



Figure No. 4

Table No. 1  
Pilot Plant Flotation Tests

Products	Weight percent	Assay, percent		Distribution, percent	
		Cu	WO <sub>3</sub>	Cu	WO <sub>3</sub>
Magnetics	3.70	0.10	<0.01	2.7	<0.1
Copper concentrate <sup>1</sup>	0.66	16.3	<0.01	75.8	<0.1
Scheelite concentrate	0.53	0.04	68.5	0.3	78.9
Final flotation tailing	95.11	0.03	0.095	21.3	21.1
Feed	100.00	0.14	0.45	100.0	100.0

<sup>1</sup> First cleaner concentrate

Table No. II  
Chemical Composition of Scheelite Concentrate, Percent

Component	Percent	Component	Percent
CaWO <sub>4</sub>	83.2	Mo	0.008
CaF <sub>2</sub>	9.2	Mn	0.013
CaCO <sub>3</sub>	2.5	Fe	2.10
Fe <sub>2</sub> O <sub>3</sub>	2.64	Cu	0.022
FeO	0.32	Be	0.004
MnO	0.02	Y	0.015
MgO	0.06	Sn	0.0015
Al <sub>2</sub> O <sub>3</sub>	0.27	Pb	<0.0005
SiO <sub>2</sub>	0.60	As	<0.005
TiO <sub>2</sub>	0.02	Sb	<0.002
V <sub>2</sub> O <sub>5</sub>	0.09	Ri	0.023
P <sub>2</sub> O <sub>5</sub>	0.09	P	0.04
Na <sub>2</sub> O	0.04	S	0.085
K <sub>2</sub> O	0.03		
	99.08		

with and without addition of metal salts, lignin-sulphonates, and quebracho were tested alone or together in various combinations. As collector sodium oleate was utilized throughout. To obtain optimum results it was also necessary to choose suitable pH and pulp temperature. The best test conditions resulted in high grade rougher concentrate at 80 to 85 percent WO<sub>3</sub> recoveries.

In order to confirm laboratory results, pilot plant tests were run with a capacity of one ton per hour according to the Yxsjöberg model flowsheet given in Figure No. 4. The ore was ground in two stages to 80 percent minus some 140 microns and then pyrrhotite was dis-

carded by magnetic separation. In the first flotation step chalcopyrite and the remainder of pyrrhotite were floated off. In the second stage the rougher scheelite concentrate was cleaned twice. The results of a typical pilot plant test are summarized in Table No. 1.

The scheelite concentrate contains extremely small amounts of impurities except some fluorspar, as seen in Table No. II.

In January 1977 it was decided to go ahead with the necessary modifications for a switch-over from gravity concentration to flotation. The concentrator has been reconstructed and production went on stream with the new flowsheet in late 1977. The plant has a rated capacity of 200,000 tons per year.

References

1. Rothelius, E., *Swedish Mineral Dressing Mills*, Stockholm, 1957.
2. Klassen, V. I. and Muzkrov, V. A., *An Introduction to the Theory of Flotation*, London, Butterworth, 1961, 111-114.
3. Mitrodanov, S. I., *Solution of Some Problems Concerning the Theory and Practice of Selective Flotation in the USSR*, Proceedings, 4th International Mineral Congress Stockholm, Sweden, 1957. E.N.D.