

CONCENTRATOR
CENTRIFUGAL WITH FLOATING BED
Flexicone170SD with self-discharge of concentrate

User's manual

Flexicone
Australia



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Attention to consumers of Flexicone170 concentrators

This passport, combined with a technical description and operating instructions, is a document certifying the main parameters and technical characteristics of the product guaranteed by the manufacturer.

The passport is intended to study the design of the concentrator and the principle of its operation and establishes the operating rules, the observance of which ensures the maintenance of the concentrator in constant readiness for operation.

Taking into account consumer feedback, the developer is constantly improving the design of the product, therefore, some design changes in individual units and parts may not be reflected in this passport.

The new FlexiconeSD170 concentrator model has a concentrate self-unloading unit, which allows the concentrator to be used both in the traditional manual mode of removing the bowl and concentrate rinsing, and in the automated mode of concentrate rinsing without operator intervention.

The concentrator is supplied with an optional standard, unperforated internal catcher cone. This allows the concentrator to be used as a manual concentrate rinse. The manual removal of the flexible cone and strip is recommended for exploration and processing of small-volume samples and ensures the purity of sampling. Also, the manual mode is necessary to work out the optimal mode and the time of concentrate accumulation before rinsing.

1. PURPOSE OF THE PRODUCT

1.1. The centrifugal concentrator with floating bed Flexicone170 (hereinafter referred to as the concentrator) is designed for high-quality gravity beneficiation of fine-grained material (placer sands and crushed ores) containing free gold, silver and platinum, in the industrial extraction of fine and fine fractions of precious metals and other heavy valuable minerals.

1.2. The concentrator can be applied:

- 1) During semi-industrial technological research of large-volume samples of mineral raw materials containing noble metals.
- 2) in the processing of ore and placer deposits and tailings of past developments, containing fine and micron gold, as well as the tailings of floatation processes and cyanide leaching
- 3) in the industrial processing of technogenic raw materials containing noble metals (sand and gravel mixtures, non-metallic dumps and ash from thermal power plants, metallurgical slags, electronic scrap).

1.3. The concentrator should be used indoors or under a shed at a positive air temperature. Operating conditions correspond to IP44.

1.4. Concentrator must be operated under attended conditions.

2. TECHNICAL CHARACTERISTICS

2.1. Coarseness of the processed material, mm - no more than 3.

2.2. Solid productivity, kg / h: - up to 1000 *).

2.3. Extraction of gold size,% + 50 microns 96-99

+ 10-50 microns 92-96

+3-10 microns, 50-92

2.4. Pulp density (Solids:Liquid ratio) from 1: 4 to 1:12.

(When enriching placer sands and finely ground ores Solids:Liquid ratio - 1: 4 , and when finishing rough concentrates Solids:Liquid ratio - 1: 8/1: 10), When enriching placer sands with clay Solids:Liquid ratio - 1: 12 recommended for best recovery.

2.5. The volume of the resulting concentrate, ml not more than 150

2.6. Material concentration with concentrate accumulation up to 10000

2.7. Bowl rotation frequency, rpm 0 - 1380

2.8. Bowl vibration frequency, k / min 4140

2.9. Power supply characteristics: 220-240V, frequency (50 + _ 1) Hz

2.10. Installed power W 450

2.11. Overall dimensions, mm:

length 450

width 500

height 540

2.12, Weight, kg. 15

*) The given maximum productivity corresponds to ideal operating conditions (achieved when testing the concentrator on artificial mixtures of quartz sand and granular ferrosilicon, imitating noble metals in density), allowing to ensure high extraction of fine and ultrafine heavy particles. Equipment may not achieve the best performance at peak performance depending on material composition, particle shapes of heavy minerals and feed characteristics (pulp density). See Table 1

4. STRUCTURE AND OPERATING PRINCIPLE

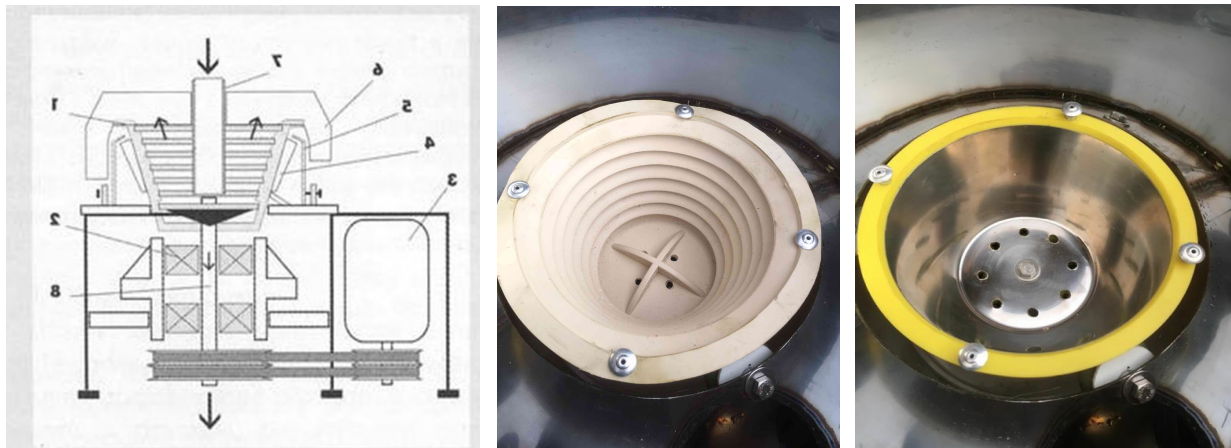


Fig. 1. Schematic diagram of a floating bed centrifugal concentrator with self-discharge of concentrate

1. Elastic catching cone. 2. Bearing unit. 3. Electric motor with belt drive. 4. Compression rollers. 5. Squeeze roller bracket. 6. A snail for unloading the tail slurry. 7. Power supply branch pipe 8. Cone rotation shaft

A distinctive feature of the Flexicone centrifugal apparatus is the use of a manufactured flexible wave-bending catching body (truncated cone), which is compressed from three sides by rollers mounted on fixed supports. As a result of compression, the cone in cross-section acquires the

shape of a rounded triangle. With the rotation of such a cone, the points of the mineral bed periodically approach the axis of rotation and move away from it, as if floating in a centrifugal field. The radius of curvature of the inner surface of the cone with a frequency of tens of hertz changes in a certain interval from the minimum to the maximum value. The latter can be infinitely large. As a result, the centrifugal field has a variable value along the angular coordinate. The maximum centrifugal overload exceeds the overload in an undeformed cone by approximately 1.5 times. The mineral bed, which forms in deep grooves between the grooves, under bending deformations of the cone wall undergoes frequent compression and tension in the direction of circular motion. When compressed, the mineral bed is squeezed out of the grooves, and when stretched, it descends again in the centrifugal field and, thus, performs movements similar to those in a jig.

Due to the design features of the cone wall, during its rotation in the compressed state, shear vibrations of the layers of the mineral bed are excited, reminiscent of the vibrations of the mineral bed on the vibrating deck of a concentration table.



Thus, in the described apparatus, the mineral bed undergoes complex movements, similar simultaneously to the movements in the jig and on the vibrating table. All this takes place in a centrifugal field that is variable in intensity. Centrifugal acceleration changes with the process frequency equal to the product of the rotational speed and the number of rollers. The range of values of centrifugal acceleration from the first hundred "g" to a value close to zero or even to a small negative (with a strong compression of the cone by the rollers). As a result, the mineral bed is constantly in a loosened (fluidized) state, in which grains of different density, regardless of their shape and size, quickly differentiate according to the depth of the groove. High-density grains sink to the bottom, and light grains float in the centrifugal field, move to the open surface of the groove, where they are carried away by the upward flow of the tail pulp and are carried out of the cone. Unlike previous models of floating bed hubs, Flexi Cone is made using a special technology, which has reduced engine power and weight of the product, as well as increased service life several times.

The Flexicone170SD concentrator has a concentrate self-unloading unit, which allows the concentrator to be used both in the traditional manual mode of removing the bowl and concentrate rinsing, and in the automated mode of concentrate rinsing without operator intervention. For this, there are discharge holes at the bottom of the bowl. When the cone rotates, the slurry moves only

upward and does not enter the concentrate unloading unit. When the rotation of the cone is stopped, the pulp feed is stopped and the rinsing mode is activated. The strip is supplied with clean or recirculated water through nozzles in the strip tube attached to the pulp feed pipe. The concentrate is unloaded through the holes in the bottom of the bowl to the concentrate unloading unit and discharged through the drain pipe.

4.3. The principle of operation of the electrical schematic diagram.

The circuit is powered by 220 volts AC 50 Hertz.

An automatic control system is supplied with the SD models.

The main automatic control module has a programmable cyclic timer. The timer sets 2 parameters: T1. Time of rotation of the cone and feeding of the slurry by the sand pump (concentrator and sand pump are on / the pump of the concentrate rinse is off)

T2. rinse time (concentrator and sand pump off / concentrate rinse pump on).

The timer is switched on by switch 1. There are 3 more independent switches in the control panel, which independently of the timers connect and disconnect the concentrator, sand pump and concentrate rinse pump.

5. SAFETY PRECAUTIONS

5.1. Persons familiar with its device and trained in safety are allowed to service the concentrator.

5.3. When carrying out maintenance, the concentrator must be disconnected from the mains and precautions must be taken against inadvertent connection to the mains.

5.4. It is prohibited:

- 2) during the operation of the concentrator, place hands or objects in the rotation zone of the cone
- 3) work on a faulty hub
- 4) Include the rotation of the cone with the loose inner rubber cone

... 6. MAINTENANCE

6.1. When carrying out maintenance, it is necessary to comply with the safety requirements in accordance with section 5 "Safety instructions" of this passport.

6.2. Once a week, a preventive inspection of the condition of the concentrator should be performed:

Free rotation of rollers without play and knocking. If there is wear, the bearings must be replaced. Wear condition of the cone outside at the crimp point. If worn, the outer cone must be replaced. For effective enrichment of the material, the amplitude of the deflection of the cone from the circle should be 4mm (at the top of the cone). The crimp adjustment is made by axially moving the cone up and down using additional washers, for this it is necessary to unscrew the axial bolt of the cone.

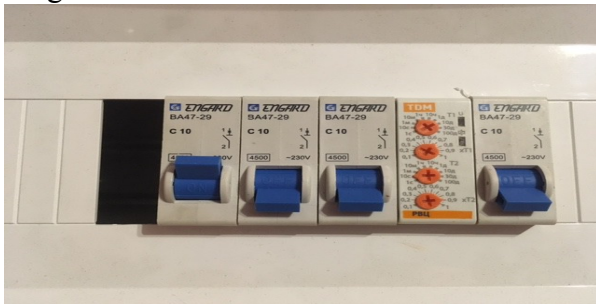
7. PREPARATION OF THE PRODUCT FOR OPERATION AND OPERATION PROCEDURE

7.1. The hub installation site must be supplied with:

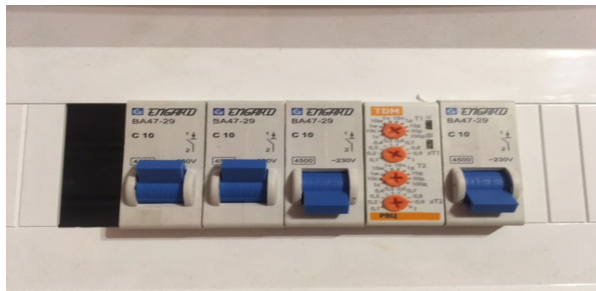
- 1) power supply by single-phase alternating current with voltage of 220 V at a frequency of 50 Hz; total installed power 1.0 kW (Taking into account: electric motor of the concentrator -450W, sand pump -500W. Pump of the slurry rinse -300W)
- 2) feeding with a pulp with a particle size of up to 3 mm (placer sands) or up to 0.1 mm (ore) and a Solids:Liquid ratio from 1: 4 to 1: 6 (when enriching placers) and Solids:Liquid ratio from 1 : 8 to 1:12 (when dressing crushed ores);
- 3) unloading of the pulp with a volume of at least 4m³ / hour
- 4) concentrator must be installed tilted (about 10 degree) towards discharge pipes.

7.4 The order of work on the concentrator.

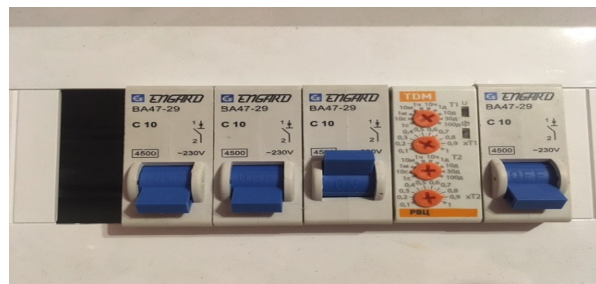
To operate the circuit, connect the power cord of the automatic control module to the network.
Program the timer for the concentration / washout operating modes:



The concentrator is ON. Sand pump, Flush pump and Automatic switch OFF



Concentrator and Sand pump are ON. Flush pump and Automatic switch OFF



Flush pump is ON. Concentrator, Sand Pump and Automatic switch OFF



The Automatic switch is ON. Concentrator, Sand Pump, and Flush Pump OFF.

Green indicator - 230V mains presence.

The red indicator is constantly on when the concentrator and the sand pump are turns.

The red indicator flashes when the automatic flush pump is turned on.

t1. concentration: the time of rotation of the cone and the feeding of the slurry by the sand pump (concentrator and sand pump on / pump of the concentrate rinse off) - in accordance with the recommended table 1. set by the two upper regulators on the timer. The value of the time t1 is calculated by multiplying the readings of the two upper regulators

t2. concentrate rinsing time 5-10 seconds (concentrator and sand pump are off / concentrate flush pump is on) - set by two lower regulators on the timer. The value of the delay time t2 is calculated by multiplying the readings of the two lower regulators.

Connect the power cords of the concentrator, sand pump and rinse pump to their respective outputs on the module.

Switch ON the concentrator using the switch on the concentrator housing.

Check the rotation modes of the concentrator, sand pump and rinse pump.

The automatic control system of the system is started with the automatic switch ON.

The pulp is supplied with water in an amount of not more than 4m³ / hour. The ratio of liquid to solid is served as recommended in Table 1. Through a hopper or feed pipe, the slurry is fed to the bottom of the bowl, which is twisted by rotating impeller blades and thrown to the bowl ribs.

Under the action of centrifugal acceleration, the granular fraction of the pulp enters the inter-rip grooves of the bowl, where, as a result of undulating vibrations, the material loosens and the heavy particles of minerals and gold segregate into the formed mineral "bed" with their concentration mainly in the depth of the grooves.

At the same time, light mineral particles of the pulp, carried away by the ascending flow of the pulp, rolling over the reefs, are carried out of the bowl into the tailings receiver and further along the main pipe outside the concentrator (into the tailings dump).

After the accumulation mode, the rotation of the cone is stopped and the pulp feed is stopped. The flush of the concentrate with water from the ejector of the flush tube in the cone is switched on for 5-10 seconds. At the same time, under the action of the jet, the cone rotates, which is necessary for thorough flushing of the concentrate. The washed concentrate is discharged through the holes in the lower part of the cone and then through the concentrate drain pipe. In addition, the drain tube serves to drain the slurry that accidentally fell into the lower section during the operation of the concentrator. During operation, no slurry should flow out of the drain tube.

Attention! If, when working in concentration mode, slurry flows from the lower drain tube, it is required to increase the ratio W / T - to decrease the supply of solid and increase the supply of water. Do not exceed the maximum slurry feed 4m³ / min.

Attention! Avoid slurry overflow from upper part of concentrator and wetting main switch on concentrator . Operate all switches only only with dry hands.

Table1 Recommended operating modes of the concentrator

	Alluvial material	Dredge concentrate	Drilling/exploration material	Ore material first run	Ore material tailings run
RunCapacity, kg/hout	1000	250	400	1000	1000
Concentration time, min t1	60-120	30	3	6	6
Material run weight,kg	1000-2000	120	20	100	100
Concentrate weight,kg	0.3	0.3	0.3	0.3	0.3
Concentration ratio	3300-6600	400	66	330	330

When working on a concentrator in manual mode, an internal cone without drain holes is installed in the concentrator before starting. **The inner rubber cone attaches to 4 washers / holders and is easy to remove by pulling up from washers.** Concentration / drain operating mode automatic switch off.

At the end of the cycle of work (enrichment), the electric motor of the drive of the cone rotation

unit is stopped and the flexible cone is taken out to extract the concentrate.

To ensure effective enrichment of technogenic material with different material and granulometric composition of the solid phase, higher extraction of fine and fine classes of noble metals, the concentrator can be adjusted to achieve the most optimal modes by changing the bowl rotation frequency. It is recommended to select the optimal values of the bowl rotation frequency by changing the frequency of the electric current supplying the bowl rotation electric motor using a regulator. The maximum productivity of the installation is achieved at maximum speed.

Attention! After working on the concentrator, clean all the components from dirt and sand. Wipe off moisture. Turn on the concentrator and let it run dry for about a minute at full throttle to remove excess water from the bearing assemblies and to avoid rust in the assemblies when the concentrator is stored.

8. POSSIBLE FAULTS, REASONS, WAYS OF THEIR ELIMINATION AND REPAIR (Very important , please read it properly)

1. When turned on, the hum of the electric motor is heard, but there is no bowl rotation or rotation is slow:

1.1 Sand penetrated under shaft disk .

1.1.1 Reason:: overloading concentrator , keep Solid to Liquid ratio 1:4 and do not let the pulp come from bottom pipe during concentration cycle;

1.1.2 Reason:: Concentrator not tilted towards discharging pipes , tilt must be 15 degree.

1.2 Lack of lubrication or contamination of the lubricant in the crimp bearings. No free rotation in bearings after long-term storage. Knocking or intermittent noise in the bowl rotation unit.

1.2.1 Reason: concentrator was not prepared properly for long storage. Add lubricating fluid (kerosene or WD40) to the bearings. Disassemble the units and replace worn bearings with new ones.

1.2.2 Wear of rollers. Reason : bearing was not free rotating , avoid operating the concentrator with rusted bearing. Replace worn rollers with new ones.

1.2.3 Outer cone wear. Reason : bearing was not free rotating , avoid operating the concentrator with rusted bearing . Replace the worn out cone with a new one.

2. When turned on there is no bowl rotation , and the hum of the electric motor is not heard .

2.1 electrical faults, check all control switches and lines in correct position.

2.2 the switch on concentrator is faulty. Reason: water and sand penetrate inside the switch.

Replace switch. Avoid wetting the switch on concentrator , use dry hand when switching ON/OFF

3. Increased vibration of the concentrator body after repair of the outer cone .Reason: the cone is not balanced.

Unscrew the bowl fixing bolt. Rotate the bowl 180 degrees in the mounting axis. Check vibration. If the vibration persists, slowly rotate the bowl by hand and determine the asymmetric bowl beat. Adjust the side deflection of the bowl and the tilt of the bowl with the 3 fixing bolts (removing or adding washers under the bowl).

4. Self-discharge not operates properly

4.1 Concentrate not coming from bottom pipe.

4.1.1 Reason: flush does not work . Check the flushing pump in works

4.1.2 Reason : holes outer bowl not aligned with steel middle steel bowl Unscrew bolt , align holes, Tight bolt properly.

4.2 The concentrate volume each wash too low

4.2.1 Reason : During flushing the bowl stays in fixed position . Sprays power not strong enough to twist the bowl . Check the flushing pump. The bowl rotates too tight , check bearing and rollers for free rotation.

When the frequency motor driver in use, check the set up the slow rotating mode of frequency motor driver was programmed properly. For proper cleaning concentrate from grooves the bowl must turned 5-10 times .

4.2.2 The concentrate builds up inside discharging unit. The concentrator not tilted 15 degree

toward discharging pipes. Tilt the concentrator.