

PlantStar: Milling and Flotation Control Technical Information

Product and Technology.

During the year 2000, Mintek end up the development of PlantStar, our third generation platform for process control. During this development process the most important issue for us was to completely understand the client's needs and as consequence PlantStar was developed to allow the implementation of many control features. Therefore, in all the application cases when the needs are identified, these are analysed and the solution to satisfy them are implemented in Plantstar.

PlantStar can accommodate a group of control modules specifically dedicated to a particular unit operation. This is the case of milling where we have the Control and Optimisation module. We can also accommodate control modules for Cyanide addition control. Within Plantstar, we can also implement strategies for the stabilisation and optimisation of flotation circuits.

The technology to implement the knowledge is a combination of process models, rules in the expert system sense, special PID control loops, safety jackets to take care of restrictions and customised strategies. The WEB technology used allows us to do remote support from and also provide to the user (manager for instance) with access to monitor the system.

The technology is open, in the sense that allows the users to enhance the knowledge by adding new rules and strategies to the configuration. All these topics are included and emphasised during the training.

The PlantStar Advantage

The PlantStar represents the culmination of Mintek's efforts to produce a plant wide control platform that has the following advantages amongst others:

- Support - In-house development makes Mintek directly accountable. The PlantStar is also web-based which means Mintek can support this over the Internet or via modem.
- Configurability - This Open System does not consist of black box controllers.
- User-friendliness - The PlantStar is run from a Windows 2000 operating system, using the same object-orientated tree-structure that makes the user-interface intuitive. Clients log on with Microsoft Internet Explorer with classic Windows features like copy-and-paste, drag-and-drop, etc. making it easy to understand, maintain and/or re-configure. From the intuitive user-interface, it is possible to modify any part of the system's function. This allows the clients to use, modify and maintain the system themselves, without requiring the services of Mintek
- Stability - The PlantStar is run from a server and clients (operator stations) interface to it. This client server architecture results in a more stable and robust system with minimal interruptions to the server and hence minimal downtime of the advanced control system.
- Maintainability - The PlantStar includes auto-tuners that make tuning of advanced multivariable controllers as easy as pressing a button. Process Knowledge is sufficient and adequate to configure the plant, and develop control strategies and no programming knowledge is required.
- Adaptability - The PlantStar is easily re-configured following circuit configuration changes. As a result, having frequent changes in circuit configurations is handled in a few minutes by loading saved information or making the required change. The PlantStar platform is fully with OPC (OLE for process control) compliant. This International Compliance with OLE standard makes communication with DCS's and PLC's possible in almost every situation.

Milling Stabilising and Optimising Control.

In the milling case, the control part of this milling module takes care of the stabilisation problem by taking into consideration plant operating constraints. The optimisation part also look the operating constraints and deals with the issue of production, viz. tonnage improvement. This tonnage improvement approach also looks for the quality of the grind and establishes the best trade-off between tonnage and grind. It is left to the plant metallurgist on how to prioritise between these two.

Regarding our expertise in the milling side we have implemented control and optimisation for ROD, BALL, ROM (run of mine), milling process. The ROM is equivalent to Fully Autogenous and we can understand that this covers SAG. So, we can also do milling control for the SAG case.

Flotation Stabilising and Optimising Control.

In respect of flotation we have implemented an important number of applications for the stabilisation of levels of flotation circuits and currently we are implementing also the optimisation of this flotation unit operation. The PlantStar Flotation System combines both pulp level stabilising control to take care of short-term disturbances entering the circuit and optimising control to respond to long-term variations in the feed to the circuit. The advanced stabilising controller considers all levels simultaneously instead of acting locally. This ensures that flow disturbances do not spread throughout the entire flotation circuit. Instead, the disturbances are eliminated quickly and efficiently.

The PlantStar's Flotation Optimising Controller optimises the operation of a flotation circuit by controlling the flows of froth and pulp in the process. To ensure that the entire circuit remains at a steady-state, the PlantStar's Flotation Optimising Controller will control the flows of froth and pulp in an optimising strategy that operates above the fast-acting stabilisation of pulp levels. It will achieve this through the manipulation of pulp levels and/or aeration rates. The PlantStar's Flotation Optimising Controller will control both the froth and pulp flowrate from a flotation bank. Thus the PlantStar optimiser will ensure that the flow of concentrate and pulp is maintained at all times in a flotation circuit by choosing the optimum setpoints for the operation of the flotation banks. With flows properly controlled, the flotation banks will operate at the optimum to achieve the maximum possible grade and recovery. The PlantStar's Flotation Optimiser Controller **does NOT** require any additional instrumentation.

Benefits in Milling and Flotation

1. The improvement in production from other PlantStar milling control and optimisation installations has been in the range of 6% to 16% while maintaining a tight control on particle size around setpoint with a standard deviation within 2%. Both figures are critical and particularly important is the grind during period of times where quality of grind is more important than production, for instance when there are excess of stocks.
2. The improvement in production and size control mentioned above has been achieved while the safety jackets allow maintaining stable operation and performing under plant restrictions
3. Information gathered from other PlantStar Flotation System installations indicates that the PlantStar Flotation System can improve the recovery of a flotation circuit by anything from 0.5% to 1.3% over the existing recovery.
4. Information gathered from other PlantStar Flotation System installations indicates that the PlantStar Flotation System can reduce the time taken to reach steady-state by up to 60%. This will reduce the amount of valuable copper (or the relevant material) lost to the tailings stream during start-up.
5. With the froth and pulp flow properly controlled, the flotation banks will operate at the optimum to achieve the maximum possible grade and recovery
6. With the froth and pulp flow properly controlled, the control of reagents will be able to fit in quite easily to achieve final concentrate grades.
7. General more effective use of existing labour.

Return on investement

Despite that each case is different we have the experience of cases where the return on investment varies from three weeks to three months (in flotation) while the milling case has given a return on investment varying from two months to five months.

General

The experience of the past has been accommodated to the new technology of PlantStar. This is a very brief summary of what can be done by using PlantStar, in particular for clients interested in milling and flotation control.

The above could provide significant tangible metallurgical and operational benefits to any particular plant. During the year 2001 we completed an important number of implementation in both milling and flotation control. All milling implementations included stabilisation and optimisation while in the flotation case was the stabilisation of the flotation process. All these implementation were evaluated and accepted by the client. Mintek has been servicing the global process control industry for over 25 years. Its position as a key element of the South African minerals processing industry ensures its long-term commitment to its client.