APPENDIX XI

DESIGN CRITERIA FOR A 500 T/DAY PROCESSING FACILITY

Source:
Max Molybdenum Property, Scoping Study, Capital and Operating Costs Estimate for a Grinding and Recovery Plant, Prepared for Roca Mines Inc., Prepared by International Metallurgical and Environmental Inc., December 23, 2004

DESIGN CRITERIA REVISION A SOURCE

CLIENT	Roca Mines Inc.
PROJECT	Max Molybdenum Project
DATE	16-Nov-04

1 - Client
2 - Experience
3 - Testwork
4 - Calculation
5 - Mass Balance
6 - Other

				Source	Details
A	**OPERATING SCHEDULE**				
	Process plant	shifts/d	2	1	
	(Campaign basis, target 72,000 tpy)	h/shift	12	1	
B	**PROCESS PRODUCTION**				
	THROUGHPUT (DRY BASIS)				
	Daily throughput, nominal	t/d	500	1	
	Daily throughput, design	t/d	543	4	
	Hourly throughput, nominal	t/h	21	4	
	Hourly throughput, design	t/h	23	4	
	ORE CHARACTERISTICS				
	ROM moisture content, design	%	5	2	
	Ore specific gravity		2.73	6	
	Ore bulk density (-12.7mm)	t/m^3	1.938	6	
	Ball Mill BWI	kWh/t	9.26	6	
	GRADES AND RECOVERIES				
	Feed Grade	% MoS_2	0.8 - 2.0	1	
	Final Concentrate	% MoS_2	91.0	6	
	Recovery	% MoS_2	90	6	
C	**CRUSHING**				
	Mining, crushing and screening		Contract	6	
D	**PRIMARY MILL GRINDING**				
	Mill feed rate, daily (design)	t/d	543	2	
	Mill feed rate, hourly	t/h	23	4	
	Feed F_{80}	microns	12,700	6	
	Product P_{80}	microns	106		
	Product % -75um	%	65	6	
	Mill grind density	% solids, m/m	70	5	
	Prim. Mill diameter	m	2.44	4	
	Prim. Mill length	m	3.5	4	
	Prim. Mill installed power	hp	350	4	
	Recirculating load	%	200	2	
	Estimated steel ball consumption	kg/t	0.55	6	0.15lbs/t per kWhr/t
	Estimated liner consumption	kg/t	0.055	6	10% of media consumption
	Cyclone feed density	% solids, m/m	50	6	
E	**FLOTATION**				
	Flotation Feed	tph	22.6	4	
	Flotation Feed Density	% solids, m/m	0	5	
	Rougher mass recovery	% of new feed	4.0	3	
	Scavenger mass recovery	% of new feed	1.0	3	
	1st Cleaner mass recovery	% of new feed	3.5	estimate	
	2nd Cleaner mass recovery	% of new feed	3.0	estimate	
	3rd Cleaner mass recovery	% of new feed	2.7	estimate	
	4th Cleaner mass recovery	% of new feed	2.3	estimate	
	Final Cleaner mass recovery	% of new feed	2.00	3	
	Rougher and Scavenger Cells				
	No. of cells		4	6	
	Cell type		Outokumpu OK1.5TC	6	
	Individual cell volume	m3	5	4	
	Feed flowrate	m3/hr	57	5	

DESIGN CRITERIA REVISION A SOURCE

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F	**REGRIND MILL & CLEANER FLOTATION**			
	Mill feed rate, daily (design)	t/d	25	4
	Mill feed rate, hourly	t/h	1.1	4
	Feed F_{80}	microns	106	3
	Product P_{80}	microns	45	3
	Mill grind density	% solids, m/m	70	2
	Regrind Mill Bond Work Index (149um)	kWh/t	3.0	3
	Regrind Mill diameter	m	0.9	4
	Regrind Mill length	m	1.83	4
	Regrind Mill installed power	hp	15	4
	Recirculating load	%	200	2
	Estimated steel ball consumption	kg/t	0.55	6
	Estimated liner consumption	kg/t	0.055	6
	Cyclone feed density	% solids, m/m	41	5
	1st Cleaner Cells			
	No. of cells		1	
	Cell type		OK1.5-TC	
	Individual cell volume	m3	1.5	
	2nd Cleaner Cells			
	No. of cells		1	
	Cell type		OK1.5-TC	
	Individual cell volume	m3	1.5	
	3rd Cleaner Cells			
	No. of cells		1	
	Cell type		OK1.5-TC	
	Individual cell volume	m3	1.5	
	4th Cleaner Cells			
	No. of cells		1	
	Cell type		OK1.5-TC	
	Individual cell volume	m3	1.5	
	Final Cleaner Cells			
	No. of cells		1	
	Cell type		Column	
	Individual cell volume	m3	2.0	
	Thickener			
	Thickener feed rate	tph	23	5
		m3/hr	54	5
	pH		8.3	3
	Thickener unit area required	m2/t/24h	0.087	3
	Thickener area	m2	65	4
	Safety factor	%	50	2
	Calculated thickener diam.	m	9.1	4
	Flocculant addition	kgs/t	0.01	3
G	**FILTRATION**			
	Filter type		Shriver 800x800mm	6
	Concentrate production	tph	0.45	4
	Filter cake moisture	%	10	6
H	**REAGENTS**			
	Dowfroth 250	kg/t	0.04	3
	Pine oil	kg/t	0.03	3

Roca Mines Inc.
Max Molybdenum Project
Mill Circuit Modelling

		500 tonnes per day	
		Primary Ball Mill	Regrind Ball Mill
Mill Power Required:			
Daily Feed Tonnage	tpd	500	25
Mill Availability	%	92	92
Mill Feed Rate	tph	23	1.13
Feed Size F80	um	12,700	106
Discharge Size P80	um	106	45
Ball Mill Work Index	kWh/t	9.26	3.0
Transmission Loss Factor		1.05	1.05
Unit Power Consumption	kWh/t	8.98	6.70
Mill Power Required	kW	203	7.6
Mill Power Required	HP	273	10
Mill Power Installed	HP	**300**	**15**
Mill Size Calculation:			
Mill Diameter	ft	8	3
Mill Length	ft	11.5	6
Mill Diameter Inside Liners	ft	7	2.5
Mill Length Inside Liners	ft	10.5	5.5
Volume Inside Mill	ft^3	404	27
Percent Volume Load	%	40	30
Ball Loading, tons	t	23.4	1.2
Percent of Mill Critical Speed	%	70	70
Mill Speed, rpm		20.3	33.9
Bulk Density of Charge	lb/ft^3	290	290
Makeup Ball Diameter	inches	3	1
Ball Size Factor		0.98	0.31
Kilowatts per tonne	kW	8.56	6.72
Mill Power Draw	kW	201	7.9
Mill Power Draw	HP	269	10.6

CLIENT Roca Mines Inc
PROJECT Max Molybdenum Project
DATE 24-Nov-04

PROCESS MASS BALANCE
DATE 16-Nov-04
Revision A

MILL THROUGHPUT	**500**	TONS PER DAY
CRUSHER AVAILABILITY	**75%**	
CRUSHER OPERATING TIME	**24**	HOURS
MILL AVAILABILITY	**92%**	
FEED SOLIDS S. G.	**2.73**	

STREAM NO.	DESCRIPTION	SOLIDS tph	% SOLIDS	SOLN tph	SOLIDS SG	SLURRY tph	SOLIDS m3/h	SOLN m3/h	SLURRY m3/h	SLURRY S.G.	DETAILS
	CRUSHING (16 HRS PER DAY)										
10	R.O.M FEED TO CRUSHER	27.8	95.0	1.5	2.73	29.2	10.2	1.5	11.6	2.51	
	GRINDING										
20	PRIMARY MILL NEW FEED	22.6	95.0	1.2	2.73	23.8	8.3	1.2	9.5	2.51	
21	BALL MILL CIRCULATING LOAD	45.3	70.0	19.4	2.73	64.7	16.6	19.4	36.0	1.80	200% circulating load
22	TOTAL FEED TO MILL	67.9	70.0	29.1	2.73	97.0	24.9	29.1	54.0	1.80	70% mill density
23	MILL INLET DILUTION			8.5				8.5			
24	CYCLONE DILUTION			37.8				37.8			
25	CYCLONE FEED	67.9	50.0	67.9	2.73	135.9	24.9	67.9	92.8	1.46	50% solids - cyclone feed
26	CYCLONE OVERFLOW	22.6	31.8	48.5	2.73	71.2	8.3	48.5	56.8	1.25	
27	CYCLONE UNDERFLOW	45.3	70.0	19.4	2.73	64.7	16.6	19.4	36.0	1.80	
28	GSW CYCLONE FEED PUMP			1.0				1.0			
	RO/SCAV FLOTATION										
30	ROUGHER CELL FEED	22.6	31.8	48.5	2.73	71.2	8.3	48.5	56.8	1.25	
31	ROUGHER CONC	0.9	30.0	2.1	2.73	3.0	0.3	2.1	2.4	1.23	
32	SCAVENGER CONC	0.2	30.0	0.5	2.73	0.8	0.1	0.5	0.6	1.23	30% solids in conc stream
	REGRIND MILL AND CLEANER FLOTATION										
40	REGRIND MILL NEW FEED	1.1	30.0	2.6	2.73	3.8	0.4	2.6	3.1	1.23	65 % solids cyclone u/f
41	REGRIND MILL CIRCULATING LOAD	2.3	65.0	1.2	2.73	3.5	0.8	1.2	2.0	1.70	100% mill density
42	CYCLONE FEED	3.4	41.1	4.9	2.73	8.3	1.2	4.9	6.1	1.35	200% circulating load
43	GSW REGRIND MILL CYCLONE FEED PUMP			1.0				1.0			55% solids - cyclone feed
44	CYCLONE OVERFLOW	1.1	23.7	3.6	2.73	4.8	0.4	3.6	4.1	1.18	1.00 m3/hour
45	CYCLONE UNDERFLOW	2.3	65.0	1.2	2.73	3.5	0.8	1.2	2.0	1.70	
46	Ist CLEANER CELL FEED	1.1	23.7	3.6	2.73	4.8	0.4	3.6	4.1	1.18	
47	Ist CLEANER CONC	0.8	23.7	2.5	2.73	3.3	0.3	2.5	2.8	1.18	
48	Ist CLEANER TAILS	0.3	23.7	1.1	2.73	1.4	0.1	1.1	1.2	1.18	
49	2nd CLEANER CONC	0.7	23.7	2.2	2.73	2.9	0.2	2.2	2.4	1.18	
50	3rd CLEANER CONC	0.6	23.7	2.0	2.73	2.6	0.2	2.0	2.2	1.18	
51	4th CLEANER CONC	0.5	23.7	1.7	2.73	2.2	0.2	1.7	1.9	1.18	
52	FINAL CONC	0.5	23.7	1.5	2.73	1.9	0.2	1.5	1.6	1.18	
	TAILINGS THICKENER										
60	THICKENER FEED	21.5	31.9	45.9	2.73	67.4	7.9	45.9	53.8	1.25	
61	THICKENER UNDERFLOW	21.5	65.0	11.6	2.73	33.1	7.9	11.6	19.5	1.70	65% thickener density
62	THICKENER OVERFLOW WATER			34.3				34.3			
											90% solids filter product
	CONCENTRATE FILTER										
71	FILTER PRODUCT	0.5	90.0	0.1	2.73	0.5	0.2	0.1	0.2	2.33	
72	FILTRATE RECYCLED			1.4				1.4			
	TAILINGS										
80	FINAL TAILS	21.5	65.0	11.6	2.73	33.1	7.9	11.6	19.5	1.70	
81	WATER RECYCLED			9.8				9.8			85% water recovery
82	EVAPORATION			1.7				1.7			

ROCA MINES INC - MAX MOLYBDENUM PROJECT
EQUIPMENT LIST
Process Plant

	Size	HP	QTY	UNIT
Feed hopper (shop fab)	25t		1	ea
Bin feed conveyor 600mm	60	15	1	lot
Mill storage bin	200m3		1	ea
Vibrating feeder		1	1	ea
Mill feed conveyor (600mm)	20m	5	1	lot
Mill feed conveyor belting (600mm)	600mm		50	m
Feed conveyor VFD drive			1	ea
Conveyor brush assembly (24")			1	ea
Mill feed hopper			1	ea
Weightometer			1	ea
Prim. Mill incl. Motor	8' diam x 12'	350	1	ea
Ball charge			24	t
Compressor		7.5	1	ea
Mill discharge pump box			1	ea
Primary Cyclone feed pump PP01	HR100	15	1	ea
Primary Cyclone feed pump (standby)	HR100	15	1	ea
Cyclopak			1	lot
Rougher flotation cells	5m3	20	2	ea
Scavenger flotation cells	5m3	20	2	ea
Scavenger concentrate recycle pump		3	1	ea
Scavenger Tails pumpbox			1	ea
Scavenger Tails pump PP05	HR75	7.5	1	ea
Scavenger Tails pump PP05 (standby)	HR75	7.5	1	ea
Regrind Mill discharge pump box			1	ea
Regrind Mill incl. Motor	4' diam x 7'	15	1	ea
Ball charge			3	t
Regrind Cyclone feed pump PP03	HR50	5	1	ea
Regrind Cyclone feed pump (standby)	HR50	5	1	ea
Cyclopak			1	ea
Flotation pumps (various, total 8 units)	HR50	24	8	ea
1st Cleaner cell	1.5m3	7.5	1	ea
2nd Cleaner cell	1.5m3	7.5	1	ea
3rd Cleaner cell	1.5m3	7.5	1	ea
4th Cleaner cell	1.5m3	7.5	1	ea
Final Cleaner cell	2m3 column	7.5	1	ea
Filter feed tank (shop fab)	2.4m diam x 2.4m		1	ea
Filter feed tank agitator	10		1	ea
Filter	Shriver 800x800mm	20	1	lot
Filter Feed pump			incl	
Filtrate pump		3	1	ea
Tailings thickener	10m diam	5	1	ea
Thickener underflow pump PP06	HR50	5	1	ea
Thickener underflow pump PP06 (standby)	HR50	5	1	ea
Process water tank (field fab)	10m diam		1	ea
Mill water pump PP07	HR100	7.5	1	ea
Mill water pump PP07 (standby)	HR100	7.5	1	ea
GSW tank (shop fab.)	4.2m diam		1	ea
GSW pump		5	2	ea
GSW pump (standby)		5	1	ea
Reagent storage tanks and pumps		2	1	lot
Spillage pumps	VS50L	6	3	ea

Concrete - slab on grade 20m x 20m x 200mm			80	m3
Concrete - mill foundations			60	m3
Rebar - mill foundations, slab, pads			10	t
Concrete - equipment pads			10	m3
Steel structure and flooring			25	t
Cranage			1	lot

Electrical allowance			1	lot
Electrical building, MCC			1	lot
Process piping & valve allowance (10%)			1	lot
Instrumentation allowance (3%)			1	lot

TOTALS		624		