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# ENGINEERING INSIGHT

**What Exactly Are You Measuring in a Flotation Cell?**

**Understanding the pulp/froth interface**

When we talk about level measurement, it is easy to think of the application as simple:

**Measure the level. Send the signal to the control system. Control the process.**

But flotation is different.

A flotation cell does not contain one clearly defined liquid surface.

There is slurry or pulp.

There is froth.

And between them is an interface that can change depending on the process conditions.

That interface is what the control system ultimately needs to know.

**LOOKING INSIDE A FLOTATION CELL**

The lower part of a flotation cell contains the pulp or slurry.

Above it is the froth layer.

Fine bubbles generated within the cell rise through the slurry and carry particles towards the froth.

As the bubbles move upwards, they coalesce and the froth structure changes.

Importantly, slurry can become trapped within the voids between the bubbles, particularly in the lower part of the froth.

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That slurry then drains back into the cell.

The result is that the boundary between pulp and froth is not always a sharp, visually obvious line.

**WHY DOES THIS MATTER?**

Because the measurement instrument does not simply need to determine **how high the material is.**

It needs to determine:

Where is the pulp/froth interface?

That is a very different measurement problem.

The amount of slurry contained within the lower froth can vary according to the flotation conditions.

As the froth characteristics change, the interface can become more difficult to define.

A measurement technology that responds to the wrong physical property can therefore produce a level indication that does not accurately represent the process condition.

**THREE FACTORS THAT CAN AFFECT LEVEL MEASUREMENT**

1. **SLURRY DENSITY**

Slurry density can change as the percentage of solids changes.

For float-based systems, a change in apparent specific gravity can cause the float to sit higher or lower even if the actual level remains unchanged.

Pressure differential systems can also respond to changes in slurry weight.

In both cases, density variation can influence the level reading.

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## 2. SOLIDS BUILD-UP

Mechanical measuring devices can become affected by solids accumulating on the measuring mechanism.

A float can become heavier.

A mechanical movement can become restricted.

A mechanism can become jammed.

The result can be a measurement that no longer responds smoothly to actual process changes.

## 3. FROTH CHARACTERISTICS

Froth is not simply an empty layer of bubbles.

Slurry can be held within the spaces between the bubbles, particularly in the lower part of the froth.

As the bubbles rise and coalesce, slurry drains back into the cell.

The amount of slurry held within the froth can therefore vary.

This can make the pulp/froth interface indistinct and difficult to measure consistently.

**SO WHAT SHOULD THE INSTRUMENT MEASURE?**

This brings us back to the fundamental engineering question:

**What physical property best identifies the pulp/froth interface?**

The **LTM-2** uses **conductivity.**

The probe is sensitive enough to detect very low concentrations of slurry.

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As the probe moves through the froth towards the pulp, the conductivity changes as the amount of conductive slurry increases.

The interface can therefore be identified at the point where there is insufficient slurry to conduct an electrical current.

This provides a measurement principle that is directly related to the presence of slurry rather than relying primarily on:

- Float position
- Slurry weight
- Mechanical movement

**WHY THE MEASUREMENT PRINCIPLE MATTERS**

Instrumentation is often selected by looking at familiar specifications:

**Range.**
**Accuracy.**
**Output.**
**Process connection.**

These are important.

But in difficult applications, the more fundamental question is:

**Does the measurement principle suit the process?**

For flotation level measurement, the process includes:

- Changing slurry density
- Variable solids concentration
- A dynamic froth layer
- Slurry retained within the froth
- Changing operating conditions

The measurement technology needs to be considered within that environment.

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## THE LTM-2 APPROACH

The LTM-2 is designed specifically for pulp/froth interface measurement.

Its published applications include:
**Bank flotation cells**
**Tank flotation cells**
**Column flotation cells**

The technology has also been tested in sump environments.

The LTM-2 therefore provides an alternative approach when conventional level measurement methods become difficult to apply reliably.

**ENGINEERING TAKEAWAY**

The most important question is not:

**“What level instrument should we use?”**

It is:

**“What exactly are we trying to measure, and what physical property best represents that measurement?”**

In flotation applications, the answer is the **pulp/froth interface**.

Understanding that measurement challenge is the first step towards selecting the right instrumentation.

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# LTM-2

## Conductivity-Based Pulp/Froth Interface Measurement

For technical information and application guidance, contact:
Instek Control (Pty) Ltd
Helping Industry Measure. Control. Improve.
www.instek.co.za \ www.LTM-2.com

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*Technical information based on LTM-2 manufacturer's published measurement information. Application suitability should be confirmed for the specific process conditions.*