

Flotation Level Control and Optimisation



Flotation circuit stability has a significant influence on the overall economic efficiency of a mine.

Froth flotation is arguably the most commonly used process for the separation of valuable mineral from fine grained ore types. Flotation is employed in base metal operations, coal washing and in the processing of industrial minerals.

Unstable level control is a widespread cause of sub-optimal flotation performance. At MIPAC, we know from practical experience, the importance of having a stable flotation circuit, in particular stable pulp level control in flotation banks and cells. If feed-flow is reasonably steady, then a simple control strategy can be sufficient. In many concentrators though, particularly those using SAG mills for primary grinding, feed-flow rates can vary significantly. For these plants, a more sophisticated control strategy is required.

Other common factors for sub-optimal flotation circuit operation include incorrect tuning of sump and hopper level controllers; poorly configured process alarming on the Distributed Control System (DCS) or Programmable Logic Controller (PLC); poorly configured HMI; or poor management and control of circulating loads.

In our experience, many of the issues identified above can be overcome with a modest investment in appropriate advanced process control and/or advanced regulatory control strategies. Such strategies can often be implemented using the existing plant DCS or PLC, without additional capital expenditure. For example, the following factors can make a significant contribution to stable flotation level control:

- Well calibrated and maintained field level instrumentation and valves.
- Employing feed-forward and multi-variable control where required.
- Sound process control skills, particularly loop-tuning.

Stabilise Level Control and Optimise Flotation

MIPAC's proven project expertise has helped customers realise improvements in flotation circuit operation, usually without the need for additional expert or black-box systems.

MIPAC's approach can involve one or more of the following:

Perform benefits study to identify process control opportunities; Identify and correct under-performing control loops; Stabilise flotation level control using feed-forward and multivariable control techniques; Implement averaging level control in sumps/hoppers; Implement override and constraint control to manage circulating loads in the flotation circuit.

MIPAC's advanced process or regulatory control in flotation circuits can lead to:

- Better utilisation of plant operators and their skills.
- Improved disturbance rejection.
- Less variation in final concentrate grade.
- Improved metal recovery.
- Faster return in stable operation following plant start-up.



Customer Example:

Rio Tinto, Northparkes Mine, Grinding & Flotation Optimisation

In recent work at Rio Tinto's Northparkes copper and gold mine in Australia, MIPAC improved the stability of the grinding and flotation plant through improved instrumentation and control strategies.

Examples of how MIPAC achieved the improvements in plant performance, throughput and stability include:

- Designing, installing and commissioning control loops in grinding and flotation plants
- Specifying novel instrumentation solutions (Flash flotation density control)
- Training site personnel on practical loop-tuning techniques

Frequently Asked Questions

Why can flotation level control be difficult? The main reasons are usually: Poor valve maintenance (sticky action and broken positioners); Poor level measurement (sticky action, incorrect installation, and/or calibration); Inappropriate tuning; Not using all process measurements.

How accurately can flotation (Pulp) level be controlled? Routinely to within ± 5 mm of setpoint.

Can my PLC or DCS be used for flotation level control? Yes. Most modern control systems have a rich library of control blocks to build effective level control strategies. MIPAC has experience with a number of systems which can be used for flotation level control.

Are flotation level loops difficult to tune? No.

Is a "black-box" solution necessary? No, if flotation level control is the main objective then a suitable PI control algorithm with feed-forward capability is an appropriate and cost-effective solution. Signal noise filtering is sometimes required.

Are additional flow measurements required? No, although they can be used if available.

How long will it take to implement a typical system? In a typical flotation plant with around 10 level control loops this may take as little as 5 days to implement and tune.

Can a typical plant instrumentation technician keep the system going? Yes, if they are correctly trained. MIPAC can supply this training.

Can the system be monitored remotely? Yes. MIPAC can assist with remote monitoring.

What should I do prior to installation of a MIPAC level control strategy? Firstly, check your field instrumentation. This means dart or pinch valves must be working freely and level measurements must be correctly installed and calibrated. Also, all sump level measurements (usually ultrasonics) should be correctly installed and calibrated. These sump level controllers should also be correctly tuned.

MIPAC Process Advantage™

MIPAC Process Advantage™ is the application of process knowledge and appropriate automatic techniques to stabilise and optimise industrial process. At MIPAC, we combine our experience with your process knowledge to collaboratively reduce variability and inefficiency, whilst improving consistency and increasing yield. **MIPAC Process Advantage™** can be applied at any level in a control hierarchy from basic regulatory control to plant wide economic optimisation strategies. Business success in a processing or production operation is directly related to how well assets are deployed and used to generate profits. **MIPAC Process Advantage™** ensures we have a good understanding of your plant operations and that we deliver the most appropriate strategies and tools to operate your plant assets as efficiently and profitably as possible.

MIPAC is a respected provider of process control, instrumentation and electrical engineering solutions to major, complex process and production facilities. MIPAC specialises in industries such as minerals and metals processing, pulp and paper, and food and beverage. MIPAC employees are some of the industry's most talented process control engineers and we have worked on more than 100 projects in over a dozen countries.

Learn more at
www.mipac.com.au

Postal:
PO Box 3129
Hendra Q 4011
Australia

Tel: +61 7 3212 5600
Fax: +61 7 3212 5699

Email: email@mipac.com.au
Web: www.mipac.com.au

ACN 097 111 772 • ABN 66 097 111 772
Effective: May 2010