

Sampling in concentrators

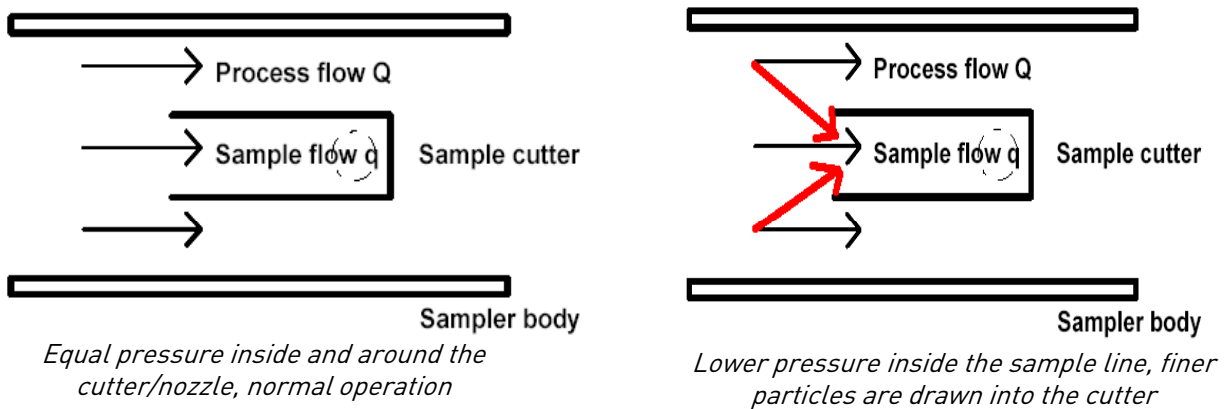
Author: Brian McPherson

In order to manage and optimize your plant, it is critical to truly understand how the plant operates. This understanding will come through accurate and efficient measurement of key performance parameters. One vital performance parameter is, of course, the metallurgical performance, and measurements of this can be carried out via sampling and analysis. This article will focus on continuous sampling, which not only saves time and money but also provides a high degree of reliability and accuracy, and is not subject to human error.

Key sampling principle

An important principle of correct sampling is the concept that all materials in a process flow must have the same probability of being part of the sample, therefore all particles must be in suspension and well mixed. If slurry velocity is greater than 1.5m/second, turbulence keeps fine particles in suspension and well mixed horizontally. The finer and lighter the solids in slurry, the more ideal the mixing. The effects of gravity will come into play when the particle size rises above 100um and/or the SG of the material is high.

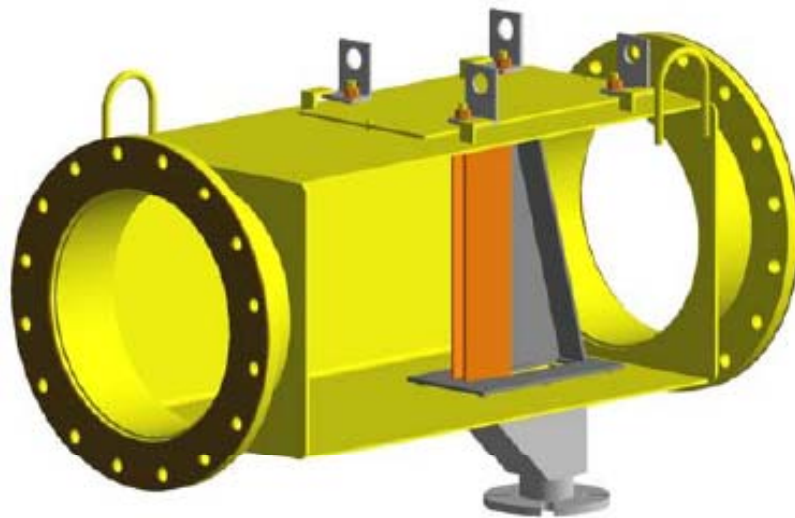
To achieve true representation of all particle sizes the velocity of the slurry should be equal both inside the sample nozzle /cutter and outside around the nozzle/cutter. For example, if the pressure inside the nozzle/cutter is lower (suction in the sample line) the sample will be biased with fine material as these smaller lighter particles are drawn preferentially into the sample nozzle/cutter.



Key considerations before choosing a sampler

There are some important issues to discuss when choosing a sampler;

- Is this sample for metallurgical accounting or process control?
- What is the destination of the process stream and sample stream?
- Are there any future changes expected in the process e.g. increased flow, process variations?
- Are there any contaminants e.g. trash, rocks, grinding media
- What is the best location for the sampler?



Launder Box Sampler, Gravity type

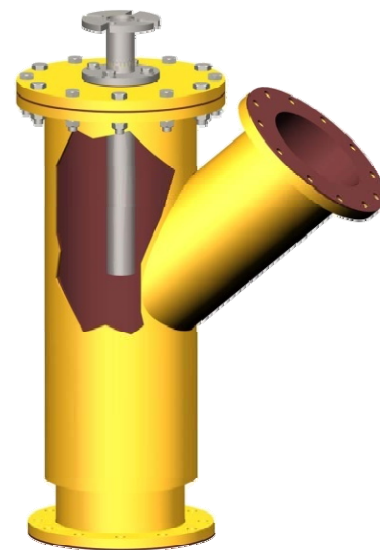
Gravity samplers

For example, if you wish to have a metallurgical quality sample it is recommended that a gravity type sampler be used. The sample volume achieved in a given time period will vary according to plant flow. This is critical to obtaining samples suitable for metallurgical accounting. A gravity sampler will give true representation of both process flow and solids content. Ideal location for these types of samplers would be at the start of the process feed; final product and final tails. The cutters on gravity samplers take an equal cut of all horizontal layers which may have different contents due to segregation.

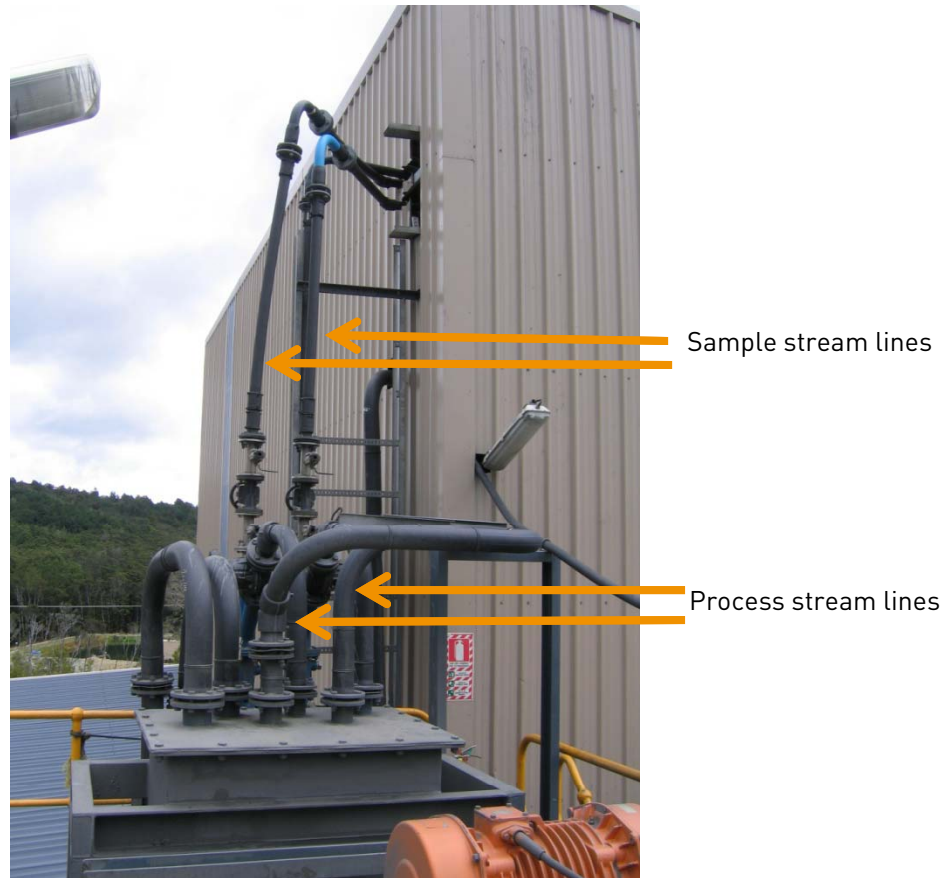
With gravity samplers it is important to ensure the line from the samplers to the pump has an atmospheric break if using pumps to deliver the sample stream to the analyser or composite point. If there is none, the sample will be compromised, i.e. the pump will dictate how much sample is to be taken. If the process flow is low, then the pump will cause lower pressure inside the cutter and so more smaller particles will be drawn into the cutter, thus biasing the sample.

Pressure samplers

Pressure type samplers are best suited to monitor process control and if positioned correctly do not require any other pumping assistance to deliver sample to the analyser or composite point. The rate of sample flow is best controlled by the diameter and length of the sample line. During installation it is important that the sample flow must not go higher than the process pipe, otherwise there is the possibility that the sample stream will not flow. At one particular site, for example, this is exactly what was installed, and shown in the following photo. One option to remedy the situation was to install a pumping stage, which had substantial cost implications. Outotec, however, suggested raising the sampler to a greater height, a solution which took just two days work and saved thousands in the process. The sampler was raised, thereby increasing the process stream height, equaling the sample discharge point which resulted in continuous sample flow.



Pressure Pipe Sampler



*Problem - sample stream is above process stream lines
 Solution - sampler subsequently raised above sample discharge point*

In summary, it is important to remember that, although the sampling cost of a project is typically low, sampling correctly is the key to successfully monitoring the metallurgical performance of the plant and achieving the best economical return. If the sampling is not of a high quality, it can have an adverse effect on the life and direction of a project. It is highly recommended that major consideration and careful planning be made when choosing sampler type, location and layout - as this small outlay in time and money will quickly reap rewards.

Brian McPherson is currently Applications Engineer- Automation for Outotec in Perth, Australia, with over 20 years experience in minerals processing. Previously, Brian worked in the Service Department in mills, thickeners, flotation, automation and training. In this current role he helps customers in Australia optimise automation and sampling installations in both new projects and brown field operations.

If you would like more information, click here to contact

brian.mcpherson@outotec.com