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A REVIEW OF GAS SPARGING IN LEACHING APPLICATIONS: WHAT WE CAN LEARN FROM FROTH FLOTATION

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ABSTRACT

With decreasing gold grades and increasing operating costs, the need for the optimisation of leaching plants is clear. Often the simplest and most effective optimisation strategies are based upon implementing existing techniques from other applications or industries. In this paper, we examine the sparging technologies that are used successfully in froth flotation and discuss their potential and current application in atmospheric gold leaching processes.

Improving gas sparging in leaching can decrease cyanide and oxygen requirements and simplify maintenance and thereby reduce the operating costs of the plant. The fundamental objective of improving the sparging in leaching processes is to increase the mass transfer of oxygen from gas to solution, this can be done by increasing bubble surface area, dispersion, or gas hold-up. Additionally, changes to the sparging system can be made to improve reliability and efficiency the system thereby reducing energy costs and downtime.

Gas sparging in leaching is typically done by simply injecting air or oxygen into the tank below the agitator at relatively low pressure, often with an inverted cone or dispersion chambers to delay the rise of and improve dispersion of the injected gas. The agitator is relied on to shear these bubbles into smaller ones. These systems require that the tank be drained to perform maintenance on or replace the system.

Bubble generation is at the core of froth flotation, bubbles are used to separate minerals by exploiting (or inducing) hydrophobic properties of minerals. As such significant effort has been put into making the sparging systems used in flotation as effective and efficient as possible. The sparging found in flotation cells are designed to create high shear environments that produce small bubbles and maximize contacting time between bubbles and particles. These include insertion style spargers that inject a high-pressure gas stream around the circumference of the cell and recirculation style systems that pump slurry through a restriction and introduce gas just prior to the restriction causing high shear. Both these systems are external to the tank and can be isolated and maintained with minimal downtime.

While the purpose of the injected gas is different for flotation, the objective of the sparging systems is the same for both leaching and flotation: the efficient generation of small, well dispersed bubbles.

Keywords: Leaching, froth flotation, gas sparging, gas injection, air, oxygen, cyanide consumption, oxygen consumption, OPEX.