



Bergvesenet

Postboks 3021, N-7441 Trondheim

Rapportarkivet

Innlegging av nye rapporter ved: Peter

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Kommer fra ..arkiv Folldal Verk AS	Ekstern rapport nr	Oversendt fra Folldal Verk a.s.	Fortrolig pga	Fortrolig fra dato:
Tittel SKIFTESMYR HOVEDFELT Cu - ZN DEPOSIT, TENTATIVE CALCULATION				
Forfatter		Dato År 20.02. 1990	Bedrift (oppdragsgiver og/eller oppdragstaker) Outokumpu Metals & Resources	
Kommune Grong	Fylke Nord-Trøndelag	Bergdistrikt	1: 50 000 kartblad 18234	1: 250 000 kartblad Grong
Fagområde Prøvedrift, rentabilitetsberegninger	Dokument type		Forekomster (forekomst, gruvefelt, undersøkelsesfelt) Skiftesmyr	
Råstofgruppe Malm/metall	Råstofftype Cu, Zn, S			

Sammendrag, innholdsfortegnelse eller innholdsbeskrivelse

Rapporten er en rentabilitetsberegning over forekomsten på Skiftesmyr i Grong. Utvinnbare reserver er anslått til 400.000 tonn malm, med gjennomsnittlige gehalter på 1,2% Cu, 1,4% Zn og 36,6% S. Driften forutsetter mobilt oppredningsanlegg. Avslutningsvis i rapporten pekes det på at "siden påliteligheten til reserveestimatet er meget lav er resultatene til denne studien meget veiledende. rapporten har to vedlegg som danner grunnlaget for den. Disse er på finsk.

SKIFTESMYR HOVEDFELT CU-ZN DEPOSIT

TENTATIVE CALCULATION

SUMMARY

The tentative calculation of Skiftesmyr Hovedfelt Cu-Zn deposit is based on the very inadequate material obtained from H. Rosenqvist. The accuracy of the estimates is therefore less than 30 %.

The deposit is located east from the town of Grong in Norway. The distance to the Grong Mine is about 100 km and to the harbour in Namsos about 50 km.

The mineralized horizon is intersected by 11 diamond drill holes in three sections. The distance between the sections is 100 m.

The geological ore reserve estimation presented in the appendix 1 reaches only to the depth of about 85 m from the surface, because underground mining is out of any consideration.

The width of the ore vein is from 4 to 10 m and its dip is about 70-80 degrees.

The geological reserves are:

640 000 t;	Cu = 1,4 %,
	Zn = 1,6 %,
	S = 43,1 %

The open pit mining method is applied. The maximum pit depth is optimized to be 48 m. The dilution is estimated to be 15 %.

The mineable reserves are:

400 000 t;	Cu = 1,2 %,	1.33
	Zn = 1,4 %	1.57
	S = 36,6 %.	

Total waste rock mining is

1 120 000 t; i.e. O:W ratio is 1:2,8

The open pit excavation is done by a contractor.

Following concentrates are produced:

Cu-conc.	Cu = 22 %	R = 88 %
Zn-conc.	Zn = 50 %	R = 80 %
S-conc.	S = 50 %	R = 75 %

The mobilia flotation concentrator is intended to be used. The investment cost of the concentrator provided by the necessary "infra-package" is 37 Mmk. In the calculations only amortization cost of 6,0 Mmk/a is considered.

The total project life time is 4 years.

The production starts in the second year. The annual ore production is 150 000 t.

The production schedule is as follows:

Year	Feed t	Cu-conc. t	Zn-conc. t	S-conc. t
1	-	-	-	-
2	150 000	7 200	3 360	82 350
3	150 000	7 200	3 360	82 500
4	100 000	4 800	2 240	54 900

The concentrate values are as follows:

Cu-conc.	887 mk/t
Zn-conc.	1 404 "
S-conc.	100 "

Metal prices used are:

Cu =	7,6 mk/kg
Zn =	4,2 "

The results of the feasibility calculations are presented in the appendices 1 and 2. The project is not economically feasible primarily because of low ore grade and small reserves but also for low metal prices used.

Present value of the cash flow is -7,7 Mmk and present value of operating margin is 13,2 Mmk.

The feasibility of the project is more sensitive to the operating costs and concentrate values than to the investment costs.

For instance, if Cu-price were 8,7 mk/kg and the NSR of S-conc. 125 mk/t at the same time, the IRR would be 10 % (= interest rate used in calculation). All presented figures are on pre-tax basis.

Because the reliability of the ore reserve estimation is very low, the results of this study are very tentative.

APPENDICES

- 1 Bases of the study
- 2 OKKALA calculations

CC OMS/TV, EMS, JJR, IH

SKIFTESMYR HOVEDFELT/ TENTATIVE CALCULATION
THE BASES OF THE STUDY

1. ORE RESERVE

PROF.	TONNES	Cu %	Zn %	S %	WASTE t
4900	89000	1.3	1.6	44.9	150000
5000	140000	1.9	1.1	43.3	630000
5000	247000	1.2	1.6	42.0	
5100	167000	1.5	2.1	43.6	340000
TOTAL GEOL.	643000	1.4	1.6	43.1	1120000
0.53	340790	1.4	1.6	43.1	
0.15	60139	0	0	0	
TOTAL MINEABLE	400929	1.2	1.4	36.6	1120000

ACCORDING TO THE ROUGH MANUAL OPEN PIT OPTIMATION THE MAX. PIT DEPTH
IS 48 m.

2. CONCENTRATING

2.1. MOBILIA

IT IS ASUMED THAT MOBILIA CONCENTRATOR COULD BE USED AT THE SITE.
TOTALLY THREE COCENTRATES ARE PRODUCED: Cu-CONC.
Zn-CONC
S-CONC.

THE ESTIMATION OF FLOTATION RESULTS IS BASED ON EXPERIENCE IN
FLOTATION OF SIMILAR ORE TYPES.

2.1.1. PRODUCTION

Cu-CONC.

YEAR	FEED t	GRADE OF THE FEED			CONCENTRATES		
		Cu %	Zn %	S %	Cu t	R-%	Cu-%
1	0						
2	150000	1.2	1.4	36.6	7200	0.88	22
3	150000	1.2	1.4	36.6	7200	0.88	22
4	100000	1.2	1.4	36.6	4800	0.88	22
						19200	

Zn-CONC.

YEAR	FEED t	GRADE OF THE FEED			CONCENTRATES		
		Cu %	Zn %	S %	Zn t	R-%	Zn-%
1	0						
2	150000	1.2	1.4	36.6	3360	0.8	50

retrieving = 80%

3	150000	1.2	1.4	36.6	3360	0.8	50	
4	100000	1.2	1.4	36.6	2240	0.8	50	2

8960

S-CONC.

YEAR	FEED t	GRADE OF THE FEED		CONCENTRATES			
		Cu %	Zn %	S %	SC t	R-%	S-%
1	0						
2	150000	1.2	1.4	36.6	82350	0.75	50
3	150000	1.2	1.4	36.6	82350	0.75	50
4	100000	1.2	1.4	36.6	54900	0.75	50

219600

2.1.2. CONCENTRATE PRICE

CuC			
Cu	1596 mk/t	Cu	7.6 mk/kg = 12.16 w/t
TC	-315 mk/t	U. DEDUCT	1 %
RC	-204 mk/t	TC	315 mk/t
PENALTY	-40 mk/t	RC	0.97 mk/kg
FREIGHT	-150 mk/t	PENALTY	40 mk/t
		FREIGHT	150 mk/t
	887.3 mk/t		

ZnC			
Zn	1764 mk/t	Zn	4.2 mk/kg 6.72 w/t
TC	-170 mk/t	U. DEDUCT	8 %
RC	0 mk/t	TC	170 mk/t
PENALTY	-40 mk/t	RC	0 mk/kg
FREIGHT	-150 mk/t	PENALTY	40 mk/t
		FREIGHT	150 mk/t
	1404 mk/t		

SC			
SR	200 mk/t	SR	200 mk/t
FREIGHT	-100 mk/t	FREIGHT	100 mk/t
	100 mk/t		

3. INVESTMENTS

MINE	1.0 Mmk		
INFRA	4.0 Mmk		
MOBILIA	37.0 Mmk	=	6.0 Mmk/a
WORKING C	4.8 Mmk		AMORTIZATION

4. OPERATING COSTS

MINE ORE	12 mk/t
MINE WASTE	10 mk/t
MILL	46 mk/t
GENERAL	10 mk/t
TOTAL	96 mk/t

5. RESULTS OF FEASIBILITY CALCULATIONS (OKKALA)

3

REVENUE	51.6 Mmk
OPERATING COST	38.4 Mmk
OPERATING MARGIN	13.2 Mmk
PRESENT VALUE OF OP.MARG	10.5 Mmk
TOTAL CAPEX	21.0 Mmk
PRESENT VALUE OF CASH FLOW	-7.7 Mmk
INTERNAL RATE OF RETURN	-50 %
(INTEREST RATE	10 %)

6. SENSITIVITY

THE FOLLOWING CHANGES RAISE THE IRR TO THE LEVEL OF INT.RATE.

CAPEX	-42 %	
OPERATING COST	-26 %	
CONC. VALUE CUR	60 %)	CONC.VALUE=NSR
CONC. VALUE SR	45 %)	
CONC.VALUE (CUR+ SR)	25 %)	

SKIFTESMYR CU,ZN-DEP 9.2.90.IH(SKIFT)

KAIVOKSEN ELINIKÄ: 4 VUOTTA

KORKOKANTA: 10.00 %

VEROKANTA: 0.00 %

VAIHTOKURSSI: 1.000

VOOSI	MALMIN MR TN/VOOSI	RAAKUN MR TN/VOOSI	MALMIN LOUHINTA MK/TN	RAAKUN LOUHINTA MK/TN	RIKASTUS KUSTANNUS MK/TN	YHTEIS KUSTANNUKSET MK/TN
1	0	0	12.00	10.00	46.00	10.00
2 - 3	150000	400000	12.00	10.00	46.00	10.00
4	100000	320000	12.00	10.00	46.00	10.00

MORE...

RIKASTEIDEN MAARAT TN:

VOOSI	CUR	ZNR	SR
1	0	0	0
2 - 3	7200	3360	82350
4	4800	2240	54900

RIKASTEIDEN RAHDIT MK/TN:

VOOSI	CUR	ZNR	SR
1 - 4	0.000	0.000	0.000

RIKASTEIDEN KOSTEUKSET %:

VOOSI	CUR	ZNR	SR
1 - 4	6.000	6.000	6.000

MORE...

RIKASTEIDEN METALLIPITOISUUDET:

UR-RIKASTE:

VOOSI	CUR %
1 - 4	100.000

MR-RIKASTE:

VOOSI	ZNR %
1 - 4	100.000

SR-RIKASTE:

VOOSI	SR %
1 - 4	100.000

VUOSI	CU MK/KG	AU MK/G	AG MK/G	NI MK/KG	CO MK/KG	ZN MK/KG	CD MK/KG
1 - 4	6.699	0.000	0.000	0.000	0.000	4.199	0.000

MORE...

VALINNAISTEN RIKASTEIDEN HINNAT MK/TN:

VUOSI	CUR	ZNR	SR
1 - 4	887.00	1404.00	100.00

INVESTOINNIT:

VUOSI	MAARA MMK	POISTOTAPA	POISTOPROS. TAI -MAARA
1	5.000	MENOJAANNOSPOISTO	0.00
2	6.000	MENOJAANNOSPOISTO	0.00
2	4.800	MENOJAANNOSPOISTO	0.00
3	6.000	MENOJAANNOSPOISTO	0.00
4	4.000	MENOJAANNOSPOISTO	0.00
4	-4.800	MENOJAANNOSPOISTO	0.00

JAANNOSARVO MMK: 0.000

MORE...

KIFTESMYR CU,ZN-DEP 9.2.90.IH(SKIFT)

VUOSI	CUR-RIKASTE		ZNR-RIKASTE		SR -RIKASTE	
	MR	TN ARVO MMK	MR	TN ARVO MMK	MR	TN ARVO MMK
1	0	0.000	0	0.000	0	0.000
2 - 3	7200	6.386	3360	4.717	82350	8.235
4	4800	4.258	2240	3.145	54900	5.490
YHT.	19200	17.030	8960	12.580	219600	21.960

VUOSI	TUOTANNON ARVO MMK	KYTTKUST (ROYALTY = 0.00 %) MMK	KYTTKATE MMK	POISTOT MMK	VEROT MMK	KYTTKATE VEROJEN JLKEEN MMK
1	0.000	0.000	0.000	0.000	0.000	0.00
2 - 3	19.339	14.200	5.139	0.000	0.000	5.139
4	12.893	10.000	2.893	0.000	0.000	2.893
YHT.	51.570	38.400	13.170	0.000	0.000	13.170

MORE...

HANKINTA

KUMULAT.

KASSAVIRTA

KUMULAT.
KASSAVIRTA

1	5.000	-5.000	-5.259	-5.000	-5.259
2	10.800	-5.661	-11.751	-5.661	-11.751
3	6.000	-0.861	-13.862	-0.861	-13.862
4	-0.800	3.693	-11.399	3.693	-11.399

3

YHT. 21.000 MMK

LASKELMAT ILMAN VEROJA:

KYTTKATTEEN NYKYARVO 10.468 MMK
KASSAVIRRRAN NYKYARVO -7.701 MMK

MORE...

SISINEN KORKO -50.35 %
INVESTOINNIT EIVAT MAKSA ITSEAAAN TAKAISIN.
(KORKO 10.00 %)

VEROT MUKANA:

KYTTKATTEEN NYKYARVO 10.468 MMK
KASSAVIRRRAN NYKYARVO -7.701 MMK
SISINEN KORKO -50.35 %
INVESTOINNIT EIVAT MAKSA ITSEAAAN TAKAISIN.
(KORKO 10.00 %)

HALUATKO SEURAAVAN TULOSTUKSEN TIEDOSTOON K/E

VM READ

-50,10,50

SKIFTESMYR CU,ZN-DEP 9.2.90.IH(SKIFT)

MUUTTUJAN INVE		ENNEN VEROJA:	
		KASSAVIRRRAN	KYTTKATTEEN
		NYKYARVO	NYKYARVO
MUUTOS (%)	SISKO	MMK	MMK
-50.00	27.18	1.384	10.468
-40.00	5.19	-0.433	10.468
-30.00	-12.59	-2.250	10.468
-20.00	-27.31	-4.067	10.468
-10.00	-39.71	-5.884	10.468
-0.00	-50.35	-7.701	10.468
10.00	-59.59	-9.517	10.468
20.00	-67.72	-11.334	10.468
30.00	-74.94	-13.151	10.468
40.00	-81.41	-14.968	10.468
50.00	-87.25	-16.785	10.468

MORE...

SKIFTESMYR CU,ZN-DEP 9.2.90.IH(SKIFT)

4

		ENNEN VEROJA:	
MUUTTUJAN MENO		KASSAVIRRRAN	KYTTKATTEEN
		NYKYARVO	NYKYARVO
MUUTOS (%)	SISKO	MMK	MMK
-50.00	50.96	7.470	25.638
-40.00	35.77	4.436	22.604
-30.00	18.67	1.402	19.570
-20.00	-0.81	-1.632	16.536
-10.00	-23.39	-4.666	13.502
-0.00	-50.34	-7.701	10.468
10.00	-84.29	-10.735	7.434
20.00	131.92	-13.769	4.400
30.00	-	-16.803	1.366
40.00	-	-19.837	-1.668
50.00	-	-22.871	-4.702

MORE...

0,50

SKIFTESMYR CU,ZN-DEP 9.2.90.IH(SKIFT)

		ENNEN VEROJA:	
MUUTTUJAN RIAR		KASSAVIRRRAN	KYTTKATTEEN
(CUR)		NYKYARVO	NYKYARVO
MUUTOS (%)	SISKO	MMK	MMK
0.00	-50.35	-7.701	10.468
10.00	-37.81	-6.353	11.816
20.00	-26.28	-5.005	13.163
30.00	-15.60	-3.658	14.511
40.00	-5.64	-2.310	15.858
50.00	3.69	-0.962	17.206

HALUATKO SEURAAVAN TULOSTUKSEN TIEDOSTOON K/E

VM READ

0,10,50

SKIFTESMYR CU,ZN-DEP 9.2.90.IH(SKIFT)

		ENNEN VEROJA:	
MUUTTUJAN RIAR		KASSAVIRRRAN	KYTTKATTEEN
(ZNR)		NYKYARVO	NYKYARVO
MUUTOS (%)	SISKO	MMK	MMK
0.00	-50.35	-7.701	10.468
10.00	-40.98	-6.705	11.463
20.00	-32.19	-5.710	12.459
30.00	-23.91	-4.714	13.454
40.00	-16.07	-3.719	14.450
50.00	-8.62	-2.723	15.445

VM READ

0,10,50

SKIFTESMYR CU,ZN-DEP 9.2.90.IH(SKIFT)

MUUTTUJAN RIAR (SR) MUUTOS (%)	ENNEN SISKO	VEROJA:	
		KASSAVIRRRAN NYKYARVO MMK	KYTTKATTEEN NYKYARVO MMK
0.00	-50.35	-7.701	10.468
10.00	-34.37	-5.963	12.206
20.00	-20.01	-4.225	13.943
30.00	-6.92	-2.487	15.681
40.00	5.11	-0.750	17.419
50.00	16.22	0.988	19.157

HALUATKO SEURAAVAN TULOSTUKSEN TIEDOSTOON K/E

VM READ

SKIFTESMYR CU,ZN-DEP 9.2.90.IH(SKIFT)

MUUTTUJAN RIAR
(CURMUUTOS (%)
0.00

MUUTTUJAN RIAR (SR) MUUTOS (%)	ENNEN SISKO	VEROJA:	
		KASSAVIRRRAN NYKYARVO MMK	KYTTKATTEEN NYKYARVO MMK
0.00	-50.35	-7.701	10.468
10.00	-34.37	-5.963	12.206
20.00	-20.01	-4.225	13.943
30.00	-6.92	-2.487	15.681
40.00	5.11	-0.750	17.419
50.00	16.22	0.988	19.157

MORE...

MUUTTUJAN RIAR
CURMUUTOS (%)
10.00

MUUTTUJAN RIAR	VEROJA:	
	ENNEN	KASSAVIRRRAN KYTTKATTEEN

0.00	-37.81	-6.353	11.816
10.00	-23.11	-4.615	13.553
20.00	-9.75	-2.877	15.291
30.00	2.49	-1.140	17.029
40.00	13.80	0.598	18.766
50.00	24.28	2.336	20.504

6

MUUTTUJAN RIAR
(CUR

MORE...

)
MUUTOS (%)
20.00

MUUTTUJAN RIAR (SR) MUUTOS (%)	ENNEN VEROJA:		
	SISKO	KASSAVIRRRAN NYKYARVO MMK	KYTTKATTEEN NYKYARVO MMK
0.00	-26.28	-5.005	13.163
10.00	-12.65	-3.268	14.901
20.00	-0.17	-1.530	16.639
30.00	11.33	0.208	18.376
40.00	21.99	1.946	20.114
50.00	31.91	3.683	21.852

MUUTTUJAN RIAR
(CUR

)
MUUTOS (%)
30.00

ENNEN VEROJA:

MORE...

MUUTTUJAN RIAR (SR) MUUTOS (%)	KASSAVIRRRAN KYTTKATTEEN		
	SISKO	NYKYARVO MMK	NYKYARVO MMK
0.00	-15.60	-3.658	14.511
10.00	-2.88	-1.920	16.249
20.00	8.83	-0.182	17.986
30.00	19.67	1.556	19.724
40.00	29.74	3.293	21.462
50.00	39.15	5.031	23.199

MUUTTUJAN RIAR
(CUR

)
MUUTOS (%)
40.00

MUUTTUJAN RIAR (SR) MUUTOS (%)	ENNEN VEROJA:		
	SISKO	KASSAVIRRRAN NYKYARVO MMK	KYTTKATTEEN NYKYARVO MMK

MORE...

0.00	-5.64	-2.310	15.858
------	-------	--------	--------

30.00	27.55	2.903	21.072
40.00	37.09	4.641	22.809
50.00	46.02	6.379	24.547

MUUTTUJAN RIAR
(CUR

MUUTOS (%)
50.00

MUUTTUJAN RIAR (SR) MUUTOS (%)	ENNEN VEROJA:		
	KASSAVIRRRAN	KYTTKATTEEN	
	NYKYARVO	NYKYARVO	
	SISKO	MMK	MMK
0.00	3.69	-0.962	17.206
10.00	14.90	0.775	18.944
20.00	25.31	2.513	20.682
30.00	35.00	4.251	22.419

MORE...

40.00	44.06	5.989	24.157
50.00	52.56	7.726	25.895

HALUATKO SEURAAVAN TULOSTUKSEN TIEDOSTOON K/E

VM READ