

JKTech Specialist Consulting

Froth Recovery & Entrainment



JKTech can measure froth recovery and recovery via entrainment in all types of flotation cells to provide key operating information for the optimisation of plant performance.

Froth Recovery

A flotation cell has two distinct phases: the pulp phase and the froth phase.

Each phase influences the overall flotation performance in different ways but they are interrelated via a continuous recycle of material between the two phases. It is important to decouple the influence of the pulp phase from the froth phase.

The mass transfer between the collection zone and the froth zone in a flotation cell for particles that are recovered by true flotation is shown in the diagram below. The overall flotation recovery is dependent on the collection zone recovery due to true flotation (R_c) and the froth zone recovery (R_f), with respect to solids entering the froth attached to gas bubbles.

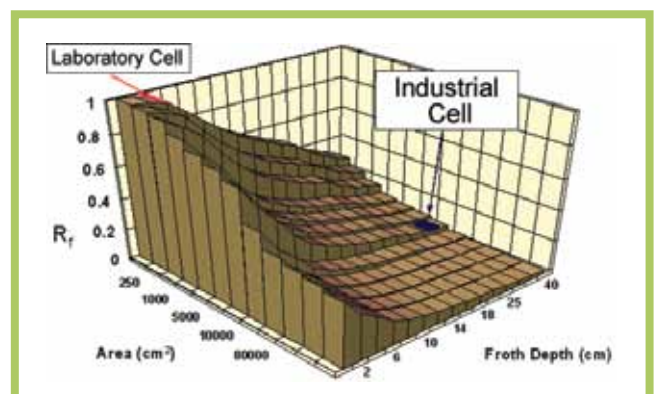
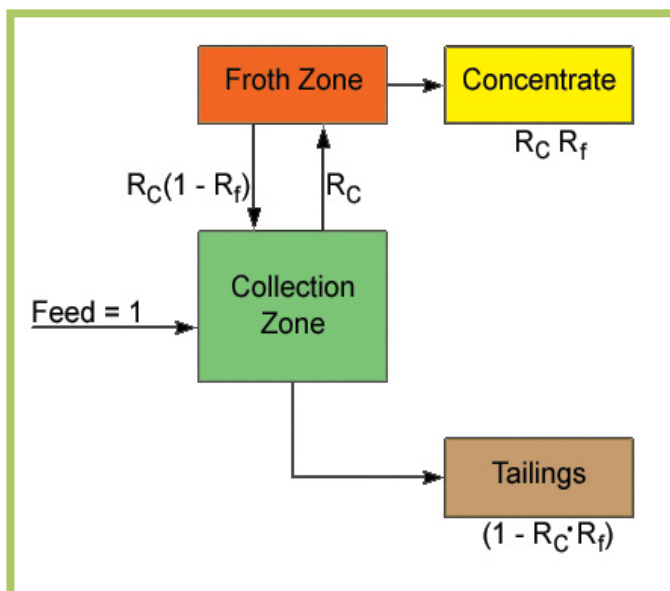
Froth recovery is defined as the recovery of particles attached to bubbles in the concentrate based on the particles attached to bubbles entering the froth phase.

Factors that affect froth recovery include frother type and concentration, froth depth, air flow rate, impeller speed and impeller design.



Using research outcomes from the AMIRA P9 Project, JKTech has developed techniques to measure and model the froth recovery in any type of flotation cell.

These techniques also measure the amount of particles on a bubble per unit volume, or bubble load. These measurements allow operating personnel to further understand the complexities of the froth phase for the optimisation of flotation plant performance.

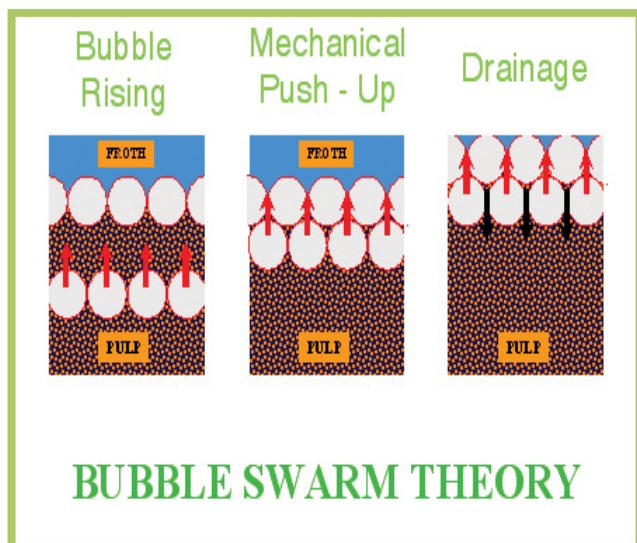


Recovery via Entrainment

Entrainment is defined as the process by which particles enter the base of a flotation froth and are transferred up and out of the flotation cell suspended in the water between bubbles.

It is the undesirable and unpreventable recovery of gangue particles that involves classification based upon size and specific gravity.

Entrainment occurs simultaneously with true flotation. The principle factors affecting entrainment are the recovery of water, the feed size distribution, the pulp percentage solids, the froth structure, the mineral specific gravity and the froth residence time.

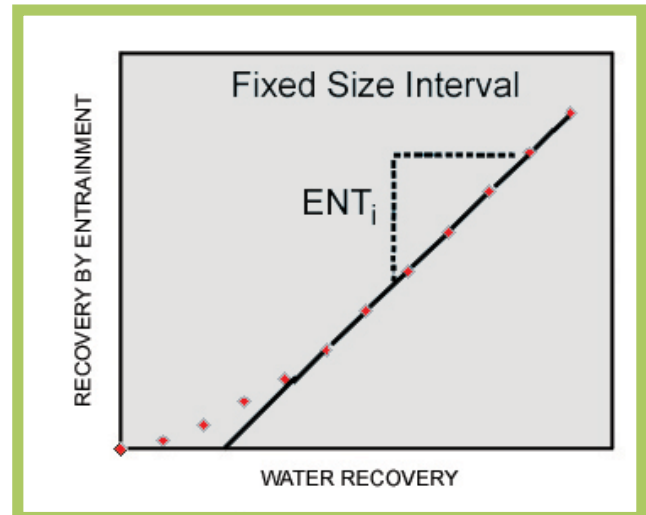


Entrainment is always detrimental to the flotation performance, resulting in a decrease in the concentrate grade.

There is a strong relationship between the recovery of entrained solids in the concentrate and the recovery of water. This relationship is linear above a certain minimum water recovery.

JKTech uses a number of techniques to determine the recovery due to entrainment, including the measurement of a known non-floating liberated tracer which if recovered to the concentrate is via entrainment only.

The measurements can also be used to develop an entrainment model which is used in the JKTech flotation optimisation methodology.



JKTech Can:

- Perform measurements of froth recovery in all types of flotation cells.
- Model the effect of froth recovery on flotation performance in terms of operating variables such as froth depth, air rate and impeller speed.
- Determine the recovery of entrained particles to the concentrate.
- Model the effect of entrainment recovery on concentrate grade in terms of particle properties such as size and density and on operating variables such as froth depth and water recovery.

JKTech Services

- Consulting (comminution, flotation, mineralogy, mining & geometallurgy)
- Process Mineralogy and In-House Instrument Analysis
- Specialist Software (JKSimMet, JKSimFloat, JKMultiBal, JKSimBlast)
- Specialist Equipment (ore breakage characterisation, flotation characterisation)
- Metallurgical Laboratory Services
- SMI Knowledge Transfer

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