

Accepted Manuscript

Title: A biobjective DC programming approach to optimization of rougher flotation process

Author: Tatiana V. Gruzdeva Anton V. Ushakov Rentsen Enkhbat



PII: S0098-1354(17)30346-0
DOI: <https://doi.org/doi:10.1016/j.compchemeng.2017.10.001>
Reference: CACE 5907

To appear in: *Computers and Chemical Engineering*

Received date: 21-4-2017
Revised date: 22-9-2017
Accepted date: 3-10-2017

Please cite this article as: Tatiana V. Gruzdeva, Anton V. Ushakov, Rentsen Enkhbat, A biobjective DC programming approach to optimization of rougher flotation process, *Computers and Chemical Engineering* (2017), <https://doi.org/10.1016/j.compchemeng.2017.10.001>

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A Biobjective DC Programming Approach to Optimization of Rougher Flotation Process

Tatiana V. Gruzdeva^a, Anton V. Ushakov^{a,*}, Rentsen Enkhbat^a

^a*Matrosov Institute for System Dynamics and Control Theory, Siberian Branch of the Russian Academy of Sciences, Irkutsk 664033, Russia*

Abstract

New economic and environmental challenges have recently led to a growing interest in modern mathematical optimization and modeling techniques in order to improve the froth flotation performance. An important issue is that most of corresponding mathematical optimization models are non-convex and involve multiple criteria; hence, conventional convex optimization methods cannot guarantee finding global (Pareto) optimal solutions. We propose a deterministic bi-objective mathematical programming framework, combined with experimental design and regression analysis, to optimizing flotation performance and determining the optimal operating conditions that meet specific needs. The framework aims at maximizing concentrate grade and recovery and is based on some well-known and advanced approaches including an epsilon-constraint method, DC programming, an exact penalty method, and the special global search strategy. To demonstrate the effectiveness of the proposed approach, we present a case study for the rougher flotation process of copper-molybdenum ores performed at the Erdenet Mining Corporation Mineral Processing Plant (Mongolia).

Keywords: DC programming, multiobjective optimization, froth flotation, mineral processing, global optimization, copper

*Corresponding author

Email addresses: gruzdeva@icc.ru (Tatiana V. Gruzdeva), aushakov@icc.ru (Anton V. Ushakov), renkhat46@yahoo.com (Rentsen Enkhbat)

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