

CONCENTRATOR
CENTRIFUGAL WITH FLOATING BED
FlexiconeSD300 with self-discharge concentrate

User's manual

Flexicone
Australia



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Attention to consumers of Flexicone300 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 FlexiconeSD300 concentrator model has a concentrate self-discharge 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.

1. PURPOSE OF THE PRODUCT

1.1. The centrifugal concentrator with floating bed Flexicone300 (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 ephels of past developments containing fine and ultra-fine gold, as well as tailings .
- 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. The concentrator must be operated in the presence of an operator.

2. TECHNICAL CHARACTERISTICS

Coarseness of the processed material, mm -		no more than 3.
Solid productivity, t / hour: -		up to 10 *).
Extraction of gold size,%	+ 50 microns	96-99
	10-50 microns	92-96
	3-10 microns	50-92
Pulp density (S: L ratio)		from 1: 3 to 1:12.
(When enriching placer sands and finely ground ores Solids to Hard: Zh - 1: 3 ... 1:10, and when finishing rough concentrates Solids to Hard- 1: 8/1: 12).		
The volume of the resulting concentrate, liters		no more than 1
Material concentration with concentrate accumulation		up to 10000
with continuous discharge CVD-FB		10-500
Bowl rotation frequency, rpm		0 - 1380
Bowl vibration frequency, k / min		4140
Power supply characteristics:	220-240V, frequency (50 + _ 1) Hz	
Motor power kW		1.5
Overall dimensions, mm:		
length		750
width		700
height		840
Weight, kg		90

) The given maximum productivity corresponds to the ideal operating conditions (achieved when testing the concentrator on artificial mixtures of quartz sand and granular ferrosilicon, imitating the density of precious metals), allowing high extraction of fine and fine 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).

4. STRUCTURE AND OPERATING PRINCIPLE

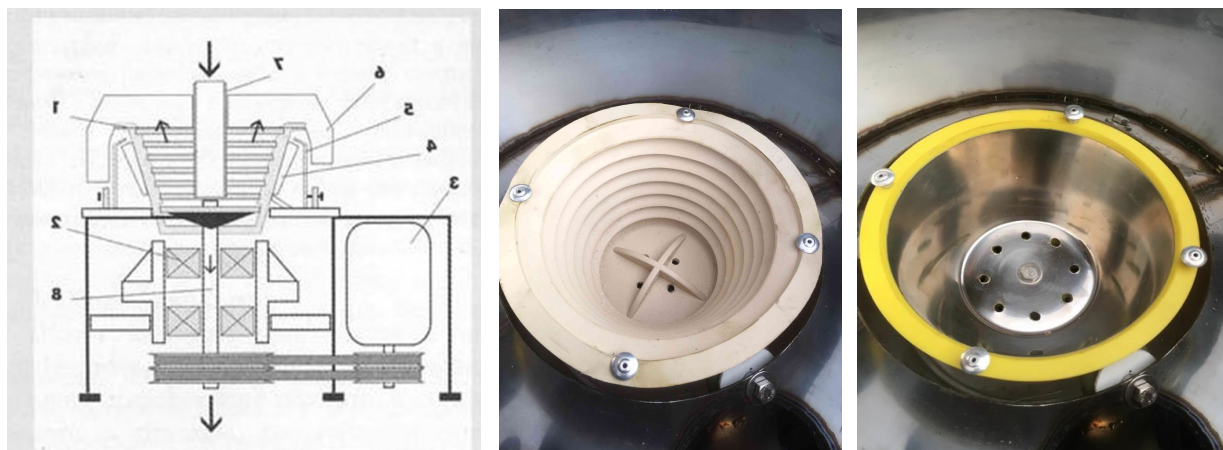


Fig. 1. Schematic diagram of floating bed centrifugal concentrator

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

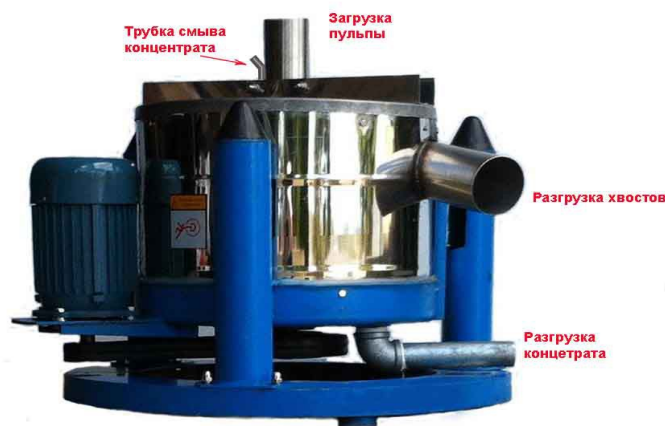
A distinctive feature of the Flexicone centrifugal apparatus is the use of a manufactured flexible wave-bending catching body (truncated cone), which is compressed from several sides by rollers mounted on fixed supports. As a result of compression, the cone in cross-section acquires the shape of a rounded triangle, square, etc. (depending on the number of crimping rollers). When such a cone rotates, 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 stretching 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, makes 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 FlexiconeSD300 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.

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:

1. T1 time of cone rotation and slurry feeding by the sand pump (concentrator and sand pump on / concentrate rinse pump off)
2. T2 rinse time (concentrator and sand pump off / concentrate rinse pump on).

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) Turn on the rotation of the cone with a loose inner rubber cone on the four washer holders.
- 5) Attention! Avoid slurry overflow from the top of the concentrator and water entering the concentrator switch. Operate all switches with dry hands only.

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 3-5mm (in the upper part of the cone). The crimp is adjusted 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 concentrator and automatic control system must be installed in a place protected from direct precipitation.

7.2. The concentrator should be installed with a 10 degree slope towards the discharge pipes

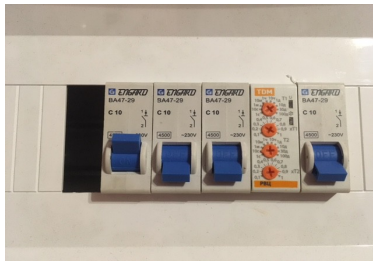
7.3. The concentrator installation site must be supplied with a single-phase alternating current with a voltage of 220 V and a frequency of 50 Hz; total installed power 3.5 kW (Taking into account: electric motor of the concentrator -1500 W, sand pump -1000 W. Pump of the slurry rinse -300 W)

7.4. The concentrator must be fed with a pulp with a particle size of up to 3 mm (placer sands) or up to 0.1 mm (ore) and a S: L ratio from 1: 4 to 1: 6 (when enriching placers) and S: F from 1: 3 to 1: 6 (when dressing crushed ores);

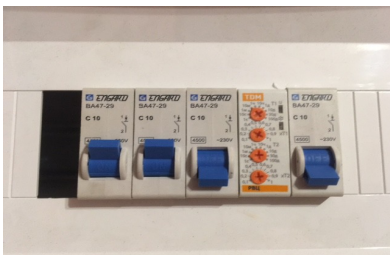
7.5. unrolling of the slurry with a volume of at least 40m³ / hour

7.6 The order of work on the concentrator.

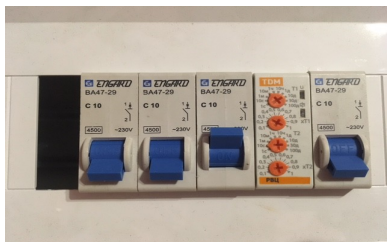
To operate the circuit, connect the power cord of the automatic control module to the network.



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



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



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



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

Green indicator - 230V mains presence

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

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

Program the timer for the concentration / washout operating modes:

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 and on the timer. The value of the delay 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 and 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 frequency controller, concentrator, sand pump and rinse pump to the corresponding outputs on the module.

Check the operating modes of the concentrator and pumps in manual mode.

Switch on the hub and frequency regulator. Check 2 modes of rotation of the concentrator cone on the frequency regulator: the mode of revolutions of concentration (35-50Hz) and the mode of the strip (2-5 Hz)

Check the modes of the sand pump and the rinse pump.

The automatic control system of the installation is started by the switch of the machine.

The pulp is supplied with water in an amount of no more than 40m³ / hour. The ratio of liquid to solid is fed in accordance with that 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 wave-like 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 pipe serves to drain the slurry that accidentally got into the lower section during the operation of the concentrator. During operation, no slurry should flow out of the drain tube.

Attention! If, during operation in the concentration mode, slurry flows from the lower drain tube, it is required to increase the W / T ratio - to decrease the solid supply and increase the water supply. Do not exceed the maximum slurry feed 40m³ / min.

Table1 Recommended operating modes of the hub

	Россыпные пески	Хвосты ШОУ и ЗИФ	Первая концентрация рудной породы	Перечистка рудной породы
Скорость подачи, т/час	10	3	10	10
Время накопления, мин t1	60	30	6	6
Вес пропущенной породы, т	10	1,5	1	1
Объём концентрата, кг	3	3	3	3
Степень сокращения	3300-6600	500	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 cone attaches to 6 washers / holders and can be easily removed from the 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 precious 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, CAUSES, WAYS OF THEIR ELIMINATION (Very important, read carefully)

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

1.1 Sand has penetrated under the shaft disc.

1.1.1 Reason: Concentrator overloaded, maintain a 1: 4 solid to liquid ratio and do not allow slurry to exit the bottom tube during the concentrating cycle;

1.1.2 Reason: The concentrator is not tilted towards the outlet pipes, the tilt should be 10 degrees.

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

1.2.1 Cause: The concentrator was not properly prepared for storage in the pond. Fill the bearings with a lubricating fluid (kerosene or WD40). Disassemble the units and replace the worn bearings with new ones.

1.2.2 Roller wear. Reason: The bearings did not rotate freely, avoid using the hub with rusted bearings. Replace worn rollers with new ones.

1.2.3 Wear on the outer cone. Reason: The bearings did not rotate freely, avoid using the hub with rusted bearings. Replace the worn out cone with a new one.

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

2.1 electrical faults, check that all switches and control lines are correctly positioned.

2.2 the switch on the hub is faulty. Cause: Water and sand got inside the switch. Replace switch.

Avoid getting the switch on the hub wet, use dry hands when turning on / off.

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

Remove the cone mounting bolt. Rotate the cone 180 degrees on the axis. Check vibration. If vibration persists, slowly rotate the cone by hand and determine the asymmetry of the cone rotation. Adjust the lateral taper deflection and taper tilt.

4. Self-unloading does not work properly.

4.1 Concentrate does not come out of the down pipe.

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

4.2.1 Cause: The holes in the outer bowl are not aligned with the holes in the steel middle bowl.

Remove the bolt and line up the through holes.

4.2 Concentrate volume too low for each rinse

4.2.1 Cause: During rinsing, the bowl remains in a fixed position. The spray is not too strong to turn the cone. Check flush pump. The bowl turns too tight, check the free rotation of the bearings and rollers.

When the frequency motor driver is used, check its setting, the motor creep mode is programmed correctly. To properly clean the riffle concentrate, the copus must be rotated 5-10 times.

4.2.2 Concentrate builds up inside the unloader. The concentrator is not tilted 10 degrees towards the outlet pipes. Tilt the hub.