainless steel welds with sealing requirements. And there shall be no welding defects such as missing welding, false welding, slag inclusion, etc.

5.1.12 The appearance quality of the dewatering machine shall comply with the provisions given in JB/T 7217.

5.1.13 The insulation resistance of power circuit and control circuit to the frame shall be greater than 2 MΩ.

5.1.14 The safety warning marks shall be set. The rotation direction shall be marked at the rotating motion part. The waterproof signs and electrical safety signs shall be marked at the electrical part. The safety protection device shall comply with the requirements given in GB/T 8196.

5.2 Performance requirements

5.2.1 No-load test of dewatering machine shall comply with the following requirements:

a) The transmission parts operate stably without any abnormal phenomenon

b) The speed regulating process of speed reducer shall be smooth and sensitive

c) The operation current of the driving motor of main engine is stable. The movable plate moves freely during the operation.

5.2.2 The load test of dewatering machine shall comply with the following requirements:

The load test shall be carried out after passing the no-load test. And the continuous running time of load test shall not be less than 8h. The load test shall comply with the following requirements:

a) The transmission parts operate stably without any abnormal phenomenon

b) The speed regulating process of speed reducer shall be smooth and sensitive

c) The three-phase current is 30% - 80% of the rated current of the motor. The running current of the motor shall not be greater than the rated current. If the current is more than 1.05 times of the rated current during operation, the dewatering machine shall automatically shut down and give an alarm.

5.2.3 Dewatering performance: the moisture content (mass fraction) of filter cake for activated sludge shall not be greater than 85%. The moisture content (mass fraction) of filter cake for chemical sludge shall not be greater than 80%.

5.2.4 The treatment capacity of absolute dry sludge shall comply with the requirements of Table 1.

5.2.5 The noise of the whole machine shall be less than 70dB(A) during the no-load operation.

6 Testing Methods

6.1 The inspection of selected materials, purchased parts, stainless steel fasteners, castings and variable frequency motors shall be carried out according to the provisions of 5.1.2 ~ 5.1.5.

6.2 Working speed inspection of extrusion shaft: measuring the time about running 10 laps by using the mark on the outer circumference of extrusion shaft as a baseline and calculating the rotating speed of extrusion shaft. The accuracy of timer shall not be less than 0.1s.

6.3 The electrical control devices shall be tested according to the provisions given in GB/T 5226.1.

6.4 The cleaning effect of the main engine shall be inspected by visual method.

6.5 The mechanical accuracy of movable plate, fixed plate, extrusion shaft, input part and output part shall be tested according to the requirements given in GB/T 1184. The surface roughness shall be tested according to the requirements given in GB/T 6060.2. The hardness and thickness of the wear layer for the extruded shaft shall be tested by using a portable hardness meter and an ultrasonic thickness gauge, respectively.

6.6 Weldments shall be inspected in accordance with the requirements given in JB/T 5943.

6.7 The dye penetration detection shall be tested and evaluated in accordance with the requirements given in JB/T 9218.

6.8 Appearance quality shall be tested in accordance with the requirements given in JB/T 7217.

6.9 Insulation resistance measurement: measuring the insulation resistance of control circuit and power circuit to rack and cabinet by using 500V meg ohm meter, respectively. The precision grade of the instrument shall be not less than level1.

6.10 The safety protection device shall be tested in accordance with the requirements given in GB/T 8196.

6.11 No-load test shall be carried out at the frequency of 25Hz and 50Hz for the main engine drive motor, respectively, and run continuously (no less than 1h). The following contents shall be inspected:

6.11.1 Checking the operational aspect of all the transmitting and rotating parts. They shall be operated normally with no abnormal vibration and noise.

6.11.2 Adjusting the frequency of the converter in the range of 25Hz-50Hz. The speed reducer shall be smooth and sensitive during the speed adjustment process. The flexibility, accuracy and reliability of the system action shall be inspected during starting and shutting down the whole machine 3 times.

6.11.3 The three-phase current of the motor of the main engine's speed reducer shall be measured by using the clamp-type ammeter with a range ability of 0.00mA-300.0A and a resolution of 10uA

at the operating state of the whole machine. The current shall be uniformly and generally about 30%-80% of the rated current of the motor.

6.12 The load test shall be tested according to the 6.11.1, 6.11.2 and 6.11.3 items under continuously running for 8 hours at frequency of 25Hz-50Hz of the main driving motor.

6.13 The water content of filter cake shall be measured according to CJ/T 221.

6.14 Measuring the treatment capacity of the absolute dry sludge:

a) Sampling method: Under the condition of stable operation at the main engine's frequency of 25Hz, 40Hz and 50Hz, respectively, the mud cake produced by one dewatering machine in 1min is sampled at the output part. The precision of the timer shall be not less than 0.1s.

b) Measuring method: The measurement method of moisture content shall be measured according to 6.13. And the ω is used to represent the moisture content. The mud cake outputs sampled at three frequency are weighed by an electronic balance with these sibility of 1g. And the M is used to represent the weight. The amount of the absolute dry sludge treated by the whole machine is calculated according to the formula (1):

$$W=M(1-\omega)\times 60 \quad (1)$$

In the formula:

W---the amount of the absolute dry sludge treated by the whole machine (kg/h)

ω---the water content (mass fraction) of the sampled sludge (%)

M---Moisture content of sampled sludge(kg)

c) Number of measurements: the absolute dry sludge amount of the whole machine shall be measured three times at three frequencies, respectively. And the treatment capacity of the absolute dry sludge for the single machine is the arithmetic average of each measurement.

6.15 The running noise of the dewatering machine shall be tested according to the requirements given in GB/T 10894.

7 Inspection Rules

7.1 Inspection Classification

The inspection is divided into delivery inspection and type inspection.

7.2 Delivery Inspection

7.2.1 The delivery inspection of all parts, components and equipment of the dewatering machine shall be carried out. And the quality inspection department shall provide the certificate of conformity.

7.2.2 Inspection items are listed in Table 3.

Table 3. Inspection items and requirements of the dewatering machine

NO.	Items	Type inspection	Delivery inspection	Requirements	Test methods
1	Materials and Purchased Parts	√	—	5.1.2~5.1.4	6.1
2	Casting	√	√	5.1.5	6.1
3	Working speed of extrusion shaft	√	√	5.1.6	6.2
4	Electrical control devices	√	√	5.1.7	6.3
5	Main engine cleaning and effect	√	√	5.1.8	6.4
6	Mechanical accuracy of main parts	√	√	5.1.9	6.5
7	Weldments	√	√	5.1.10	6.6
8	Stainless steel weld	√	√	5.1.11	6.7
9	Appearance quality	√	√	5.1.12	6.8
10	Insulation resistance	√	√	5.1.13	6.9
11	Safety protection device and identification	√	√	5.1.14	6.10
12	No-load test	√	√	5.2.1	6.11
13	Load Test	√	—	5.2.2	6.12
14	Sludge dewatering performance	√	—	5.2.3	.613
15	treatment capacity of the absolute dry sludge	√	—	5.2.4	6.14
16	Noise during no-load operation of the dewatering machine	√	√	5.2.5	6.15
"√" and "—" means the items shall be or not be inspected, respectively.					

7.3 Type Inspection

7.3.1 Type inspection shall be carried out of the following conditions:

a） New product finalization or old product turning factory;

b） The products' performance may be changed because of the greatly changes of the product structure, material and process.

c） Resuming production after shutting down more than 2 years.

d） The big difference is existed between the results of the delivery inspection and that of last type inspection.

e）The type inspection is proposed by the market supervision and administration departments.

7.3.2 Sampling method: Random sampling, 1 set of samples.

7.3.3 The test items are listed in Table 3.

7.4 Judgement Rules

7.4.1 Inspection results shall comply with the requirements given in Chapter 5 of this standard.

7.4.2 If any inspection item is not qualified, double sampling shall be carried out. If there are still unqualified, the batch of products shall be determined to be unqualified.

8 Marks, Packaging, Transport and Storage

8.1 Marks

8.1.1 The nameplate and mark shall be fixed on the appropriate and obvious position and in accordance with the requirements in GB/T 13306.

8.1.2 The following contents shall be included in the mark:

a) Manufacture name

b) Product name

c) Product type

d) Product execution standard number

e) Manufacturer number

f) Production date

8.2 Packing

8.2.1 The packing of the dewatering machine shall comply with the requirements in GB/T 13384.

8.2.2 The marks of the packing, storage and transport shall comply with the requirements in GB/T 191.

8.2.3 The shipping marks outside the package shall comply with the requirements in GB/T 6388.

8.2.4 The following documents shall be put in the package:

a) Packing list;

b) Product certification;

c) Operating instructions (in accordance with the requirements given in GB/T 9969);

d) Electrical schematic diagram of the equipment;

e) Equipment outline structure drawing and accessories.

8.3 Transport and Storage

The measures of corrosion protection, damage prevention, rain protection and moisture proof shall be employed during transport and storage.