

# How to Measure Liquid Concentration in Industrial Processes

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*A Practical Guide to Accurate and Reliable Measurement*

## Why Concentration Measurement Matters More Than You Think

In many industrial processes, what really matters is not just the liquid — but what's in it.

From chemical production to food processing and battery manufacturing, **liquid concentration** plays a direct role in:

- Product quality
- Process efficiency
- Cost control
- Safety and compliance

Yet, measuring concentration accurately is not always straightforward.

Variations in temperature, flow conditions, and fluid properties can all affect results. And in many cases, traditional methods are simply too slow for modern production requirements.

At **LONNMETER**, we often work with customers who are trying to move from manual testing to more reliable, real-time solutions.

This guide explains the most common methods used to measure liquid concentration — and how to choose the right one for your process.

## What Is Liquid Concentration?

In simple terms, concentration refers to the amount of a substance dissolved in a liquid.

Depending on the application, it can be expressed as:

- Percentage (%)
- Mass fraction
- Volume fraction
- Specific gravity or density-based values

In industrial environments, concentration is often used to control:

- Chemical reactions
- Mixing and blending processes
- Product formulation

## Common Methods for Measuring Liquid Concentration

There is no single method that fits all applications. The right approach depends on the type of liquid, required accuracy, and process conditions.

## 1. Density-Based Measurement

One of the most widely used methods in industry.

### How it works:

In many liquids, there is a direct relationship between **density and concentration**. By measuring density, concentration can be calculated using known correlations.

### Typical applications:

- Acids and alkalis (e.g., sulfuric acid, sodium hydroxide)
- Alcohol solutions
- Sugar solutions
- Suitable for continuous online measurement
- Reliable and stable
- Works well in industrial environments
- Requires a known relationship between density and concentration
- Less suitable for complex multi-component mixtures

### Advantages:Limitations:

This is one of the most practical methods for real-time process control.

At **LONNMETER**, our online density meters are often used as concentration meters by applying calibrated conversion models.

## 2. Refractometry

Refractometers measure how light changes direction when passing through a liquid.

### Typical applications:

- Food and beverage (sugar concentration, Brix)
- Pharmaceutical solutions
- High accuracy in clean liquids
- Fast response
- Sensitive to impurities and bubbles
- Requires clean optical surfaces
- Not ideal for harsh industrial environments

### Advantages:Limitations:

## 3. Conductivity Measurement

This method measures how well a liquid conducts electricity.

### **Typical applications:**

- Electrolytes
- Acid and alkaline solutions
- Simple and cost-effective
- Suitable for certain chemical processes
- Only works for conductive solutions
- Accuracy depends on temperature and composition

### **Advantages:Limitations:**

## **4. Laboratory Analysis**

Traditional lab testing is still widely used.

### **How it works:**

- Sample is taken from the process
- Analyzed using specialized equipment
- High accuracy
- Detailed composition analysis
- Time delay
- Labor intensive
- Not suitable for real-time control

### **Advantages:Limitations:**

Lab methods are useful for validation, but not for continuous monitoring.

## **Inline vs Offline Measurement: What's the Difference?Inline (Online) Measurement:**

- Continuous
- Real-time data
- Integrated into process control
- Periodic
- Requires sampling
- Delayed results

### **Offline (Manual) Measurement:**

In modern industrial processes, inline measurement is increasingly preferred because it allows immediate response to changes.

## **Why Density-Based Measurement Is Widely Used in Industry**

Among all methods, density-based measurement stands out for its practicality.

### **Key reasons:**

- Works directly in pipelines and tanks

- Provides continuous data
- Less sensitive to harsh conditions
- Easier to integrate into automation systems

For many applications, it offers the best balance between accuracy, reliability, and cost.

## **Key Factors That Affect Measurement Accuracy**

Regardless of the method used, several factors can influence results.

### **1. Temperature**

Temperature changes can affect both density and concentration readings.

#### **Solution:**

- Use instruments with built-in temperature compensation

### **2. Flow Conditions**

Turbulence or unstable flow can lead to fluctuating readings.

#### **Solution:**

- Install sensors in stable flow areas
- Avoid locations near pumps or strong vibration

### **3. Air Bubbles**

Gas in the liquid can distort measurements.

#### **Solution:**

- Ensure full liquid contact with the sensor
- Avoid installation points where gas accumulates

### **4. Fouling and Contamination**

Build-up on sensors can affect accuracy over time.

#### **Solution:**

- Regular cleaning and maintenance
- Proper material selection

## **Choosing the Right Method for Your Application**

When selecting a concentration measurement method, consider:

- Type of liquid (clean, corrosive, multi-component)

- Required accuracy
- Need for real-time data
- Process conditions (temperature, pressure, flow)
- Density-based measurement is preferred for continuous monitoring
- Lab methods are used for validation
- Other methods (refractometry, conductivity) are used for specific applications

**In many industrial cases:**

## How [LONNMETER](#) Supports Concentration Measurement

At **LONNMETER**, we provide solutions that combine practicality with reliability.

Our [online density meters](#) are widely used for concentration measurement in:

- Chemical processing
- Petrochemical applications
- Food and beverage production
- Battery and electrolyte industries
- Measurement range: 0–2 g/cm<sup>3</sup>
- Accuracy up to ±0.002 g/cm<sup>3</sup>
- Built-in temperature compensation
- Suitable for continuous inline operation

**Key features:**

We also support customers with:

- Application analysis
- Calibration guidance
- Integration into existing systems

## Practical Tips from Industrial Applications

From real-world experience, a few simple practices can improve results significantly:

- Always match the measurement method to the application
- Prioritize stability over extreme precision
- Ensure proper installation and maintenance
- Use inline measurement for process control whenever possible

## Conclusion: Reliable Measurement Starts with the Right Approach

Measuring liquid concentration is not just about choosing an instrument.

It's about:

- Understanding your process
- Selecting the right method
- Ensuring stable operating conditions

For many industrial applications, density-based measurement offers a reliable and practical solution — especially when real-time data is required.

### **Need Help with Concentration Measurement?**

If you're evaluating different measurement methods or looking to improve process control, it's worth reviewing your current approach.

At **LONNMETER**, we help customers find solutions that work in real operating conditions.

Visit: <https://www.lonnmeter.com/>

Contact us for:

- [Technical consultation](#)
- [Product recommendations](#)
- Fast support for industrial applications

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