Energy-saving flotation equipment

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Synopsis

New mechanical and pneumatic-mechanical flotation machines with axial impellers have been developed. Industrial tests show that these machines ensure lower power expenditure (on flotation) by 1.5-2.0 times as compared with reference machines (with the same or improved technological indices). Application of the newly developed axial impeller, with these advantages, is possible in any volume chambers of type OK, Dorr-Oliver, Wemko etc.

Construction and industrial scale tests

Flotation machines with axial impellers have been constructed (Figure 1).

Industrial tests have been conducted using non-ferrous ores and leachable ores, Figure 1 (a and b).

Tests have shown that flotation machines with axial impellers consume 24%–50% less energy than standard FKM-6,3; OK-3, OK-16, FPM-16 machines, with similar recoveries of non-ferrous metal ores of size 0.1 mm. Power savings of 41% or higher, than in the machine OK-16 for flotation of a coarsely ground (21%+1 mm) ores were observed.

The tests results made with standard machine FKM-6,3; OK-3; OK-16 are in Table I.

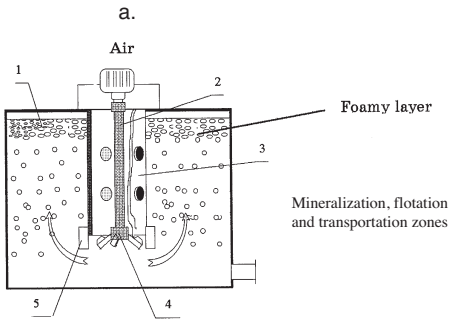

Figure 1a—Mechanical direct driving flotation machine with axial impellers
1 - chamber 2 - shaft 3 - circulatory cylinder
4 - impeller 5 - stator

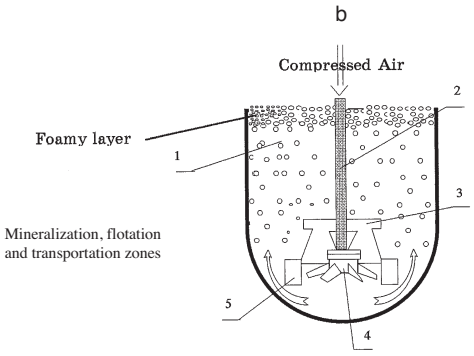

Figure 1b—The flotation machines with axial impellers. Pnematic-mechanical machine
1 - chamber 2 - shaft 3 - circulatory cylinder
4 - impeller 5 - stator

The coefficient for the effective utilization of the lifting force of air bubbles (obtained on the basis of calculated and experimental data) for the various flotation machines in operation at the main flotation plant is as follows:

FKM-6,3	98,1 kg/m^3 (100%)
FMO-6,3	98,55 kg/m^3 (~100%)
OKM-16	83,5 kg/m^3 (84,8%)
FPM-6,3	50.2 kg/m^3 (50,9%)_
OK-16	46,3 kg/m^3 (46,7%)
Mechanobr-7	32,3 kg/m^3 (38,8%).

Comparisons of the machines are characterized by the coefficient of effective utilization of volumetric space of the chambers as follows:

OKM-16	93%
FPM-6,3	80%
FMO-6,3	80%
FKM-6,3	80%
OK-16	73%.

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Table I

Results of comparative tests of standard and new flotation machines

No.	Type of flotation machine	Number of chambers	Productivity t/h	Size mm	Contents in concentrate %	Recovery %	Power consumption kW(%)	Factory year
1	FKM-6.3 FMO-6.3	12 12	280-250 230–250	15–20% +1mm	71.49KCl 71.55KCl	89.10 92.02	304.0(100) 206.1(68.2)	SKPRU-2 J.-S.C. Silvinit, November 1991
2	FKM-6.3 OK-16 OKM-16	12 4 4	240 221 238	20% +1mm	80.2KCl 76.3KCl 74.5KCl	92.20 54.10 95.16	300.0(100) 168.0(65) 104.0(34.6)	SKPRU-3 J.-S.C. Silvinit, August 1991
3	OK-3 OKM-3	4 4	25 25	-0.1mm	33.54Zn 38.01Zn	89.75 88.36	24.4(100) 11.9(49)	Pyhasilmi Finland, June 1994
4	FPM-16 (OK-16) FPMO-16 (OKM-16)	4 4	100-110 100-110	-0.1mm 0.4Cu	8.08Zn 0.4Cu 8.98Zn 5.18	14.46 4.0 18.96	68.8(100) 52.4(76)	Uchalinskaya March 1996*)

** At a factory four rear chambers have been compared on section 1 and 2*

Conclusions

Application of the newly developed axial impellers in the mechanical and pneumatic-mechanical machines, having volumes of the chambers of 3, 6,3 and 16 cubic metres, ensures that compared with the reference machines FKM-6,3, OK-16, FPM-16 the same or better metallurgical recoveries are achieved.

References

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