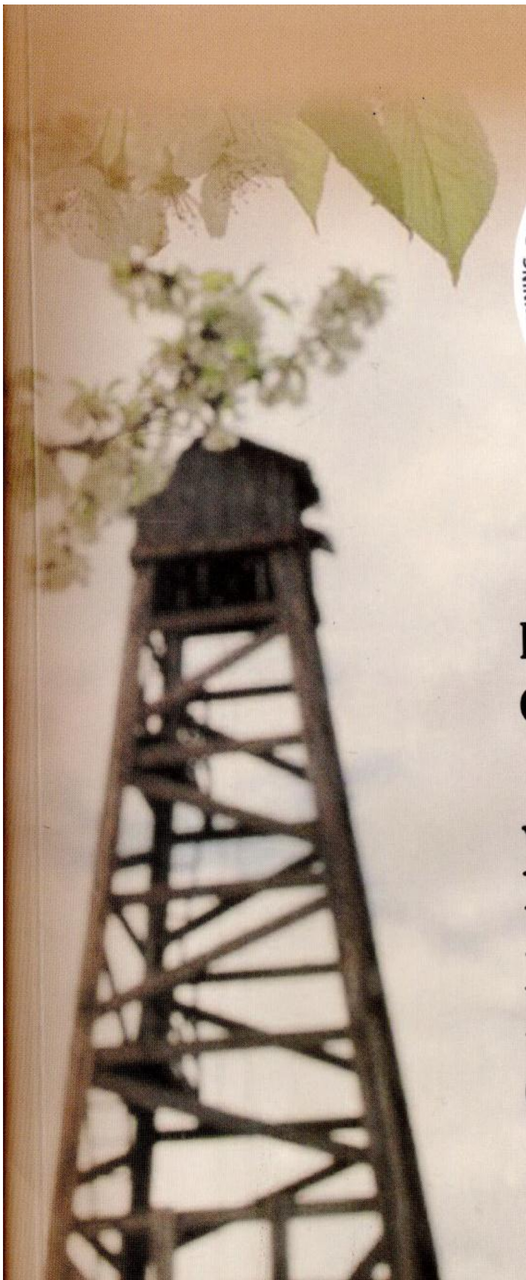

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NEW INOVATIONS AND IMPROVMENTS IN LEAD AND CONCENTRATOR FOR SELECTIVE FLOTATION FOR LEAD-ZINC MINE SASA

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Abstract: *New improvement in technological process from collective to selective lead and zinc flotation, renewed recent and advanced equipments, new flotation flowsheet with increased recovery and quality in lead and zinc concentrates. Many advantages in other sections of the concentrator, better financial results with appropriate environmental approaches with ensured conditions in tailing dam, improvement in refused mine water in the surrounding river.*

Key Words: *flowsheet, galena, sphalerite, hystograms*

1.INTRODUCTION

The ores from Sasa mine at the SvinskaReka, KozjaReka and GolemaReka ore bodies occur in three chief textural minerak types, such as most distributed compact ore , banded ore and least distributed impregnated ore. The main minerals are galena, sphalerite and pyrite, althoughtpyrhotine, chalcopyrite, magnesite, hematite, ceruzite, marmatite and other occur in small amounts as well. The gange minerals are quartz, calcite, chlorite, epidote etc. The galena and sphalerite rarely occur in the form of free grains ranging in size from 10 to 270 micrometers, while the free sphaleritechristal grains can reach a size even to 350 micrometers and galena and sphalerite ratio aproximativelly is 1:1.
Flotation separation and recovery of lead and zinc concentrates from ores containing galena (PbS) and sphalerite (ZnS) is well established and generally achieved quite effectively. Silver often provides highly significant economic value, if not the greatest value, with the silver most often associated with the galena mineralization which is fortuitous since smelters pay more for silver in lead vs. zinc concentrates. The non-values include iron sulphides such as pyrite and pyrrhotite that, while are often floatable, can be controlled. Siderite, an iron carbonate mineral, is often also associated in at least some minor quantity.
Lead flotation collectors and frother are conditioned before lead flotation which is conducted typically at near neutral to slightly elevated pH which can be increased in the cleaner circuit to ensure iron sulphide rejection. Sometimes cyanide, if can be used, is added to help depress iron sulphides. Because silver typically is mineralogically associated with galena, most of the silver values are carried with and report to the galena concentrate. Sphalerite that is rejected into the lead flotation tails is then floated in a second flotation step after activation with copper sulphate. The copper ions replace zinc atoms on the sphalerite surface creating a pseudocopper mineral surface coverage on the sphalerite which is then collected using copper flotation type collectors.
Optimum lead concentrate metallurgy and recoveries are usually achieved using a combination of a xanthate and dithiophosphates. If the galena surfaces are slightly oxidized ("tarnished"), including mercaptobenzothiazole (MBT) is often made part of the collector suite to maximize galena recoveries. Frothers used in galena flotation tend to be of the weaker type, such as MIBC, because galena is readily floatable and have high flotation kinetics. However, because of the high float kinetics and high galena mineral density, the mineral froth carrying capacity may necessitate use of a slightly stronger frother or a combination with a stronger frother component for achieving optimum metallurgical results. Normal sphalerite flotation practice is to raise flotation pH to 10-12 for enhancing the rejection of iron sulphide minerals to the sphalerite flotation tails. Many operators prefer to use an alcohol type frother in sphalerite flotation to maximize sphalerite flotation selectivity. A lower molecular weight xanthate such as NaIPX is used in combination with a less powerful dithiophosphate flotation collector, and in rare cases, a thionocarbamate flotation reagent.
If the silver is associated with the galena, the silver reports to the lead concentrate.

2. LEAD AND ZINC CONCENTRATES AND RESULT FROM FLOTATION IN SASA MINE

Lead-zinc ores in the Republic of Macedonia is processed in three flotation plants and mines:

Zletovomine, Sasa mine and Toranica mine. Former Sasa concentrator flowsheet gave the following technological results: Pb+Zn collective concentrate with average 32-34% Pb and 21-23% Zn with appropriate recoveries of 92-94% Pb and 77-80%Zn. The recent Sasa concentrator has changed flowsheet from collective to selective flotation of galena concentrate and sphalerite concentrate with following contents in concentrate from average 73-75%Pb (2,5-3,0%Zn) and average 49,5-51%Zn (1-1,5%Pb), with appropriate recoveries from cca 89-91%Pb and 89-91%Zn.

Table 1 Reagent regime in the Sasa Mine

Reagents and Materials (kg/t)	January		February		March		April	
	Plan	Fact	Plan	Fact	Plan	Fact	Plan	Fact
CaO	5,100	3,644	3,700	3,954	3,700	3,790	3,600	2,801
KEX	0,100	0,095	0,095	0,118	0,095	0,095	0,095	0,076
KAX	0,030	0,022	0,027	0,025	0,027	0,026	0,027	0,017
DOW 250	0,060	0,049	0,055	0,046	0,055	0,049	0,055	0,052
NaCN	0,060	0,057	0,060	0,050	0,060	0,043	0,060	0,032
$CuSO_4$	0,530	0,453	0,490	0,458	0,490	0,400	0,420	0,349
$NaSO_3$	0,190	0,179	0,180	0,173	0,180	0,142	0,170	0,064
$ZnSO_4$	0,160	0,145	0,160	0,155	0,160	0,110	0,160	0,081
RODS φ100	0,400	0,479	0,400	0,411	0,400	0,461	0,400	0,309
BALLS φ60	0,300	0,224	0,300	0,310	0,300	0,250	0,300	0,276
BALLS φ20	0,030	0,000	0,027	0,031	0,027	0,013	0,027	0,015

Table 2Reagent regime in the Sasa Mine

Reagents and Materials (kg/t)	May		Jun		July		August	
	Plan	Fact	Plan	Fact	Plan	Fact	Plan	Fact
CaO	3,600	2,985	4,000	2,219	3,400	1,806	3,400	1,822
KEX	0,095	0,088	0,095	0,104	0,105	0,101	0,105	0,093
KAX	0,027	0,022	0,027	0,021	0,033	0,026	0,033	0,023
DOW 250	0,055	0,031	0,040	0,037	0,040	0,035	0,040	0,038
NaCN	0,060	0,057	0,060	0,050	0,060	0,043	0,060	0,032
$CuSO_4$	0,420	0,350	0,480	0,340	0,400	0,270	0,400	0,280
$NaSO_3$	0,170	0,005	0,060	0,125	0,140	0,101	0,140	0,111
$ZnSO_4$	0,160	0,066	0,100	0,097	0,110	0,094	0,110	0,087
RODS φ100	0,400	0,369	0,400	0,313	0,400	0,345	0,400	0,400
BALLS φ60	0,300	0,246	0,300	0,252	0,300	0,267	0,300	0,299
BALLS φ20	0,027	0,041	0,027	0,017	0,027	0,031	0,027	0,029

Table 3Reagent regime in the Sasa Mine

Reagents and Materials (kg/t)	September		October		November		December	
	Plan	Fact	Plan	Fact	Plan	Fact	Plan	Fact
CaO	2,200	1,807	2,400	2,076	2,400	2,090	2,400	2,401
KEX	0,105	0,089	0,100	0,102	0,095	0,095	0,095	0,076
KAX	0,033	0,024	0,030	0,024	0,027	0,026	0,027	0,017
DOW 250	0,067	0,056	0,060	0,048	0,055	0,049	0,055	0,055
NaCN	0,040	0,033	0,045	0,035	0,045	0,043	0,045	0,032
$CuSO_4$	0,340	0,296	0,380	0,324	0,380	0,340	0,380	0,349
$NaSO_3$	0,125	0,107	0,130	0,090	0,130	0,100	0,130	0,065
$ZnSO_4$	0,100	0,077	0,110	0,078	0,100	0,085	0,100	0,085
RODS φ100	0,400	0,480	0,400	0,433	0,400	0,420	0,400	0,365
BALLS φ60	0,300	0,474	0,300	0,315	0,300	0,250	0,300	0,300
BALLS φ20	0,027	0,015	0,027	0,015	0,027	0,013	0,027	0,015

Table 4 Lead and Zinc contents in appropriate concentrates

Months 2010	GALENA KONCENTRATE		SPHALERITE CONCENTRATE	
	Pb%	Zn%	Pb%	Zn%
January	76,2	2,7	1,3	50,1
February	77,5	2,8	1,5	51,2
March	76,5	3,0	1,3	50,8
April	76,5	3,2	1,0	50,0
May	74,5	3,0	1,1	49,5
Jun	72,5	2,8	0,8	51,0
July	74,0	2,6	0,8	50,8
August	73,5	2,8	1,0	51,0
September	74,5	3,0	1,1	51,5
October	75,5	2,9	1,3	51,2
November	75,0	2,6	1,1	50,7
December	75,5	2,3	1,0	51,0

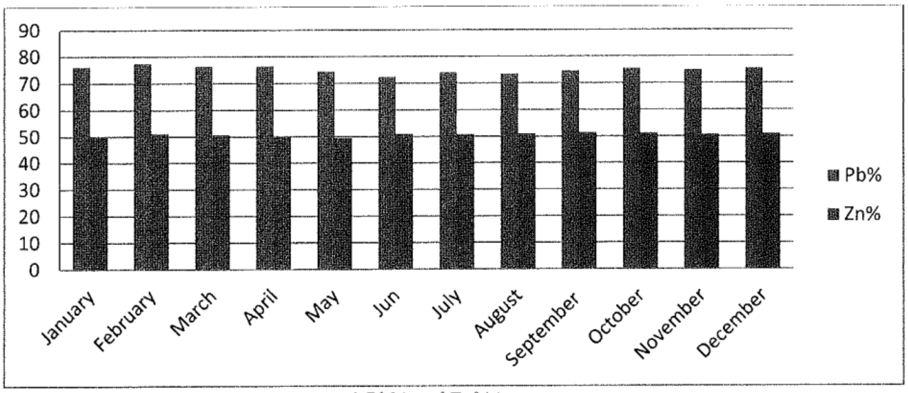

Figure 1.Pb% and Zn% in concentrates

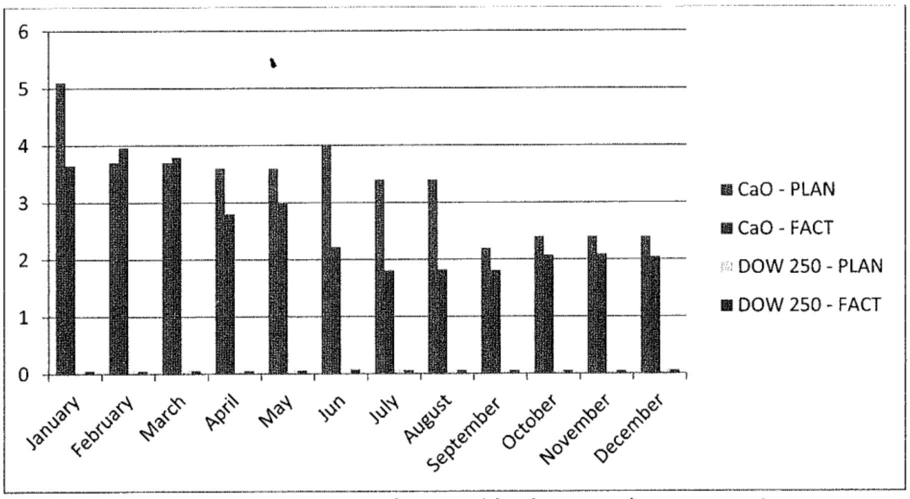

Figure 2. The ratio of CaO and DOW 250 by planning and true consumption

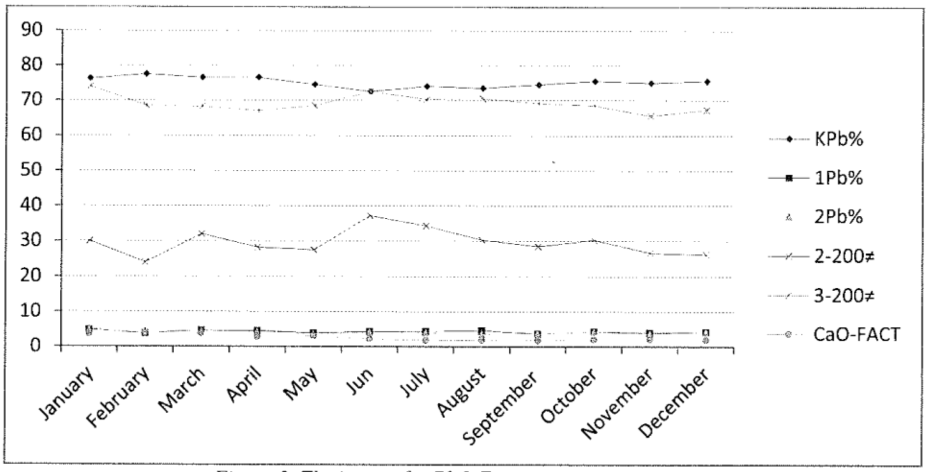

Figure 3. The impact for Pb& Zn contents in concentrates

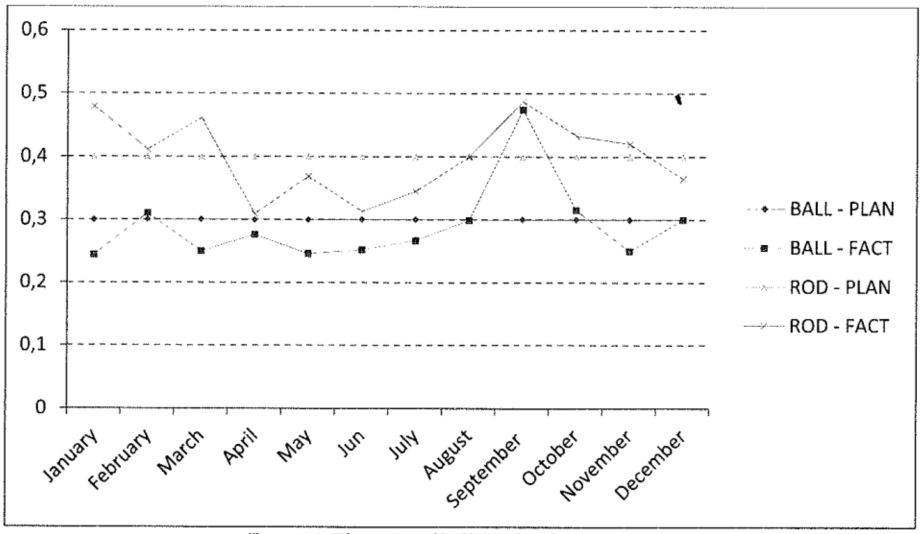

Figure 4. The ratio of balls and rods consumption

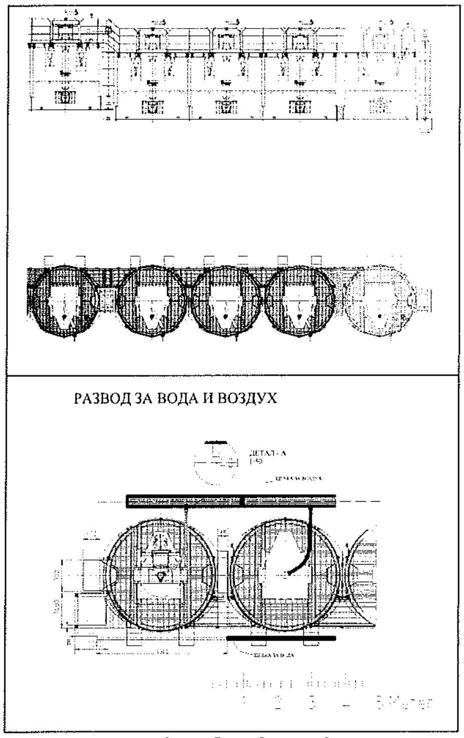

Figure 5. Galena flowsheetin Sasa mine

3. CONCLUSION

It's evidently that recent technological flowsheet gave results with satisfactory characteristics which are needed for the metallurgical demands in the lead and zinc smelter outside from the Republic of Macedonia. The reagents regime clearly is seen from tables shown above of the paper. As a matter of fact, the results are expected after changes of flowsheets, new performance and equipment ensured from new owner of the Sasa mine with from average 73-75%Pb (2,5-3,0%Zn) and average 49,5-51%Zn (1-1,5%Pb), with appropriate recoveries from cca 89-91%Pb and 89-91%Zn.

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