

**PROJECT OF PRODUCTION DEVELOPED FOR CHONYA GOLD-DISTRICT DISTRICT OF
TANZANIA**

ORE RECYCLING

Technological scheme of ore processing.

Initial data, operating mode

The main provisions of the terms of reference and the initial data characterizing the work of technological redistribution and obtained as a result of R & D are presented in the table.

Table. Initial data, operating mode and performance

Parameter name	Value
Operating mode of the enterprise	Year-round
Number of working days per year	330
Equipment load factor,%	90
Performance:	
on the initial ore ton / year (t / h)	80000 (10.0)
Maximum grain size, mm	340
Size of crushed ore, mm	10.0
Factory location	In the mining area
Water supply	Revolving
Warehousing of tails	Dry warehousing
Enrichment method	Gravitational
Type of ore	Gold-quartz, low sulfide
Specific weight of ore, kg / dm ³	2.7
Demand for final products	Dore ingots, min.80% by the amount of precious metals meeting the requirements of TU 117-2-7-75

Adopted technology.

Based on the studies performed, it is proposed to adopt the following technological scheme for ore processing:

Two-stage crushing of ore, control screening in the class of 10 mm.

Two-stage grinding in a rod mill in the first stage and a ball mill in the second stage.

One stage of classification is hydrocyclone after the second mill.

Enrichment is proposed two-stage in a jigging machine and centrifugal concentrators and a control third enrichment of the tails of gravity on a centrifugal concentrator.

Finishing and cleaning of the gravy concentrate on the tables, obtaining a golden head and industrial product.

Short description:

The ore from the mine (mine), 300-350 mm in size, is fed to the crushing and sorting complex (DSC). Crushing is performed in two stages, on the jaw and cone crushers. The crushed ore class - 10 mm, comes to the ore store, for filing in the shredding department of the factory.

The first stage of grinding is carried out on a rod mill, MSC. The grinding is direct, the mill is drained with a 40% (-0.074 mm) content of the finished class, fed to the first stage of enrichment in the diaphragm jigging machine.

Concentrate jigging machine is enriched and brought to the concentration tables. The tailings of the jigging machine are additionally subjected to centrifugal enrichment on the DCOC concentrator and fed to a second shredding.

The second stage of grinding is carried out in a ball mill, MSHTS, with a central discharge. Shredding of semi-closed type with classification in hydrocyclones. The product of the second stage of grinding of the hydrocyclone discharge with the content of the finished class is 90%.

The second mill outlet is fed to centrifugal enrichment in the Falcon C concentrator. The concentrate of the Falcon C separator is enriched and brought to concentration tables. Tailings of the Falcon C separator are classified for classification into a hydrocyclone.

Also, the feeding of the hydrocyclone of the second grinding stage is the tailings of the jigging machine and the tails of the gravity tables of the first concentrating concentrates. Circulation of the second grinding is 250%.

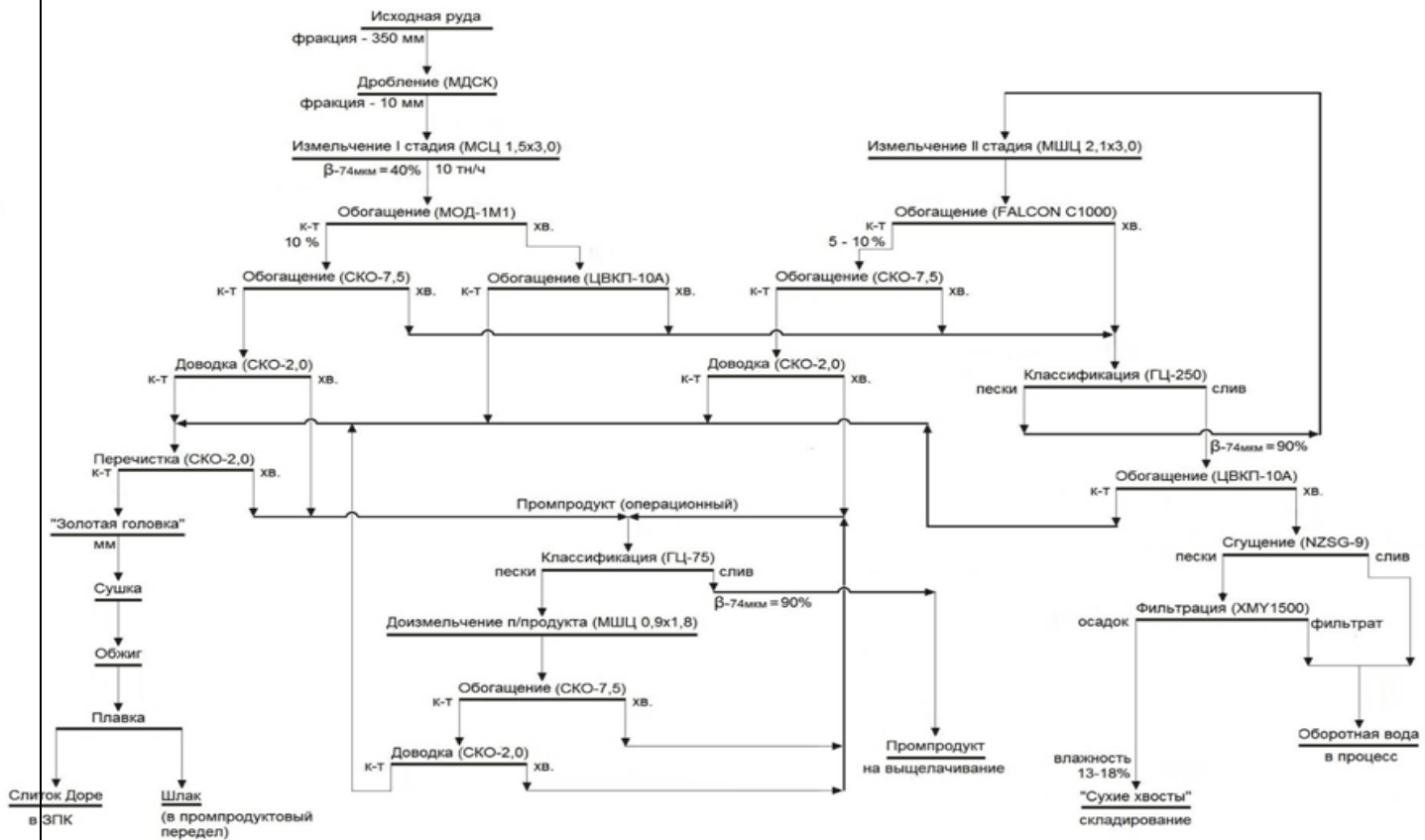
Draining of the hydrocyclone passes control enrichment on the concentrator CVOC and is sent for thickening and filtration. The final tails of gravity cake filter presses with a moisture content of 13-17%, are stored before use in the future. Draining of thickener and press filtrate is recycled water and is sent to the process of the factory.

The concentrates of the first tables are brought together, combined with the concentrates of the separators of the CVCR and are subjected to a clean-up. The product of cleaning - the "golden head" enters the smelting department for metallurgical redistribution.

Tails of finishing and cleaning tables are an intermediate product (industrial product), which is processed additionally. The industrial product is re-grinded in a ball mill to 90% by the ready class and sent to leaching in a separate plant.

The process flow diagram is shown in the figure:

Технологическая схема золотоизвлекательной фабрики



Metal Balance

The main processing indices laid down in the calculation of the scheme, as initial data, were taken on the basis of the terms of reference and the materials of the ore sample studies at APT (Zimbabwe), as well as the practices of operating enterprises.

The metal balance for technological operations is presented in the table below

Table. The forecast balance of metal in the gold recovery factory.

Product name	%, from products Mass,	tn / h Weight	t / year	Sod-e Au	g / tn Extraction Au	% Mass Au	g / h Mass Au, g / year
Enters the process							
Crushed ore 0 - 10 mm	100,00%	10,002	80000,0	3,86	100,00%	38,57	308480,0
TOTAL		10,002	80000,0			38,57	308480,0
Exits the process							
GOLD HEAD	0,0132%	0,00132	10,536	23674,8	80,86%	31,18	249426,2
KEEK TAILS OF	98,71%	9,872	78965,8	0,38	9,76%	3,77	30121,3

GRAVITATION							
PROMPRODUCT	1,00%	0,100	797,42	35,81	9,26%	3,57	28555,6
Recycled water		0,029	226,2	1,67	0,12%	0,05	376,9
TOTAL		10,002	80000,0			38,57	308480,0

The technological recovery of gold at the mill is 90.12%, including:

- in the "golden head" - 80.86%, with the output of the "golden head" 0.0132% and the content of 23674.8 g / t;

- in industrial products - 9.26%, with the output of gravel concentrate 1.0% and the content of 35.81 g / t.

Water balance.

The total water consumption in the factory will be 74.87 m³ / h (excluding water consumption for household and household needs).

Specific water consumption per ton of processed raw materials will be 7.48 m³ / t.

The minimum return of circulating water through the operation of thickening of the tail, the form of draining the thickener is 54, 75 m³ / h. If you install a "dry tail system" by filtering a thickened product on a frame filter press, you can additionally obtain a filtrate of 10.50 m³ / h. And also when installing a small radial thickener on the line of industrial products, we will obtain an additional clarified water of 6.62 m³ / h. Total maximum return of water in the process can reach 71.87 m³ / h.

The fresh water consumption will be from 2.75 m³ / h for hydraulic support of the stuffing boxes of the pumps and 5 m³ / h for washing the floors, up to 18.7 m³ / h with work on the tables and the product, depending on the options. Fresh water is used to prepare flocculent solutions and technological operations such as enrichment on tables.

Parameter name	Value of parameters
Capacity of the plant, t / year	80000
t / day.	240
t / h.	10
Gold content, g / t	3.86
The extraction of gold in the "golden head" (in the bar from MZ),%	80,86 (99,0)
Coefficient of equipment use	0,9
Mode of operation, days / year	year-around 360 days
shift / hours per shift	2/12
Splitting up	
Number of crushing plants	1
Type of crushing plant	movable crushing and grading complex
Mode of operation, days / year	year-around 360 days
Productivity, t / day	300-330

Required capacity, t / h	30
Fineness of finished product, less than, mm	10,0
Specific weight, g / cm ³	2,70
Bulk weight, g / cm ³	1,8
Coefficient of loosening op.ed	1,4
Moisture of the initial ore,%	6,0
Number of stages of crushing, pcs.	2
Stage I crushing unit	secondary crusher СМД-521
Crusher modification	roll-jaw crusher СМД-109А-Р
Size of crusher	ЩДС-4x9
The maximum piece in the feed, mm	340
Passport productivity, m ³ / h	18 – 28,8
Discharge slit adjustment interval, mm	±30
Width of the discharge opening in the opening phase, mm	90
Size of crushed ore, less than, mm	60
Actual productivity, t / h	30
With an unloading slot B = 54 mm, t / h	62,4
Stage II crushing unit	Crusher and classifier СМД-522
Cone Crusher	Size reduction equipment-592 (PSC 600)
Bolt	Rock-rill-742
Conveyor - 3 pcs.	СМД 150А, СМД 150А-10
The maximum piece in the feed, mm	75
Passport productivity, m ³ / h	12 – 35
Discharge slit adjustment interval, mm	10 – 35
Width of the discharge gap, mm	10
Size of crushed ore, less than, mm	10
Actual performance	
With an unloading slot B = 10 mm, t / h	25,0
The size of the food pieces of the screen, less than, mm	43
Size of the screening surface, mm	1250 x 3000
Size of sieve cells, mm	10 x 10 (second net16 x 16)
Productivity, t / hour	140
Degradation. Stage 1	
Type of stage I mills; number, pcs.	Stage collar 1,5 x 3,0; 1 piece
Size of crushed ore, mm	10 (12)
Moisture of crushed ore,%	6,0
Mass fraction of the class minus 0.074 mm in the crushed ore (mill feed),%	10,0
Fineness of grinding, mm	0,43
Mass fraction of solid in the sink of the mill,%	70,0
Mass fraction of the class minus 0.074 mm in the sink of the mill,%	40 – 43
Mill capacity by initial feed, t / h	10,0
Specific productivity class -0.074 mm, t / m ³ .h	0,71

Consumption of rods per 1 ton of ore, kg	0,5 – 0,7
Gravitational enrichment of the 1st stage of grinding.	
Type of jigging machine	МОД – 1М1
- jigging diaphragm machine	Denver Mineral jig
Number of machines, pcs.	1
Landing area, m2	1,0
Maximum specific load, t / m 2	17
Specific load, t / m2.h	10,0
Consumption of sub-surface water, l / sec	3,3
Parameters of the jigging machine:	
Solid content in food,% tv.	50,0 (50 – 30)
Feed size, mm	0,45 (max. 1.25)
Course of the bottoms (traverse), length, mm	10 – 14 (40)
Diaphragm pulsation rate, units / min	180 – 240 (130 – 350)
The yield of concentrate of MOD (operating),%	10,0
The content of solid in the concentrate of MOD,% tv.	35,0
The content of solid in the tails of the MOU,% tv.	30,9
Enrichment on the centrifugal concentrator of the 1st stage of grinding	
Type of centrifugal concentrator	CVKP – 10 А
- centrifugal concentrator (vertical)	Slurry periodical pump
Number, pcs.	1
Capacity by solid, t / h	10,0
Pulp productivity, m3 / h	max. 65
Density of pulp feed,% tv.	min до 8,0
Maximum particle size in feed, mm	max. 3,0
Bowl rotation frequency, rpm	400
Frequency of vibration oscillations of the bowl, c / min	2820
Hub parameters:	
Capacity by solid, t / h	10,0
Pulp productivity, m3 / h	27,0
Maximum particle size in feed, mm	1,25 (0,45)
Solid content in food,%	25,0
Enrichment cycle, min	15
Flushing water consumption of concentrate, m3 / h	0,2 (до 1,0)
Volume of the concentrate, ml	No more than 600
Amount of concentrate, t / h	0,015
Enrichment on the concentration table I	
Table type concentration I	6 S (BY 4500x1830 or CKO – 7,5)
Number, pcs.	1
Useful area of enrichment, m2	7,5

Type of the deck	Thin sand-like
Specific productivity, t / m ² h	0,15 (до 0,35)
Work parameters:	
Solid content in food,% tv.	25,0 (min до 20)
Water consumption, m ³ / h	2,0 (3,0)
Length of the deck, mm	18 (12-20)
The frequency of the deck, times / min.	220 (200-320)
Feed size, mm	0,45 (max. 1,25)
Productivity on solid, t / h	1,0
Grinding II stage	
Mill type II stage	МШЦ 1,5 x 3,0
Number, pcs.	1
Size of ore in feed, mm	0,45
Mass fraction of the class minus 0.074 mm in nutrition,%	40 – 45
Solid content in food,% tv.	67,0
Fineness of grinding, less, mm	0,100
Mass fraction of the class minus 0.074 mm in the sink,%	90,0
Mill capacity by initial feed, t / h	10,0
Circulating load,%	250
Productivity with circulation, t / h	25,0
Specific productivity of the mill in the class minus 0.074 mm, t / m ³ .h	0,79
	1,5
Type of classification equipment	Cyclone separator ГЦД – 250
Number, pcs.	3 (2 – working.; 1 reserve)
Solid content in food,% tv.	30,9
Mass fraction of the class minus 0.074 mm in nutrition,%	47,5
Capacity on solid in feed, t / h	34,8
Capacity for food, pulp, m ³ / h	92 (87 – 92)
Working pressure in a hydrocyclone, atm	0,8 – 1,2
Solid content in sands,% tv.	67,0
Outlet outlet, on firm,%	28,5
Solid content in the sink,% tv.	13,0
Mass fraction of the class minus 0.074 mm in the sink,%	90
Quantity of industrial product, t / h	
Au content in industrial product, g / t	
Output of industrial product from initial ore,%	Falcon C 1000
Extraction of metal into industrial product from initial ore,%	Continuously pulping type
Enrichment on the centrifugal concentrator of the tails of gravity	7 - 27
- centrifugal concentrator (vertical)	max. 74
Type of centrifugal concentrator	max. 40 – 45
Number, pcs.	1,0

Capacity by solid, t / h	2
Pulp productivity, m3 / h	10
Density of pulp feed,% tv.	65 –72
Maximum particle size in feed, mm	0,600
Bowl rotation frequency, rpm	300
Frequency of vibration oscillations of the bowl, c / min	50
Hub parameters:	
Capacity by solid, t / h	25,0
Pulp productivity, m3 / h	46.6
Maximum particle size in feed, mm	40,0
Solid content in food,%	0,32
Enrichment cycle, min	6,5
Flushing water consumption of concentrate, m3 / h	1,62
Volume of the concentrate, ml	0,93
Amount of concentrate, t / h	4,0
Enrichment on Concentration Table II	
Table type concentration II	6 S (BY 4500x1830 or CKO – 7,5)
Number, pcs.	1
Useful area of enrichment, m2	7,5
Type of the deck	Slurry
Specific productivity, t / m2h	0,22 (till 0,35)
Work parameters:	
Solid content in food,% tv.	25,0 (min till 20)
Water consumption, m3 / h	2,0 (3,0)
Length of the deck, mm	18 (12-20)
The frequency of the deck, times / min.	220 (200-320)
Feed size, mm	0,32
Productivity on solid, t / h	1,62
Enrichment on Concentration Table II	
Refining Concentration I	
Type of table of concentration I	CKO – 2,0 (LY 1.95; YC 2100x1050)
Number, pcs.	1
Useful area of enrichment, m2	2,0
Type of the deck	Thin sand-like
Specific productivity, t / m2h	till 0,20
Work parameters:	
Solid content in food,% tv.	25,0
Water consumption, m3 / h	1,0
Length of the deck, mm	14 (12-28)
The frequency of the deck, times / min.	240 (200-450)
Feed size, mm	0,43

Productivity on solid, t / h	0,015
Refining Concentration I	
Refining Concentration II	
Type of table of the concentration of II	CKO – 2,0 (LY 1.95; YC 2100x1050)
Number, pcs.	1
Useful area of enrichment, m2	2,0
Type of the deck	Slurry
Specific productivity, t / m2h	до 0,20
Work parameters:	
Solid content in food,% tv.	25,0
Water consumption, m3 / h	1,0
Length of the deck, mm	14 (12-28)
The frequency of the deck, times / min.	240 (200-450)
Feed size, mm	0,32
Productivity on solid, t / h	0,065
Refining Concentration II	
Re-grinding of industrial products of gravity	
Mill type	Spherical МШЩ 0,9 x 1,8
Number, pcs.	1
Size of ore in feed, mm	0,038 (0,032 – 0,45)
Mass fraction of the class minus 0.074 mm in nutrition,%	45 (40 – 50)
Solid content in food,% tv.	67
Fineness of grinding, less, mm	0,100
Mass fraction of the class minus 0.074 mm in the sink,%	90
Mill capacity by initial feed, t / h	0,2 (max. 1,0)
Circulating load,%	200
Productivity with circulation, t / h	0,21
Ball flow rate per 1 ton, kg	1,2
Enrichment on the concentration table of the mill drainage grinding of the industrial product of gravity	
Type of table of the concentration of II	CKO – 2,0 (LY 1.95; YC 2100x1050)
Number, pcs.	1
Useful area of enrichment, m2	2,0
Type of the deck	Slurry
Specific productivity, t / m2h	till 0,20
Work parameters:	
Solid content in food,% tv.	25,0
Water consumption, m3 / h	1,0
Length of the deck, mm	14 (12-28)
The frequency of the deck, times / min.	240 (200-450)
Feed size, mm	0,32
Productivity on solid, t / h	0,2

Classification of re-grinding of industrial products of gravity

Type of classification equipment	Cyclone separator ГЦД – 75
Number, pcs.	2 (1 – working.; 1 reserve)
Solid content in food,% tv.	4,93
Mass fraction of the class minus 0.074 mm in nutrition,%	43,6
Capacity on solid in feed, t / h	0,29
Capacity for food, pulp, m ³ / h	5,78
Working pressure in a hydrocyclone, atm	0,8 – 1,2
Solid content in sands,% tv.	67
Outlet outlet, on firm,%	32,0
Solid content in the sink,% tv.	1,64
Mass fraction of the class minus 0.074 mm in the sink,%	90
Quantity of industrial product, t / h	0,100
Au content in industrial product, g / t	35.81
Output of industrial product from initial ore,%	1,00
Extraction of metal into industrial product from initial ore,%	9,26
Enrichment on the centrifugal concentrator of the tails of gravity	
- centrifugal concentrator (vertical)	Pulpy periodical type
Type of centrifugal concentrator	ЦБКП – 10 А
Number, pcs.	1
Capacity by solid, t / h	10,0
Pulp productivity, m ³ / h	max. 65
Density of pulp feed,% tv.	min till 8
Maximum particle size in feed, mm	max. 3,0
Bowl rotation frequency, rpm	400
Frequency of vibration oscillations of the bowl, c / min	2820
Hub parameters:	
Capacity by solid, t / h	9,91
Pulp productivity, m ³ / h	70,4
Maximum particle size in feed, mm	0,10
Solid content in food,%	13,0
Enrichment cycle, min	30
Flushing water consumption of concentrate, m ³ / h	0,1 (to 0,5)
Volume of the concentrate, ml	No more than 600
Amount of concentrate, t / h	0,0075
Concentration of the tails of gravity	
Thickener type	Radial type speedNZSG-9
Number, pcs.	1
Thickener tank dimensions, m	Diameter – 9,0 м; Height – 3,37 м.
Rake speed, rpm	0,26
Weight of thickening node, t	21,96

Effective deposition area, m ²	63,0
Thickener operation parameters:	
Productivity, m ³ / h	70,4
Density of the condensed product,% tv.	45,0
Mass fraction of the class minus 0.074 mm,%	90
The amount of the condensed product, t / h	9,87
Drain density,% tv.	0,05
Number of drains, m ³ / h	54,7
Consumption of flocculant (magnonflok), g / tn	20,0
Filtration of the tails of gravity	
Type of filter	Frame-type filter press XMY1500-30U
Number, pcs.	2
Dimensions of the filter press, mm	10450 x 2100 x 1360
Filter press weight, tn	23,30
Number of frames in the filter press	99
Overall dimensions of the filter press frame, mm	1500 x 1500
Filtering area of one filter, m ²	400
Supply pressure, MPa	1,0 (0,5 – 1,6)
Specific productivity, kg / m ² .h.	25
Maximum thickness of cake (mm), mm	30
Density of power supply,% tv.	45,0
Number of cakes per one filtration cycle, m ³	5,96
Moisture of cake,%	15 – 17
Time of one filtration cycle, min	80
1	2
Time of unloading, min.	8-10
Amount of filtrate, m ³ / h	10,50
Cleaning of finishing concentrates	
The type of the clearing concentration table	CKO – 2,0 (LY 1.95; YC 2100x1050)
Number, pcs.	1
Useful area of enrichment, m ²	2,0
Type of the deck	Slurry
Specific productivity, t / m ² h	to 0,20
Work parameters:	
Number of cleaning supplies, kg / h	39
Solid content in food,% tv.	75 – 85
Water consumption, m ³ / h	0,2 – 0,5
Length of the deck, mm	12 (12-28)
The frequency of the deck, times / min.	240 (200-450)
Feed size, mm	0,0 – 0,45
Output concentrate "gold head" (tv), kg / h	1,317

Au content in gold head, g / t	23674,8
Output of the "gold head" from the initial ore,%	0,0132
Extraction of metal into the "golden head" from the original ore,%	80,86
Cleaning of finishing concentrates	
Cleaning of finishing concentrates	
The type of the clearing concentration table	
Number, pcs.	31,62
Useful area of enrichment, m2	23674,8
Type of the deck	8 - 10
Specific productivity, t / m2h	1150 - 1200
Work parameters:	Inductive
Number of cleaning supplies, kg / h	
Solid content in food,% tv.	0,31
Water consumption, m3 / h	1,07
Length of the deck, mm	1,0
The frequency of the deck, times / min.	99,0
Feed size, mm	1,0
Output concentrate "gold head" (tv), kg / h	2
Au content in gold head, g / t	85 – 90 (87)
Output of the "gold head" from the initial ore,%	1,85 – 2,00 (1,95)
Extraction of metal into the "golden head" from the original ore,%	0,741
	80,05

Process parameters

Table. Process parameters

The technological recovery of gold at the mill is 90.12%, including:
- in the "golden head" - 80.86%, with the output of the "golden head" 0.0132% and the content of 23674.8 g / t;

- in promprodukt - 9,26%, with the output of gravity concentrate 1,00% and the content of 35,81 g / t.

- in the tails of gravity (dry filter cake) - 9.76%, with a content of 0.38 g / t.

The extraction of gold in the ingot during the melting of the "golden head" will be: operational - 99%, from ore -80,05%.

Taking into account the future processing of gravel concentrate (industrial product), leaching with extraction of 90%, the extraction of gold in the ingot from the gold content in the ore will be 8.25% ($9.26 \times 0.90 \times 0.99$).

The total extraction of gold in the ingot during the melting of the "golden head" and the chemically extracted industrial product will amount to 88.30%. The loss in the refining of the alloy alloy is 0.06%. The operational recovery of gold at refining will be 99.95%, the offset gold recovery from the initial ore content (after refining) will be 87.77%.

Circuit diagram of apparatus. Hardware Specification

Circuit diagram of apparatus.

The recommended circuit diagram of the apparatus of the factory is presented below:

Crushing department.

The crushing is carried out in the mobile crushing and sorting complex MDZK pos. 1.

The ore is 300-350 mm in size fed by a loader to the hopper with MDSK feeder (mobile crushing and sorting complex), the first crushing is performed in a jaw crusher type SMD 109. The material is sorted on a vibrating screen 1200x3500, a superfine product of class + 10 mm is fed to crushing into a cone crusher, and the sub-class material of the class - 10 mm is sent to the warehouse of the finished crushed ore. Material is transported by belt conveyors. The capacity of MDZK is 30 tons / hour in the class 0-10 mm.

Ore from the dump by the front loader is fed into the crusher hopper. In accordance with the size of the receiving aperture, pieces of ore with a size of no more than 340 mm are fed into the jaw crusher. Pieces of ore larger than 340 mm are considered oversized. Before the ore is fed to the crusher of the crusher, the oversize from the stack of ore should be removed and stored in a separate pile for further sorting and destruction of ore pieces by a hydraulic butoboy.

Ore into the jaw crusher pos. A (1st stage) is fed from a small hopper by a plate feeder. Ore after a jaw crusher with a grain size less than 60 mm by conveyor No. 1 pos. B is fed to the control screening on the vibration self-balancing screen SMD-742 pos. With the class minus 10 mm. The rasing product of the screen with the fineness of +10 mm is fed to crushing into the cone crusher KSD-600 (2nd stage). From the cone crusher comes ore of less than 10 mm. Unloading of the crusher conveyor No. 2 pos.D is fed to the same control screen as the jaw crusher.

The finished product of crushing is a sub-grid product of a screen less than 10 mm in size, which is conveyor No. 3 pos. E is fed to the storage hopper pos. 4, separation of grinding and gravitation.

To remove foreign metal objects from the ore, an electromagnetic iron separator (pos. 7) is suspended above the conveyor belt No. 1.

Branch of grinding and gravitational enrichment.

Crushed ore from the ready-mixed ore stock is loaded by the loader into the receiving hopper of the first stage of grinding or feeding by the conveyor pos. E. From the receiving hopper pos. 4, ore size of minus 10 mm is fed by belt feeder pos. 5, with tensor weights, pos. 8, automatically controlling the movement of the conveyor belt. Further, the supply of crushed ore by a belt conveyor pos. 6 in the loading of the rod mill MSC 1500x3000, pos.

From the mill, the discharge is discharged through the product heat to the sump of pos. 9, where the discharge density of recycled water is diluted, up to 50% in terms of solids content. The class content is 0.074 mm in the MSC crushed product 40%.

Extraction of large and medium gold occurs on the diaphragm jigging machine MOD-1M1 pos. 10. The concentrate of the jigging machine is guided by gravity to the concentration table of the SSC - 7.5 pos. 11. Concentrate table SKO - 7,5 is fed to the finishing table SKO - 2.0 pos. 12, and the tails of the SKO table are 7.5 pos. 11, are sent to the supply sump of hydrocyclones GC-250 pos. 23.

Tailings of jigging machine MOD-1M1 pos. 10 at the outlet are diluted to the required content over a solid portion of 25%, for enrichment on a centrifugal separator. Further, the tails are directed by gravity along the product heat for enrichment into a centrifugal concentrator of the periodic type TsVKP-10A pos. 15.

Concentrate separator TsVKP-10A pos. 15 is collected in a container or sent by gravity to the receiving hopper of the clearance table type SKO-2.0, pos. 26. Tailings TsVKP-10A pos. 15 are fed by gravity to the supply sump of hydrocyclones of the second stage of grinding pos. 20. Hydrocyclones GC-250 pos.

23 (two workers, the third standby) operate in a semi-closed cycle with a grinder of the second stage of grinding of the MSHP 2100x3000 pos. 16. The circulation in the second stage of grinding is 250%. Feeding hydrocyclones GC-250 pos. 23 consists of tails of enrichment of the devices MOD-1M1, TsVKP-10A, Falcon C 1000, tables SKO - 7,5, pos.11,17.

From the power supply sump HZ-250 pos. 20 pulp with Warman 4 / 3B-AHR slurry pump, pos. 19 is supplied for hydroclassification in hydrocyclones GC-250 pos. 23. Sands GC-250 - feeding the mill MSHTS-2100h3000. Draining hydrocyclones GC-250, containing 90% of the material, according to the finished class (-0.074 mm), is the tail of the gravitational redistribution.

Milled product MIIIИ 2100x3000 pos. 16, diluted with recycled water, up to 40% in terms of solids content and is fed by gravity through the product heat source pos. 22, through the magnetic separator CTP 600x1800 pos. 21, cutting scrap balls, for enrichment in a centrifugal concentrator of continuous type Falcon C 1000 pos. 24.

Concentrate of Falcon C 1000 pos. 24 is directed by gravity to gravity enrichment on the SKO table - 7.5 pos. 17. Concentrate Falcon C 1000 with a density of 65%, diluted before serving on the table SKO - 7,5, water up to 25%, on the content of the solid part.

Tails Falcon C 1000 are sent by gravity to the supply sump of hydrocyclone GC-250 pos. 20.

Branch of debugging.

Concentrate of tables SKO - 7,5 pos. 11,17, gravity goes to the enrichment of the finishing table of the SKO - 2.0 pos. 12,18. Tails of tables SKO - 7,5 are directed by gravity to the power supply sump of hydrocyclone GC-250 pos. 20.

Concentrate of finishing tables SKO - 2.0 pos. 12, 18, flows by gravity to a clean-up operation on a clean-up table of the SKO type - 2.0 pos. 26. Tails of finishing tables SKO - 2.0 pos. 12,18 and the tail of the clean-up concentration of the table SKO - 2.0 pos. 26, are the primary industrial product of gravity, and are collected by gravity in the power sump pos. 28 hydrocyclone ГЦ-75, a site дозольчения industrial products ,.

On the cleanup on the table SKO - 2.0 poz 26 receives concentrate TsVKP - 10A pos. 15 from the first stage of grinding, concentrate TsVKP - 10A pos. 37 control enrichment of the tails of gravity. As for the cleaning, the concentrate of tables of the industrial product section, pos. thirty.

The purification concentrate is a "golden head", which is sent to the melting department, for melting on the alloy Dore. Tailings of the cleaning by gravity are fed to the supply sump of the hydrocyclone GC-75.

Separation of thickening and filtration of tails.

Tails of gravity - drain hydrocyclone GC-250, are sent for thickening in the thickener pos. 34, through centrifugal concentrator ЦБКП - 10A, pos. 37, which carries out control enrichment of the tails of gravity. Concentrate control CVPC - 10A is collected in a container or gravity is sent to a clean-up on the table SKO - 2.0 pos. 26. Tails of the control CVCK-10A are fed by gravity into a highly efficient thickener of centrifugal type F 9.0 m, N 3.0 m, NZSG - 9 pos. 34.

To accelerate the deposition process in the thickener together with the tails of gravity is supplied by the pump pos. 45 solution of flocculant precipitant (magnonflok) from the vat of flocculant solution pos. 44. Thickened thickener product containing 40-45% solids, Warman 2 / 1.5B-AHR slurry pump, pos. 36 is sent to the collection collector pos.58, the filtration site. Draining of the thickener is recycled process water, collected in a tank of circulating water pos. 38 and returned to the process of the mill by the Warman 3 / 2D-HH pump. 35.

Thickened thickener product from the storage tank pos. 58 with a high-pressure slurry pump XPA (2) -65 pos. 59 are fed for filtration into the frame filter press XMY 1500 - 30U, pos. 61.

Two filter products are produced on the filter press:

1. Sediment-cake, final semi-dry tails of gravity, humidity 13-18%.
2. The filtrate, which is returned to the process in the form of recycled water.

The cake is unloaded from the site of filter presses by conveyor pos 60. They are stored by auto-loading equipment to the warehouse of dry tailings. In the future, these tails of gravity are planned to be

processed, in order to extract the metal, by the method of tank or heap leaching. The method of processing tailings will be determined by future technological studies.

The filtrate of the press is collected in the collection pos.64 and pumped by the GNOM pump 16-16 pos. 65 in the capacity of the return water, pos. 38.

Department of industrial product of gravity of the mill.

The industrial product of gravity is re-grinded in a ball mill MIIIQ 900x1800 pos. 27 to 90% in class - 0.074 mm for subsequent leaching.

Feeding the mill MSHTS 900h1800 pos. 27 are the sands of hydro cyclone GC-75 pos. 33. The mill operates with a hydro cyclone in a semi closed cycle. The crushed product is transported by gravity through the heat, diluted with water, for enrichment to a concentration table of the SKO type - 7.5 pos. 31. Concentrate of the table SKO - 7,5 comes to the debugging on the table SKO - 2.0 poz 30. Tails of the table SKO - 7,5 pos. 31 return to the supply sump of hydro cyclones GC-75 pos. 28.

On the table, the standard deviation is 2.0 pos. 30 receive gravity concentrate, which is collected in a receiving box (container). The collected portion of the concentrate in the collection box is subjected to a cleaning in the finishing section on the clearing table of the SSC - 2.0 pos. 26 and further enters the melting **department for melting on Dora, together with the main "golden head"**. **Tails of the table SKO - 2.0 pos. 30** gravity flow to the supply sump of the hydro cyclone GC-75, where they combine with the tailings SKO - 7.5 (industrial) pos. 31, with the tails of the lapping and cleanup lapping operation, and the Warman 1 / 1.5B-AHR pump, pos. 29 are submitted for classification in the hydro cyclone GC-75 pos. 33.

Sands GC-75 are delivered by gravity in the MSHTS 900x1800.

Draining hydrocyclones GC-75, 90% in class - 0.074 mm, is a ready-made industrial product for leaching. The discharge of GC-75 is collected in the collection receptacle-settler pos. 32. In the collection - sedimentation poz. 32 The industrial product of gravity is settled; the clarified water is drained and sent through the drainage system into the process.

From the receiving sump of the discharge GC-125 pos. 32 The continuous and cured industrial product is sent for leaching to a batch unit.

To collect the slurry of the slurry, the water of the flooding of the floors, a drainage system is organized, consisting of deep drainage sump and flow gutters. The working surface of the factory compartments is executed at an angle of 3 to 5 °, for gravity-forced movement of water by washing the floors and straits. In the drainage sump vertical slurry pumps are placed pumping material collected in the sump to the point of return to the process of the ZIF.

Drainages and straits in the chopping, gravity, finishing and industrial products are collected in the drainage sump pos. 51 and returned to the cycle by a vertical slurry pump 40PV-SP pos. 52, through the supply of hydro cyclone GC-250.

Drainages and straits in the filtration section of condensed tailings are collected in the drainage sump pos. 62 and are sent to the reserve tailings pod. 54 vertical slurry pump 40PV-SP pos. 63.

Drainages and straits in the thickening compartment are collected in the drainage sump pos. 68 and are sent to the reserve tailings pond by a vertical slurry pump 65QV-SP pos. 66.

Pump 65QV-SP pos. 66 allows for emergency shutdown from the work of the thickener pos. 34, pumping the entire volume of the tailings of gravity into the tailings tailings reserve pos. 54. In this case, the technological tail water is clarified tailings water supplied by the GNOM pump 80-45 pos. 67, in the capacity of the circulating water pos. 38.

№	Name of equipment	Quantity, pcs.		Units in operatio, pcs.	Time in work, hour / day. Power consumptio, kW / day	Power consumpti on, kW / day
1	2	3	4	5	6	7
	Crushing department					
1	Mobile Crushing Complex (30 t / h in Class 0 - 10 mm)	1	146,0	1	10	1460,00
	ZIF - Gravity					
	Separation of the 1st stage of grinding					
3	The MSC mill 1.5x3.0	1	90,0	1	24	2160,00
	Smooth start and chastotnik for MSC 1,5x3,0	1				
4	MSC feed hopper, 15 cu.	1	-	1	24	
5	Feeder for the conveyor with weights p.8	1	-	1	24	
6	Conveyor 650 x 10 m	1	4,0	1	24	96,00
7	Magnetic dry separator on the crusher (washer)	1	2,2	1	24	52,80
8	Conveyor scales on the power supply of MSC, TCE	1	2,2	1	24	52,80
10	Jigging machine MOD - 1M1	1	2,2	1	24	52,80
11	Table sko-7,5	1	2,2	1	24	52,80
12	Table sko-2,0	1	1,1	1	24	26,40
15	Concentrator ЦБКП - 10A, without automatics	1	3,0	1	24	72,00
	Automation CENTCOM - 10A	1	3,0	1	4	12,00
	Separation of the 2nd stage of grinding					
16	Mill МШЦ 2,1x3,6, with smooth start and chastotnik	1	210,0	1	24	5040,00
	Smooth start and chastotnik for MSHTS 2,1x3,6	1		1		
17	Table sko-7,5	1	2,2	1	24	52,80
18	Table sko-2,0	1	1,1	1	24	26,40
	VFD (Dalian Powtran Technology Co., Ltd.)	8	0,3	1	24	7,20
19	Slurry pumps Warman 4/3	2	22,0	1	24	528,00
20	Sump of hydrocyclone supply	1	-	1	24	
21	Magnetic wet separator on the MSHC sink	1	2,2	1	24	52,80

22	Sumpf-techek plum MShTS	1	-	1	24	
23	Hydrocyclones 250	3	-	2	24	
24	Concentrator Falcon C 1000, with automatics	1	7,5	1	24	180,00
26	Cleaning table sco-2,0	1	1,1	1	24	26,40
	Department of industrial products					
27	Mill MIIII 0,9x1,8, with smooth start-up	1	22,0	1	24	528,00
28	Sump of drainage of a finishing mill	1	-	1	24	
29	Slurry pumps Warman 1 / 1,5	2	3,0	1	24	72,00
30	Table sko-2,0	1	1,1	1	24	26,40
31	Table sko-7,5	1	2,2	1	24	52,80
32	Industrial food store	1	-	1	24	
33	Hydrocyclones 75	2	-	1	24	
52	Primary drain pump (feed to sump 20) 40PV-SP	2	1,50	1	6	9,00
	Branch of thickening					
34	Thickener highly efficient NZSG-9	1	3,0	1	24	72,00
35	Sludge pump of return water supply,	2	30,0	1	24	720,00
36	Warman 3 / 2D-HH	2	7,5	1	24	180,00
37	Slurry pump for transferring the condensed product to filtration, Warman 2 / 1.5B-AHR	1	3,0	1	24	72,00
	Concentrator IIBKII - 10A, without automatics	1	3,0	1	2	6,00
38	Automation CENTCOM - 10A	1	-	1	24	
43	Reverse process water capacity	3	0,75	3	24	54,00
44	Vibrating screen (option), DZS0718	1	-	1	24	
45	Chiang Flocculant Solution	2	2,2	1	24	52,80
66	Chemical pump, IH50-32-125	2	22,0	1	4	88,00
	Drainage discharge pump to the tailings tailings pond, 65QV-SP					
59	Filtration compartment	2	45,00	1	24	1080,00
60	High-pressure pump for supplying a thickened product to a filter press, XPA (2) -65	2	7,50	1	6	45,00
61	Dry tailings unloading conveyor, DTII-8063	2	4,00	1	24	96,00

62	Filter press for tails, XMY 1500 - 30U	2	5,50	1	4	22,00
63	Drainage discharge pump to the tailings tailings pond, 40PV-SP	1	-	1	24	
64	Drainage sump	1	-	1	24	
65	Sump for filtrate	2	1,50	1	24	36,00
54	Water supply pump in tank 38, GNOM 16 - 16					
56	Tail-up Reserve	2	-	1	24	
67	Floating pumping stations	2	18,00	1	8	144,00
	Water Pump, GNOM 80 - 45					
72	Water supply	8	4,0	4	8	128,00

The annual energy consumption by the mill is 4,233,060 kW. The electric power consumption for enrichment of 1 ton of ore is 58.7925 kW.

Control and testing of the technological process. Automation of the production process.

To conduct the technological process at the factory, testing is provided:

- testing and control for operational management of the technological process;
- testing, designed to compile the technological and commodity balance of metal;
- Complete testing for the purpose of compiling a quantitative sludge scheme.

For operational control of the content of precious metals in the initial ore, TEP provides for head sampling.

Weigh control of the ore is carried out by conveyor scales, finished products by analytical scales.

For sampling, samplers are used and an automatic operational sampling system is provided.

To perform chemical and assay analysis of ore and enrichment products, the existing assay-analytical laboratory is used.

The analytical service of the MMC includes a sanitary laboratory (with placement at the Mill) to monitor working conditions and environmental protection, to conduct instrumental measurements on emission sources and to control the operation of treatment facilities. At the plant and facilities of KV, express laboratories for the atomic absorption analysis of technological pulps and solutions are additionally organized.

Automation of the equipment for milling, bunkering, grinding, ore classification, condensation and classification, preliminary and sorption cyanidation, desorption units, electrolysis, thermal reactivation of coal is envisaged.

The work of the whole circuit of the apparatuses of the mill is displayed on the mnemonic diagram on the central panel

Management.

Factory water supply system

The water supply system of the factory consists of two parts independent of power sources, but interconnected by the factory process parts:

Turnover water supply

Water supply with fresh water

General requirements for water quality for production.

The basic requirements for recycled water for the possibility of its use in the technology of the factory are mineralization and the number of suspended particles. The content of suspended solids in recycled water to 0.2-0.3 g / l does not adversely affect the technological processes.

Data on the quality of recycled water are presented in the table.

Technical conditions for water used in the technological processes of the factory.

Table. Requirement for water quality in the factory water recycling system

Water Quality Index	unit of measurement	
Temperature	FROM	Admissible content in recycled water
Suspended substances	mg / l	thirty
Ether-soluble	mg / l	<100
Smell	score	<0.3
pH	-	<3
Stiffness (total)	mg-eq / l	7.5 - 8.5
Dry residue	mg / l	<15
Surfactants	mg / l	<2000
Oxidizing property, permanganate	mgO / l	lack of

In the preparation of reagent solutions, the quality of water is subject to requirements as to pure technical water. The use of recycled water for these purposes is unacceptable.

- 1) The flow of recycled water for operations is 71.03 m³ / h. From the calculation, the necessary feed pump and the water supply system of the circulating water supply as a whole were calculated.
- 2) The fresh water consumption will be at the minimum option of 2.75 and at a maximum of 13.26 m³ / h. It is proposed to implement both options for fresh water, despite the fact that the use of two pumping units creates some inconvenience in the design.

Water supply of operations of grinding and dressing on concentrators and a jigging machine is carried out at the expense of recycled water.

Water supply of gravitational enrichment on the tables and re-grinding of industrial products is possible both at the expense of recycled water, when obtaining good quality discharge of thickener NZSG-9, and due to fresh water. This two-variant scheme will avoid production stops due to a shortage in terms of recycled water or poor quality of recycled water for the above operations.

The ore warehouse (yard) consists of a warehouse of the initial ore, delivered by motor vehicles from a quarry (or mine), a crushing site and a warehouse of finished crushed ore. The stock of the initial ore in the warehouse, according to the norms, is the monthly volume of processing of the factory, or 6000 tons. The stock of crushed ore should be a minimum three-day rate of processing - 720 tons, but it is more reasonable to have a weekly stock of crushed ore, about 1.5 tons. The site for the direct storage of crushed ore must be equipped with a canopy to prevent caking of the ore due to rain. It is proposed to equip a light canopy with the following dimensions:

12 x 18 x 12 meters.

The main factory site includes the separation of grinding and gravitation. The equipment of the department is arranged in such a way as to maximize the gravity flow of the processed products. Pumping equipment is used only for hydro classification in the second grinding stage and at the industrial product site. Accordingly, the arrangement of the equipment is executed in the form of a step-by-step scheme, ensuring the movement of the material from the top downwards during the processing.

The main factory site consists of two buildings of light steel structures - case A of grinding-gravity and a shell B of finishing-industrial products.

The body A of grinding-gravitation consists of two sites - grinding and gravitation; enrichment on the tables SKO-7,5. It has a size in the plan of 20.0 x 22.5 m, the height up to the level of the head of the crane beam of 12 meters, is made in the form of a light steel structure of the "hangar" type. In this building are placed the supports of the bridge electric crane. Relations with the step-by-step arrangement of equipment vertical support columns have different sizes. The lower mark of this building is + 2.20 m, the upper one + 3.50 m.

The housing B of finishing and industrial products also includes two production sites for the finishing and industrial products. The dimensions of the shell are 14.0 x 18.0 x 8.0 m.

Levels of support - maximum + 2.20 m, minimum 0.00 m.

For "0,00" the lowest level is taken - the level of the foundation of the power supply supports of hydro cyclones GC-75 pos.28, the section of industrial product or the level of discharge into the drainage poz.51.

Building A

The grinding unit and gravitational enrichment of stages 1 and 2 are located on one site with dimensions of 19.60 x 18.20 m, at + 3.500 m.

The site is divided into two processing lines:

1st stage of grinding and gravitation - left side - MSC 1.5 x 3.0; MOD-1M1; TsVKP-10A.

2nd stage of grinding and gravitation - right side - MSHTS 2.1 x 3.0; MFR (magnetic separator); Falcon C 1000; a platform of hydro cyclones ПЦ-250.

Between the two mills along the edges of the foundations, a distance of 6.90 m allows you to use a car crane for installation and call a lorry. Used for a variety of production purposes.

On the site there is a traveling electric bridge crane, with a carrying capacity of 5 tons.

1 stage. The feed hopper and the ore conveyor to the mill are located at the elevation

+ 3,500 m. The axis of the mill's drum MSC 1.5 x 3.0 is located at + 7,060 m. Further in the course of the material's motion, the foundation of the jigging machine is MOD + 4,360 m. After the jigging machine, the pulp moves by gravity into the concentrator of the CVCC and then to the enrichment on the table RMS - 7,5.

Concentrator of the centralized distribution system is located at +3,920 m.

2 stage. The topmost point of the hydro cyclone platform is GC-250. It is located on a steel tower, the tower of the support on the ground of the marking is + 3,500 m. The hydro cyclone site itself has a mark of + 10,200 m. The hydro cyclones GC-250 feeds by pump pos. 19 of the sump pos. 28, the mark is 0.000 m.

The axis of the mill MSHTS 2,1 x 3,0 at the mark + 7,060 m. Further the pulp is directed by gravity through the magnetic separator to the Falcon C concentrator, from where it also flows by gravity flow to the enrichment table on the SKO - 7,5.

The magnetic separator is located at the level of + 5,090 m.

Concentrator Falcon C at around + 3,750 m.

Loading of the rods is made through a discharge port of MSC 1.5 x 3.0 at the level of + 7,000 m. Loading of balls into the mill of the MSHTS 2.1 x 3.0 is made from the middle platform on the "tower" of hydro cyclones GC-250, mark + 8.855 m. .

The table area of SKO - 7,5 with dimensions of 19,6 x 4,10 m, is at the level of + 2,200 m.

Housing B.

The platform of the finishing tables of dimensions 9.00 x 10.00 m, is located at +1000 m. The tailings of the finishing tables are assembled in a saddle, pos. 28, a mark of 0.000 m.

Gutters and points of gravity movement of the pulp are located at an angle - 12 ° - 15 °. All equipment has maintenance areas.

The industrial site is located on the site with dimensions of 14.0 x 9.40 m, at a mark of +2.200 m at the same level as the section of the gravity tables of the SSC - 7.5. The axis of the mill MSHTS 0,9 x 1,8 at the level of + 4,175 m. The mark of the hydro cyclones site is ГЦ - 75 + 5,600 m. The mark of the first table of industrial products is 7,5 + 2,200 m, the second table SKO - 2,0 is located in the finishing section at a level of + 1,000 m. The supply sump of the hydro cyclone GC-75 at 0.000 m.

Drainage sump pos. 51 is buried to a depth of 1,000 m. Its function is to collect all the factory drains of the main building, the straits, the washing of the floors. The contents of the drainage sump is transferred by pump No. 52 to the sump of pos. 20 and returned to the process via the hydro classification in GC-250.

The separation of the thickening does not have a solid canopy over the soy site, only small fragmentary canopies above the electrical equipment (pumps, shields, etc.)

The thickening compartment is located at + 3,500 m. The area of the thickening compartment is 13.0 x 20.0 m. At this point, the thickener base. The capacity of the return water at + 2,200 m.

The filtration compartment is located near the reserve tailings pond.

The filter area is located under a light canopy measuring 10.0 mx 12.0 m.

Tailings storage, as a hydraulic engineering structure, requires a separate project.

The smelting section and the gold receiving hall (ZPK) are housed in the same container-type building reinforced with brick walls together with a laboratory. Description in Appendix 10.

A mechanical workshop, an electric post and storage facilities are executed on the basis of marine 20 ft containers.

Measures to ensure the safety of metal

The gold recovery factory, like the enterprise itself, is a regime facility. The management of works on ensuring the safety of precious metals at all stages of their production (processing, processing, and enrichment), collection and delivery of waste, storage and transportation, accounting and reporting is carried out by the enterprise manager through his deputy for security and regime. Persons who are among the most advanced, most conscious workers and engineers, who are inspected through local bodies of internal affairs, are allowed to work directly related to gold-bearing products.

Masters of shifts are obliged to carry out systematic control during the shift, ensuring the safety of the gold-bearing product, in accountable production and territory.

At the factory in accordance with the rules and regulations governing the preservation of gold in mining enterprises of non-ferrous metallurgy, the following departments should be provided with special technical means of protection:

- finishing the concentrate to the "golden head";
- Hydrometallurgical processing of industrial products (GMOs);
- Storage and processing facilities for the "golden head" and cathode deposit;
- Melting department.

Number of jobs and number of employees

Organization of production

1. The main production workers working in the ore storage site and on the ore crushing site are the driver (driver) of the loader, the crusher and the grinder (the crusher's assistant).

2. Workers of the main production, working in the mill: the machinist of mills MSC, MCHC, MOD; concentrator of the separators of the Central Committee, Falcon C (assistant miller); concentrator of tables; concentrator-door closer; Thickener Apparatus; smelter; filtering device; duty electrician; duty locksmith; master of the workshop.

3. Working maintenance service: locksmith repair person, electric gas welder, repairman, electrician for repair of electrical equipment.

4. Specialists and employees:

The head of the mill, the mechanic of the shop, the electrician (power engineer).

5. Optional:

auxiliary staff - cook, driver of the hartop.

local security officers - "Masay trade union", 2 people.

Working hours

The working time of the main production workers is 12 hours per shift (1 hour - break). The project provides for work in 2 shifts.

For the continuous production of the mill, it is necessary to establish a shift work schedule. Example: a person worked 15 days for 12 hours, leaves for vacation. It is replaced by a changer for 15 days. Working hours are 15 days or 165 hours (lunch is done on a free time basis). Another variant of the shift schedule is possible.

The repair team, as well as specialists and employees of the plant, work for 8 hours per shift, five days a week.

Number of employees

The number of engineers, employees and workers is determined based on the adopted structure of the enterprise.

The calculation of the number of technological workers, auxiliary and serving workers, including repair personnel, is determined on the basis.

Annual consumption of materials

The annual consumption of basic materials for the concentrator is calculated:

- reagents - for unit costs,
- diesel fuel - for specific transportation costs by road transport in accordance with the "Fuel and Lubricant Consumption Standards for Road Transport";
- electricity - by determining the estimated capacity, depending on the installed equipment and the time of its operation;
- materials for repair needs - for unit costs per 1 ton, in accordance with the "Design standards for concentrating mills".

The annual consumption of basic materials is given in the table:

ECONOMIC SECTION OF ORE PROCESSING

1. Calculation of the production program

The production plan allows you to get an idea of the final results of the plant. The forecast volume of production is presented in the table.

Table. Calculation of the projected production volume (80,000 tons of ore processing at the plant)

№	Indicators	Unit	Planned period	Calculation Formulas
1.	Number of leading units (DSC)	pcs	1	A
2	Calendar fund of working hours	days	365	Tk
3.	Idle time on the PPD	days	65	ttmp
4	Nominal working time fund	days	330	Tones=A*(T-tp)
5.	The planned capacity of the leading unit per day	tone per day	240	N=Qg/Tn
6.	The technical norm of the performance of the leading unit	tone per day	360	N tech (12 hoursshiftДСК)
7.	Coefficient of extensive use of equipment	--	0,90	C= Tn/Tk
8.	Coefficient of intensive use of equipment	--	0,67	C=N/NTex
9.	Coefficient of integrated use of equipment	-	0,60	C = C int.xC expl
10.	Annual volume of processed raw materials	tone	80000	Qp = tonesN
11	Mass fraction of quartz in the raw material of gold	gr./tone	3,856	α_{Au}
12.	Ingots content	%	90	β_{Au}
13.	Extraction into an ingot of gold	%	80,5	ε_{Au}
14	Production of the finished product	kg./year	245,843	
15	The cost of a unit of finished goods	USD/kg.	37000,00	
16	Gross production income	USD/year	9096196	

This calculation of economic indicators does not include an industrial product, since technological parameters of processing of industrial products have not been determined. All calculations are based on indicators for the finished ingot and gold head. The industrial product of gravity will be an additional reserve for the enterprise.

2. Calculation of capital investments

Estimate for equipment and construction and installation works

It is based on the developed specification table for the equipment of the plant (the sheet "Plant Equipment" - "Feasibility Study - Capital Costs for the Construction of the Factory") and the cost of equipment installation ("(CONSTRUCTION AND INSTALLATION WORKS) Construction Plant1 Plant" - "Feasibility Study - Capital Costs for Factory Construction"). The period of installation works for the plant is 4 months.

From the article "Factory equipment" moved to "(CONSTRUCTION AND INSTALLATION WORKS) Construction Plant" - the tailings as construction; cost part of the tool of a mechanical workshop, is a separate line in the overall capital budget for the factory.

To simplify the presentation of the main equipment, division of equipment units into production departments - crushing, thickening, gravitational, etc., has been made. Accordingly, and the item costs for equipment in the estimate are presented by the departments of the plant. A complete list of equipment in the appendix "Feasibility of production costs."

The calculation of equipment not reflected in the specification was also made. The costs for this settlement equipment are taken according to the design standards for non-ferrous metallurgy enterprises. Sections added:

Spare parts of the main equipment.

Hoisting-and-transport devices (crane beam 5 tons in the main shop of the plant).

Electric power equipment, as there is no design of the electrical part.

Means of automation.

	TOTAL:									2346659	419157	2765816
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1. Spare parts are accepted at a rate of 3.0% of the total sum item of expenses for the registered equipment items 1 - 10, from 1947433 USD.
2. Electrical equipment - cables, transformer and other electric power devices (except for power generators, item 10) are accepted at 5.00% of the cost of all equipment.
3. Automation tools account for 2% of the total cost of all equipment.
4. Lifting and transport equipment is accepted according to the regulations, as 7.00% of the total cost of all equipment.
5. Unaccounted equipments is 3.50% of the registered equipments.
6. Transport, port and customs clearance costs are taken from the table "Equipment Specifications". In this estimate are reflected in the "value of the on-site warehouse".
7. Expenses for construction and installation work on equipment are also taken into account in the column "cost of free-on-site warehouse", sheet "(CONSTRUCTION AND INSTALLATION WORKS) Construction Plant".

According to design standards, they accept, as $15 \pm 5\%$ of the value of the on-site warehouse. In view of the engineering calculations carried out for CONSTRUCTION AND INSTALLATION WORKS, this coefficient is not used in the estimate.

According to the indicators of this estimate, the cost factor for installation works is 17.86%, which corresponds to the design standards. Calculated from the data "Feasibility Study - Capital Costs for the Construction of the Factory".

The total estimated cost of the equipment is reflected in the bottom line, column 13. It composes **2 765 816 USD** in our project.

Buildings and constructions

Table. Cost estimates for industrial buildings and structures.

Name of buildings and structures	Cost of materials	Cost of installation	Total estimated cost, USD
1	2	3	4
Tailing dump for 6 thousand tons	36375	20000	56375
Wells 50 - 100 m (4 pcs. - 75 m, PI tr 200)	11785	30000	41785
Construction of the Laboratory building (based on three 40-foot containers)	10500	20000	30500
Hangar canopy - basic. Plant site. A: 20 x 22.5 x 12 m, plus supports for the crane beam (5 tons). B: 14 x 18 x 8 m	200000	0	200000
Crushing department, ore warehouse, flyover - platform and hangar-hangar (12 x 18 x 12 m)	60000	0	60000
A filling station for generators (2 tanks, automatics, etc.)	40000	30000	70000
Mechanical workshop - based on 3 containers.	10500	5000	15500
Garage and industrial site (3 containers)	10500	15000	25500

2. The cost of buildings and construction and installation works for its installation is roughly estimated, in accordance with the cost of such facilities. At the moment negotiations are being conducted with the manufacturer to clarify the price of the building.
 3. As well as the building of the main building, it has large dimensions and a building for the crushed ore storage site with an overpass for the plant, but without reinforced crane beams. Overall dimensions of the building 12 x 18 x 12 m.
 4. The construction of the reserve tailings storage facility is supposed to be done by our own forces and equipment, so the low cost of this facility.
 5. The remaining objects are included in this section, since they cannot relate to the main equipment - wells, garage, generator, fences.
 6. Also transport containers purchased by the enterprise for transportation of equipment are added to this section. Containers are used at the factory as warehouse, the backbone of the laboratory building, workshop, etc. The remaining containers in the number of 12.5 pcs are used for non-factory needs of the enterprise, therefore, the cost of buildings and structures does not include.
- The costs of constructing the power transmission line are not separately presented. The approximate cost of about 100 - 150 thousand USD, allows you to distribute this article in a summary estimate between unaccounted costs (\$ 173,196) and project and survey (\$ 454,640) costs.

Summary budget for industrial construction

Explanations to the estimate:

1. Preparation of the construction site was taken in the amount of 5.00% of the cost of buildings and structures.
2. The costs for industrial buildings and structures are taken from the cost estimates for industrial buildings and structures.
3. The cost of electromechanical equipment is taken from the estimate for the acquisition and installation of equipment - the total costs for equipment and installation.
4. Costs for tools and equipment are estimated at 15% of the cost of electromechanical equipment. In our case, we accept the costs of the section "Mechanical workshop - toolkit" (sheet "Plant Equipment" - "Feasibility Study - Capital Costs for the Construction of the Factory").
5. Unaccounted expenses are accepted at a rate of 5% from results of lines with the first on the fourth in all columns.
6. The costs of the construction of the power transmission line (power transmission line) are separately presented, outside buildings and structures and equipment. The approximate cost is about 100 - 150 thousand USD. Since this is a one-time payment for connection, this cost part does not affect the design and survey work.
7. Design and survey work, expertise and training were taken in 12.5%, in half of the design standards 25%, from "Total" for the first part.
8. The total estimated cost of capital costs for the construction of a gold processing plant with a capacity of 80,000 tons per year in terms of gravity redistribution is:

4 116 758USD.

Summary budget for industrial construction

№ items	Name of parts, objects, works and costs	Estimated cost, USD			Total estimated cost, USD
		construction and installation works	equipment tools, inventory	other costs	
1	2	3	4	5	6
Part 1					
1.	Preparation of the construction site, 5% of item 2	29121			29121
2.	Expenditures on industrial buildings and structures.	582410	-		582410
3.	Expenses for electromechanical equipment (equipment and construction and installation)	419157	2346659		2765816
4.	Costs for tools and equipment (Mechanical workshop)		86575		86575
5.	Unaccounted expenses (5% of items 1,2,3)				173196
6.	The cost of supplying power lines (3.5 km) - Tanesco				125000
7.	TOTAL for part 1:	1030688	2433234	0	3637118
Part 2					
8.	Design and survey work				454640
9.	TOTAL for part 2:				454640
10.	GRAND TOTAL:	1030688	2433234	0	4116758

3. Calculation of operating costs for ore dressing

№	Profession	Rotation shift 15 x 15		Cost per hour , USD	Salary of one employee , USD	Monthly Salary Fund , USD	Annual Salary Fund , USD
		Total number of employees per month	Number of hours per person.				
<i>Main prom staff</i>							
1	Master of Shift	4	165,00	6,06	1000,00	4000,0	48000,0

2	Crusher	2	165,00	1,15	189,75	379,5	4554,0
3	Screeners	2	165,00	0,95	150,00	300,0	3600,0
4	Miller MSC and MSHTS	4	165,00	1,25	206,25	825,0	9900,0
5	Miller's assistant	4	165,00	0,95	156,75	627,0	7524,0
6	Concentrator on tables	4	165,00	1,25	206,25	825,0	9900,0
7	Assistant Concentrator	4	165,00	0,95	156,75	627,0	7524,0
8	Miller-concentrator p / p	4	165,00	1,15	189,75	759,0	9108,0
9	Melter	2	165,00	1,15	189,75	379,5	4554,0
10	Water supply operator	4	165,00	1,15	189,75	759,0	9108,0
11	Chemist Laboratory Assistant	2	165,00	1,15	189,75	379,5	4554,0
12	Filtersman	4	165,00	1,00	165,00	660,0	7920,0
13	Duty fitter	4	165,00	1,15	150,00	600,0	7200,0
14	Loader driver	4	165,00	1,15	175,00	700,0	8400,0
	TOTAL	48				11820,5	141846,0
<i>Auxiliary services of the plant</i>							
3	Gas-Electro Welder	1	165,00	1,15	175,00	175,0	2100,0
4	Duty electrician	1	165,00	1,00	175,00	175,0	2100,0
5	Chef for managers	1	165,00	1,00	120,00	120,0	1440,0
6	Cook for staff	2	165,00	1,00	120,00	240,0	2880,0
8	Hardtop Driver	1	165,00	1,00	175,00	175,0	2100,0
9	Expat Guards	4	330,00	2,00	720,00	2880,0	34560,0
	TOTAL	10				3765,0	45180,0
<i>Management & Engineering staff of the plant</i>							
1	Director of the plant	1	300,00	6,67	2000,00	2000,0	24000,0
2	Power engineer	1	300,00	3,50	1150,00	1150,0	13800,0
3	Chief mechanical engineer	1	300,00	3,50	1150,00	1150,0	13800,0
	TOTAL	3				4300,0	51600,0
The total wage bill per month is:						19885,5	USD
The total wage bill per year is:						238626,0	USD

3.1. Calculation of the wages of the main production

The calculation of the wage funds of the main production is carried out on the basis of current prices, worked time or production volumes. The minimum wage in the mining industry of Tanzania is 10 USD / change 10-hour or 1 USD / hour (data for 2017). Also, the legislation and the labor inspectorate regulate working hours per week, no more than 46 hours, without lunch, with a 6-day working week. The average working time of the shift worker of the factory is 165 hours per month, which corresponds to less than 40 working hours per week.

The minimum salary level of the plant's personnel is 150 USD for 15 working days - assistant miller and concentrator (auxiliary workers). The time of work and the level of remuneration of labor meets the requirements of the labor legislation of the Republic of Tanzania. Salaries by occupation are calculated according to the norms in the metallurgical industry and the practice of enterprises in the Republic of Tanzania.

The calculation does not take into account the increased pay at night, only the average.

In addition to rotational shift workers, there are day workers on the schedule of the six-day week. Basically, it's support staff and management team.

In view of the fact that the laboratory of the plant serves the processing industry in a continuous mode, it is referred to the plant as the production structure. Accordingly, the laboratory staff is listed in the factory staff, in this case two laboratory assistants.

3.2 Calculation of energy consumption.

The power characteristics of the equipment make up a table of daily (hourly) energy consumption. The calculation of the energy consumption of production is based on the table of the section on Specification of equipment and calculation of energy consumption of production.

The annual energy consumption of the plant is 4,233,060 kW. The electric power consumption for enrichment of 1 ton of ore is 58.7925 kW.

Connection to the lines of the state company of a power generating company Tanzania Electric Supply Company Limited (TANESCO). Diesel power plants with the option of connecting power from power lines, generating companies, are a backup power source.

Calculation of the cost of electricity generated by the ‘Tanesco’ generating company

The cost of electricity at tariffs "TANESCO" 118 shillings / kW, Tanzanian shilling rate is: 2200 TZH = 1 USD

Name of item	Unit of measure	Rate of consumption, unit / 1000 tons of ore	Quantity, thousand tons	Price, \$/t	Cost, \$
1	2	3	4	5	6
Plant productivity per ore, per year		1000 tones	72,000		
Fuels and lubricants :					
lubricating oils	tones	0,0310	2,232	3000	7440,0
Lining of crushers:					
Lining of plates and cones	tones	0,1000	7,200	2500	20000,0
Lining of mills:					
Lining of MIIIQ 1.5 x 3.0, manganese steel	tones	0,75	8,0000	2000	12000,0
Lining MIIIQ 2,1 x 3,0, rubber	tones	0,375	2,8000	9000	8391,6
Lining MIIIQ 0,9 x 1,8, rubber	tones	0,375	0,5000	9000	1498,5
Materials:					
welding electrodes	tones	0,0063	0,454	1450	730,8
metalware	tones	0,0060	0,432	1450	696,0
conveyor belt	M2	0,6400	46,080	50	2560,0
steel sheet	tones	0,0430	3,096	1100	3784,0
seamless tubes	tones	0,0099	0,713	950	752,4
different paints	tones	0,0020	0,144	3000	480,0
corner	tones	0,0300	2,160	950	2280,0
metal channel	tones	0,0200	1,440	1000	1600,0
Grinding bodies - rods	tones	0,6000	43,200	1000	48000,0
Grinding bodies - balls mill	tones	1,2500	90,000	1000	100000,0
Grinding bodies - ball mill (industrial product)	tones	0,1250	9,000	1000	10000,0
I-beam	tones	0,0063	0,454	1000	504,0
round steel	tones	0,0081	0,583	1000	648,0
wire	tones	0,0045	0,324	1000	360,0
water pipes	tones	0,0117	0,842	950	889,2
water fittings	tones	0,0014	0,101	6000	672,0
rolled rubber	tones	0,0012	0,086	2870	275,5
hoses and sleeves	tones	0,0027	0,194	12000	2592,0
oxygen cylinders	tones	0,0250	1,800	35	875,0
cylinders with acetylene	tones	0,0125	0,900	70	875,0
Filter cloth	tones	0,05400	3,888	7000,0	30240,0
Reagents:					
borax	tones	0,0031	0,223	1200	297,6

glass	tones	0,0110	0,792	0	0,0
soda ash	tones	0,00006	4,320	220	1056,0
flocculant	tones	0,00002	1,440	2000	3200,0
activated carbon	tones	0,1340	9,648	-	0,0
cyanide	tones	0,1078	7,762	-	0,0
hydrated lime	tones	0,0392	2,822	-	0,0
hydrochloric acid	tones	0,0378	2,722	-	0,0
soda ash	tones	0,0098	0,706	220	172,5
				TOTAL:	262870,1

Table. Option feed 80% power line and 20% diesel power station.

Working period	Electricity consumption, kW	Power Line "TANESCO"			Diesel power station			Amount, USD
		80,00%	Cost USD/kBT	Amount, USD	20,00%	Cost USD/kBT	Amount, USD	
Plant, Day:	14110	11288,2	0,059	666,00	2822,0	0,292	824,04	1490,0
Plant, Month:	388031	310424,4	0,059	18315,0	77606,1	0,292	22661,0	40976,0
Plant, Year:	4656366	3725092,8	0,059	219780,5	931273,2	0,292	271931,8	491712,3

The cost for producing an annual amount of electricity will be 491 712.3 USD.

3.3 Annual consumption of materials

Calculation of the need for auxiliary materials

Specific consumption rates, nomenclature of reagents, is determined on the basis of the technological part of the project. The norms for the consumption of crushing bodies, lining, are adopted for unit costs per 1 tones, in accordance with the "Norms for the Design of Concentrating Mills" and according to the practice data of enterprises having a similar technological scheme and processing a similar composition of raw materials. The cost of a unit of the relevant auxiliary materials is accepted according to the current prices for 2017.

The main cost items for auxiliary materials are ball mills, rods, lining and filter cloth for filter presses. The steel lining for the core mill is to be replaced after 1.5 years, rubber for ball mills after three years of operation.

Table. Calculation of the cost of auxiliary materials.

Name of fixed assets <i>EQUIPMENT</i>	Estimated Cost, USD	Operation Rate, year	Depreciation Rate, %	Annual depreciation , USD
<i>Crushing department</i>				
Mobile Crushing Plant	272177	15	6,67%	18145,1
Vehicle for MDSK (tractor unit)	70000	15	6,67%	4666,7
<i>PLANT</i>				
The MSC mill 1.5x3.0	63975	15	6,67%	4265,0
MSC feed hopper, 15 m3 .	12795	10	10,00%	1279,5
Feeder for MSC	2761	10	10,00%	276,1
Conveyor 650 x 10 m	6648	10	10,00%	664,8
Magnetic dry separator	2385	15	6,67%	159,0
Conveyor scales on the power supply of MSC, TCE	5269	15	6,67%	351,3
Sump for draining MSC	2634	10	10,00%	263,4
Jigging machine MOD - 1M1	22963	15	6,67%	1530,8
Table -7,5	5266	10	10,00%	526,6
Table -2,0	3888	10	10,00%	388,8
Concentrator ЦБКП - 10A ,	38650	10	10,00%	3865,0
Grinder МШШЦ 2,1x3,6,	123588	15	6,67%	8239,2
TableSKO-7,5	5266	10	10,00%	526,6
TableSKO -2,0	3888	10	10,00%	388,8
Slurry pumps 4/3	6775	7	14,29%	967,9
Sump of hydrocyclone supply	2383	10	10,00%	238,3
Magnetic wet separator	5708	15	6,67%	380,6
Sump for drainingМШШЦ	2383	10	10,00%	238,3
Hydrocyclone 250	11042	13	7,69%	849,4
Concentrator Falcon C 1000	95375	15	6,67%	6358,3
Melting Furnace	4000	10	10,00%	400,0
Clearing table SKO-2,0	3888	10	10,00%	388,8
Mill МШШЦ 0,9x1,8, with smooth start-up	15050	15	6,67%	1003,3
Sump of drainage of a finishing mill	2383	10	10,00%	238,3
Slurry pumps 1/1,5	3387	7	14,29%	483,8
TableSKO -2,0	4515	10	10,00%	451,5
TableSKO -7,5	5266	10	10,00%	526,6
Storage for Industrial Products	5500	10	10,00%	550,0
Hydrocyclone 75	6148	13	7,69%	472,9
Drainage sump (pump 52)		10	10,00%	0,0
Drainage of the main site	5018	7	14,29%	716,9
Highly efficient thickener	52527	15	6,67%	3501,8
Slurry pump (drainage) - circulating water	11042	7	14,29%	1577,4
Slurry pump (thickened product)	4014	7	14,29%	573,4
Concentrator ЦБКП - 10A	19825	15	6,67%	1321,7
Tank for collecting return water	39121	10	10,00%	3912,1
Sludge for the condensed product (pump 36)	2383	10	10,00%	238,3
Tank for Flocculant	4138	10	10,00%	413,8
Vibrating Screen	10977	7	14,29%	1568,2
Chemical pump	3361	7	14,29%	480,2
Drainage (discharge into the tailing pond - reserve)	10540	7	14,29%	1505,7

Drainage sump (pump 66)		10	10,00%	0,0
Tank for collection of tailings	20810	10	10,00%	2081,0
High pressure feed pump for filter press	19900	7	14,29%	2842,9
Dry tail conveyor	24845	7	14,29%	3549,3
Filter press for tailings	86525	15	6,67%	5768,3
Drainage (tailings in the tailing pond - reserve)	7754	7	14,29%	1107,7
Drainage sump (pump 63)		10	10,00%	0,0
Sump for filtrate	3133	10	10,00%	313,3
Water supply pump to tank 38	1755	7	14,29%	250,7
Welding machine	6525	7	14,29%	932,1
Floating pumping stations	2883	10	10,00%	288,3
Water pump	3010	7	14,29%	430,0
Capacity for clean water, 15 cubic meters.	3000	10	10,00%	300,0
Submersible well pumps (WILO)	21080	7	14,29%	3011,4
Pumps for water (main)	2885	7	14,29%	412,1
Pumps for water (reserve)	4265	7	14,29%	609,3
Laboratory				
Set of equipment (Ukraine)	77358	15	6,67%	5157,2
Sample preparation equipment	22158	10	10,00%	2215,8
Equipment for technological research	28433	10	10,00%	2843,3
Electricity Generating Equipment				
Generator 3 x 500 kW	289875	15	6,67%	19325,0
Optional equipment				
Mechanical workshop - tools	86575	7	14,29%	12367,9
Electrification of the whole factory	99135	7	14,29%	14162,1
Automatization	36385	7	14,29%	5197,9
Lifting and transport equipment - 7% of the registered equipment	138867	15	6,67%	9257,8
Unrecorded equipment - 3.5% of the registered equipment.	69433	7	14,29%	9919,0
TOTAL YEAR :	2035484			177236,0

1. Transportation marine expenses are taken by 5.8% of "TOTAL", based on calculated data on the purchase of equipment.
 2. Transportation costs for Tanzania are taken 3.9% of "TOTAL", based on calculated data on the purchase of equipment.
 3. Warehouse and port expenses are accepted at a rate of 3,0% from cost of materials.
- The total incremental factor, taking into account the above mentioned costs for the delivery of auxiliary materials, is 12.7%.

The total cost of auxiliary materials will be **296 254.6 USD** / year.

3.4. Calculation of depreciation charges of fixed assets

Depreciation is determined based on the established depreciation groups and calculated norms and the estimated value of fixed assets.

Calculation example: $DR = [1 / \text{service life of fixed assets}] \cdot 100 \%$, where DR is the depreciation rate, %;

DR 1. = $[1/15] \cdot 100 = 6,7\%$;

DR 4. = $[1/13] \cdot 100 = 7,7\%$; Further, the calculation is similar.

Table. Calculation of depreciation on buildings and facilities

Buildings and facilities	Cost of building, USD	Operational Rate	Depreciation Rate, %	Annual depreciation, USD
1	2	3	4	5
Tailings storage for 6 thousand tons	56375	7	14,29%	8053,6
Wells 50 - 100 m (4 pcs. - 75 m)	41785	7	14,29%	5969,3
The construction of the laboratory building (based on 3 containers 40 feet)	30500	10	10,00%	3050,0
Hangar - the main site of the plant. Building A and Building B.	200000	15	6,67%	13333,3
Crushing department, ore warehouse, trestle - platform and hangar	60000	15	6,67%	4000,0
A filling station for generators (2 tanks, automatics, etc.)	70000	10	10,00%	7000,0
Mechanical workshop on the basis of 3 containers.	15500	10	10,00%	1550,0
Garage and industrial site (3 contacts).	25500	10	10,00%	2550,0
Fence of the perimeter of the regime zone (Plant, Laboratory)	20000	5	20,00%	4000,0
Warehouse containers.	19000	7	14,29%	2714,3
TOTAL YEAR:	538660			52220,5

3.4 Expenses for all types of repairs of process equipment

"The expense for all types of repairs" is taken in the amount of 55.00% of the depreciation of technological equipment and this amounts to: $0.55 \times 177236.0 = 97,479.8$ USD / year.

3.5 Shop Expenses

For the calculation of shop costs, the estimate of shop costs was compiled, given in the table.

Table. Estimates of shop expenses

№	Name of expenses	%	Amount, USD
1	The basic and additional salary of shop personnel		238626,00
2	Deductions for social tax - (14% income tax on salary)	14,00%	33407,64
3	Amortization of buildings and facilities of shop purpose		52220,48
4	Maintenance of buildings and facilities	2,00%	11648,20
5	Repair of buildings and facilities	0,50%	2912,05
6	Labor protection, labor protection fund, special clothing, etc..	10,00%	23862,60
7	Other costs of the workshop	5,00%	18133,85
	Total shop costs:		380810,81

Explanations to the table:

Article 1 Labor protection fund of factory employees - 238626 USD / year.

Article 2 is adopted in the amount of 14.0% of Article 1.

Article 3 is determined on the basis of the value of the objects of the shop purpose (building, structure) and the depreciation rate on them.

Article 4 is adopted in the amounts of 2.00-3.00% of the estimated value of buildings and structures for shop use (2.0% of 582410 USD).

Article 5 Repairs of buildings and structures shall be taken as 0.50 - 1.50% of the value of buildings and structures (0.50%).

Article 6 Is accepted in the amount of 10.00 - 15.00% of the salary fund of the workshop or the rate of expenditure in monetary terms per worker per year, taken from the practice of enterprises (10.00%).

Article 7 The other costs of the shop are taken in the amount of 5.00% of the sums of shop costs for articles 1-6.

3.6. Other production costs

Other production costs include all types of taxes and payments included in the cost price, and are presented in the table.

Table. Calculation of taxes (factory part) included in the cost price

Taxes and payments	The tax rate (payment)	Plant part, %	Tax amount, USD.
Land tax			0

Water reserve tax	1000	100,00%	1000
Fire Inspection	4000	50,00%	2000
Tax on the Forest Reserve		50,00%	0
and etc.			0
Total taxes and payments:			3000

3.7 Non-production costs

Non-production costs are taken from 1.50 - 2.00% of the general production cost. All the above calculations are summarized in the costing calculation below.

Table. Calculation of the cost price of ore processing. Power supply from Tanesco power lines (80%) and backup power from own diesel power plants (20%)

№	Cost items	Spending for all volume of ore processed		Spending on 1 ton of ore
		Quantity, tonnes/mec	Amount, USD	Cost, USD/tones
1	Ore, raw materials delivered for processing to the factory	80000	-	
2	Consumables for technical needs of the plant		296254,6	
3a	Power Consumption (Power transmission line) - 80%	80,00%	219780,5	
36	Power Consumption (Diesel power station) - 20%	20,00%	271931,8	
4	Amortization of process equipment		177236,0	
5	Depreciation of buildings and facilities		52220,5	
6	Expenses for all types of repairs equipment (estimated)		97479,8	
7	Salaries and Wages		238626,0	
8	Income tax (14%)		33407,6	
9	Expenses for the maintenance of factory employees		90444,0	
10	Labor protection, overalls, etc.		23862,6	
11	Other costs of the workshop		18133,8	
	Shop cost	80000	1 519 377,2	19,18
12	General factory costs		0,0	
13	Other production costs		3000,0	
14	Non-production costs		0,0	
	Total cost price :	80000	1 522 377,2	19,22

4. Calculation of the cost of ore processing at a gold plant

The only acceptable option for power consumption is power supply from Tanesco power lines (80%) and backup power from own diesel power plants (20%). This option is adopted, due to unpredictable and fairly frequent power outages on the power line.

The cost price of ore processing in the latter version is about 19.22 USD / tones. Conclusions on costing:

The main contribution to the cost of processing the ore at the plant is made by –

Power Consumption – 32,36 %

Consumables – 19,50%

Salaries & Wage and related taxes – 17,90%

Amortization and repair of process equipment – 18,08%.

The current capital assets of the plant are 152 237.7 USD (10% of the annual operating costs)